

School Environmental Factors and Prescription Opioid Misuse in the United States: Evidence from the 2019 National Survey

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Abstract

Background: Given the current public health crisis caused by opioid abuse across the United States, this study analyzed factors in the school environment associated with the misuse of prescription opioids among adolescents in the United States.

Methods: This study used secondary data collected by the Centers for Disease Control and Prevention for the 2019 National Youth Risk Behavior Surveillance survey (N=13,677).

Descriptive analysis and multivariable logistic analysis were performed to examine the association between opioid misuse among young people and factors in their school environment.

Results: The study results showed that the odds of current opioid misuse in adolescents were three times higher in the students who had carried weapons at least once at school (Adjusted Odds Ratios, AOR, 3.27; CI, 1.97-5.42) compared to students who did not carry weapons, at P<0.001. Other significant risk factors included physical fighting at school, safety concerns at school, and perception of being threatened at school at P<0.001.

Conclusion: The school can be a critically important stakeholder in the implementation of policies and programs to tackle the current opioid epidemic in America.

Keywords: Adolescent, Opioid-related disorders, School health, Environment

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1. Introduction

In adolescents, prescription opioid misuse has become a growing concern over the past decade. More than 30 million individuals, including 21% of adolescents and 32% of young adults, used prescription opioids in 2016 (1). Opioid abuse is one of the leading causes of death and non-accidental trauma among adults in the United States as over 92,000 deaths were attributed to drug overdose in the United States in 2020, a rise of nearly 30% deaths from 2019 (1-3). In addition, two-thirds of the adults treated for opioid abuse started in early adolescence, leading to a major increase in opioid overdose mortality and morbidity over the past 15 years (4). More than 5,700 youth report opioid misuse and claim that the most common channels of free opioids were from friends and relatives. Adolescents with prior opioid misuse also reported an increased prevalence of prior cocaine, hallucinogen, heroin, and inhalant use (1, 5).

In 2019, the economic burden, including healthcare costs, addiction treatment, lost productivity, and criminal involvement of prescription opioid misuse, in the United States was \$78.5 billion (3). Evidence-based research revealed that adolescents have a greater chance

of opioid misuse compared to adults aged 25 years and older (1). About 50% of adolescents with prescription opioid misuse get the medications from the excess and unused opioid supply of family and friends (1, 6). Other risk factors associated with opioid abuse in young people are living in rural areas, poor mental and physical health, poor performance in academic matters, ease of access to opioids, medical use of opioids, and opioid use by parents and friends (7-9). Prescription opioid misuse has been linked to risky health behaviors in adolescents and it has the potential to be a modifiable risk factor for violence among this population (10-12).

Although most of the interventions to promote health equity have been on adults, health inequities and resulting disparities usually start in childhood. The school is a major determinant of child health due to the extended hours spent in the environment (13). Some of the school-related factors influencing health outcomes include physical and structural environment, school climate, health policies, and programs (13). Integrating evidence-based health education programs in schools can reduce the risk associated with the nonmedical use of prescription opioids and young people attending schools that offer more mental services have lower chances of prescription opioid misuse (11, 12).

Several researchers studied the association between risk behaviors, mental outcomes, and the use of prescription opioids (4-11); on the other hand, our study evaluates the association between the school neighborhood and physical environment as a determinant of adolescent prescription opioid misuse. To the best of our knowledge (9-13), the role of school environmental factors as a whole and prescription opioid misuse has not been examined. The objective of the current work was to examine the school-level protective and risk factors associated with the nonmedical use of prescription opioids in adolescents.

2. Methods

2.1. Design

Using a cross-sectional quantitative design, we analyzed secondary deidentified data from the 2019 National Youth Risk Behavior Surveillance System (YRBSS). This biennial survey is conducted by the Centers for Disease Control and Prevention (CDC) and provides information based on a representative sample of students in the 9th through 12th grade in 50 states and District of Columbia. This is a secondary dataset and the instrument has been tested for reliability and validity by the dataset owners. The CDC reports that about 75% of the questions were rated as having a substantial or higher reliability with kappa scores ranging from 61% to 100% and no statistically significant differences were found in the two test-retest reliability studies. While cognitive and situational factors that might affect the validity of adolescent self-reported behaviors were reviewed and the dataset owners state that the validity of self-reports of each behavioral type is not affected equally by these factors (14). The 2019 survey had 13,677 respondents with an overall 60.3% response rate. The YRBSS is made up of surveys from the national, state, territorial, tribal government, and local schools. This survey monitors risky health behaviors causing mortality and morbidity among young people in the United States and the students' responses were collected via self-administered questionnaires. The secondary dataset had a limited number of variables. The variable selection was driven by the review of literature and theory emanating from that rather than statistical methods, such as backward or forward stepwise selection of variables. The study was determined to be exempt from full review by the Georgia Southern University Institutional Review Board (Protocol H22062); the informed consent was deemed inapplicable to this study protocol, given the secondary data use.

2.2. Variables

The present work employed two dichotomous dependent variables indicating nonmedical prescription opioid misuse in adolescents: (1) current prescription opioid misuse and (2) lifetime prescription opioid misuse. The current prescription opioid misuse was operationalized through the survey item that asked the students, "During the past 30 days, how many times have you taken prescription pain medicine without a doctor's prescription or differently than how a doctor told you to use it?" The lifetime prescription opioid misuse was operationalized through the survey item that asked the students, "During your life, how many times have you taken prescription pain medicine without a doctor's prescription or differently than how a doctor told you to use it?". The response choice for both dependent variables had six categories: zero times, one or two times, three to nine times, 10 to 19 times, 20 to 39 times, and 40 or more times which was recoded into a dichotomous variable of zero times and at least one time.

The study included the following six independent variables reflecting school-level protective and risk factors: physical fighting at school during the past 12 months, safety concerns at school during the past 30 days, being threatened at school during the past 12 months, weapon carrying at school during the past 30 days, sports team participation, and physical education class attendance in an average week.

Physical fighting at school during the past year preceding the survey was operationalized through the survey item "During the past 12 months, how many times were you in a physical fight on school property" and being threatened at school during the past 12 months was operationalized through the survey question "During the past 12 months, how many times has someone threatened or injured you with a weapon, such as a gun, knife, or club, on school property?". The variables of physical fighting at school during the past 12 months and being threatened at school during the past 12 months were recoded into two categories, zero times and at least one time, from the eight original response categories: zero times, one time, two or three times, four or five times, six or seven times, eight or nine times, 10 or 11 times, 12 or more times.

The variable safety concerns at school during the past 30 days was operationalized through the survey item "During the past 30 days, on how many days did you not go to school because you felt you would be

unsafe at school or on your way to or from school?” and weapon carrying at school during the past 30 days was operationalized through the survey item “During the past 30 days, on how many days did you carry a weapon, such as a gun, knife, or club on school property?”. The variables safety concern at school during the past 30 days and weapon carrying at school during the past 30 days had five response categories: zero days, one day, two or three days, four or five days, and six or more days and was recoded into dichotomous variables of zero days or at least one day.

The variable physical education class attendance in an average week was operationalized through the survey item “In an average week when you are in school, how many days do you go to physical education (PE) classes?” and the six response categories for this survey question were recoded into zero days or at least one day.

The variable sports team participation was operationalized through the survey item “During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups)”. The question had four response categories of zero teams, one team, two teams, and three or more teams and was recoded to zero teams or at least one team. The control variables were sociodemographic characteristics: age, gender, and race.

2.3. Analysis

We performed descriptive analyses for both dependent, independent, and control variables to provide contextual information for our multivariable analyses. Two logistic regression analysis models were

computed for each dependent variable. Each regression model contained a dependent variable, six independent variables, and three control variables. The analyses for this study were performed using STATA version 16. The YRBSS sampling weight was utilized in the data analysis to account for the multistage sampling design of the survey.

3. Results

The survey participants are a representative sample of enrolled students in the 9th through 12th grade in private and public schools in the 50 States and the District of Columbia in the United States. The proportions of students in the male and female gender categories were almost equal with about 51% male respondents. The majority of the survey participants were white (51%), 12.2% were Black, 9.2% were Hispanic, and 5.1% were Asians. The other races and ethnic groups represented in the survey are American Indian/Alaska Native, either Native Hawaii or other Pacific Island, multiracial Hispanic, and multiracial non-Hispanic. The mean age of the respondents was 16 years with a standard deviation of 1.2. Among the US adolescents, 14.3% had misused opioids at least once during their lifetime while 7.2% had misused opioids at least once during the last 30 days before the survey (Figure 1).

Table 1 exhibits that during the past month prior to the survey, most participants felt safe at school (91.3%) and did not carry weapons (97.2%). During the past year prior to the survey, many of the students were not threatened at school (92.6%) and did not fight at school (92.0%). More than half (57.4%) of the respondents participated in about one team sport.

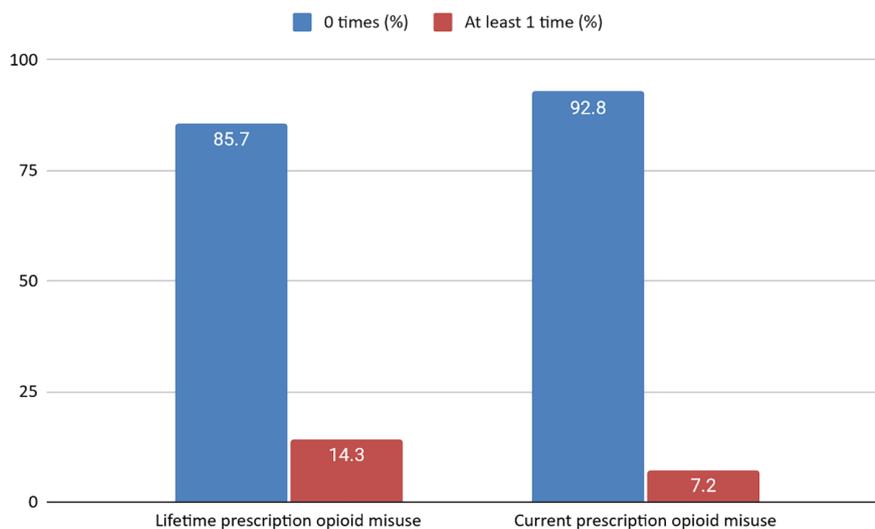


Figure 1: The figure shows the percentage of adolescents with prescription opioid misuse at least once in their lifetime and at least once during the last 30 days.

Table 1: Descriptive statistics for prescription opioid use for adolescents

Variables	N (not weighted)	% (weighted)
Dependent variables		
Lifetime prescription opioid misuse		
0 times	10983	85.7
At least 1 time	2000	14.3
Current prescription opioid misuse during the past 30 days		
0 times	8016	92.8
At least 1 time	661	7.2
Independent variables		
Age		
14 years or younger	1786	12.3
15 years	3473	24.8
16 years	3628	25.6
17 years	3102	23.7
18 years or older	1616	13.7
Gender		
Female	6885	49.4
Male	6641	50.6
Race		
American Indian or Alaska Native	145	0.6
Asian	618	5.1
Black	2040	12.2
Native Hawaii or other Pacific Island	69	0.3
White	6668	51.2
Hispanic	1009	9.2
Multiple Hispanic	2029	16.9
Multiple non-Hispanic	661	4.5
Physical fighting at school during the past 12 months		
0 day	11954	92.0
At least 1 day	1165	8.0
Safety Concerns at School during the past 30 days		
0 day	12331	91.3
At least 1 day	1270	8.7
Threatened at School during the past 12 months		
0 times	12473	92.6
At least 1 time	1072	7.4
Weapon carrying at school during the past 30 days		
0 day	12509	97.2
At least 1 day	392	2.8
Physical Education Class Attendance in an average week		
0 day	5865	47.8
At least 1 day	5423	52.2
Sport Team Participation		
0 team	4242	42.6
At least 1 team	5545	57.4

Table 2 demonstrates the logistic regression of current prescription opioid misuse (30 days before the survey) with independent variables reflecting the survey participant's school climate and sociodemographic characteristics. The odds of current prescription opioid misuse in adolescents were more than three times higher for the students who had carried a weapon at least one day at school versus

those who never carried one (AOR=3.27; CI, 1.97-5.42). The students had higher odds of current prescription opioid misuse if they engaged in physical fighting at school during the past 12 months (AOR=2.68; CI,1.96-3.66) versus no physical fights at school during the same period and if they felt unsafe at school during the past 30 days (AOR=2.19; CI,1.55-3.09) compared to feeling safe, or if they were threatened

Table 2: Logistic regression of current prescription misuse in adolescents

	AOR	CI	P value
Race			
American Indian/Alaska Native	Ref. category		
Asian	0.50	0.13-1.87	0.291
Black or African American	0.84	0.21-3.31	0.798
Native Hawaiian/Other Pacific Island	1.17	0.17-7.95	0.868
White	0.64	0.19-2.13	0.46
Hispanic / Latino	1.12	0.33-3.78	0.851
Multiple – Hispanic	1.06	0.28-3.99	0.925
Multiple - Non-Hispanic	0.99	0.27-3.62	0.983
Age			
14 years or younger	Ref category		
15 years	0.90	0.57-1.42	0.651
16 years	0.93	0.61-1.43	0.747
17 years	0.85	0.55-1.32	0.452
18 years or older	1.09	0.61-1.95	0.761
Gender***			
Female	Ref category		
Male	0.59	0.49-0.72	<0.001
Physical fighting at school during the past 12 months***			
0 day	Ref category		
At least 1 day	2.68	1.96-3.66	<0.001
Safety concerns at school during the past 30 days***			
0 day	Ref category		
At least 1 day	2.19	1.55-3.09	<0.001
Threatened at school during the past 12 months***			
0 day	Ref category		
At least 1 day	2.51	1.70-3.70	<0.001
Weapon carrying at school during the past 30 days***			
0 day	Ref category		
At least 1 day	3.27	1.97-5.42	<0.001
Sport team participation			
0 team	Ref category		
At least 1 team	0.96	0.73-1.28	0.794
Physical Education class attendance in an average week			
0 day	Ref category		
At least 1 day	0.83	0.70-1.00	0.052

AOR, adjusted odds ratio; CI, Confidence Interval; *AORs significant at $P<0.05$; ***AORs significant at $P<0.001$

at school during the past year (AOR=2.51; CI,1.70-3.70) versus not being threatened at school during the past year. There were no significant associations between current prescription opioid misuse and the independent variables - sports team participation and average weekly attendance in a physical education class. Compared to females, the males had lower odds of current misuse of prescription opioids (Adjusted Odds Ratio or AOR=0.59; Confidence Interval or CI, 0.49-0.72).

Table 3 presents the logistic regression of the association of lifetime prescription opioid misuse and school climate. The students that carried a weapon at least once at school had higher odds of lifetime

prescription opioid misuse than the students who did not carry any weapons in the past 30 days (AOR=2.61; CI=1.78-3.82). The odds were also higher for lifetime opioid misuse in the adolescents with the following characteristics: physical fighting at school during the past 12 months (AOR=2.07; CI, 1.52-2.81), feeling unsafe at school during the past month (AOR=1.92; CI, 1.46-2.52), and being threatened at school during the past year (AOR=2.55; CI, 2.08-3.13). There were no significant associations between sports team participation and physical education class attendance in an average week and lifetime prescription opioid misuse. Compared to females, the males had lower odds of lifetime misuse of prescription opioids (AOR=0.65; CI, 0.54-0.78).

Table 3: Logistic regression of lifetime prescription opioid misuse in adolescents

	AOR	CI	P value
Race/Ethnicity			
American Indian/Alaska Native	Ref category		
Asian	0.40	0.14-1.13	0.20
Black or African American	0.55	0.20-1.49	0.23
Native Hawaiian/Other Pacific Island	0.40	0.06-2.74	0.34
White	0.60	0.23-1.52	0.270
Hispanic / Latino	0.66	0.27-1.65	0.365
Multiple – Hispanic	0.70	0.30-1.64	0.405
Multiple - Non-Hispanic	0.82	0.29-2.28	0.692
Age			
14 years or younger	Ref category		
15 years	1.09	0.82-1.45	0.536
16 years	1.14	0.87-1.49	0.336
17 years	1.25	0.98-1.59	0.071
18 years or older	1.17	0.84-1.64	0.343
Gender***			
Female	Ref category		
Male	0.65	0.54-0.78	<0.001
Physical fighting at school during the past 12 months***			
0 day	Ref. category		
At least 1 day	2.07	1.52-2.81	<0.001
Safety concerns at school during the past 30 days***			
0 day	Ref category		
> 1 day	1.92	1.46-2.52	<0.001
Threatened at school during the past 12 months***			
0 day	Ref category		
At least 1 day	2.55	2.08-3.13	<0.001
Weapon carrying at school during the past 30 days***			
0 day	Ref category		
At least 1 day	2.61	1.78-3.82	<0.001
Sport team participation			
0 team	Ref category		
At least 1 team	0.82	0.67-1.01	0.06
Physical Education class attendance in an average week			
0 day	Ref category		
At least 1 day	0.92	0.76-1.11	0.358

AOR, adjusted odds ratio; CI, Confidence Interval; *AORs significant at $P < 0.05$; ***AORs significant at $P < 0.001$

4. Discussion

Our study examined the school environmental factors associated with adolescent prescription opioid misuse in the United States. This is the first study to explore whether there was a relationship between the school climate and the misuse of opioids. In summary, the analysis revealed that several school factors, such as physical fighting at school in the past 12 months, safety concerns at school during the past month, and weapon carrying at school during the past 30 days, were associated with both the current and lifetime misuse of prescription opioids. While our study findings showed that being threatened at school during the past 12 months is a risk factor for current and lifetime

opioid misuse, another study stated that prescription opioid abuse was a risk factor for being threatened or injured with weapons (11). Since in both associational papers, causation is not implied, their findings are not conflicting but perhaps supportive of each other. The results found that the adolescents feeling unsafe or threatened at school were more likely to have both current and lifetime misuse of opioids. This could be owing to the fact that the unsafe place in and around the school can, directly and indirectly, impact adolescent drug abuse (1, 10).

It is also possible that the students engaging in physical fighting are perceived to be weak and easy to be threatened by school peers misuse opioids to mask

the psychological pain from these adverse experiences. This suggests the importance of providing a safe no-bullying school environment and ensuring bullies and victims of bullying are monitored for opioid misuse.

Despite prescription opioid misuse being a risk factor for violent behaviors, such as weapon carrying at school during the past 30 days and physical fighting at school during the past 12 months, our results showed that weapon carrying at school during the past 30 days and physical fighting at school during the past 12 months can also increase the chances for prescription opioid misuse among young people (10, 15). This could be another example of a bidirectional association between both variables, suggesting that school counselors should identify and monitor students with violent behaviors for signs of prescription opioid misuse.

Although some studies have found no significant differences in prescription opioid misuse between the male and female gender, more research has found that female adolescents are more likely to misuse prescription opioids (16, 17). Our results provided more evidence supporting that female adolescents have higher chances of misusing prescription opioids. This is an important finding from the public health perspective, highlighting why adolescents irrespective of gender are at risk of opioid misuse and interventions should be developed in collaboration with school stakeholders to address this issue.

There was no evidence to support our hypothesis that there was a negative association between attending a physical education class attendance or participating in team sports and prescription opioid misuse. Despite the mixed reports regarding the association between exercise or sports and opioid misuse, our study found no association between adolescent participation in team sports and opioid misuse. Our result is consistent with the findings from a study conducted among undergraduates that revealed no association between participating in high school sports and lifetime nonmedical prescription opioid use (18). Although several studies have illustrated that student-athletes have a higher risk of misusing opioids due to injuries and participating in sports and exercise can protect against opioid misuse among adolescents (1, 18, 19). While opioids do not improve their performance, young athletes abuse these medications due to the euphoric feelings the drugs elicit (20). Not all sporting or physical activities are associated with increased substance abuse and

intramural sports activity can protect against some types of substance abuse, such as cannabis and cigarette (21). There is a need for further research on the role of sports or physical education participation as a protective or risk factor in opioid misuse among young people.

The school environment plays an essential role in prescription opioid misuse in adolescents since they spend many hours in school. Protective and risk factors associated with the misuse of prescription opioid exist at the school level. While the prevalence rate of opioid misuse differs among different schools, programs that support a safe school climate can reduce drug abuse and improve academic performance (13, 22, 23).

4.1. Limitations

The study findings should be interpreted within the following limitations. The YRBS survey participants are only youths enrolled in schools and does not represent the entire age group, including those not enrolled in schools. The YRBS is not administered in every state or school and because it was a cross-sectional survey, it does not indicate causality. In addition, our study is subject to limitations inherent in cross-sectional studies, particularly because the aim of the current study was to evaluate the associations between the independent variables and dependent variables measured at the same time, without the lag time between the potential causes and effects. Therefore, these findings present mere correlations and should not be interested to imply causation. Nevertheless, this study provides critical information on how the school climate in the US is associated with the misuse of prescription opioids among youths.

5. Conclusion

Our findings revealed that the school environment can harbor both harmful and protective determinants of prescription opioid misuse in adolescents. Policy changes and programs that stop school injury and violence from physical fighting and weapon carrying to school should be enacted and implemented. School programs, such as team sport and physical education classes, should be assessed for risk and explored as a possible protective factor against adolescent opioid misuse. Making the school environment a safe place should be a priority if prescription opioid misuse in adolescents is to be addressed. Stakeholders and school administrators should enact and enforce policies that make the school safe.

Ethical Approval

The study was determined to be exempt from full review by the Georgia Southern University Institutional Review Board (Protocol H22062); the informed consent was deemed inapplicable to this study protocol, given the secondary data use.

Conflict of interest: None declared.

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