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The Association of Screen Time, Television in the Bedroom, and Obesity Among School-Aged Youth: 2007 National Survey of Children's Health

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Abstract

BACKGROUND—Among school-aged youth, we sought to identify characteristics associated with (1) exceeding screen time recommendations (ie, television/videos/video games more than 2 hours/weekday), and (2) exceeding screen time recommendations, the presence of a television in the bedroom, and obesity.

METHODS—Using 2007 National Survey of Children's Health data, we used multivariable logistic regression to identify sociodemographic and behavioral characteristics associated with excessive screen time among 6 to 11- and 12 to 17-year-olds on a typical weekday. For 12 to 17-year-olds only, we used logistic regression to examine the odds of obesity using the same variables as above, with the addition of screen time.

RESULTS—Overall, 20.8% of 6 to 11-year-olds and 26.1% of 12 to 17-year-olds had excessive screen time. For both age groups, having a bedroom TV was significantly associated with excessive screen time. For the older age group, the dual scenario of excessive screen time with a bedroom TV had the strongest association with obesity (OR = 2.5, 95% CI 1.9, 3.2).

CONCLUSIONS—Given the similar risk factors for excess screen time and having a TV in the bedroom, a public health challenge exists to design interventions to reduce screen time among school-aged youth.

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Human Subjects Approval Statement

In accordance with Department of Health and Human Services (HHS) regulations (45 CFR 46), the National Center for Health Statistics Ethics Review Board and the National Opinion Research Center Institutional Review Board approved all study procedures and modifications for the 2007 National Survey of Children's Health.

Keywords

child and adolescent health; public health; physical fitness and sport; nutrition and diet

The prevalence of childhood obesity has increased over recent decades[1] and is a public health challenge because of its associations with several cardiovascular disease risk factors in childhood[2,3] and the increased likelihood of adult obesity.[4,5] One potential contributor to childhood obesity is time spent with screen media, such as viewing television (TV), videos, or video games. Three potential mechanisms linking TV viewing to weight status have been suggested: (1) TV viewing displaces physical activity; (2) increased dietary energy intake from eating while viewing or from the effects of food advertising; and (3) decreased resting metabolic rate during viewing.[6]

There are inconsistent results for the first suggested mechanism.[6] For the second mechanism, experimental studies have demonstrated direct effects, where TV viewing is positively associated with reported intakes of high-fat foods[7] and children who watched TV during 2 or more meals per day reported consuming fewer fruits and vegetables, more salty snacks, and sodas.[8] There is little support for the third suggested mechanism.[6,9]

The American Academy of Pediatrics (AAP) recommends that youth over 2 years of age spend no more than 2 hours each day with screens, and that parents do not place a TV in a child's bedroom.[10] Despite these recommendations, 8 to 18-year-olds spend approximately 7.5 hours per day with media, including TV, computers, video games, and movies; moreover, the majority of this time, 4.5 hours, is spent viewing TV.[11] Time spent watching TV is positively associated with obesity prevalence in youth;[12] this association is well documented by multiple longitudinal studies[13–15] and 2 meta-analyses.[16,17]

One factor that contributes to children and adolescents' TV-viewing time is having a TV in their bedroom. Between 1999 and 2009, the prevalence of TVs in children's bedrooms increased from 65% to 71%.[11] In 2009, it was reported that 54% of 8 to 10-year-olds and 76% of 11 to 18-year-olds had a bedroom TV. Furthermore, they found that 8 to 18-year-olds with a bedroom TV watched live TV (ie, regularly scheduled programming) about an hour more per day than those without a TV in their bedroom.[11] Other cross-sectional studies have found positive associations between having a bedroom TV and TV-viewing time for youth.[18,19] In addition to reporting more TV-viewing time, adolescents with a bedroom TV reported poorer dietary habits and fewer family meals, compared with those who did not have a TV in the bedroom;[18,19] however, longitudinal data show varying associations. Saelens et al[20] reported that having a TV in a child's bedroom was associated with increased time spent watching TV when children were younger (ie, 6 years old), but not when the children were older (ie, 12 years old). Another longitudinal study that followed 12-year-olds over a 3-year period found a positive association among boys.[21] Neither meta-analysis cited above examined the association of excessive screen time, having a TV in the bedroom, and obesity.

In this study, we used data from a nationally representative cross-sectional study and examined sociodemographic and behavioral factors associated with children aged 6 to 17

years who exceeded AAP screen time recommendations on a typical weekday. The presence of a TV in the bedroom was among the behavioral characteristics. After controlling for sociodemographic and behavioral characteristics, we then calculated the odds of obesity among 12 to 17-year-olds for those exceeding AAP screen time recommendations. Our analyses are novel because they examine the effect of exceeding AAP screen time recommendations, having a TV in the bedroom, and risk of obesity, while controlling for other characteristics.

METHODS

Participants and Instrument

We used data from the 2007 National Survey of Children's Health (NSCH), which was conducted between April 2007 and July 2008 by the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), with funding from the Maternal and Child Health Bureau of the Health Resources and Services Administration.[22,23] The survey includes data on a variety of indicators of child health and well-being.[22,23]

Procedure

A random-digit dial sample of households with landline telephones and children under 18 years of age was selected from each state and Washington, DC. The sample included approximately 1,800 households per state, with a total sample of 91,642 children from birth through 17 years of age.[22,23] The survey was conducted in English, Spanish, and 4 Asian languages.[22,23] For households with multiple eligible children, 1 child was randomly selected to be the participant of the survey. The parent or guardian who knew most about the child's health status and health care was selected as the respondent; therefore, all data are based on parental/guardian reports.

The NSCH data are weighted to be representative of noninstitutionalized children ages 0 to 17 years nationally and within each state.[23] The interview completion rate was 66%.[23]

In accordance with Department of Health and Human Services (HHS) regulations (45 CFR 46), the NCHS Ethics Review Board and the National Opinion Research Center Institutional Review Board approved all study procedures and modifications.[23]

We conducted 2 analyses. In Analysis I, we examined the association of sociodemographic and behavioral characteristics with excess screen time among 6 to 11 and 12 to 17-year-olds. We limited analyses to this age range because the screen time questions were asked only for children 6 to 17 years of age. In Analysis II, we examined the association of sociodemographic and behavioral characteristics associated with obesity among 12 to 17-year-olds only. We limited Analysis II to this age group because of the lack of accurate height and weight data for 6 to 11-year-olds.

Data Analysis

Dependent variable for analysis I—Screen time was based on the following NSCH 2007 question: "On an average weekday, about how much time does (child's name) usually

watch TV, watch videos, or play video games?" We dichotomized screen time as 2 or fewer hours per day (meeting AAP screen time recommendations) or more than 2 hours per day (exceeding AAP screen time recommendations).

Independent variables for analysis I—Sex was based on a direct question to parents/caregivers. Race/ethnicity was derived from the following questions, "Is child of Hispanic or Latino origin?" and "Is child White, Black or African American, American Indian, Alaska Native, Asian, or Native Hawaiian or other Pacific Islander?" For these analyses, we included youth whose race/ethnicity was non-Hispanic white, non-Hispanic black, or Hispanic and excluded those from the remaining race/ethnicity categories due to small sample sizes.

The Department of Health and Human Services publishes Federal Poverty Level (FPL) Guidelines to determine household poverty status. The 2007 NSCH followed these guidelines. Two variables were used to determine household poverty status: the number of people residing in a household and the total household income during the prior year.[23] The FPL categories consist of 400% FPL or greater, 200% to 399%, 100% to 199%, and 0% to 99%, where higher categories indicate higher income. Some governmental assistance programs use FPL to determine eligibility. For example, an eligibility criterion for Supplemental Nutrition Assistance Program (SNAP) benefits is a net monthly income of 100% FPL or less.[24] Because there were missing data for 8.5% of the sample for income, we used the 5 imputed data files made available by NCHS to impute household income for children with missing values. We analyzed these 5 data sets together by conducting separate analyses on them.[23] These analyses were then combined following the standard multiple imputation-combining rules.[23,25]

Physical activity was determined through the following question, "During the past week, on how many days did the child exercise, play a sport, or participate in physical activity for at least 20minutes that made [him/her] sweat and breathe hard?" Categories for analysis were 7 days, 4 to 6 days, 1 to 3 days, or never. Adequate sleep was ascertained from the following indicator, "During the past week, on how many nights did the child get enough sleep for a child (his/her) age?" Categories for analysis included 7 nights, 4 to 6 nights, 1 to 3 nights, or never. Presence of a bedroom TV was ascertained by asking, "Is there a TV in (CHILD'S NAME) bedroom?" Response categories for analyses were yes and no.

Dependent variable for analysis II—The dependent variable was obesity status, which was calculated from the following questions: "How tall is selected child now?" and "How much does selected child weigh now?" Body mass index (BMI) was then computed (BMI = weight/height^2 (kg/m^2)); obesity status was defined as a sex- and age-specific BMI greater than or equal to 95th percentile on the 2000 CDC growth charts.[26] Very short heights, very tall heights, very low weights, and very high weights were flagged in the data set by the NCHS. These extreme values represent either reporting error or identifiable characteristics (such as an extreme weight that may identify a particular child in a state) or biological implausible values (BIV), and for this reason, they were suppressed by NCHS and have been excluded from our analyses.[23] For height, BIV were z-scores less than −5 or >3, and for weight, BIV were z-scores less than −5 or >5.[27]

Independent variables for analysis II—The independent variables included the sociodemographic characteristics of sex, race/ethnicity, and FPL and the behavioral variables of physical activity, sleep adequacy, screen time, and TV in-the-bedroom status. The independent variables were as described above.

Statistical Analyses

Prevalence estimates were calculated for 3 variables: screen time >2 hours per day, for both age groups; obesity status for the older age group; and for each of the independent variables. We used *t*-tests for differences in proportions for each independent variable. This allowed us to determine if there were statistically significant differences between each category of the independent variables; differences were considered statistically significant if $p < 0.01$. Furthermore, we used logistic regression to calculate unadjusted and adjusted odds ratios (OR) for screen time >2 hours per day and obesity status.

On the basis of previous findings,[28] we tested for an interaction effect for sex × race/ethnicity among 12 to 17-year-olds and present results with this interaction term. We did not test for this interaction effect among 6 to 11-year-olds because sex was not significantly associated with screen time for this age group. In addition, we examined if there was an interaction between having a TV in the bedroom and exceeding screen time recommendations. For analyses, we used SAS-Callable SUDAAN statistical analysis software that accounted for the complex sample design.[29]

The NSCH 2007 sample included 64,076 children who were 6 to 17-years-old. We excluded those whose race/ethnicity was non-Hispanic multiracial (N = 2,776) or non-Hispanic other (N = 2,613) or missing (N = 1,091), or the response for screen time was either missing (N = 318) or the respondent did not know or refused (N = 3,067). After these exclusions, there was a total of 54,211 youth 6 to 17 years of age, with 23,416 aged 6 to 11 years and 30,795 aged 12 to 17 years. Because BMI was included for 12 to 17-year-olds only, we also excluded those who had an extreme value for height (N = 411), weight (N = 504), or both (N = 44), or were missing data to calculate BMI (N = 831). Our final sample of 12 to 17-year-olds was 29,005. With the exception of household income described above, missing data for each variable ranged from 0.02% for the TV-in-the-bedroom variable to 4.8% for the screen time variable.

RESULTS

Analysis I, children aged 6 to 11 years

For this age group, 20.8% engaged in screen time more than 2 hours per day (Table 1). We found statistically significant differences in prevalence of excess screen time for all variables examined except sex. By race/ethnicity, non-Hispanic blacks and Hispanics had the highest prevalence (37.8% and 24.4%, respectively). For FPL, the highest prevalence was among those at <100% FPL (30.9%); for physical activity participation, those who did not participate in exercise in the week preceding the survey had the highest prevalence (35%); for adequacy of sleep, those never getting enough sleep in the preceding week had

the highest prevalence (37.9%); and those with a bedroom TV had nearly double the prevalence than those who did not (27.6% and 14.7%, respectively).

Results of multivariable logistic regression show several subgroups of sociodemographic and behavioral variables were significantly associated with engaging in excessive (>2 hours per day) screen time (Table 1). Non-Hispanic black children (OR = 2.5) had significantly higher odds than Non-Hispanic white children, and children living at an FPL of <100% or 100% to 199% had higher odds than children at ≥400% FPL (OR = 1.7 and 1.6, respectively). In addition, not engaging in any physical activity the preceding week, or engaging 1 to 3 days (OR = 1.8 and 1.4, respectively) was associated with excessive screen time and children who did not get enough sleep any night in the preceding week were more likely to engage in excessive screen time, compared with children obtaining enough sleep every night in the same week (OR = 2.2). Finally, children with a bedroom TV were more likely to engage in excessive screen time per day, compared with those who had none (OR = 1.7).

Analysis I, adolescents aged 12 to 17 years

For this age group, 26.1% of 12 to 17 year olds engaged in excessive screen time (Table 2). For prevalence of screen time, t-tests found statistically significant differences within subgroups for all variables examined. The prevalence of engaging in excessive screen time varied by sex × race/ethnicity subgroup. Non-Hispanic black males and females had the highest prevalence (45.5% and 40.2%, respectively). For FPL status, the highest prevalence was found for those at <100% FPL (37.6%); for physical activity participation, those who did not participate in the week preceding the survey had the highest prevalence (38.5%); for adequacy of sleep, those never getting enough sleep in the week preceding survey had the highest prevalence (34%); and those with a TV in their bedroom had approximately 50% higher prevalence than those who did not (30.5% and 20.0%, respectively).

Multivariate logistic regression revealed that several subgroups of sociodemographic and behavioral variables were significantly associated with excessive screen time. Non-Hispanic black males (OR = 3.4) and non-Hispanic black females (OR = 2.7) had the highest likelihood of exceeding screen time recommendations, compared with non-Hispanic white females (Table 2). Youth living at less than 400% FPL also had higher odds than youth at 400% or greater FPL (<100% FPL, OR = 2.1, 100% to 199%; OR = 2.0; 200% to 399% OR = 1.6). For the behavioral variables, similar patterns were found for 12 to 17-year-olds as among 6 to 11-year-olds. Lower levels of physical activity participation were all significantly associated with higher odds of engaging in excessive screen time: Never, OR = 2.0, 1 to 3 days, OR = 1.4; never sleeping enough during the week preceding survey (OR = 1.5) and having a TV in the bedroom (OR = 1.4).

Analysis II

Among 12 to 17-year-olds, the overall obesity prevalence was 13.5%. As shown in Table 3, within each variable subgroup except for sleep, there were statistically significant differences in the prevalence of obesity. By age, obesity prevalence was highest among 12-year-olds at 18.2%. Males had a higher prevalence than females (16.7% vs. 10.0%),

Hispanics (19.3%) had the highest prevalence for race/ethnicity, as well as those living at <100% FPL (20.8%). There were variations in obesity prevalence by frequency of participation in physical activity with those who participated 1 to 3 days (15.1%) or did not participate in the previous week having the highest prevalence (14.7%). Adolescents with a TV in their bedroom and engaging in excessive screen time had nearly triple the prevalence of obesity compared with adolescents without a TV in their bedroom and meeting screen time recommendations (20.9% and 7.6%, respectively).

In multivariate logistic regression, we found several sociodemographic variables to be significantly associated with higher odds of obesity (Table 3). Children aged 12 years compared with those aged 17 years (OR = 1.8); males compared with females (OR = 1.8); non-Hispanic blacks (OR = 1.4) and Hispanics (OR = 1.6) had higher odds of obesity compared with non-Hispanic whites; and those living at a FPL below 200% (<100% OR = 2.4, 100% to 199% OR = 1.9) also had higher odds compared with youth at ≥400% FPL. For the behavioral variables, lower than daily frequencies of physical activity (Never, OR = 1.6; 1 to 3 days, OR = 1.6, 4 to 6 days, OR = 1.4) and never obtaining enough sleep (OR = 1.5) in the week preceding the survey were associated with increased odds of obesity. Last, the interaction term between having a TV in the bedroom × exceeding screen time recommendations showed that in each combination compared with the reference category, the results were significant, and that youth who had a TV in their bedroom and exceeded >2 hours per day had the highest odds of obesity (OR = 2.5).

DISCUSSION

The unique contribution of this study is that we used a nationally representative data set to examine the association between obesity status and exceeding AAP screen time recommendations and a measure of the home environment: having a TV in the bedroom. Among 12 to 17-year-olds, we found that both exceeding screen time recommendations and having a TV in the bedroom were each associated with obesity, and that the combination of having a TV in the bedroom and exceeding screen time recommendations was the strongest predictor for odds of obesity among the behavioral characteristics examined. We acknowledge that another study utilizing NSCH 2007 data examined similar variables (ie, presence of bedroom TV, screen time, and weight status), but our study is different in 2 important aspects. First, we defined excessive screen time following AAP recommendations (>2 hours/day) where Sisson et al[19] used a 1 hour cutoff for TV time. Second, we also examined obesity status (95th BMI-for-age percentile) as opposed to their examination of being at the 85th BMI-for-age percentile or greater. These findings add to the literature because even with our stricter screen time and obesity status criteria, using a nationally representative sample we still found an association among TV in the bedroom, exceeding screen time recommendations, and odds of obesity, while controlling for other factors. These findings build upon previous findings emphasizing the importance of addressing excessive screen time and having a bedroom TV.

In our study, only about 21% of 6 to 11-yearolds and 26% of 12 to 17-year-olds were reported to exceed screen time recommendations. Direct comparisons with other studies are challenging due to different definitions of screen time, methods of reporting, and age group

of sample. However, our findings are somewhat similar to those of Carlson et al[30] who found, using 2004 data, that 27% of 9 to 15-year-olds self-reported daily screen time, defined as TV viewing/video games/computer games, in excess of 2 hours.

In our study, for the younger age group, race/ethnicity and FPL were significantly associated with exceeding AAP screen time recommendations. Non-Hispanic black children engaged in more screen time, compared with non-Hispanic white children; this is consistent with previous cross-sectional studies where various forms of screen time were measured.[28,30_32] Lower income was associated with increased odds of exceeding AAP screen time recommendations, which is also consistent with previous findings.[30,32] Among 12 to 17-year-olds, sex was also significant. Our interaction term of sex × race/ethnicity revealed that non-Hispanic black males and non-Hispanic black females, Hispanic males, and non-Hispanic white males all had approximately double the odds or more for exceeding screen time recommendations than non-Hispanic white females. This follows a pattern similar to previous results, in which non-Hispanic black boys (42.8%) and girls (43.1%) had higher prevalence of watching ≥4 hours TV daily, followed by Mexican American boys (33.3%), Mexican American girls (28.3%), non-Hispanic white boys (24.3%), and non-Hispanic white girls (15.6%).[28]

Participating in physical activity 3 days a week or less was associated with exceeding AAP screen time recommendations for both age groups. Similar to our results, previous cross-sectional analyses found that youth who exceed recommended screen time limits were less likely to engage in physical activity, although Sisson et al found this association among non-Hispanic Whites only.[30,32,33]

Our sleep findings are consistent with findings by Li et al.[34] They found in a large sample of Chinese elementary children that both media in the bedroom and media use were positively correlated with shorter sleep duration.[34]

Regarding factors associated with obesity among 12 to 17-year-olds, among the sociodemographic variables, other studies have not reported an association with younger adolescents. However, our findings for sex and race/ethnicity are consistent with National Health and Nutrition Examination Survey (NHANES) data, which use measured height and weight.[1] Regarding the association between excessive screen time and obesity, our findings are consistent with Sisson et al's[35] association between excessive screen time and being overweight or obese (ie, BMI-for-age 85th percentile or above) using NSCH 2003 data of 6 to 17-year-olds. Finally, the findings regarding the association of excess screen time, having a TV in the bedroom, and obesity are consistent with a prior finding among a smaller sample of youth.[36]

Limitations

There are limitations to our findings. First, it is cross-sectional and only allows for examination of associations and not causal relationships. Second, because the respondents were parents or knowledgeable caregivers, it is possible they were unable to provide valid responses to some questions; for example, the amount of time their child spends watching TV, watching videos, or playing video games. However, prior research has shown parent

report of TV viewing is acceptable although parents tend to underestimate viewing time, especially for those children with a TV in their bedroom.[37,38] Furthermore, the questionnaire only assessed weekday TV viewing, videos and playing video games, which may lead to underestimation since viewing time may be higher on weekends than weekdays.[39] Another limitation is presence of a TV in the bedroom was not measured objectively, although due to its simplicity there is speculation this is answered fairly accurately.[21] Questions are determined by NSCH and many have not undergone psychometric testing. Third, our obesity estimates are limited by 3 factors. Age was reported in years, and the midpoint of each age group was used for calculating BMI; we excluded 959 (3.0% of analytic sample) respondents who had extreme values for height, weight, or both. Also, the respondent reported the sample child's weight and height. Despite the high correlations between measured and parent-reported weight, height, and BMI among adolescents, mean weight is typically underestimated from reported data, with larger differences between reported and measured data for females than males.[40–44] Studies have demonstrated that reported data have high specificity (92% to 99%). However, the sensitivity of self-reported data to detect obesity has ranged from 45% to 76%.[40,42,43] This low sensitivity likely accounts for the lower prevalence of obesity that we observed, compared with measured data from NHANES 2007 to 2008 showing 18.1% of adolescents aged 12 to 19 years were obese,[45] our obesity prevalence estimate from NSCH 2007 was 13.5% among adolescents aged 12 to 17 years. For younger children, we did not examine obesity status due to the 2003 NSCH experience where parents significantly underreported their child's height, which led to too many children being classified as overweight. The 2007 NSCH took measures to ensure researchers do not use these data by suppressing height and calculated BMI categorizations for children less than 10 years of age.[23] Fourth, the question on sleep is subjective. An alternative to asking about adequate sleep is asking about sleep duration to allow for comparison against the National Sleep Foundation's recommended amounts of sleep for youth.

Conclusions

In conclusion, given that more than one fifth of youth exceed screen time recommendations, and that both excess screen time *and* having a bedroom TV are associated with increased odds of obesity, a public health challenge exists to raise awareness among families and schools about the impact of excessive TV time and having a bedroom TV, and to design effective interventions to reduce screen time among youth. On the basis of our findings, interventions targeting males, non-Hispanic blacks, and those of lower FPL are needed, given the greater risks for excess screen time and obesity in these subgroups. Further research should identify modifiable family, home, and school intervention opportunities. In addition, psychometric research is needed to determine the best measures for assessing screen time and presence of a TV in the bedroom for parent-report questionnaires, especially during adolescence because parents may have less control over time use. This will help move the field forward when assessing media use.

IMPLICATIONS FOR SCHOOL HEALTH

These findings have important implications for developing youth obesity prevention programs in the school setting. Curricula could educate youth about the negative health consequences of too much screen time and having a TV in the bedroom, while school leadership could educate parents about these negative consequences. Furthermore, schools could share these findings with parents of younger elementary students to be more preventive versus reactionary. Considering how common it is to engage in excessive screen time and have a bedroom TV, even small decreases in time spent with screen media could lead to substantial impact among youth.

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Table 1

Characteristics of 6 to 11-Year-Olds Who Exceed Screen Time of 2 Hours/Day

	N	Prevalence of Exceeding >2 Hours Screen Time/Day % (SE)	Odds of Excess Screen Time	
			Unadjusted OR	Adjusted OR* (N = 23,145)†
Overall	23,416	20.8 (0.7)	—	—
Sex				
Female	11,175	20.4‡ (1.0)	Referent	Referent
Male	12,217	21.2‡ (0.9)	1.1 (0.9 to 1.2)	1.1 (0.9 to 1.3)
Race/ethnicity				
White, non-Hispanic	17,434	15.1 (0.6)	Referent	Referent
Black, non-Hispanic	2,553	37.8 (1.9)	**3.4 (2.9 to 4.1)**	**2.5 (2.0 to 3.1)**
Hispanic	3,429	24.4 (2.0)	**1.8 (1.4 to 2.3)**	1.3 (0.9 to 1.7)
Federal poverty level status				
≥400%	8,227	13.7 (1.1)	Referent	Referent
200% to 399%	8,279	17.7 (1.1)	**1.4 (1.1 to 1.7)**	1.2 (0.9 to 1.5)
100% to 199%	4,120	25.6 (1.6)	**2.2 (1.7 to 2.8)**	**1.6 (1.2 to 2.1)**
<100%	2,790	30.9 (1.9)	**2.8 (2.2 to 3.7)**	**1.7 (1.3 to 2.3)**
Days of physical activity participation				
7	8,469	18.7‡ (1.1)	Referent	Referent
4 to 6	8,474	17.5‡ (1.1)	0.9 (0.8 to 1.1)	1.1 (0.9 to 1.3)
1 to 3	5,133	24.7 (1.4)	**1.4 (1.2 to 1.8)**	**1.4 (1.1 to 1.7)**
Never	1,184	35.0 (3.5)	**2.3 (1.7 to 3.3)**	**1.8 (1.3 to 2.6)**
Number of nights with enough sleep				
7	16,359	20.5§ (0.8)	Referent	Referent
4 to 6	5,937	18.1§ (1.1)	0.9 (0.7 to 1.0)	0.9 (0.8 to 1.1)
1 to 3	724	32.0‡ (4.2)	**1.8 (1.2 to 2.7)**	1.4 (0.9 to 2.0)
Never	286	37.9‡ (6.5)	**2.4 (1.4 to 4.1)**	**2.2 (1.2 to 4.2)**
TV in bedroom				
Yes	10,245	27.6 (1.0)	**2.2 (1.9 to 2.6)**	**1.7 (1.4 to 2.1)**
No	13,170	14.7 (0.9)	Referent	Referent

*Adjusted for covariates in the table.

†N reported here lower than total N due to missing data.

‡,§Values for groups sharing a common superscript are not statistically different from each other at $p < 0.01$.

Table 2

Characteristics of 12 to 17-Year-Olds Who Exceed Screen Time of 2 Hours/Day

	N	Prevalence of Exceeding >2 Hours Screen Time/Day % (SE)	Odds of Excess Screen Time	
			Unadjusted Odds Ratio	Adjusted Odds Ratio[*] (N = 28,485)[†]
Overall	29,005	26.1 (0.7)	—	—
Sex × Race/Ethnicity[‡]				
Female, non-Hispanic White	10,715	16.2 (0.9)	Referent	Referent
Female, non-Hispanic Black	1,459	40.2[¶,**] (2.7)	**3.5 (2.7 to 4.5)**	**2.7 (2.0–3.6)**
Female, Hispanic	1,427	25.6[‖,#] (3.1)	**1.7 (1.3 to 2.4)**	1.4 (0.9–1.9)
Male, non-Hispanic White	12,081	24.9[§,#] (1.0)	**1.8 (1.3 to 2.5)**	**1.8 (1.5–2.1)**
Male, non-Hispanic Black	1,717	45.5[**] (2.4)	**4.3 (3.4 to 5.4)**	**3.4 (2.7–4.4)**
Male, Hispanic	1,606	32.9[§,‖,¶] (3.4)	**2.5 (1.8 to 3.5)**	**2.0 (1.4–2.8)**
Federal poverty level status				
≥400%	11,963	16.1 (0.8)	Referent	Referent
200% to 399%	10,038	26.5 (1.3)	**1.9 (1.6 to 2.2)**	**1.6 (1.4–2.0)**
100% to 199%	4,405	32.5[§] (1.9)	**2.5 (2.0 to 3.1)**	**2.0 (1.6–2.4)**
<100%	2,599	37.6[§] (2.0)	**3.1 (2.5 to 3.9)**	**2.1 (1.7–2.7)**
Days of physical activity participation				
7	6,315	24.1[§,‖] (1.5)	Referent	Referent
4 to 6	11,008	21.1[‖] (0.9)	0.9 (0.7 to 1.0)	1.0 (0.8–1.2)
1 to 3	8,076	28.0[§] (1.4)	1.2 (1.0 to 1.5)	**1.4 (1.1–1.8)**
Never	3,328	38.5 (2.2)	**2.0 (1.6 to 2.5)**	**2.0 (1.6–2.6)**
Number of nights with enough sleep				
7	14,769	27.3[§,‖] (1.0)	Referent	Referent
4 to 6	10,386	23.7[‖] (1.1)	0.8 (0.7 to 1.0)	0.9 (0.8–1.1)
1 to 3	2,523	24.9[§,‖] (2.1)	0.9 (0.7 to 1.1)	0.9 (0.7–1.2)
Never	1,021	34.0[‖] (3.2)	**1.4 (1.02 to 1.8)**	**1.5 (1.1–2.0)**
TV in bedroom				
Yes	15,555	30.5 (1.0)	**1.4 (1.2 to 1.6)**	**1.4 (1.2–1.6)**
No	13,449	20.0 (1.0)	Referent	Referent

[*] Adjusted for covariates in the table.

[†] N reported here lower than total N due to missing data.

[‡] Sex × Race/Ethnicity interaction term significant.

[§,**] Values for groups sharing a common superscript are not statistically different from each other at $p < 0.01$.

Table 3

Analysis II. Prevalence, Unadjusted and Adjusted Odds Ratios of Obesity Among 12 to 17-Year-Olds

	N	Prevalence of Obesity % (SE)	Odds of Obesity	
			Unadjusted OR (95% CI)	Adjusted OR (95% CI)[*](N = 28,485)[†]
Overall	29,005	13.5 (0.6)	—	—
Age				
12 years	4,155	18.2[‡] (1.7)	**1.7 (1.2 to 2.5)**	**1.8 (1.3 to 2.5)**
13 years	4,357	14.6[‡,§] (1.3)	1.3 (1.0 to 1.8)	1.3 (1.0 to 1.9)
14 years	4,754	11.6[§] (1.0)	1.0 (0.7 to 1.4)	1.0 (0.7 to 1.4)
15 years	4,788	11.8[§] (0.9)	1.0 (0.8 to 1.4)	1.0 (0.8 to 1.4)
16 years	5,352	13.6[‡,§] (1.7)	1.2 (0.8 to 1.8)	1.0 (0.7 to 1.5)
17 years	5,599	11.4[§] (1.3)	Referent	Referent
Sex				
Female	15,404	10.0 (0.7)	Referent	Referent
Male	13,601	16.7 (0.9)	**1.8 (1.5 to 2.2)**	**1.8 (1.5 to 2.2)**
Race/ethnicity				
White, non-Hispanic	22,796	10.7 (0.5)	Referent	Referent
Black, non-Hispanic	3,176	18.3[‡] (1.3)	**1.9 (1.5 to 2.3)**	**1.4 (1.1 to 1.7)**
Hispanic	3,033	19.3[‡] (2.1)	**2.0 (1.5 to 2.7)**	**1.6 (1.2 to 2.2)**
Federal poverty level status				
≥400% FPL	11,963	9.0[§] (1.0)	Referent	Referent
200% to 399% FPL	10,038	11.9[§] (0.9)	**1.4 (1.02 to 1.9)**	1.2 (0.9 to 1.7)
100% to 199% FPL	4,405	18.1[‡] (1.5)	**2.3 (1.7 to 3.1)**	**1.9 (1.4 to 2.6)**
<100% FPL	2,599	20.8[‡] (1.8)	**2.7 (1.9 to 3.7)**	**2.4 (1.8 to 3.2)**
Days of physical activity participation				
7	6,315	11.3[‡] (1.1)	Referent	Referent
4 to 6	11,008	12.8[‡] (0.9)	1.2 (0.9 to 1.5)	**1.4 (1.02 to 1.9)**
1 to 3	8,076	15.1[‡] (1.2)	**1.4 (1.1 to 1.9)**	**1.6 (1.3 to 2.1)**
Never	3,328	14.7[‡] (1.3)	**1.4 (1.02 to 1.8)**	**1.6 (1.2 to 2.1)**
Number of nights with enough sleep				
7	14,769	13.2[‡] (0.7)	Referent	Referent
4 to 6	10,386	13.3[‡] (1.0)	1.0 (0.8 to 1.2)	1.1 (0.9 to 1.4)
1 to 3	2,523	15.6[‡] (2.7)	1.2 (0.8 to 1.9)	1.2 (0.8 to 1.7)
Never	1,021	16.2[‡] (2.2)	1.3 (0.9 to 1.8)	**1.5 (1.01 to 2.1)**
TV/Videos/Video game time by tv in bedroom (BDRM)[§]				
≤2 hours/No TV BDRM	11,351	7.6 (0.6)	Referent	Referent
>2 hours/No TV BDRM	2,098	14.2[‡] (1.6)	**2.0 (1.5 to 2.7)**	**1.7 (1.2 to 2.4)**

	N	Prevalence of Obesity % (SE)	Odds of Obesity	
			Unadjusted OR (95% CI)	Adjusted OR (95% CI)*(N = 28,485)†
≤2 hours/TV BDRM	11,253	15.2‡ (1.1)	**2.2 (1.7 to 2.7)**	**1.9 (1.6 to 2.4)**
>2 hours/TV BDRM	4,302	20.9 (1.6)	**3.2 (2.5 to 4.1)**	**2.5 (1.9 to 3.2)**

*Adjusted for covariates in the table.

†N reported here lower than total N due to missing data.

‡,§Values for groups sharing a common superscript are not statistically different from each other at $p < 0.01$.

‖TV/videos/video game time × TV in bedroom interaction term significant.