



THE SCHOOL DISTRICT OF  
PHILADELPHIA

# Findings from Student Responses to Questions about Mental Health and Suicide from the 2019 Philadelphia Youth Risk Behavior Survey

## Key Findings

- Philadelphia students responded more negatively to questions about mental health and suicide in 2019 than in 2017.
- Multi-Racial, Hispanic/Latino, and Black/African American students responded more negatively to questions about mental health and suicide than White and Asian students.
- Students in 9<sup>th</sup> and 10<sup>th</sup> grade responded more negatively than 11<sup>th</sup>- and 12<sup>th</sup>-graders.
- Lesbian, gay, and bisexual (LGB) students responded more negatively to all four mental health and suicide questions than heterosexual students.
- Consistent with existing literature, *food insecurity* was also strongly associated with feeling sad or hopeless, considering suicide, and planning suicide.
- For female students, both *in-school* and *cyberbullying* were consistent and strong risk factors for feeling sad/hopeless and considering, planning, and attempting suicide.
- For male students, *cyberbullying* was a strong risk factor for poor mental health. Being *physically active* and *sleeping more than eight hours* were associated with a reduced risk of attempting suicide.

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## Overview

Mental health is an important public health concern. In 2018, suicide was responsible for 48,000 deaths in the United States; among people of 10 to 34 years of age, it was the second leading cause of death (Center for Disease Control, 2020). Research evidence supports that students' mental health is positively associated with their academic outcomes (Nix et al., 2012). Ensuring students' well-being is important but also a challenge for a large urban school district, as students in urban settings are typically more exposed to social stressors associated with poor mental health outcomes (Lederbogen et al., 2011). Literature also documents racial/ethnic group differences in mental health service use, suggesting that students with in need of mental health supports may not always reach out for help (Garland et al., 2005). In this brief, we seek to deepen understanding of Philadelphia students' mental health by examining student responses to questions about mental health and suicide asked on the Youth Risk Behavior Survey (YRBS).

## About the Youth Risk Behaviors Survey (YRBS)

The Youth Risk Behaviors Surveillance System (YRBSS) was developed by the Division of Adolescent and School Health, a part of the Centers for Disease Control and Prevention (CDC). The YRBSS monitors health-related behaviors that contribute to the leading causes of death and disability among youth and adults. The YRBSS includes national, state, territorial, tribal government, and local school-based surveys of representative samples of 9th through 12th grade students. The surveys are conducted every two years, typically during the spring semester. The survey includes 99 questions and responses that are completely anonymous and voluntary. The YRBS, which is the survey portion of the YRBSS, covers six topic areas: 1) behaviors that contribute to unintentional injuries and violence; 2) tobacco use; 3) alcohol and other drug use; 4) sexual behaviors related to unintended pregnancy and sexually transmitted diseases, including HIV infection; 5) physical activity and dietary behaviors and 6) mental health.

## About this Report

In spring 2019, the School District of Philadelphia (SDP) administered the Philadelphia YRBS <sup>1</sup>to 1,217 high school students at 25 randomly selected District schools using a two-stage cluster sample design.<sup>2</sup> This report analyzes student responses to four questions related to mental health and suicide that were asked on the 2019 Philadelphia YRBS.<sup>3</sup> The questions asked were:

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<sup>1</sup> For Philadelphia YRBS, visit [https://www.philasd.org/performance/programsservices/open-data/school-information/#youth\\_risk\\_behavior\\_survey](https://www.philasd.org/performance/programsservices/open-data/school-information/#youth_risk_behavior_survey)

<sup>2</sup> The Philadelphia YRBS uses a two-stage cluster sample design. In the first stage, schools with any grades 9-12 are sampled with probability proportional to the school enrollment. In the second stage, classes with required subject areas (e.g., English, homerooms) are randomly sampled. The overall response rate was 70%. For more details about YRBS sampling, visit <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6002027/>.

1. During the past 12 months, did you ever feel so sad or hopeless almost every day for *two weeks or more in a row* that you stopped doing some usual activities?
2. During the past 12 months, did you ever *seriously* consider attempting suicide?
3. During the past 12 months, did you make a plan about how you would attempt suicide?
4. During the past 12 months, how many times did you *actually* attempt suicide?

Responses to question 1-3 were provided as “Yes” or “No,” and responses to question 4 were provided on an ordinal scale: *0 times, 1 time, 2-3 times, 4-5 times, and 6 or more times*. We recoded question 4 as “Yes” (1 or more times) or “No” (0 times).

Our analyses of these four survey items are organized into three sections, each aligned to a different area of inquiry:

1. **Section 1: YRBS Results** describes how Philadelphia high school students responded to the four YRBS items related to mental health and suicidality in 2019 and explores areas of statistically significant difference between responses in 2019 and 2017.
2. **Section 2: Subgroup Analysis** describes differences in student responses to the four mental health and suicidality questions in 2019 by racial/ethnic group, gender, lesbian/gay/bisexual (LGB) status, and grade.
3. **Section 3: Protective and Risk Factors** draws on existing literature to outline what we know about protective and risk factors for high school students’ mental health and suicidality.

Sections 1 and 2 use descriptive statistics to examine student responses to the four survey items. We also report associated confidence intervals from the weighted results<sup>4</sup> of the survey to infer statistical significance. In Section 3, we use correlations and logistic regressions to investigate the relationships between the survey items and the risk and protective factors of mental health.<sup>5</sup> The report concludes with a summary of findings. For information about the respondent sample, see the Appendix.

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<sup>4</sup> “Weighting is a mathematical procedure that makes data representative of the population from which it was drawn” (YRBS Frequently Asked Questions: What does it mean for data to be weighted? From <https://www.cdc.gov/healthyyouth/data/yrbs/faq.htm>).

<sup>5</sup> The list of variables included in these analyses are provided in Appendix A1.

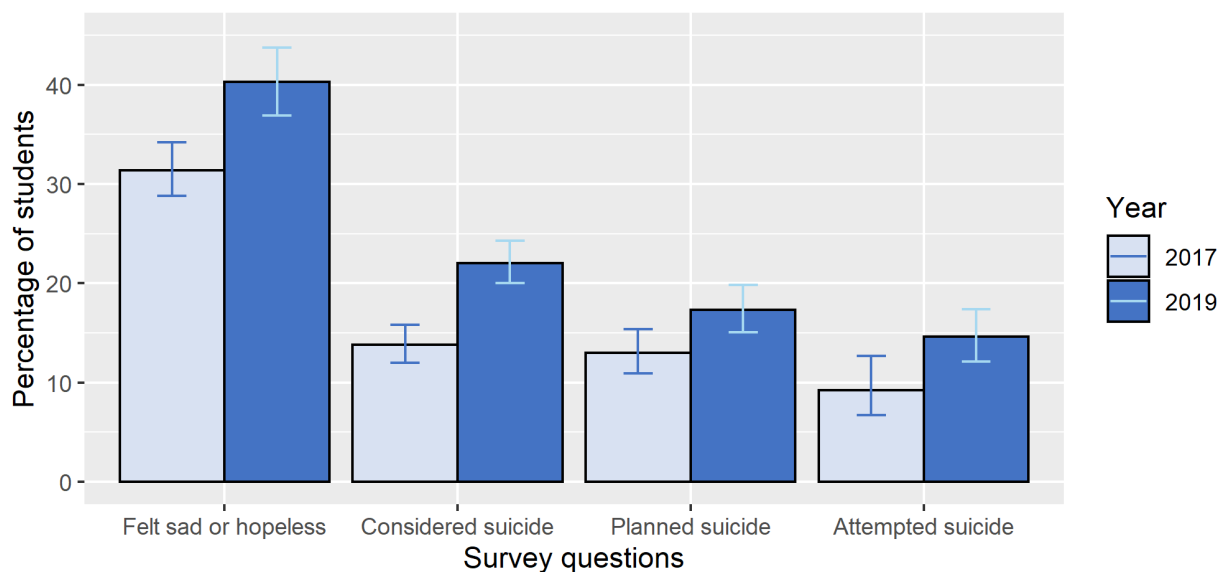
## Section 1: YRBS Results

### Philadelphia high school students responded more negatively to all four YRBS questions in 2019 than in 2017.

In 2019, Philadelphia high school students responded more negatively to all four YRBS survey questions related to mental health and suicidality than in 2017; that is, more students reported that they felt sad or hopeless or considered, planned, or attempted suicide (Figure 1). The differences between responses in 2019 and 2017 were statistically significant for two questions: the percentage of students who reported *feeling sad or hopeless* increased from 31.4% to 40.3%, and the percentage of students who said they *considered suicide* increased from 13.8% to 22.0% (Table 2).

In addition, the percentage of students who reported having a *suicide plan* also increased, by 4.3 percentage points (13% to 17.3%) and the percentage of students who said they *attempted suicide* increased by 5.3 percentage points (9.2% to 14.6%, Table 2). These were not statistically significant changes.

**Figure 1.** Weighted student responses and estimated 95% confidence intervals to four YRBS mental health related questions in Philadelphia: changes between 2017 and 2019



**How to read this figure:** The height of each bar shows the weighted average percentage of students who responded “Yes” to each question. The brackets represent the 95% confidence interval for each question; that is, they represent the range of values that should include the true value with 95% certainty. If the span of the light blue bracket does not align with the span of the dark blue bracket, we can infer that the difference between student responses in 2017 and 2019 is statistically significant for that question. For example, the confidence intervals for *felt sad/hopeless* in 2017 and 2019 do not overlap. Therefore, we can visually infer that the differences are statistically significant.

**Table 2.** Weighted student responses and estimated 95% confidence intervals for four YRBS mental health questions: changes in responses between 2017 and 2019

Survey Question	2017 weighted percentage (95% confidence interval)	2019 weighted percentage (95% confidence interval)	Percentage-point change
Q1. Felt sad or hopeless (almost every day for two or more weeks in a row, so that they stopped doing some usual activities, during the 12 months before the survey)	31.4% (28.8 - 34.2)	40.3% (36.9 - 43.7)	8.9*
Q2. Seriously considered attempting suicide (during the 12 months before the survey)	13.8 (12.0 - 15.8)	22.0 (19.9 - 24.3)	8.2*
Q3. Made a plan about how to they would attempt suicide (during the 12 months before the survey)	13 (10.9 - 15.4)	17.3 (15.0 - 19.8)	4.3
Q4. Attempted suicide (one or more times in the previous 12 months)	9.3 (6.7 - 12.7)	14.6 (12.1 - 17.4)	5.3

**Note:** 2017 Philadelphia results were obtained from the Centers for Disease Control (CDC) Youth Online: High School YRBS. 95% confidence intervals are included in parentheses.

**How to read this table:** With weighted data, we can say that 40.3% of Philadelphia students in grades 9-12 responded that they felt sad or hopeless almost every day for 2 or more weeks in a row so that they stopped doing some usual activities during the 12 months before the survey. The 95% confidence interval is the range that the true value will fall under with 95% certainty. For example, with 95% certainty, between 36.9% and 43.7% of Philadelphia students in grades 9-12 *felt sad or hopeless*.

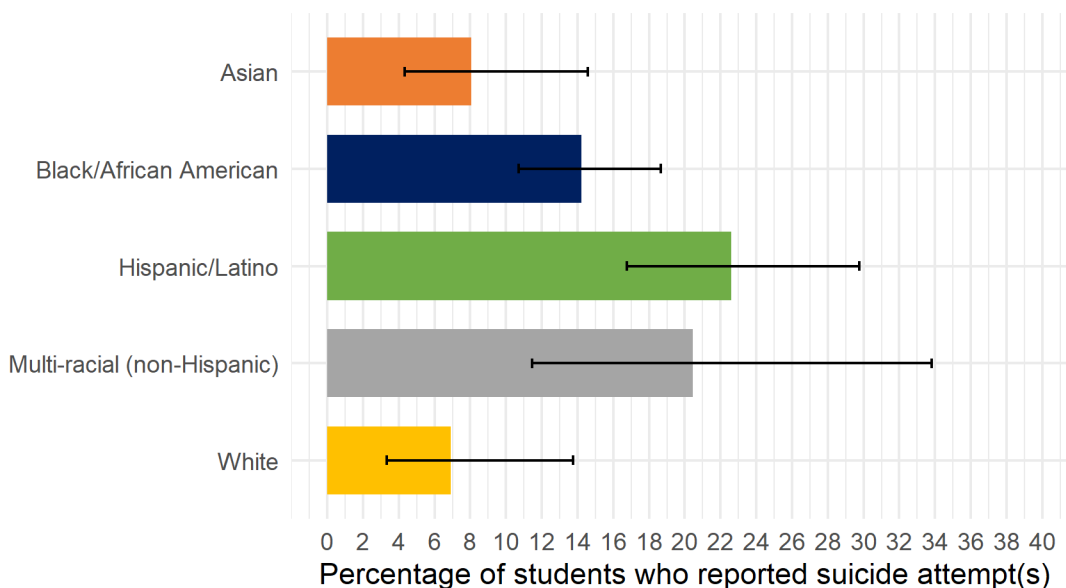
\*  $p < 0.05$

## Section 2: Subgroup Analysis

**In 2019, 22.6% of Hispanic/Latino students said they had attempted suicide in the previous 12 months; this was the highest percentage of any racial/ethnic subgroup.**

We detected statistically significant disparities between racial/ethnic subgroups in student responses about suicide attempts.<sup>6</sup> Hispanic/Latino students had the highest percentage who reported they attempted suicide in the previous 12 months (22.6%), followed by Multi-Racial (non-Hispanic) students (20.45%) and African American/Black students (14.23%). Fewer Asian students (8.07%) and White students (6.91%) reported attempting suicide (Table 3).

**Figure 2.** Weighted student responses and 95% confidence intervals for student responses to YRBS question about suicide attempts, by race/ethnicity (2019)



**How to read this figure:** The length of each bar shows the weighted average percentage of students in each racial/ethnic subgroup who said they had attempted suicide in the previous 12 months. The brackets represent the 95% confidence interval for each subgroup; that is, they represent the range of values that should include the true value with 95% certainty. If the span of any two brackets do not overlap, we can infer that the difference between student responses for that subgroup are statistically significant. For example, the 95% confidence interval bracket for Hispanic/Latino student responses does not overlap with the 95% confidence interval bracket for White student responses. This suggests that the difference in responses between the two groups is statistically significant.

<sup>6</sup> We provide a design-corrected chi-square test statistic converted to an *F*-statistic. ( $F(5.20, 156.09) = 4.07, p < 0.01$ ).

**Table 3.** Weighted percentages and 95% confidence intervals for students who said they attempted suicide in the previous 12 months, by race/ethnicity

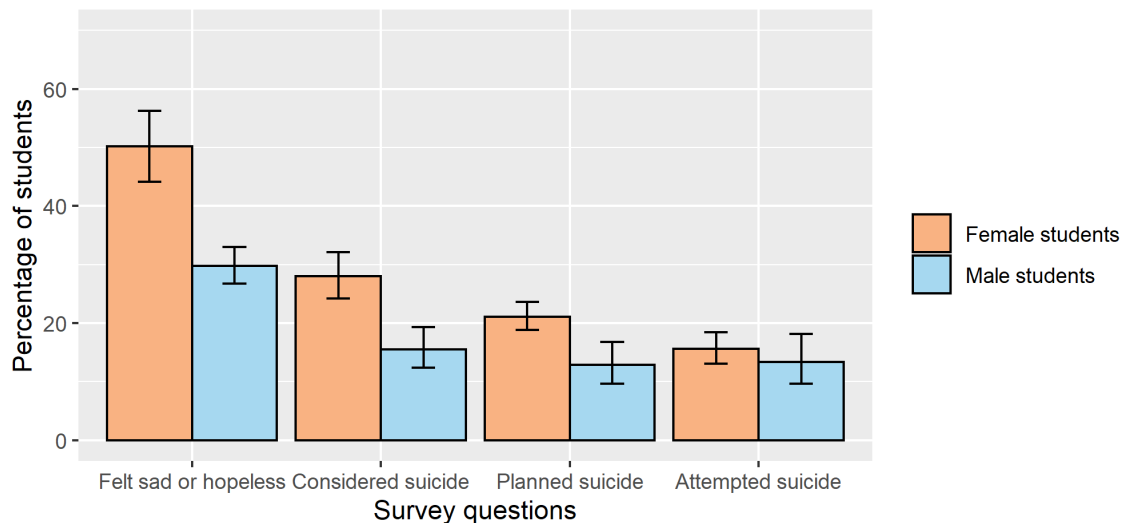
	Attempted suicide (%)	95% CI
Asian	8.1%	(4.3-14.6)
Black/African American	14.2	(10.7-18.7)
White	6.9	(3.3-13.8)
Hispanic/Latino	22.6	(16.8-29.8)
Multi-Racial (non-Hispanic)	20.5	(11.5-33.8)

**How to read this table:** With weighted data, we can say that 22.6% of Philadelphia’s Hispanic/Latino students in grades 9-12 responded that they attempted suicide during the 12 months before the survey. The 95% confidence interval is the range that the true value will fall under with 95% certainty. For example, with 95% certainty, between 16.8% and 29.8% of Philadelphia’s Hispanic/Latino students in grades 9-12 said they attempted suicide in the past 12 months.

### A higher percentage of female students than male students responded negatively to questions about mental health and suicide in 2019.

There were differences between male and female student responses to each of the four survey questions (Figure 3). Compared to male students, a higher percentage of female students said they felt sad/hopeless (50.2% vs. 29.8%), considered suicide (28.0% vs. 15.6%), planned suicide (21.1% vs. 12.8%) and attempted suicide (15.6% vs. 13.3%; Table 6).

**Figure 3.** Weighted student responses and 95% confidence intervals for student responses to YRBS question about suicide attempts in the previous 12 months, by gender



**How to read this figure:** The height of each bar shows the weighted average percentage of students who responded “Yes” to each survey question. The brackets represent the 95% confidence interval for each question; that is, they represent the range of values that should include the true value with 95% certainty. If any two brackets do not overlap, we can infer that the difference in responses is statistically significant for that question. For example, a higher percentage of female students than male students said they attempted suicide. However, the confidence intervals between the male and female respondent groups overlap, suggesting that the difference between them is not statistically significant.

**Table 6.** Weighted percentage of students reporting to have attempted suicide in the last 12 months by gender

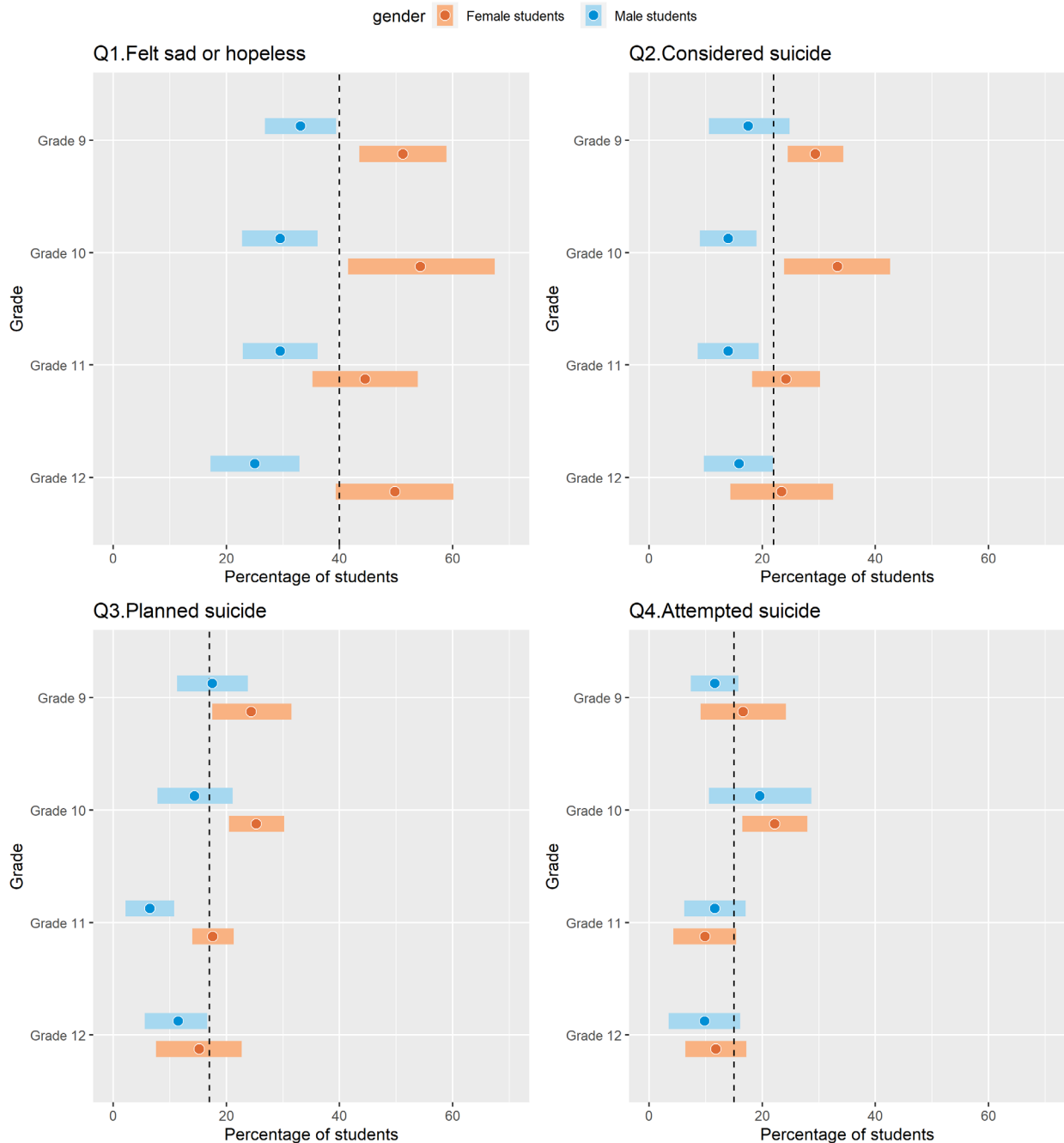
Question	Gender	Mean (%)	95% CI
Felt sad/hopeless	Female	50.2	(44.1-56.2)
	Male	29.8	(26.8-33.0)
Considered suicide	Female	28.0	(24.2-32.1)
	Male	15.6	(12.4-19.4)
Planned suicide	Female	21.1	(18.8-23.6)
	Male	12.8	(9.7-16.8)
Attempted suicide	Female	15.6	(13.1-18.5)
	Male	13.3	(9.6-18.2)

**How to read this table:** With weighted data, we can say that 50.2% of Philadelphia’s female students in grades 9-12 responded that they felt sad or hopeless almost every day for 2 or more weeks in a row so that they stopped doing some usual activities during the 12 months before the survey. The 95% confidence interval is the range that the true value will fall under with 95% certainty. For example, with 95% certainty, between 16.8% and 29.8% of Philadelphia students in grades 9-12 felt sad or hopeless almost every day for 2 or more weeks in a row so that they stopped doing some usual activities during the 12 months before the survey.



The data visualization below shows weighted responses to each survey item by gender and grade level. In general, higher percentages of female students than male students responded “Yes” to each of the four survey items. However, the differences became less pronounced (that is, the bars are closer together) from question 1 to question 4 (Figure 4).

**Figure 4.** Weighted average percentages and confidence intervals of responses to four YRBS mental health questions, by gender and grade (2019)



**How to read this figure:** Each dot shows the weighted average percentage of male or female students who responded “Yes” to that survey item (Q1, Q2, Q3, and Q4) in each grade (9-12). The bars represent the 95% confidence interval for that subgroup and question; that is, they represent the range of values that should include the true value with 95% certainty. If any two bars do not overlap, we can infer that the difference between male and female student responses to that question were statistically significant in that grade. The dotted vertical lines denote the District average for each question across grades.  
Q1 = Felt sad or hopeless; Q2 = Seriously considered suicide; Q3= Made suicide plan; Q4 = Attempted suicide.

## There were racial/ethnic disparities between male and female student responses to all four survey items.

We continued to find disparities between student responses by race and ethnicity when we examined subgroup responses by gender. For example, among female students, Hispanic/Latino students had the highest percentage who said they attempted suicide in the previous 12 months (26.3%), followed by Multi-Racial (non-Hispanic) students (24.1%) and African American/Black students (14.4%); slightly more than 10% of Asian female students and almost 7% of White female students reported the same (Table 7). Among female students, these differences by race/ethnicity were least pronounced in responses to Question 1 (“Have you felt sad or hopeless”): a higher percentage of Asian (45.8%) and White students (54.5%) responded affirmatively to this question compared to the other three.

Among male students, Hispanic/Latino students had the highest percentage (19.6%) who said they attempted suicide in the previous 12 months, followed by Multi-Racial (non-Hispanic) students (16.6%) and African American/Black students (14.2%, Table 7). For White male students, 7.1% reported having attempted suicide and 5.9% of Asian male students reported having attempted suicide (Table 7). Similar to the patterns observed for the female students, despite the lower percentage of Asian and White students reporting having attempted suicide during the last 12 months, high percentages of Asian (25.8%, Table 7) and White male students (35.8%, Table 7) reported having felt sad/hopeless for two weeks in a row that they discontinued usual activities.

**Table 7.** Weighted responses to Philadelphia YRBS mental health/suicide questions by race/ethnicity and gender (2019)

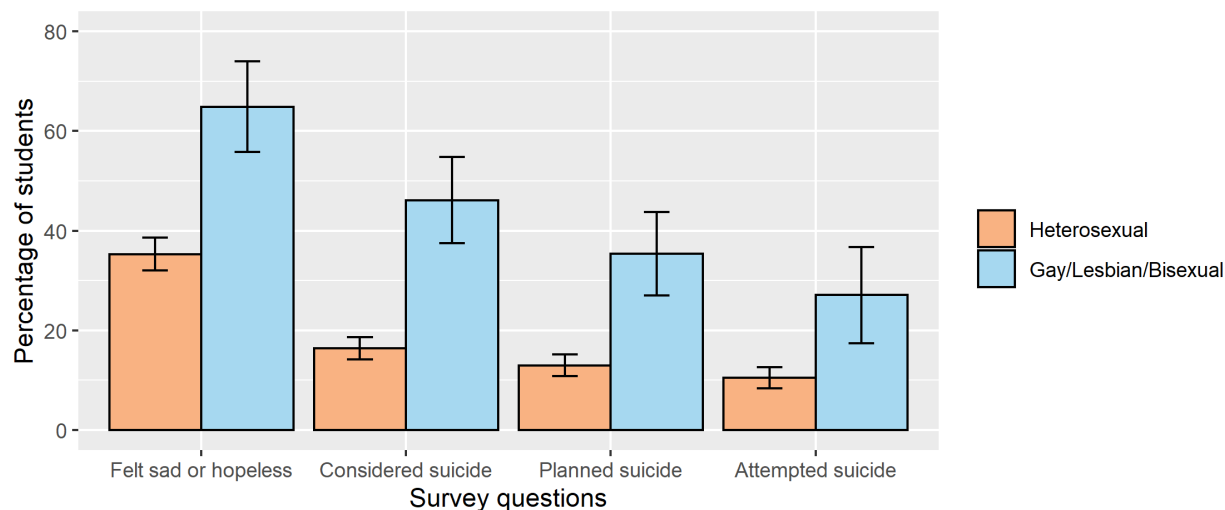
	Felt sad/hopeless	Considered suicide	Planned suicide	Attempted suicide
<b>Female students</b>				
Asian	45.8%	28.8%	23.1%	10.4%
Black/African American	48.3	27	22.1	14.4
Hispanic/Latino	52.5	31.4	19.6	26.3
Multi-Racial (non-Hispanic)	68.6	42.1	34.6	24.1
White	54.5	22.7	13	6.8
<b>Male students</b>				
Asian	25.8	10.7	6	5.9
Black/ African American	24.9	15	14.8	14.2
Hispanic/Latino	35.7	15.9	10.9	19.6
Multi-Racial (non-Hispanic)	24.2	24	24	16.6
White	35.8	20.4	13.9	7.1

**Mental health disparities between LGB and heterosexual students were observed consistently across all four survey items.**

Across all four survey items, we found consistent disparities in students’ mental health based on their self-reported LGB (gay/lesbian/bisexual) status <sup>7</sup>(Figure 5). A higher percentage of self-identified LGB students reported feeling sad or hopeless compared to students who self-identified as heterosexual (64.88% vs. 35.3%, Table 8). Similarly, a higher percentage of students who self-identified as LGB reported having considered suicide compared to students who self-identified as heterosexual (46.14% vs. 16.39%, Table 8). The pattern held true for having made a suicide plan (35.34 % vs. 12.97%, Table 8) and for having attempted suicide (27.06% vs. 10.47%, Table 8).

<sup>7</sup> YRBS uses a separate question to identify transgender students: “Some people describe themselves as transgender when their sex at birth does not match the way they think or feel about their gender. Are you transgender?” Because the issue of gender identity does not necessarily align with that of sexual orientation, this analysis does not address the complete range of LGBTQ student experiences.

**Figure 5.** Weighted average percentages and confidence intervals of responses to four YRBS mental health/suicide questions, by LGB status (2019)



**Table 8.** Weighted percentage of students who responded negatively to the four YRBS mental health/suicide questions by self-reported LGB identification (2019)

	Heterosexual (%)	95% CI	LGB (%)	95% CI
Felt sad/hopeless	35.3%	(31.99 - 38.61)	64.88%	(55.76 - 73.99)
Considered suicide	16.39	(14.19 - 18.59)	46.14	(37.50 - 54.78)
Planned suicide	12.97	(10.77 - 15.17)	35.34	(26.96 - 43.73)
Attempted suicide	10.47	(8.34 - 12.60)	27.06	(17.37 - 36.70)

**Note:** Due to its small sample size, confidence intervals tended to be larger for the LGB group.

**There were disparities between responses from students who self-identified as lesbian, gay, or bisexual (LGB) and those who did not across all racial/ethnic subgroups and on each survey item.**

Table 9 shows the weighted percentage of heterosexual and LGB students from each racial/ethnic group who responded “Yes” to each survey item. Due to the LGB group’s small sample size, the standard errors for this population tend to be larger; this results in broader 95% confidence intervals, especially for certain racial/ethnic groups. Therefore, the results should be interpreted with caution.

Despite the large confidence intervals for responses from LGB students, we consistently observed that LGB students across all racial/ethnic groups tended to respond more negatively to all four survey items. For example, about 68% of Asian LGB respondents reported feeling sad/hopeless, compared to about a third of heterosexual Asian students (32.98%; Table 9).

**Table 9.** Weighted percentage of students responding negatively to the 2019 Philadelphia YRBS mental health/suicide questions by LGB and race/ethnicity groups

<b>Felt sad/hopeless</b>	<b>Percentage of heterosexual students responding yes</b>	<b>95% CI</b>	<b>Percentage of LGB students responding yes</b>	<b>95% CI</b>
Asian	32.1	(23.04 - 41.12)	68.3	(39.11 - 97.52)
Black/African American	33.6	(27.97 - 39.15)	61.8	(51.17 - 72.43)
Hispanic/Latino	37.2	(30.61 - 44.21)	76.1	(55.44 - 89.10)
Multi-race (non-Hispanic)	32.9	(17.07 - 48.81)	83.2	(68.85 - 97.57)
White	39.9	(27.68 - 52.06)	55.9	(25.44 - 86.37)
<b>Considered suicide</b>	<b>Percentage of heterosexual students responding yes</b>	<b>95% CI</b>	<b>Percentage of LGB students responding yes</b>	<b>95% CI</b>
Asian	16.4%	(10.27 - 22.56)	44.6	(18.91 - 70.35)
Black/African American	15.5	(10.85 - 20.23)	48.6	(37.15 - 60.09)
Hispanic/Latino	18.5	(12.96 - 25.73)	48.7	(34.01 - 63.62)
Multi-race (non-Hispanic)	15.7	(1 - 30.56)	76.1	(60.58 - 91.66)
White	16.2	(8.24 - 24.20)	32.4	(12.61 - 52.15)

Table 9. Continued

<b>Planned suicide</b>	<b>Percentage of heterosexual students responding yes</b>	<b>95% CI</b>	<b>Percentage of LGB students responding yes</b>	<b>95% CI</b>
Asian	11.2	(6.18 - 16.14)	28.6%	(3.91 - 53.35)
Black/African American	14.3	(10.53 - 18.08)	34.8	(22.27 - 47.28)
Hispanic/Latino	12.1	(6.51 - 21.45)	42.7	(26.65 - 60.50)
Multi-race (non-Hispanic)	12.4	(1.95 - 22.78)	68.9	(52.87 - 82.93)
White	11.3	(5.57 - 16.93)	24.1	(4.06 - 44.06)
<b>Attempted suicide</b>	<b>Percentage of heterosexual students responding yes</b>	<b>95% CI</b>	<b>Percentage of LGB students responding yes</b>	<b>95% CI</b>
Asian	6.6	(1.70 - 11.52)	14.4	(0 - 34.61)
Black/African American	10.1	(5.7 - 14.56)	26.9	(16.50 - 37.19)
Hispanic/Latino	18.4	(12.61 - 26.09)	38.5	(24.01 - 55.42)
Multi-race (non-Hispanic)	2.6	(0 - 7.77)	46.6	(14.20 - 79.07)
White	6.1	(0 - 12.31)	10.0	(0 - 25.21)

**Note:** Due to its small sample size, confidence intervals tended to be larger for the LGB group.

**How to read this table:** With weighted data, we can say that 32.1% of Philadelphia’s heterosexual female students in grades 9-12 responded that they felt sad or hopeless almost every day for 2 or more weeks in a row so that they stopped doing some usual activities during the 12 months before the survey. The 95% confidence interval is the range that the true value will fall under with 95% certainty. For example, we can say with 95% certainty that between 23% and 41.1% of Philadelphia students in grades 9-12 felt sad or hopeless almost every day for 2 or more weeks in a row so that they stopped doing some usual activities during the 12 months before the survey.

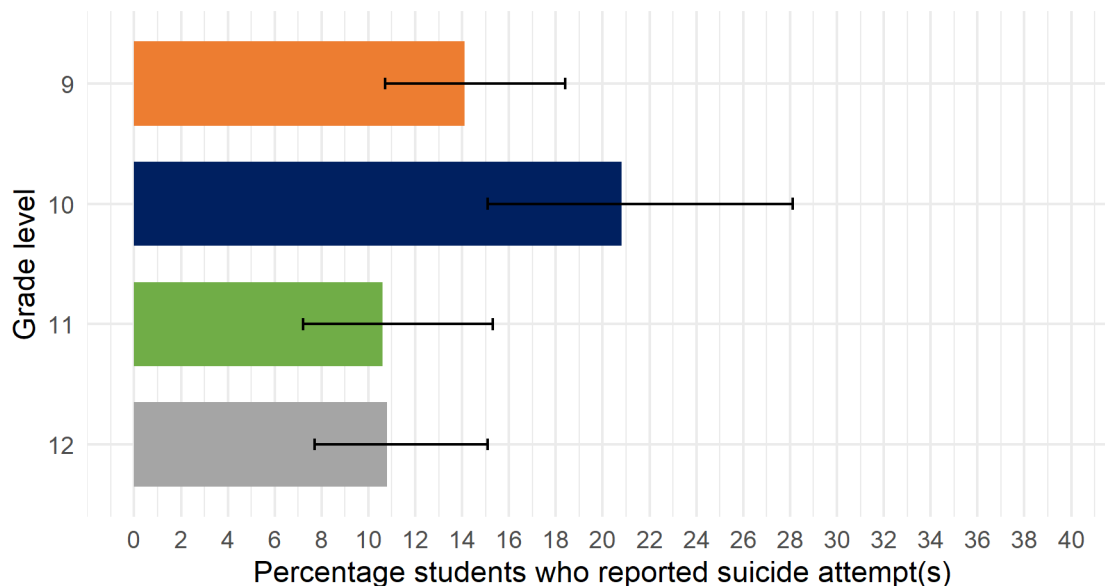
## 10<sup>th</sup>-grade students had the highest percentage of respondents who said they attempted suicide in the previous 12 months.

We observed statistically significant differences in responses about attempting suicide by grade level (Figure 6).<sup>8</sup> The highest percentage of 10<sup>th</sup>-graders reported attempting suicide (20.82%), followed by 9<sup>th</sup>-grade students (14.12%, Table 10). Fewer high school juniors (10.61%) and seniors (10.83%) reported attempting suicide.

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<sup>8</sup> We provide a design-corrected chi-square test statistic converted to an  $F$ -statistic. ( $F(2.70, 80.90) p = 0.0080$ ).

**Figure 6.** Weighted percentage of students who reported attempting suicide, by grade level (2019)



**How to read this figure:** The length of each bar shows the weighted average percentage of students in each racial/ethnic subgroup who said they had attempted suicide in the previous 12 months. The brackets represent the 95% confidence interval for each subgroup; that is, they represent the range of values that should include the true value with 95% certainty. If the span of any two brackets do not overlap, we can infer that the difference between student responses for that subgroup are statistically significant. For example, the 95% confidence interval bracket for responses for the 9<sup>th</sup>-grader responses overlaps with the 95% confidence interval bracket for the 10<sup>th</sup>-grader responses. This suggests that the difference in responses between the two groups is not statistically significant.

**Table 10.** Weighted percentage of students who reported attempting suicide, by grade level (2019 YRBS)

Grade level	Mean	95% Confidence Interval
9	14.12%	10.7 - 18.4
10	20.82%	15.1 - 28.1
11	10.61%	7.2 - 15.3
12	10.83%	7.7 - 15.1

### There were variations in student responses by gender in addition to by grade.

Among both male and female students, a larger percentage of 9<sup>th</sup>- and 10<sup>th</sup>-graders responded negatively to the four survey items than 11<sup>th</sup>- and 12<sup>th</sup>-graders. Among female students, 54.3% of 10<sup>th</sup>-graders said they felt sad/hopeless, and 23.3% of female 10<sup>th</sup>-graders said they attempted suicide (Table 11). Among male students, the highest percentage of 9<sup>th</sup>-graders said they felt sad/hopeless (33.2%), considered suicide (17.7%), and planned suicide (17.5%), but a larger percentage of 10<sup>th</sup>-graders reported attempting suicide (19.6%, Table 11).



**Table 11.** Weighted percentage of male and female students who responded “yes” to YRBS mental health/suicide questions, by grade (2019)

	<b>Felt sad/hopeless (%)</b>	<b>Considered suicide (%)</b>	<b>Planned Suicide (%)</b>	<b>Attempted Suicide (%)</b>
<b>Female students</b>				
Grade 9	51.2	29.4	24.5	16.6
Grade 10	54.3	33.3	25.3	22.3
Grade 11	44.5	24.2	17.7	9.9
Grade 12	49.8	23.5	15.2	11.8
<b>Male students</b>				
Grade 9	33.2	17.7	17.5	11.6
Grade 10	29.5	14.0	14.4	19.6
Grade 11	29.6	14.0	6.5	11.6
Grade 12	25.1	15.9	11.1	9.8

The next section of this report provides an overview of extant literature on risk and protective factors for young people’s mental health.

## Section 3: Protective and Risk Factors

Research has found that *bullying* and *poverty* are risk factors for poor mental health, while evidence on *screen time* has been mixed.

Literature has documented some statistically significant links between bullying and suicidality. With increased use of internet and social media among teenagers, a growing number of research studies have distinguished between *bullying*, which occurs in-person, and *cyberbullying*, which is done through technology (Bauman et al., 2013; Litwiller & Brausch, 2013). One study found that cyberbullying tended to be less common than traditional bullying, but that traditional bullying and cyberbullying are positively correlated (Modecki et al., 2014). Research has also found that the causal mechanisms for traditional bullying and cyberbullying may differ by gender. In a study analyzing 2009 YRBS data from 1,491 high school students, depression served as a link between being a victim of traditional bullying and attempting suicide; this was true for both male and female students. However, for cyberbullying, depression mediated the link between victimization and attempting suicide for female students only (Bauman et al., 2013).

Evidence supporting a relationship between increased screen time and adolescent mental health exists, but it has been inconclusive. Some studies have associated increased screen time with risks to mental health and non-screen activities with a reduction in mental health issues (Twenge, 2019; Twenge et al., 2018). However, one study suggested that the substantive negative effects of screen time on mental health were very small (Orben & Przybylski, 2019).

The negative effects of *poverty* on adolescents' mental health have been well-documented (Dupéré et al., 2009; Najman et al., 2010; Yoshikawa et al., 2012). Dupéré et al. (2009) found that adolescents in poor neighborhoods were four times as likely to report attempting suicide than adolescents elsewhere. In a 14-year longitudinal study, Najman et al. (2010) illustrated that poverty during adolescence was the strongest predictor of anxiety and depression in young adulthood.

Previous research has found that *sports participation*, *physical activity*, and *hours of sleep* can serve as protective factors for students' mental health.

Research studies have found that *physical activity* and *sports participation* may serve as protective factors against feeling sad or hopeless and suicidal ideation (Babiss & Gangwisch, 2009; Eime et al., 2013; Taliaferro et al., 2008). Using 2005 YRBS data, Taliaferro et al. (2008) found that vigorous physical activity lowered the risk of reporting sad/hopeless feelings and suicidality. The number of hours that adolescents slept was also found to be important to their mental health. Data from the 2007 and 2008 YRBS, for example, showed an association between fewer total hours spent asleep and serious suicidality (Fitzgerald et al., 2011). However, the study was inconclusive on whether the relationship was causal or descriptive.

## Overall, 2019 YRBS data support the general relationships between mental health and risk/protective factors in existing literature.

We used student responses to other items on the 2019 Philadelphia YRBS survey to measure the risk and protective factors identified in the literature review and described above. We then correlated these items with the four mental health survey items analyzed throughout this report. (See the Appendix for a summary of student responses to each survey item.)

Overall, responses to the four mental health survey questions and the pre-identified risk and protective factors were correlated in the expected directions. Negative responses to YRBS survey items on sports participation, physical activity, and sleep were negatively associated with feeling sad/hopeless and suicidality, while positive responses to being bullied in school or electronically were positively associated with feeling sad/hopeless and suicidality. The relationships between screen time and mental health items were mixed, as suggested by the changing signs and small sizes of the correlations (Table 12).

**Table 12.** Correlations between responses to 2019 Philadelphia YRBS mental health/suicide questions and purported protective/risk factors

Variables	Felt sad/hopeless	Considered suicide	Planned suicide	Attempted suicide
Participates in sports	-0.12	-0.18	-0.15	0.03
Physically active at least 60 min for all 7 days	-0.11	-0.09	-0.12	-0.18
Sleep 8 hours or more on a school day	-0.23	-0.21	-0.23	-0.12
Bullied in school	0.41	0.43	0.35	0.39
Bullied electronically	0.33	0.39	0.42	0.38
Food insecurity	0.27	0.23	0.29	0.18
Watches TV 3 hours a day or more	-0.05	-0.03	0.09	0.14
Plays video/computer games or uses computer for non-school work for 3 hours a day or more	0.11	0.13	0.08	-0.06

**Note:** Tetrachoric correlations are reported instead of Pearson’s because survey items were measured in binary variables (Yes/No). The interpretation is the same; values range between -1 and 1, with a negative number indicating negative relationship and a positive number indicating a positive relationship between the two variables of interest. In this table, negative numbers mean the variable is **negatively** correlated with a *yes* response, and positive numbers mean the variable is **positively** correlated with a *yes* response. For example, there is a negative correlation between sports participation and feeling sad or hopeless (meaning that as sport participation increases, feeling sad or hopeless decreases), but the small value shows that the correlation is not strong.

We further used logistic regressions to statistically assess the association between the risk and protective factors and each of the four survey items, controlling for all identified variables. Because we observed differences between female and male student responses, we fit the models for each gender separately.

### **For female students, *in-school bullying* and *cyberbullying* were strong risk factors for poor mental health and suicidality.**

Among female students, *in-school bullying* and *cyberbullying* were statistically significant risk factors for reporting a suicide plan or attempt. Our results suggest that female students who have been bullied in school were 3.16 times more likely to report feeling sad/hopeless than female students who have not been bullied in school (Model 1, Table 13). Similarly, female students who have been bullied in school were 2.77 times as likely to report attempting suicide than female students who have not been bullied in school (Model 4, Table 13). The effects of electronic or cyberbullying were similar. Female students who said they had been electronically bullied were 2.5 times more likely to report feeling sad/hopeless than female students who had not been electronically bullied (Model 1, Table 13), and female students who had been electronically bullied were 2.77 times more likely to say they had attempted suicide than peers who were not electronically bullied (Model 4, Table 13).

Food insecurity was significantly associated with an increased risk for female students feeling sad/hopeless (Odds Ratio = 5.93, Model 1, Table 13) considering suicide (Odds Ratio = 2.74, Model 2, Table 13), and planning suicide (Odds Ratio = 3.77, Model 3, Table 13). However, the association with suicide attempts was *not* statistically significant (Odds Ratio = 1.77, Model 4, Table 13). On a positive note, having *more than eight hours of sleep on a school night* was a statistically significant protective factor against feeling sad/hopeless (Odds Ratio = 0.52, Model 1, Table 13), considering suicide (Odds Ratio = 0.46), and planning suicide (Odds Ratio = 0.39, Model 3, Table 13). However, the association with attempting suicide was *not* statistically significant (Odds Ratio = 1.04, Model 4, Table 13).

**Table 13.** Weighted odds ratios from logistic regression models predicting mental health and suicidality:  
*female students*

	Model (1) Felt sad/ hopeless	Model (2) Considered suicide	Model (3) Planned suicide	Model (4) Attempted suicide
Participates in sports	0.86	0.77	0.62*	0.95
Physically active at least 60 min for all 7 days	1	1.05	0.96	0.9
Sleep 8 hours or more on a school day	0.52**	0.46**	0.39**	1.04
Bullied in school	3.16**	4.37**	1.96*	2.77**
Bullied electronically	2.50**	1.52	2.18*	2.66*
Food insecurity	5.93**	2.74**	3.77**	1.77
Watched TV 3 hours a day or more	0.76	0.88	1.46	1.51
Non-school related screen time for 3 hours a day or more	1.73***	1.31	1.16	1.13
<b>N</b>	516	512	516	423

**Notes:** All coefficients are reported in odds ratios. An odds ratio greater than 1 indicates a positive association, and an odds ratio less than 1 indicates a negative association. Estimates are weighted to be representative. Race/ethnicity and grade levels were included as additional controls.

\*\*\*p<0.01, \*\*p<0.05, \*p<0.1

**For male students, *cyberbullying* was a strong risk factor for feeling sad/hopeless, considering suicide, and planning suicide, while *being physically active* and *sleeping more than eight hours* were associated with reduced suicide risks.**

For male students, being electronically bullied was significantly associated with increased risks of feeling sad/hopeless (OR = 2.42, Mod (1), Table 14), considering suicide (OR = 4.10, Mod (2), Table 14), and planning suicide (OR = 5.57, Mod (3), Table 14). Regarding suicide attempts, the odds ratios for being bullied electronically were positive (OR = 1.37, Mod (4), Table 14) but not statistically significant. Unlike female student responses, male student responses did not show an association between in-school bullying and mental health.

We did find that *physical activity* and *sleeping at least eight hours* were statistically significant and strong protective factors against attempting suicide (Mod (4), Table 14). Among male students, being physically active at least 60 minutes per day was associated with a 55% reduction in the odds of attempting suicide. Similarly, sleeping at least eight hours per school night was associated with an 89% reduction in the odds of attempting and a 72% reduction in the odds of planning suicide.

**Table 14.** Weighted odds ratios from logistic regression models predicting mental health and suicidality: *male students*

	Model (1) Felt sad/ hopeless	Model (2) Considered suicide	Model (3) Planned suicide	Model (4) Attempted suicide
Participates in sports	0.83	0.58	0.81	1.78
Physically active at least 60 min for all 7 days	1.36	0.94	1.12	0.45*
Sleep 8 hours or more on a school day	0.44	0.51	0.28**	0.11**
Bullied in school	2.07	0.8	1.55	2.34
Bullied electronically	2.42*	4.10**	5.57**	1.37
Food insecurity	3.83**	2.48	2.75	2.31
Watched TV 3 hours or more	1.16	0.99	1.49	1.24
Non-school related screen time for 3+ hours	1.4	1.9	1.14	0.75
<b>N</b>	316	362	362	310

**Notes:** All coefficients are reported in odds ratios. An odds ratio greater than 1 indicates a positive association, and an odds ratio less than 1 indicates a negative association. Estimates are weighted to be representative. Race/ethnicity and grade levels were included as additional controls.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

## Conclusions

This report documents trends in Philadelphia student responses to four mental health and suicidality questions on the Philadelphia YRBS. We found that Philadelphia students responded more negatively to these four items in 2019 than in 2017, and differences were statistically significant on two survey items: the percentage of students who reported *feeling sad or hopeless* increased from 31.4% to 40.27%, and the percentage of students said they *seriously considered suicide* increased from 13.8% to 22.03%.

This report also highlights disparities in student responses by race/ethnicity, grade, and lesbian/gay/bisexual (LGB) status. We found that Multi-Racial (non-Hispanic), Hispanic/Latino, and African American students tended to respond more negatively to the four survey items than Asian and White students; students in 9<sup>th</sup> and 10<sup>th</sup> grade tended to respond more negatively than 11<sup>th</sup> and 12<sup>th</sup> graders; and LGB students responded more negatively on all four mental health-related survey items than students who identified as heterosexual.

We further identified statistically significant risk and protective factors for male and female students. The relationships between purported risk and protective factors with Philadelphia student responses on the survey items were generally consistent with existing literature. However, the relationships did vary by gender. For female students, both *in-school bullying* and *electronic bullying or cyberbullying* were strong risk factors for feeling sad/hopeless, considering suicide, planning suicide, and attempting suicide. *Food insecurity* was also strongly associated with feeling sad/hopeless, considering suicide, and planning suicide, although the association was not statistically significant.

For male students, *cyberbullying* was a strong risk factor for feeling sad/hopeless, considering suicide, and planning suicides. However, the associations between *in-school bullying* and the four survey items were not statistically significant. *Being physically active* and *sleeping more than eight hours* were associated with a reduced risk of attempting suicide. For male students, the negative effects of food insecurity were only statistically significant on feelings of sadness/hopelessness.

This study has several important limitations which must be taken into consideration when interpreting the results. First, we note that the absence of statistically significant results for certain variables should not be interpreted as an absence of adversarial effects. This is especially true because we only looked at data from respondents who answered all survey items, which reduces the generalizability of the findings despite our adjustments to the survey weights. Second, we note there might be some important confounding variables important to adolescent mental health but not included in our study, such as health conditions and exposure to violence. Finally, due to the design of the YRBS, we note that any conclusions drawn from our study cannot demonstrate causal relationships but are limited to showing associations.

Despite these limitations, this study provides some insight on the mental health of Philadelphia students, and it suggests possible directions for programmatic efforts, especially with regard to actionable steps for protecting youth from suicidality. For example, our study shows that electronic bullying, which can be difficult for adults to detect, is an important risk factor with negative effects

on students' mental health that may be as strong as in-school bullying. As adolescents spend more time on social media and the internet, we must recognize the importance of ensuring these peer interactions are healthy. Moving forward, it will be important to establish a common understanding of online communication norms and raise awareness about cyberbullying to prevent future victimizations.

Consistent with existing literature, food insecurity also poses a risk to students' mental health and suicidality. This evidence suggests that access to healthy food benefits students' mental health in addition to their physical well-being. Our results also suggest that being physically active and sleeping eight hours may be of particular benefit as a mitigating factor against suicidality among male students. The next Philadelphia YRBS will be administered in the Fall of 2021, and we will continue to monitor these risk factors over time.



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## Appendix A. Respondent Sample

The student-level 2019 YRBS is available on SDP's Open Data<sup>9</sup>. Table A1 describes the 2019 Philadelphia YRBS respondents; about 42% were Black/African American, about 14% were Multi-Racial (Hispanic), 13% were Asian, and 12% were Hispanic/Latino.<sup>10</sup> Slightly more respondents were female (54.56%) than male (45.44%). About 17% of respondents self-identified as lesbian, gay, or bisexual (LGB), and grades were distributed evenly from 9 through 12. Our analyses weight the results from the 2019 Philadelphia YRBS to produce estimates representative of the SDP high school population.<sup>11</sup>

**Table A1.** Sample characteristics in 2019 Philadelphia YRBS (unweighted)

	N	%
Race/ethnicity		
American Indian/Alaska Native	7	0.6
Asian	160	13.61
Black or African American	497	42.26
Native Hawaiian/Other PI	15	1.28
White	128	10.88
Hispanic/Latino	143	12.16
Multi-race (Hispanic)	168	14.29
Multi-race (Non-Hispanic)	58	4.93
Gender		
Female students	658	54.56
Male students	548	45.44
Self-identified sexual orientation		
Heterosexual	859	76.97
LGB	193	17.29
Don't know	64	5.73
Grade levels		
9	274	22.76
10	334	27.74
11	289	24
12	307	25.5
N		1,217

<sup>9</sup> <https://www.philasd.org/performance/programsservices/open-data/>

<sup>10</sup> In order to report all Hispanic/Latino students, we combined Hispanic/Latino with Multi-Racial (Hispanic). This is the general practice in YRBS reports: <https://www.philasd.org/research/wp-content/uploads/sites/90/2019/10/2019-YRBS-Graphs-Philadelphia.pdf>.

<sup>11</sup> When the N size is small for the subgroup analysis, the standard errors tend to be larger and we make note of them in our analyses.

**Note:** Due to missing data, the cells in each characteristic may not sum to equal numbers.

## Appendix B. Survey Items

### B1. Risk and protective factors in the logistic regression models

*Participates in sports:* “During the past 12 months, how many sports team did you play?”

(recoded as 0 if selected 0 team; 1 if selected 1 or more teams)

*Physically active at least 60 min for all 7 days:* “During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spend in any kind of physical activity that increased your heart rate and made you breathe hard some of the time).

(recoded as 0 if selected 0 to 6 days; 1 if selected 7 days)

*Sleep 8 hours or more on a school day:* “On an average school night, how many hours of sleep do you get?”

(recoded as 0 if selected hours less than 8; 1 if selected 8 hours or more)

*Bullied in school:* “During the past 12 months, have you ever been bullied on school property?”

(recoded as 0 if selected “No”; 1 if selected “Yes”)

*Bullied electronically:* “During the past 12 months, have you ever been electronically bullied? (Count being bullied through texting, Instagram, Facebook, or other social media)

(recoded as 0 if selected “No”; 1 if selected “Yes”)

*Food insecurity:* “During the past 30 days, how often did you hungry because there was not enough food in your home?”

(recoded as 0 if selected “Never”, “Rarely”, and “Sometimes; 1 if selected “Most of the time” or “Always”)

*Watched TV 3 hours a day or more:* “On an average school day, how many hours do you watch TV?”

(recoded as 0 if responded that they do not watch TV or watch TV less than 3 hours per day; 1 if watched 3 hours or more per day)

*Non-school related screen time for 3 hours a day or more:* “On an average school day, how many hours do you play video or computer games or use a computer for something that is not schoolwork? (Count time spent playing games, watching videos, texting, or using social media on your smartphone, computer, Xbox, PlayStation, iPad, or other tablet.)

(recoded as 0 if responded that they do not play video or computer games or use a computer for something that is not schoolwork or selected less than 3 hours; 1 if selected 3).

**B2.** 2019 Philadelphia YRBS survey items in the logistic regression models

	Responses	N	%
Participates in sports	No	631	59.9
	Yes	422	40.1
Physically active at least 60 min for all 7 days	No	760	71.0
	Yes	311	29.0
Sleep 8 hours or more on a school day	No	872	82.8
	Yes	181	17.2
Bullied in school	No	1,036	87.1
	Yes	153	12.9
Bullied electronically	No	1,066	89.4
	Yes	127	10.7
Did not have enough to eat	No	971	95.4
	Yes	47	4.6
Watched TV 3 hours a day or more	No	784	73.6
	Yes	281	26.4
Non-school related screen time for 3 hours a day or more	No	472	44.1
	Yes	599	55.9

**B3.** Correlations among the four 2019 Philadelphia YRBS survey items

Variables	(1)	(2)	(3)	(4)
(1) sad/hopeless	1.000			
(2) consider suicide	0.756	1.000		
(3) made suicide plan	0.667	0.866	1.000	
(4) attempt suicide	0.458	0.806	0.747	1.000

**Note:** Tetrachoric correlations are reported because survey items were measured in binary responses (Yes/No).