

Mental Health and Physical Activity in Adolescents: Analysis of 2021 Youth Risk Behavior Study Data

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Abstract

The latest 2021 Youth Risk Behavior Survey (YRBS) data were analyzed to explore association between mental health and physical activity. Through analyzing YRBS data, females were more likely to be impacted by mental health during Covid than males. Baseline statistics were carried out and used chi-square to test for differences. Race and sex were controlled for in the study and odds ratios were calculated for subgroups. Twenty-nine percent of youth reported mental health was most of the time or always not good. Highest reports of poor mental health were reported among American Indians/Alaskan Natives. Ninth graders were less likely to report poor mental health compared to 11th and 12th graders. The prevalence of poor mental health was 29.3 %. The results demonstrated an association between poor mental health and lack of physical. Thirty two percent of youth were overweight and obese. Controlling for race and gender, the statistically significant groups were who were found to have an association between reports of not being physically active and poor mental health were Black males and white females. In addition, white females, American Indian/Alaskan Native and Asian Females were at increased risk of reporting poor mental health during Covid pandemic among those who were not physically active for at least 60 minutes on at least 1 day. These findings point for the need for improved school-based services for mental health and the need for schools to provide mental health services or referral systems to community resources. These findings of association between mental health and physical activity were consistent with previous studies.

Keywords: Mental Health, Physical Activity

1. Introduction

Obesity is a major contributor to morbidity and mortality in the US population. Obesity impacts public health with obese having higher risks for diabetes, stroke, cancer, and premature death. Previous research indicates that obesity can affect youth's psychological as well as cardiovascular health and their overall physical health. The association between obesity and other conditions makes it a public health concern for youth. Due to the increase in the prevalence of obesity among children. (Sanyaolu, et al., 2019) Mental health impacts our emotional state, how we act and think. Mental disorders are chronic health conditions that last a long time and often there is no cure. Without early diagnosis and treatment, youth with mental disorders can have problems at home, in school, and in friendships. Mental disorders can also interfere with a child's healthy development, causing problems that can continue into adulthood. (CDC,2023) A previous study found that teens with both physical and mental health disorders were more likely to have very low quality of life as adults, in comparison with teens who suffered from only one form of disorder. (Chen, et al., 2006) Previous research also suggests that comorbid physical and mental health problems persist into adulthood (Cohen, et al., 1998) Given the previous research findings, additional research studies are needed

to discover what associations and risk factors increase the probability that youth will present with obesity and mental health issues and whether they are associated.

This study aims to seek if there is an association between poor mental health and physically activity among youth. Hypothesis is that poor mental health is associated with not being physically active. Also, is there an increased risk for less physical activity among those who reported poor mental health? Youth that report poor mental health will be more likely to report physical inactivity than youth who do not report poor mental health during Covid-19. In addition, it is hypothesized that there will be statistically significant differences by gender and race. Given the public health implications this research study can provide insights in identifying potential higher risks youth for planning targeted public health interventions for youth. Poor mental health was determined by respondents who answered their mental health was most of the time or always not good (CDC, 2021). A significant percentage (37%) of youth reported poor mental health during Covid.

2. Methods

Statistical analysis was performed on YRBS data imported into Epi Info 7 using procedures that accommodate the weighted sampling design of YRBS. YRBS is used to monitor priority health risk behaviors among youth in the United States. The national Youth Risk Behavior Survey (YRBS) uses a three-stage cluster sample design to produce a representative sample of 9th through 12th grade students (CDC, 2021). National data in YRBS High school student survey for 2021 were used to analyze the data. (CDC, 2021) Baseline statistics were carried out and used chi- square to test for differences. Statistical analysis was carried out using Epi Info 7 software. Race and sex were controlled for in the study and odds ratios were calculated for subgroups.

Poor mental health was defined by specific questions on the YRBS. “During the past 30 days, how often was your mental health not good? (Poor mental health includes stress, anxiety, and depression.” (CDC, 2021) The other YRBS question included the time period of during the pandemic. “During the COVID-19 pandemic, how often was your mental health not good? (Poor mental health includes stress, anxiety, and depression.” (CDC, 2021)

The following are statistical definitions and purpose of p values, 95% confidence interval and odds ratios used in this study. P values are defined as the probability assuming no effect or difference of obtaining a result that what was observed. P value measures how likely it is that any observed difference between groups is due to chance. A p-value of 0.05 or lower is generally considered statistically significant. 95% confidence interval is a range of values that is likely to include a populations value with a certain degree of confidence. It is expressed as a percentage whereby a population mean lies between an upper and lower interval. Odds ratio is the ratio of the odds of the event happing in an exposed group versus a non-exposed group. The odds ratio is used to report the strength of association between an exposure and an event. The larger the odds ratio the more likely the event is to be found with exposure.

Calculation of odds ratio is described below as shown in Figure 1. The odds ratio is odds of the event in the exposure group (a/b) divided by the odds of the event in the control or non-exposure group (c/d). Therefore, the odds ratio is (a/b) / (c/d) which can be simplified to ad/bc.

		Outcome	
		Yes	No
Exposure	Yes	a	b
	No	c	d

$$Odds Ratio = \frac{\text{Odds of the Outcome in Exposed Group}}{\text{Odds of the Outcome in Non – Exposed Group}}$$

$$Odds Ratio = \frac{a/b}{c/d} = \frac{a \times d}{b \times c}$$

Figure 1. Calculating Odds Ratio (OR)

The total youth sample size for YRBS was 17,232 youth with 48.3% being female and 51.7% male. White youth accounted for 50.7%, black 12.1%, Hispanic 25.4% and other 11.8%.

3. Results

The analysis from the YRBS, indicated that 36.9% of youth reported mental health was poor during the Covid-19 pandemic. Compared with those without mental health issues, those with mental health issues were generally

Table 1. Mental Health and Sex

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic			
Sex	Percentage	95% Confidence Interval	P value
Females	51.00	48.42 – 53.57	0.00
Males	23.71	21.89 – 25.63	

Comparison by race: White students were more likely to have poor mental health than Black, Asian students ($p = 0.00$) and Hispanic students. ($p = 0.02$) There was no statistically significant difference in poor mental health between white and American Indian/Alaska Native students ($p = 0.72$) There is no statistical difference since the 95% confidence intervals overlap. Only when 95% confidence intervals do not overlap is there a statistically significant difference.

Using 95% confidence intervals, the only grades that had statistically significance differences in reporting poor mental health was between 9th graders and 11th, and 9th and 12th graders. 9th graders were

Table 3. Mental Health and Grade Level

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic		
Grade Level	Percentage	95% Confidence Interval
9	31.71	29.28 – 34.24
10	36.97	34.17 – 38.85
11	40.56	38.16 – 43.00
12	39.06	36.01 – 42.20
Grade		P Values
9 & 10		0.00
9 & 11		0.00
10 & 11		0.04
11 & 12		0.47

Table 5. Overweight Youth by Race

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic		
Race	Percentage	95% Confidence Interval
American Indian/Alaska Native (AI/AN)	13.97	7.75 – 23.88
Asian	8.29	4.29 – 13.61
Black	18.65	16.96 – 20.46
Hispanic	20.88	19.68 – 22.14
White	14.57	13.51 – 15.71
Race		P Values
White & Asian		0.00
White & Black		0.00
White & Hispanic		0.00
White & AI/AN		0.89

younger and female, less likely to be Native Hawaiian or other Pacific Islander, be less physically active and overweight.

Female students (51%) were more likely to have poor mental health than male students (23%), $p = 0.00$

Table 2. Mental Health and Race

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic		
Race	Percentage	95% Confidence Interval
American Indian/Alaska Native (AI/AN)	41.49	30.90 – 52.93
Asian	29.78	27.50 – 32.16
Black	30.16	27.24 – 33.26
Hispanic	35.76	34.25 – 37.30
White	39.53	36.81 – 42.31
Race		P Values
White & Black		0.00
White & Asian		0.00
White & Hispanic		0.02

less likely to report poor mental health compared to 11th and 12th graders.

9th graders (32%) were less likely than 11th graders (40%) to report poor mental health ($p = 0.00$) 10th graders more likely to have poor mental health than 9th graders. ($p = 0.00$) 11th graders (41%) more likely to have poor mental health than 10th graders (37%), ($p = 0.04$) 12th graders (39%) were not statistically different than 11th graders (41%) in likelihood to have poor mental, ($p = 0.47$)

Table 4. Overweight Youth by Sex

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic		
Sex	Percentage	95% Confidence Intervals
Female	17.36	15.95 – 18.88
Male	14.81	13.82 – 15.86

White youth (14.57%) were more likely to be overweight than Asians (8.29 %), ($p = 0.00$). Black youth (18.65%) were more likely to be overweight than White youth (14.57%), ($p = 0.00$). Hispanic youth 20.88% were more likely to be overweight than White youth (14.57%), ($p = 0.00$). There was no statistically significant difference between White youth (14.57%) than AI/AN youth (13.97%), ($p = 0.89$)

White youth (13.69%) were more likely to be obese than Asians (7.69%), ($p = 0.00$). Black youth (21.24%) were more likely to be obese than White youth (13.69%), ($p = 0.00$). Hispanic youth (20.2%) were more likely to be obese than White youth (13.69%). ($p = 0.00$). AI/AN youth (29.4%) were more likely to be obese than White youth (14.57%), ($p = 0.03$).

Table 7. Mental Health and Physical Activity

Reported mental health was most of the time or always not good	Were not physically active for at least 60 minutes	
	Yes	No
Yes	803	2870
No	1365	7579

Odds Ratio (OR) = 1.55

Odds Ratio of 1.55 indicates increased risk for less physical activity among those who reported poor mental health.

Table 8. Mental Health and Physical Activity Among Black Males

Reported mental health was most of the time or always not good	Were not physically active for at least 60 minutes	
	Yes	No
Yes	44	117
No	160	716

OR=1.68

Odds ratio of 1.68 indicates increased risk among black males for poor mental health among those who reported they were not physically activity for at least 60 minutes on at least 1 day.

Table 10. Mental Health during Covid and Physical Activity for American Indian/Alaska Native Females

Reported mental health was most of the time or always not good during COVID-19 pandemic	Were not physically active for at least 60 minutes	
	Yes	No
Yes	703	2798
No	899	5254

OR= 1.47

This indicates an increased risk among AI/AN females for poor mental health during the Covid pandemic among those who were not physically active for at least 60 minutes on at least 1 day.

Table 12. Mental Health during Covid and Physical Activity for White Females

Reported mental health was most of the time or always not good during COVID-19 pandemic	Were not physically active for at least 60 minutes	
	Yes	No
Yes	221	956
No	116	894

OR = 1.78

The odds ratio of 1.78 Indicates increased risk for poor mental health among white females during Covid pandemic for those who are not physically active for at least 60 minutes on at least 1 day.

Table 6. Obesity by Race

Reported Mental Health was most of the time or always not good during the Covid-19 Pandemic		
Race	Percentage	95% Confidence Interval
American Indian/Alaska Native (AI/AN)	29.43	17.60 – 44.87
Asian	7.69	4.97 – 11.71
Black	21.24	18.48 – 24.28
Hispanic	20.23	17.87 – 22.81
White	13.69	11.98 – 15.61
Race		P Values
White & Asian		0.00
White & Black		0.00
White & Hispanic		0.00
White & AI/AN		0.03

Table 9. Mental Health and Physical Activity Among White Females

Reported mental health was most of the time or always not good	Were not physically active for at least 60 minutes	
	Yes	No
Yes	241	989
No	201	1419

OR=1.72

The odds ratio of 1.72 indicates increased risk among white females for poor mental health who were not physically activity for at least 60 minutes on at least 1 day.

Table 11. Mental Health during Covid and Physical Activity for Asian Females

Reported mental health was most of the time or always not good during COVID-19 pandemic	Were not physically active for at least 60 minutes	
	Yes	No
Yes	36	989
No	26	1419

OR = 2.38

This indicates an increased risk among Asian females for poor mental health during the Covid pandemic among those who were not physically active for at least 60 minutes on at least 1 day

Poor mental health and not being physically active were associated and statistically significant ($p = 0.000$) for youth in YRBS but when controlled for my race and sex only White females, Asian females $p = 0.000$ and AI/AN females showed a statistically significant association between poor mental health during Covid-19 and low physical activity.

4. Discussion

This study analyzed most recent 2021 YRBS survey data. In this large survey of high school students, the prevalence of poor mental health was 29.3%. As seen in previous research, females reported poor mental health more than males. 17.36% of females and 14.82% of males were overweight. Current mental health 40.77% of females and 18.08% of males reported that their mental health was most of the time or always not good. Fifty one percent of females and 23.71% of males reported their mental health was most of the time or always not good during the Covid-19 pandemic. This is consistent with findings from Reinherz, et al 1993. “Moreover, consistent with national-level data, females in this population exhibited a significantly greater risk for both mental and physical health issues than males.”³³ In addition, “... studies found relationships among physical activity, sedentary behavior, and depression, but more recent information is needed to inform research and practice.” (Das, et al., 2016)

Controlling for race and gender, the only statistically significant groups were who were found to have an association between not being physically active and poor mental health were Black males, white females, and Native Hawaiians. AI/AN youth 29.4% were more likely to be obese than White 14.57% youth ($p=0.03$) During the pandemic, there was an increased risk for poor mental health among those who were not physically active for at least 60 minutes on at least 1 day among American Indian/Alaska Native females, Asian females and white females. The strength of the association (odds ration =2.38) was highest among Asian females during Covid-19 pandemic. Poor mental health and not being physically active were associated and statistically significant for youth in YRBS but when controlled for by race and sex. only White females, Asian females $p=0.000$ and AI/AN females showed a statistically significant association between poor mental health during Covid-19 and low physical activity.

According to Reinherz, et al., (1993), “there is a need to report differential effects for gender, age groups, socioeconomic status, and geographic settings since the impact of mental health interventions might vary according to various contextual factors.” This study controlled for race and gender and found statistically significant results. Moreover, these findings on the association between mental health and physical activity are consistent with research by Wang and Peiper published in Preventing Chronic Disease. Wang and Peiper (2022) found that “Inadequate physical activity and excessive sedentary behavior are associated with depressive symptoms among US high school students.” (Wang and Peiper, 2022) According to Reinherz, et al., (1993) “approximately one in every four to five youth in the U.S. meets criteria for a mental disorder with severe impairment across their lifetime. The likelihood that common mental disorders in adults first emerge in childhood and adolescence highlights the need for a transition from the common focus on treatment of U.S. youth to that of prevention and early intervention.”

The results demonstrate an association between poor mental health and the lack of physical.

Given that over 29% of youth had poor mental health and 37% reported poor mental health during covid, these findings point for the need for improved school-based services in the area of mental health. Therefore, there is a need for schools to assess youth for mental health and provide mental health services or referral systems to community resources. Results of community surveys in regions of the United States have shown one in every four children experiences a mental disorder with few affected youth receiving adequate mental health care. There has been a lack of data on the prevalence and distribution of a wide range of mental disorders from a nationally representative sample of children or adolescents. This information is necessary to establish resource allocation priorities for prevention and treatment. (Cohen, et al.,1993) (Reinherz, et al., 1993) (Lahey, et al.,1996) (Braumer and Stephens, 2006)

Further research is needed to identify specific causes of poor mental health and identification of effective early interventions for at risk youth to prevent poor physical activity and related health outcomes. The findings in this study that mental health is associated with physical health in youths suggest the need for a closer look at this population and their risks for health problems. Future research should focus on tracking incidence and prevalence of mental health in youth, identify effective treatment and intervention strategies that promote mental and physical health of youth.

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