NYC Health

Epi Data Brief

January 2018, No. 99

Inadequate Sleep and Mental Health of New York City School Children and Adolescents

Inadequate sleep places children at risk for emotional and behavioral problems, and increases the risk of depression and suicide among adolescents.[1-4] Excessive television viewing and use of electronic devices have been associated with not getting adequate sleep.[5-7]

This report presents data on the prevalence of inadequate sleep on school nights among school children and adolescents in New York City (NYC), and examines associations between sleep and excessive screen time, emotional and behavioral problems, depressive symptoms, self-injury and suicidal tendencies among these groups.

The recommended levels of sleep differ for children and adolescents. The American Academy of Pediatrics (AAP) recommends:[8]

Children aged 6 to 12 years get **9** to **12** hours	Adolescents aged 13 to 18 years get **8** to **10** hours
Among children, **inadequate sleep** is defined as getting fewer than 9 or more than 12 hours on a typical school night.	Among adolescents, **inadequate sleep** is defined as getting fewer than 8 or more than 10 hours. For these analyses, due to data limitations, inadequate sleep among adolescents is defined as fewer than 8 hours on an average school night.

Inadequate sleep varied by age group and sex

Prevalence of inadequate sleep on school nights among New York City school children and adolescents, 2015

11% **of New York City school children** aged 6 to 12 got either fewer than nine or more than twelve hours of sleep on a typical school night, as reported by their caregivers in 2015.

75% **of New York City adolescents** got fewer than eight hours of sleep on an average school night in 2015.

Sources: Child Health, Emotional Wellness and Development Survey (CHEWDS), 2015; NYC Youth Risk Behavior Survey (YRBS), 2015

- Among school children:
  - older school children (10 to 12 years) were more likely to get inadequate sleep than younger (6 to 9 years; 19% vs. 5%).
  - boys were more likely to get inadequate sleep than girls (13% vs. 8%).
- Among adolescents, girls had a higher prevalence of inadequate sleep than boys (77% vs. 73%).

Definitions:

School children refer to 6 to 12 year olds in the NYC public or private school system.

Excessive screen time is defined as two or more hours watching television or videos; playing on cell phones, tablets, or hand held video games; or using the computer for non-school purposes on an average weekday.

Emotional and behavioral problems are based on caregiver reports on the *Strengths and Difficulties Questionnaire* (SDQ)[9], a 25-item screening tool. The SDQ captures social skills and problems in the domains of emotion, hyperactivity/inattention, conduct, peer, and prosocial (interactions with peers and others) behaviors. Children were classified as having emotional and behavioral problems if the sum of items across all domains except social skills was greater than 13 out of 40 points.

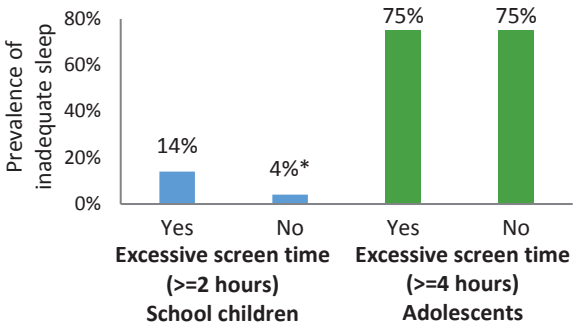
Adolescents refer to NYC public high school students in grades 9 through 12.

Excessive screen time is defined as four or more hours of watching television, playing video or computer games, or using the computer for non-school purposes on an average school day.

School children who spent excessive time on screens were more likely to report inadequate sleep

- Approximately two-thirds (66%) of school children and 53% of adolescents spent excessive time on screens (two or more hours a day for school children and four or more hours a day for adolescents) on an average school day.
- School children with reported excessive amounts of screen time were more than three times as likely to get inadequate amounts of sleep on an average weekday compared with school children without excessive screen time (14% vs. 4%*).
- Levels of inadequate sleep were similar between adolescents who reported excessive screen time and adolescents who did not (75% vs. 75%).

Inadequate sleep by screen time among school children and adolescents, New York City, 2015

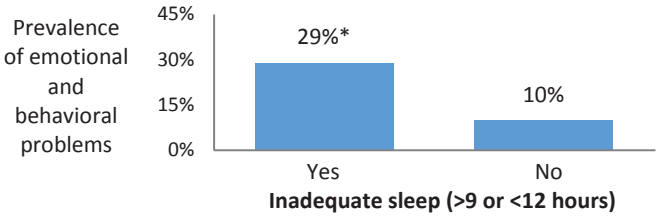


*Estimate should be interpreted with caution due to small sample size.
Source: Child Health, Emotional Wellness and Development Survey (CHEWDS), 2015; NYC Youth Risk Behavior Survey (YRBS), 2015

School children who did not get adequate sleep had a greater prevalence of emotional and behavioral problems

- School children with inadequate sleep were approximately three times as likely to have emotional and behavioral problems compared with children who did get adequate sleep (29%* vs. 10%).

Emotional and behavioral problems by sleep adequacy among New York City school children, 2015



*Estimate should be interpreted with caution due to small sample size.
Source: Child Health, Emotional Wellness and Development Survey (CHEWDS), 2015

Adolescents who did not get adequate sleep reported higher levels of depressive symptoms, self-injury, and suicidal tendencies

- Adolescents who got inadequate sleep were more likely to report persistently sad or hopeless feelings (more than two weeks in a row during the past year) that interfered with their usual activities (indicative of depressive symptoms) compared with those who got adequate sleep (33% vs. 21%).
- Adolescents who got inadequate sleep were more likely to engage in non-suicidal self-injury (purposely hurting themselves without wanting to die during the past year) compared with those with adequate sleep (15% vs. 11%).
- Sleep-deprived adolescents were more likely to have seriously considered attempting suicide (15%) and to have actually attempted suicide (8%) during the past year compared with those who got adequate sleep (9% and 6%, respectively).

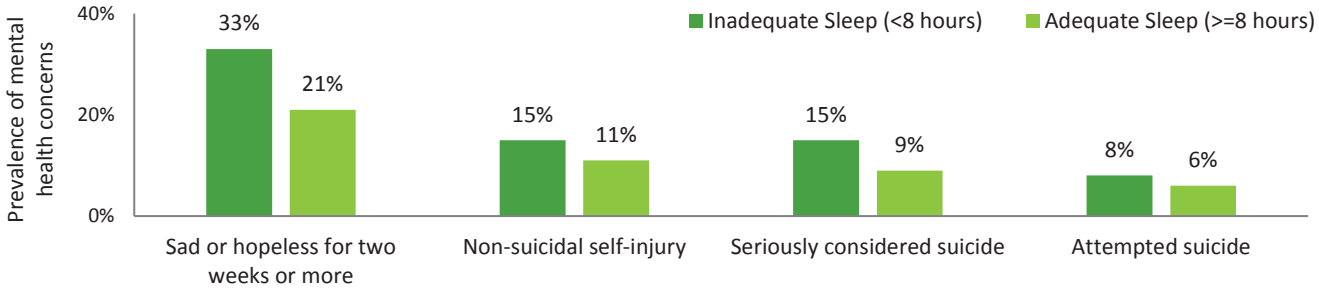
Data Sources

Child Health, Emotional Wellness and Development Survey (CHEWDS), 2015 was a population-based telephone survey conducted by the Health Department in 2015. A parent, guardian or other knowledgeable adult (85% biological parents) was interviewed about the health of one child aged 12 years or younger in the selected household for a sample of approximately 3,000 children. Survey data are weighted to the NYC population of children 12 years and younger, per American Community Survey. This analysis is limited to children ages 6 to 12 who attended public or private school, approximately half of the sample.

NYC Youth Risk Behavior Survey (YRBS), 2015 is a biennial self-administered, anonymous survey conducted in NYC public high schools by the Health Department and the NYC Department of Education. For more survey details, visit www1.nyc.gov/site/doh/data/data-sets/nyc-youth-risk-behavior-survey.page.

An estimate with an asterisk should be interpreted with caution - the Relative Standard Error (a measure of estimate precision) is greater than 30%, the 95% Confidence Interval half-width is greater than 10, or the sample size is too small, making the estimate potentially unreliable.

Prevalence of depressing symptoms, self-injury, suicidal tendencies by sleep adequacy among New York City adolescents, 2015



Source: NYC Youth Risk Behavior Survey (YRBS), 2015

Findings from longitudinal analyses point to a predictive relationship between inadequate sleep and adverse outcomes among children and adolescents. Although this report does not establish whether sleep causes health outcomes, several studies from The National Longitudinal Study of Adolescent to Adult Health[10] have found inadequate sleep in adolescence precedes and predicts poor outcomes such as low academic performance, obesity, depression, and drug abuse. Additional evidence also suggests that among middle and high school students, delaying school start time by thirty minutes improves students' sleep duration, academics, and physical and mental health.[11]

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Epi Data Tables

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Data Tables

Data Sources

Child Health, Emotional Wellness and Development Survey (CHEWDS), 2015 was a population-based telephone survey conducted by the Health Department in 2015. A parent, guardian or other knowledgeable adult (85% biological parents) was interviewed about the health of one child aged 12 years or younger in the selected household for a sample of approximately 3,000 children. Survey data are weighted to the NYC population of children 12 years and younger, per American Community Survey. This analysis is limited to children ages 6 to 12 who attended public or private school, approximately half of the sample.
NYC Youth Risk Behavior Survey (YRBS), 2015 is a biennial self-administered, anonymous survey conducted in NYC public high schools by the Health Department and the NYC Department of Education. For more survey details, visit www1.nyc.gov/site/doh/data/data-sets/nyc-youth-risk-behavior-survey.page.

NYC Health

Table 1. Sleep patterns on school nights among New York City school children and adolescents, 2015

Sources: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015; Data are weighted to the population of children ages 0 to 12 years, per 2011-2013 American Community Survey.
NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

		Weighted N	%	95% CI
School Children[1]				
Inadequate sleep		71,000	10.8	(8.5 - 13.5)
Adequate sleep	¥	586,000	89.2	(86.5 - 91.5)
Adolescents[2]				
Inadequate sleep		51,000	74.8	(72.4 - 77.1)
Adequate sleep	€	151,000	25.2	(22.9 - 27.6)

Data are not age-adjusted.
Weighted N population estimates are rounded to the nearest 1,000.
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
1 Children age 6-12 who attend public or private school
2 Students who attend public high school
¥Adequate sleep defined as 9-12 hours
€Adequate sleep defined as >=8 hours

Table 2. Distribution of hours of sleep on school nights among New York City school children and adolescents, 2015

Sources: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015;
Data are weighted to the population of children ages 0-12 years, per 2011-2013 American Community Survey.
NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Hours of sleep on school nights	
	%	95% CI
School Children[1]		
<9 hours	10.5 U	(8.3 - 13.3)
9 to <10 hours	37.1	(33.1 - 41.3)
10 to 12 hours	52.1	(47.8-56.4)
> 12 hours	0.2 *	(0.1 - 0.6)
Adolescents[2]		
<= 4 Hours	12.3	(11.1 -13.6)
5 Hours	13.6	(12.2 - 15.2)
6 Hours	22.7	(21.0 - 24.6)
7 Hours	26.2	(24.6 - 27.8)
8 Hours	17.6	(16.0 - 19.4)
9 Hours	5.8	(4.7 - 7.2)
>=10 Hours	1.7	(1.3 - 2.4)

Data are not age-adjusted.
U When rounding to the nearest whole number, round up.
*Estimate should be interpreted with caution. Estimate's Relative Standard Error (a measure of estimate precision) is greater than 30%, or the 95% CI's half width is greater than 10, or the sample size is too small, making the estimate potentially unreliable.
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
1 Children age 6-12 who attend public or private school
2 Students who attend public high school

Table 3. Demographics of New York City school children and adolescents by amount of sleep, 2015

Sources: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015; Data are weighted to the population of children age 0-12 years per 2011-2013 American Community Survey.
NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Total		Adequate Sleep Ω		Inadequate Sleep		
	%	95% CI	%	95% CI	%	95% CI	p-value[1]
School children[2]							
Age							
6 to 9 years	57.0	(52.8-61.2)	95.1	(91.9-97.1)	4.9	(2.9-8.1)	*referent*
10 to 12 years	43.0	(38.8-47.2)	81.5 D	(76.4-85.6)	18.5 U	(14.4-23.6)	**<0.001**
Race/Ethnicity							
White, non-Latino	23.2	(20.2-26.6)	91.5 D	(86.9-94.5)	8.5 U	(5.5-13.1)	*referent*
Black, non-Latino	26.4	(22.7-30.4)	84.5 U	(76.6-90.1)	15.5 D	(9.9-23.4)	0.078
Latino	36.0	(31.9-40.2)	92.4	(89.2-94.6)	7.6	(5.4-10.8)	0.700
Asian/Pacific Islander, non-Latino	11.9	(9.0-15.6)	85.0 *	(73.8-92.0)	15.0 *	(8.0-26.2)	0.192
Other, non-Latino (Native American, other, multiple)	2.5 U	(1.7-3.8)	93.2 *	(83.9-97.3)	6.8 *	(2.7-16.1)	0.633
Sex							
Male	51.1	(46.8-55.4)	86.8	(82.7-90.0)	13.2	(10.0-17.3)	*referent*
Female	48.9	(44.6-53.2)	91.8	(87.8-94.6)	8.2	(5.4-12.2)	**0.046**
Nationality							
Born in the US	91.6	(88.9-93.6)	90.0	(87.1-92.2)	10.0	(7.8-12.9)	*referent*
Born outside of the US	8.4	(6.4-11.1)	81.5 *D	(69.3-89.5)	18.5 *U	(10.5-30.7)	0.108
Household poverty							
Low poverty (>=400% of federal poverty level)	24.2	(20.8-28.0)	92.0	(88.4-94.6)	8.0	(5.4-11.6)	*referent*
Medium poverty (200-399% of federal poverty level)	13.4	(10.9-16.5)	85.2	(76.3-91.2)	14.8	(8.8-23.7)	0.093
High poverty (<200% of federal poverty level)	62.4	(58.0-66.5)	89.6	(85.3-92.8)	10.4	(7.2-14.7)	0.325
Borough							
Bronx	20.9	(17.6-24.7)	91.0	(86.6-94.0)	9.0	(6.0-13.4)	0.492
Brooklyn	34.1	(30.3-38.2)	89.1	(84.1-92.6)	10.9	(7.4-15.9)	*referent*
Manhattan	12.5 U	(10.0-15.6)	93.7 *	(87.4-97.0)	6.3 *	(3.0-12.6)	0.138
Queens	25.9	(22.3-29.8)	85.5 D	(77.6-90.9)	14.5 U	(9.1-22.4)	0.372
Staten Island	6.6	(5.1-8.4)	90.8	(84.3-94.8)	9.2	(5.2-15.7)	0.606
Adolescents[3]							
Race							
White, non-Latino	13.4	(9.9-18.0)	26.8	(23.4-30.6)	73.2	(69.4-76.6)	*referent*
Black, non-Latino	29.9	(24.5-36.0)	22.1	(18.7-26.1)	77.9	(73.9-81.3)	**0.018**
Latino	37.8	(32.5-43.4)	26.4	(24.0-28.9)	73.6	(71.1-76.0)	0.821
Asian, non-Latino	16.8	(14.1-19.8)	24.4	(18.8-30.9)	75.6	(69.1-81.2)	0.432
Other, non-Latino (Native American, Native Hawaiian/other Pacific Islander, multiple)	2.1	(1.7-2.5)	23.1	(17.3-30.1)	76.9	(69.9-82.7)	0.266
Sex							
Male	50.9	(47.1-54.6)	27.3	(23.9-31.0)	72.7	(69.0-76.1)	*referent*
Female	49.1	(45.4-52.9)	23.1	(20.5-25.9)	76.9	(74.1-79.5)	**0.043**
Always lived in the US							
Yes	73.6	(70.6-76.4)	24.4	(22.0-27.1)	75.6	(72.9-78.0)	*referent*
No	26.4	(23.6-29.4)	27.4	(23.9-31.3)	72.6	(68.7-76.1)	0.122
Borough of residence							
Bronx	22.7	(18.9-27.0)	26.4	(22.8-30.5)	73.6	(69.5-77.2)	0.857
Brooklyn	31.3	(26.8-36.1)	25.0	(22.8-27.3)	75.0	(72.7-77.2)	0.716
Manhattan	11.1	(7.7-15.8)	25.9	(21.7-30.5)	74.1	(69.5-78.3)	*referent*
Queens	28.1	(23.8-32.8)	24.9	(19.0-31.8)	75.1	(68.2-81.0)	0.794
Staten Island	6.8	(6.0-7.7)	23.1	(19.2-27.5)	76.9	(72.5-80.8)	0.383

Data are not age-adjusted.
*Estimate should be interpreted with caution. Estimate's Relative Standard Error (a measure of estimate precision) is greater than 30%, or the 95% CI's half width is greater than 10, or the sample size is too small, making the estimate potentially unreliable.
U indicates rounding up.
D indicates rounding down
Ω Adequate sleep defined as 9-12 hours for school children and >=8 hours for adolescents
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
1 P-values represent the comparison between Adequate and Inadequate sleep groups. Bold p-values indicate a statistically significant difference from the reference group.
2 Children age 6-12 who attend public or private school
3 Students who attend public high school

Table 4. Screen time among New York City school children and adolescents, 2015

Sources: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015; Data are weighted to the population of children age 0-12 years per 2011-2013 American Community Survey.
NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Weighted N	%	95% CI
School children[1]			
Hours spent watching TV/videos; playing on cell phones, tablets, or hand held video games; or using the computer for non-school purposes on an average weekday			
>= 2 hours (excessive screen time)	420,000	66.1	(61.9-70.2)
< 2 hours	215,000	33.9	(29.8-38.1)
Adolescents[2]			
Hours spent watching TV, playing video or computer games, or using the computer for non-school purposes on an average school day			
>= 4 hours (excessive screen time)	113,000	53.0	(50.6-55.4)
< 4 hours	101,000	47.0	(44.6-49.4)

Data are not age-adjusted.
Weighted N population estimates are rounded to the nearest 1,000.
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
1 Children age 6-12 who attend public or private school
2 Students who attend public high school

Table 5. Amount of sleep by excessive screen time among New York City school children and adolescents, 2015

Sources: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015; Data are weighted to the population of children age 0-12 years per 2011-2013 American Community Survey.
NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Inadequate sleep Ω		
	%	95% CI	p-value
School children[1]			
Excessive screen time†	14.5 D	(11.2-18.4)	*referent*
Less than excessive screen time	4.2 *	(2.3-7.6)	**<0.001**
Adolescents[2]			
Excessive screen time₴	75.1	(72.3 - 77.8)	*referent*
Less than excessive screen time	74.8	(71.8 - 77.6)	0.855

Data are not age-adjusted.
D When rounding to the nearest whole number, round down.
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
Bold p-values indicate a statistically significant difference from the reference group.
Ω Inadequate sleep defined as <9 or >12 hours for school children and <8 hours for adolescents
† Defined as two or more hours using the computer for non-school purposes, watching TV, watching videos, or playing on cell phones, tablets, or hand-held video games on an average weekday
₴ Defined as four or more hours watching TV, playing video or computer games, or using the computer for non-school purposes on an average school day
1 Children age 6-12 who attend public or private school
2 Students who attend public high school

Table 6. Prevalence of emotional and behavioral problems by amount of sleep among New York City school children, 2015

Source: Child Health, Emotional Wellness, and Development Survey (CHEWDS) 2015; Data are weighted to the population of children age 0-12 years per 2011-2013 American Community Survey.

	Emotional and behavioral problems			
	%		95% CI	p-value
School children[1]				
Inadequate sleep (<9 or >12 hours)	28.8	*	(17.6-43.4)	**0.005**
Adequate sleep (9-12 hours)	9.7		(7.1-13.1)	*referent*

Data are not age-adjusted.

*Estimate should be interpreted with caution. Estimate's Relative Standard Error (a measure of estimate precision) is greater than 30%, or the 95% CI's half width is greater than 10, or the sample size is too small, making the estimate potentially unreliable.

Note: Emotional and behavioral problems are based on caregiver reports on the Strengths and Difficulties Questionnaire (SDQ)11, a 25-item screening tool. The SDQ captures social skills and problems in the domains of emotion, hyperactivity/inattention, conduct, peer, and prosocial (interactions with peers and others) behaviors. Children were classified as having emotional and behavioral problems if the sum of items across all domains except social skills was greater than 13 out of 40 points.

95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.

1 Children age 6-12 who attend public or private school

Table 7. Prevalence of mental health concerns by amount of sleep among New York City adolescents, 2015

Source: NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities during the past 12 months?			Ever purposely hurt yourself without wanting to die (i.e., non-suicidal self-injury) during the past 12 months?			Ever seriously consider attempting suicide during the past 12 months?			Ever actually attempted suicide during the past 12 months?		
	%	95% CI	p-value	%	95% CI	p-value	%	95% CI	p-value	%	95% CI	p-value
Adolescents[1]												
Inadequate sleep (<8 hours)	33.1	(30.5-35.9)	*referent*	14.9	(13.4-16.5)	*referent*	15.3	(13.0-17.9)	*referent*	8.3	(7.2-9.6)	*referent*
Adequate sleep (>=8 hours)	20.9	(18.0-24.1)	**<0.001**	11.0	(8.8-13.7)	**0.010**	9.1	(7.4-11.2)	**<0.001**	5.7	(4.0-8.0)	**0.029**

Data are not age-adjusted.

95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.

Bold p-values indicate a statistically significant difference from the reference group.

1 Adolescents are defined as students who attend public high school

Table 8. Prevalence of inadequate sleep by mental health concerns among New York City adolescents[1], 2015

Source: NYC Youth Risk Behavior Survey, 2015; Data are weighted to the NYC public high school student population.

	Inadequate sleep (<8 hours)		Adequate sleep (>= 8 hours)		
	%	95% CI	%	95% CI	p-value
Ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities during the past 12 months?					
Yes	82.4	(80.0-84.7)	17.6	(15.3-20.0)	*referent*
No	71.4	(67.9-74.7)	28.6	(25.3-32.1)	**<0.001**
Ever purposely hurt yourself without wanting to die (i.e., non-suicidal self-injury) during the past 12 months?					
Yes	80.0	(76.1-83.4)	20.0	(16.6-23.9)	*referent*
No	73.9	(71.0-76.5)	26.1	(23.5-29.0)	**0.013**
Ever seriously consider attempting suicide during the past 12 months?					
Yes	83.2	(79.1-86.6)	16.8	(13.4- 20.9)	*referent*
No	73.3	(70.5-75.9)	26.7	(24.1-29.5)	**<0.001**
Ever actually attempted suicide during the past 12 months?					
Yes	81.5 D	(75.6-86.2)	18.5 U	(13.8-24.4)	*referent*
No	74.4	(71.3-77.3)	25.6	(22.7-28.7)	**0.037**

Data are not age-adjusted.
U indicates rounding up.
D indicates rounding down.
95% confidence intervals (CIs) are a measure of estimate precision. The wider the interval, the more imprecise the estimate.
Bold p-values indicate a statistically significant difference from the reference group.
1 Adolescents are defined as students who attend public high school