

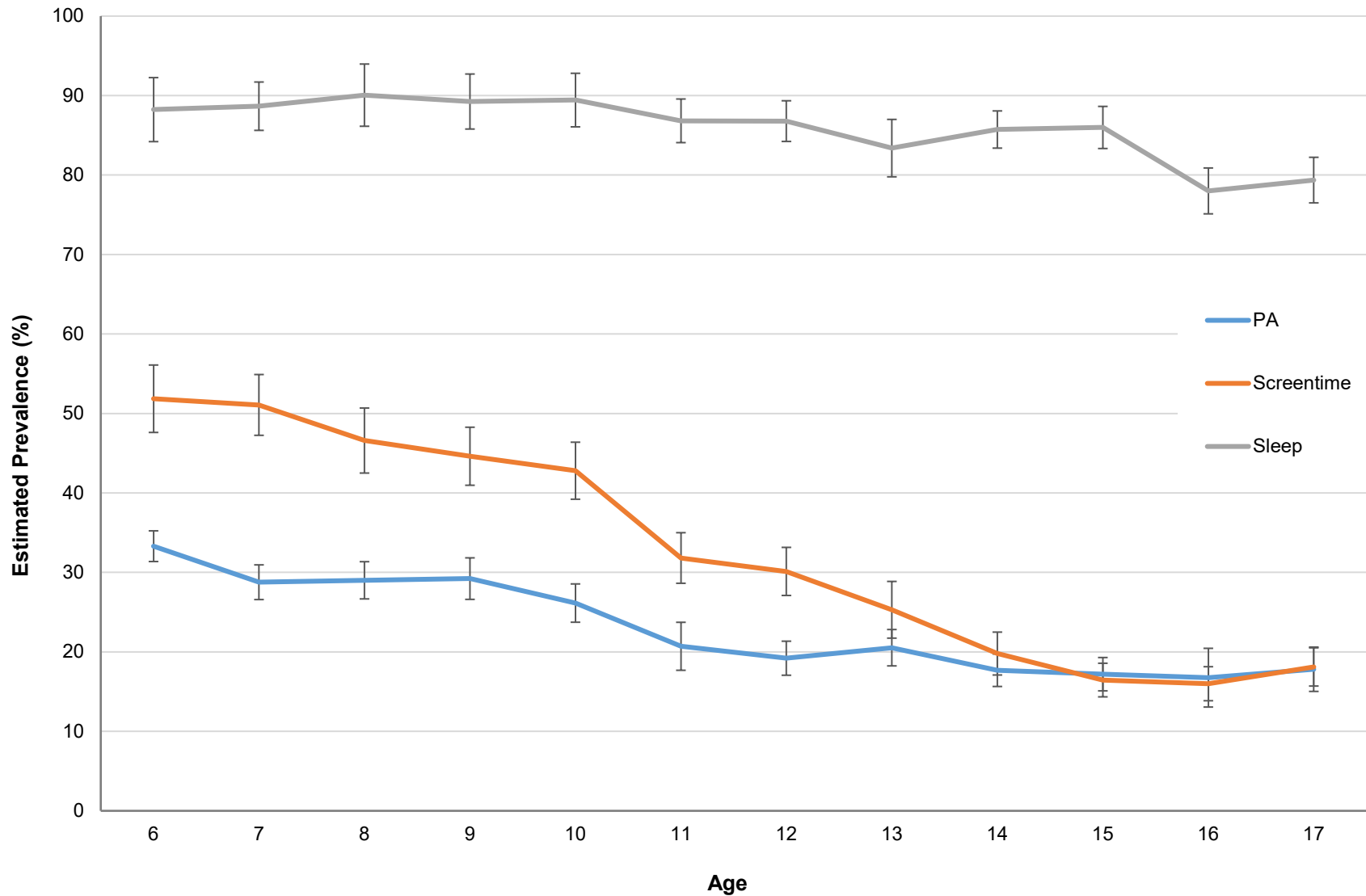
## **SUPPLEMENTAL METHODS**

### **Sociodemographic and Lifestyle Characteristics**

Sociodemographic and lifestyle characteristics derived from the NSCH (National Survey of Children's Health) topical questionnaire included age, sex, race, Hispanic ethnicity, household poverty level, and BMI. In the present analysis, race was defined as white, black, Asian or other (any race other than white, black or Asian, including multiracial). To determine household poverty level, total household income during the past year was queried. A family poverty ratio was calculated as the ratio of total family income and the family poverty threshold, derived from the U.S. Census Bureau's poverty threshold which varies according to family size and number of children. The family poverty-to-income ratio is top and bottom coded with values ranging from 50 (total family income is 50% of the family poverty threshold) to 400 (total family income is 400% of the family poverty threshold). Values beyond this range are reported as 50 or 400, respectively. For the purpose of this analysis, family poverty-to-income ratio was coded into four groups: <200%, 200–299%, 300–399%, and ≥400%. Age- and sex-specific BMI was calculated from parental report of height and weight. Centers for Disease Control and Prevention recommendations for classifying BMI into weight status categories were created: underweight (<5th percentile), healthy weight (≥5th percentile to <85th percentile), overweight (≥85th to <95th percentile), and obese (≥95th percentile). BMI classification in the NSCH was limited to only children/adolescents aged 10–17 years.

Appendix  
U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines  
Friel et al.

**Appendix Figure 1.** Estimated prevalence of children and adolescents meeting physical activity (PA), screen time, or sleep guidelines by age in the 2016–2017 National Survey of Children’s Health.



Notes: Data are weighted to be nationally representative. Error bars indicate 95% CI. Age is in years.

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 1.** Estimated prevalence of U.S. Children/Adolescents Meeting Zero to Three Guidelines (Physical Activity<sup>a</sup>/Screen Time<sup>b</sup>/Sleep<sup>c</sup>)

Characteristic	Unweighted sample size, n	Number of guidelines met (0–3), weighted % (95% CI)			
		0	1	2	3
Overall	49,606	8.8 (8.2, 9.4)	49.4 (48.4, 50.5)	33.0 (32.0, 34.0)	8.8 (8.2, 9.5)
Gender					
Female	24,242	9.7 (8.8, 10.6)	50.2 (48.7, 51.7)	32.3 (30.9, 33.7)	7.8 (6.9, 8.9)
Male	25,364	7.9 (7.2, 8.7)	48.7 (47.2, 50.2)	33.7 (32.3, 35.1)	9.7 (9.0, 10.6)
Age groups					
Children (aged 6–11 years)	20,919	5.3 (4.6, 6.2)	40.9 (39.3, 42.5)	40.9 (39.3, 42.4)	12.9 (11.8, 14.0)
Adolescents (aged 12–17 years)	28,687	12.2 (11.3, 13.1)	58.0 (56.6, 59.4)	25.1 (23.9, 26.3)	4.7 (4.1, 5.4)
Race					
White	38,444	7.2 (6.6, 7.8)	48.4 (47.2, 49.6)	34.3 (33.2, 35.5)	10.1 (9.3, 10.9)
Black	3,219	16.5 (14.1, 19.0)	50.5 (47.4, 53.6)	28.2 (25.5, 30.9)	4.8 (3.7, 6.2)
Asian	2,699	6.2 (4.8, 8.0)	51.1 (47.0, 55.3)	36.6 (32.6, 40.5)	6.1 (4.5, 8.1)
Other <sup>d</sup>	5,244	9.1 (7.6, 10.8)	53.0 (49.6, 56.4)	30.4 (27.3, 33.5)	7.5 (6.0, 9.4)
Ethnicity					
Not Hispanic	44,115	8.5 (8.0, 9.2)	47.8 (46.9, 48.8)	34.4 (33.5, 35.3)	9.2 (8.7, 9.8)
Hispanic	5,491	9.4 (7.9, 11.0)	54.2 (51.2, 57.2)	28.8 (26.0, 31.6)	7.6 (6.0, 9.7)
Family poverty-to-income ratio level, %					

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

<200	12,669	11.0 (9.8, 12.2)	49.7 (47.7, 51.7)	30.6 (28.8, 32.4)	8.7 (7.5, 10.0)
200–299	8,131	7.4 (6.4, 8.5)	50.8 (48.3, 53.3)	33.1 (30.8, 35.5)	8.7 (7.4, 10.1)
300–399	7,675	7.7 (6.6, 9.0)	50.8 (48.3, 53.3)	34.0 (31.6, 36.5)	7.4 (6.4, 8.6)
≥400	21,131	6.6 (6.0, 7.3)	47.7 (46.3, 49.1)	36.0 (34.7, 37.3)	9.7 (8.8, 10.6)
<i>p</i> -trend		<b>&lt;0.001</b>	0.145	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>BMI<sup>c</sup></b>					
Underweight (BMI <5th percentile)	2,124	9.0 (6.5, 12.3)	52.0 (47.4, 56.5)	35.0 (30.7, 39.3)	4.0 (3.0, 5.4)
Normal weight (5th–85th percentile)	22,903	8.8 (8.1, 9.6)	53.7 (52.2, 55.3)	30.7 (29.3, 32.2)	6.7 (6.0, 7.6)
Overweight (BMI 85th–94th percentile)	4,888	12.6 (10.5, 14.7)	59.1 (55.8, 62.3)	23.8 (21.3, 26.3)	4.6 (3.2, 6.5)
Obese (BMI ≥95th percentile)	4,386	16.1 (13.3, 19.0)	60.7 (57.0, 64.4)	18.8 (15.9, 21.8)	4.3 (3.0, 6.2)

*Notes:* All estimates were weighted to be nationally representative. Boldface indicates statistical significance ( $p < 0.001$ ).

<sup>a</sup>Physical activity >60 minutes every day.

<sup>b</sup>Screen time ≤2 hours each day.

<sup>c</sup>Sleep duration per night between 9 and 11 hours (ages 6–13 years), or between 8 and 10 hours (ages 14–17 years).

<sup>d</sup>Other race category includes American Indian or Alaska Native (unweighted  $n=369$ ), Native Hawaiian and other Pacific Islander (unweighted  $n=162$ ), some other race (unweighted  $n=1,261$ ), and two or more races (unweighted  $n=3,452$ ).

<sup>e</sup>BMI data only available for those aged 10–17 years.

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 2.** Estimated Prevalence of U.S. Children/Adolescents Meeting Combinations of Guidelines (Physical Activity<sup>a</sup>/Screen Time<sup>b</sup>/Sleep<sup>c</sup>)

Characteristic	Unweighted sample size, n	Guidelines met, weighted % (95% CI)		
		Physical activity + screen time	Physical activity + sleep	Screen time + sleep
Overall	49,606	9.7 (9.1, 10.3)	20.1 (19.2, 20.9)	29.7 (28.7, 30.6)
Gender				
Female	24,242	8.6 (7.7, 9.7)	16.9 (15.7, 18.1)	30.2 (28.8, 31.6)
Male	25,364	10.7 (9.9, 11.5)	23.1 (21.8, 24.3)	29.1 (27.8, 30.4)
Age groups				
Children (aged 6–11 years)	20,919	14.3 (13.2, 15.4)	24.7 (23.4, 26.1)	40.6 (39.0, 42.1)
Adolescents (aged 12–17 years)	28,687	5.1 (4.5, 5.8)	15.4 (14.3, 16.4)	18.7 (17.7, 19.8)
Race/ethnicity				
White	38,444	11.1 (10.3, 12.0)	20.7 (19.6, 21.7)	32.9 (31.7, 34.1)
Black	3,219	5.3 (4.1, 6.8)	19.6 (17.2, 22.0)	17.7 (15.5, 19.9)
Asian	2,699	6.5 (4.9, 8.6)	14.0 (10.8, 17.3)	34.2 (30.5, 38.0)
Other <sup>d</sup>	5,244	8.2 (6.7, 10.1)	19.7 (16.8, 22.6)	25.0 (22.3, 27.8)
Ethnicity				
Not Hispanic	44,115	10.2 (9.6, 10.8)	20.6 (19.8, 21.4)	31.2 (30.3, 32.1)
Hispanic	5,491	8.1 (6.5, 10.2)	18.4 (15.9, 20.9)	25.2 (22.4, 27.9)
Family poverty-to-income ratio level, %				
<200	12,669	9.5 (8.3, 10.8)	22.5 (20.8, 24.2)	24.6 (22.9, 26.4)
200–299	8,131	9.4 (8.2, 10.9)	20.4 (18.4, 22.4)	29.4 (27.2, 31.5)
300–399	7,675	8.1 (7.1, 9.3)	16.5 (14.8, 18.2)	31.7 (29.3, 34.1)
≥400	21,131	10.8 (9.9, 11.7)	17.8 (16.8, 18.9)	36.4 (35.0, 37.7)
<i>p</i> -trend		0.283	<b>&lt;0.001</b>	<b>&lt;0.001</b>
BMI <sup>e</sup>				
Underweight (BMI <5th percentile)	2,124	4.6 (3.5, 6.0)	15.5 (12.4, 18.6)	27.0 (23.1, 30.9)

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

Normal weight (5th–85th percentile)	22,903	7.2 (6.5, 8.1)	18.8 (17.5, 20.1)	24.9 (23.6, 26.2)
Overweight (BMI 85th–94th percentile)	4,888	4.9 (3.5, 6.8)	13.3 (11.2, 15.4)	19.3 (16.8, 21.9)
Obese (BMI ≥95th percentile)	4,386	4.7 (3.3, 6.6)	11.3 (8.9, 13.8)	15.7 (13.0, 18.4)

*Notes:* All estimates were weighted to be nationally representative. Boldface indicates statistical significance ( $p < 0.001$ ).

<sup>a</sup>Physical activity >60 minutes every day.

<sup>b</sup>Screen time ≤2 hours each day.

<sup>c</sup>Sleep duration per night between 9 and 11 hours (ages 6–13 years), or between 8 and 10 hours (ages 14–17 years).

<sup>d</sup>Other race category includes American Indian or Alaska Native (unweighted n=369), Native Hawaiian and other Pacific Islander (unweighted n=162), some other race (unweighted n=1,261), and two or more races (unweighted n=3,452).

<sup>e</sup>BMI data only available for those aged 10–17 years.

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 3.** Adjusted Relative Odds of U.S. Children/Adolescents Meeting Combinations of Guidelines (Physical Activity<sup>a</sup>/Screen Time<sup>b</sup>/Sleep<sup>c</sup>)

Characteristic	Guidelines met		
	Physical activity + screen time, OR (95% CI)	Physical activity + sleep, OR (95% CI)	Screen time + sleep, OR (95% CI)
<b>Gender</b>			
Female	<b>0.79 (0.67, 0.92)</b>	<b>0.67 (0.60, 0.76)</b>	1.06 (0.97, 1.17)
Male	1.00 (ref)	1.00 (ref)	1.00 (ref)
$\Delta R^2$	3.5%	22.5%	0.2%
<b>Age groups, years</b>			
6–11	1.00 (ref)	1.00 (ref)	1.00 (ref)
12–17	<b>0.32 (0.28, 0.40)</b>	<b>0.56 (0.50, 0.62)</b>	<b>0.33 (0.30, 0.36)</b>
$\Delta R^2$	71.1%	50.0%	69.6%
<b>Race/ethnicity</b>			
White	1.00 (ref)	1.00 (ref)	1.00 (ref)
Black	<b>0.42 (0.32, 0.56)</b>	<b>0.83 (0.70, 0.97)</b>	<b>0.47 (0.40, 0.55)</b>
Asian	<b>0.52 (0.38, 0.71)</b>	<b>0.60 (0.46, 0.79)</b>	1.04 (0.87, 1.23)
Other <sup>d</sup>	0.77 (0.59, 1.02)	0.96 (0.78, 1.19)	<b>0.76 (0.64, 0.90)</b>
$\Delta R^2$	18.3%	7.3%	12.8%
<b>Ethnicity</b>			
Not Hispanic	1.00 (ref)	1.00 (ref)	1.00 (ref)
Hispanic	<b>0.69 (0.52, 0.90)</b>	<b>0.74 (0.62, 0.89)</b>	<b>0.76 (0.64, 0.89)</b>
$\Delta R^2$	5.3%	8.0%	2.6%
<b>Family poverty-to-income ratio level, %</b>			
<200	1.01 (0.84, 1.20)	<b>1.44 (1.28, 1.63)</b>	<b>0.63 (0.56, 0.71)</b>
200–299	0.91 (0.75, 1.10)	<b>1.21 (1.05, 1.40)</b>	<b>0.76 (0.67, 0.85)</b>
300–399	<b>0.73 (0.61, 0.88)</b>	0.90 (0.78, 1.05)	<b>0.83 (0.73, 0.94)</b>
≥400	1.00 (ref)	1.00 (ref)	1.00 (ref)
<i>p</i> -trend	0.081	<b>&lt;0.001</b>	<b>&lt;0.001</b>
$\Delta R^2$	2.7%	17.9%	7.3%
<b>BMI<sup>e</sup></b>			

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

Underweight (BMI <5th percentile)	<b>0.52 (0.38, 0.71)</b>	<b>0.70 (0.54, 0.90)</b>	0.97 (0.78, 1.21)
Normal weight (5th–85th percentile)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Overweight (BMI 85th–94th percentile)	<b>0.64 (0.45, 0.92)</b>	<b>0.63 (0.51, 0.77)</b>	<b>0.74 (0.61, 0.88)</b>
Obese (BMI ≥95th Percentile)	<b>0.58 (0.39, 0.85)</b>	<b>0.47 (0.36, 0.61)</b>	<b>0.59 (0.47, 0.74)</b>
$\Delta R^2$	18.5%	33.2%	14.2%

*Notes:* All estimates were weighted to be nationally representative. Boldface indicates statistical significance ( $p < 0.001$ ). All models adjusted for sex, age, race, ethnicity, and family poverty–income level.  $\Delta R^2$  denotes the unique variance accounted for by each variable (i.e., the difference in variance between the full model and the model when omitting each specific characteristic). It reflects the percent of the percent of variance explained (e.g., percent of a model's  $R^2$ ) by each variable.

<sup>a</sup>Defined as physical activity  $\geq 60$  minutes every day.

<sup>b</sup>Defined as screen time  $\leq 2$  hours each day.

<sup>c</sup>Defined as sleep duration per night between 9 and 11 hours (ages 6–13 years), or between 8 and 10 hours (ages 14–17 years).

<sup>d</sup>Other race category includes American Indian or Alaska Native (unweighted  $n=369$ ), Native Hawaiian and other Pacific Islander (unweighted  $n=162$ ), some other race (unweighted  $n=1,261$ ), and two or more races (unweighted  $n=3,452$ ).

<sup>e</sup>BMI data only available for those aged 10–17 years.



**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 4.** Estimated Prevalence of U.S. Children/Adolescents Meeting Zero to Three Guidelines (Physical Activity<sup>a</sup>/Screen Time<sup>b</sup>/Sleep<sup>c</sup>) by Age

Age, years	Unweighted sample size, n	Number of guidelines met (0–3), weighted % (95% CI)			
		0	1	2	3
6	3,104	3.4 (2.4, 4.7)	35.7 (31.6, 39.8)	45.0 (40.8, 49.2)	15.9 (12.5, 19.2)
7	3,252	4.5 (3.2, 6.4)	37.5 (33.7, 41.4)	43.0 (39.2, 46.7)	15.0 (12.8, 17.3)
8	3,469	4.3 (3.1, 5.9)	40.0 (35.8, 44.1)	41.5 (37.6, 45.5)	14.2 (11.0, 17.4)
9	3,531	5.9 (4.1, 8.6)	38.2 (34.8, 41.7)	42.6 (38.9, 46.3)	13.2 (10.7, 15.7)
10	3,702	5.6 (4.1, 7.6)	42.6 (39.0, 46.3)	39.6 (36.1, 43.1)	12.2 (9.6, 14.7)
11	3,861	8.3 (5.9, 11.5)	51.1 (47.2, 55.0)	33.7 (30.4, 37.1)	6.9 (5.6, 8.5)
12	4,062	10.3 (8.4, 12.3)	51.3 (48.0, 54.5)	30.3 (27.4, 33.2)	8.1 (6.3, 10.3)
13	4,229	12.4 (10.3, 14.4)	52.9 (49.0, 56.8)	28.0 (24.1, 31.8)	6.8 (4.8, 9.5)
14	4,537	9.1 (7.7, 10.8)	62.1 (58.9, 65.3)	25.3 (22.5, 28.1)	3.5 (2.5, 4.9)
15	4,926	11.1 (9.2, 13.1)	62.1 (59.0, 65.1)	22.9 (20.2, 25.6)	4.0 (2.8, 5.5)
16	5,484	16.2 (13.1, 19.3)	60.1 (56.6, 63.5)	20.6 (18.2, 22.9)	3.2 (2.4, 4.3)
17	5,449	13.9 (12.0, 15.8)	59.7 (56.6, 62.7)	23.6 (20.8, 26.4)	2.8 (2.1, 3.7)

*Notes:* All estimates were weighted to be nationally representative.

<sup>a</sup>Physical activity >60 minutes every day.

<sup>b</sup>Screen time ≤2 hours each day.

<sup>c</sup>Sleep duration per night between 9 and 11 hours (ages 6–13 years), or between 8 and 10 hours (ages 14–17 years).

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 5.** Estimated Prevalence of U.S. Children/Adolescents Meeting Specific Movement Guidelines by Age in Years

Age, years	Unweighted sample size, n	Guidelines met, weighted % (95% CI)				
		None	Physical activity (PA) <sup>a</sup>	Screen time <sup>b</sup>	Sleep <sup>c</sup>	PA +screen time + sleep
6	3,104	3.4 (2.4, 4.7)	33.3 (29.3, 37.3)	51.9 (47.6, 56.1)	88.2 (86.3, 90.2)	15.9 (12.5, 19.2)
7	3,252	4.5 (3.2, 6.4)	28.8 (25.7, 31.8)	51.1 (47.2, 54.9)	88.7 (86.5, 90.8)	15.0 (12.8, 17.3)
8	3,469	4.3 (3.1, 5.9)	29.0 (25.1, 32.9)	46.6 (42.5, 50.7)	90.1 (87.7, 92.0)	14.2 (11.0, 17.4)
9	3,531	5.9 (4.1, 8.6)	29.2 (25.8, 32.7)	44.6 (41.0, 48.3)	89.3 (86.6, 91.9)	13.2 (10.7, 15.7)
10	3,702	5.6 (4.1, 7.6)	26.1 (22.8, 29.5)	42.8 (39.2, 46.4)	89.4 (87.0, 91.8)	12.2 (9.6, 14.7)
11	3,861	8.3 (5.9, 11.5)	20.7 (18.0, 23.4)	31.8 (28.6, 35.0)	86.8 (83.8, 89.8)	6.9 (5.6, 8.5)
12	4,062	10.3 (8.4, 12.3)	19.2 (16.6, 21.8)	30.1 (27.1, 33.1)	86.8 (84.6, 88.9)	8.1 (6.3, 10.3)
13	4,229	12.4 (10.3, 14.4)	20.5 (16.9, 24.1)	25.3 (21.7, 28.9)	83.4 (81.1, 85.7)	6.8 (4.8, 9.5)
14	4,537	9.1 (7.7, 10.8)	17.7 (15.4, 20.0)	19.8 (17.1, 22.5)	85.7 (83.7, 87.8)	3.5 (2.5, 4.9)
15	4,926	11.1 (9.2, 13.1)	17.2 (14.5, 19.8)	16.5 (14.3, 18.6)	86.0 (83.9, 88.1)	4.0 (2.8, 5.5)
16	5,484	16.2 (13.1, 19.3)	16.8 (13.9, 19.6)	16.0 (13.9, 18.1)	78.0 (74.3, 81.7)	3.2 (2.4, 4.3)
17	5,449	13.9 (12.0, 15.8)	17.8 (14.9, 20.7)	18.1 (15.7, 20.5)	79.4 (76.6, 82.2)	2.8 (2.1, 3.7)

*Notes:* All estimates were weighted to be nationally representative.

<sup>a</sup>Physical activity >60 minutes every day.

<sup>b</sup>Screen time ≤2 hours each day.

<sup>c</sup>Sleep duration per night between 9 and 11 hours (ages 6–13 years), or between 8 and 10 hours (ages 14–17 years).

**Appendix**  
**U.S. Children Meeting Sleep, Screen Time, and Physical Activity Guidelines**  
**Friel et al.**

**Appendix Table 6.** Estimated Prevalence of U.S. Children/Adolescents With  $\leq 2$  Hours TV or Device Use, by Age

Age, years	Unweighted sample size, n	Proportion with $\leq 2$ hours per day, weighted % (95% CI)	
		TV viewing	Electronic device use
6	3,104	56.2 (52.0, 60.4)	71.1 (67.1, 75.2)
7	3,252	54.4 (50.6, 58.2)	70.4 (66.6, 74.2)
8	3,469	52.6 (48.5, 56.8)	66.0 (62.0, 69.9)
9	3,531	52.2 (48.6, 55.9)	59.2 (55.5, 62.9)
10	3,702	49.2 (45.5, 52.8)	57.9 (54.2, 61.6)
11	3,861	46.2 (42.3, 50.0)	48.5 (44.5, 52.4)
12	4,062	45.5 (42.2, 48.8)	40.8 (37.6, 44.1)
13	4,229	45.6 (41.8, 49.4)	38.2 (34.0, 42.3)
14	4,537	41.9 (38.5, 45.3)	28.2 (25.0, 31.4)
15	4,926	43.7 (40.6, 46.8)	22.7 (20.1, 25.4)
16	5,484	43.6 (40.2, 47.0)	22.1 (19.3, 24.8)
17	5,449	46.0 (42.9, 49.1)	20.6 (18.1, 23.0)

*Notes:* All estimates were weighted to be nationally representative.