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Trends in heroin use and injection drug use among high school students in five urban school districts in the US (2005–2017)

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Introduction

Thirty-percent of US adults who have used heroin report that their first use was before age 20,[1] signifying adolescence as a critical period for initiation. Although prevalence estimates for heroin use and injection drug use (IDU) among US adolescents are low (<3% for both),[2] recent studies indicate that use may be higher among youth in urban areas.[3–5] Building on those studies, we examine heroin use and IDU among students in urban, public high schools, a population that has not been a focus of opioid-response efforts. Students in urban public schools face numerous challenges that stem from structural inequities (e.g., underfunded schools, adverse childhood experiences, and neighborhood social disorder – including public drug activity, violence, and poverty).[6–12] These challenges greatly increase vulnerability for adverse outcomes among those adolescents who initiate drugs, such as addiction, non-completion of high school, HIV, or overdose).[8–10]

The purpose of this study is to investigate trends heroin use and IDU in a pooled sample of high school students in five large, metropolitan school districts, i.e., Boston Public Schools (Boston, MA), Chicago Public Schools (Chicago, IL), Los Angeles Unified School District (Los Angeles, CA), San Diego Unified School District (San Diego, CA), and New York City Public Schools (New York, NY).[13,14] More than three-quarters of students in these districts are Black and/or Hispanic/Latino, and more than one-half qualified for lunch subsidies.[6] Therefore, we describe heroin use and IDU among students subject to social disadvantage at the intersection of race, Hispanic ethnicity, socioeconomic position, and residence in low-income, urban neighborhoods.

Methods

Data come from surveys of the five large, urban school districts conducted as part of the Centers for Disease Control and Prevention’s [CDC] “Youth Risk Behavior Survey” (YRBS) program, which includes biennial, cross-sectional surveys of US high school students.[13,14] Each district included items on heroin use or IDU in at least four of the seven timepoints during the study period, 2005–2017 ($n=98,911$). A cluster sample design was used to derive representative samples of students within districts, and response rates for each district were above 60%.

We generated site-pooled prevalence estimates (and 95% confidence intervals) for heroin use and IDU for each survey year. We used Joinpoint regression modeling to estimate changes in prevalence.[15] Linear, quadratic, and cubic variables (i.e., time, time-squared, and time-cubed) were cumulatively added into models to identify distinct line segments. Models were sex-stratified and adjusted for race/ethnicity and grade. We applied CDC-developed sample weights to adjust for the complex design. Analyses were conducted in SAS 9.4 with SAS-Callable SUDAAN, Version 11.0.1.

Results

Reflecting the demographic make-up of the school districts, more than two-thirds of students were Black and/or Hispanic/Latino (Table). Heroin use and IDU were highest in 2009 and 2011 (Figure, also see Supplemental Table 1). Among boys, estimates of heroin use and IDU ranged from 2.71%–4.62% and 2.48%–3.67%, respectively. Estimates of heroin use and IDU among girls were lower; 2007 estimates were <1% for both, and estimates ranged from 1%–2% for all other survey years.

Changes in heroin use and IDU over time were statistically significant among girls, but not boys. Among girls, there were increases in heroin use and IDU from 2005–2009 (respectively, $\beta=0.76$, $p<0.0001$ and $\beta=0.52$, $p=0.0077$), decreases from 2009–2015 ($\beta=-0.33$, $p=0.0153$ and $\beta=-0.43$, $p=0.0028$), and no changes from 2015–2017 ($\beta=0.21$, $p=0.1270$ and $\beta=0.20$, $p=0.2052$).

Discussion

We investigated trends in lifetime heroin use and IDU among high school students in five, large urban school districts across the US from 2005–2017. We did not observe discrete changes in heroin use or IDU for boys, but did find evidence of increases in both among girls from 2005–2009. Our study is based on a pooled-sample of youth attending public high schools in urban areas, and concurs with findings of studies based on data from individual cities.[3,4] We provide additional evidence that estimates of heroin use and IDU may be higher among urban high school students than the general population of high school students in the US. The 2017 prevalence estimates of heroin use (2.9%) and IDU (2.5%) in our sample were higher than the corresponding national estimates (1.7% and 1.5%, respectively).[2] Consistent with previous studies,[3,4], use was higher among boys than girls in urban areas. Boys' heroin use and IDU was above 2.5% at each time point. Although this estimate seems low, the fact that <2% of US adults report lifetime heroin use indicates there is cause for concern among adolescent boys.[5] Finally, we observed that trends in heroin use and IDU appear to be parallel, as was previously demonstrated by Brighthaupt and colleagues.[4] Although this finding suggests that the drug injected is heroin, further research is needed to clarify how heroin is being used and what other substances are being injected among high school students.

We were limited by data availability for inclusion in the trend analyses. Not all five districts included participated in each survey year (Supplemental Table 2), and incomplete data may have impacted findings. Additionally, results are representative of public high school

students in these five urban school districts, and may not represent urban adolescents broadly. The prevalence of heroin use and IDU varies substantially across US cities,[3,4] and our findings might have been different had additional cities been included. However, our study comprises three of the five largest public school districts in the US (i.e., #1 New York City Public Schools, #2 Los Angeles Unified School District, and #3 Chicago Public Schools); the remaining two districts are among the top 100.[9] Our sample represents a substantial subset of US adolescents, and our findings are relevant to understanding heroin use and IDU among public high school students in large US cities.

The lifetime prevalence of heroin use and IDU was low and consistent, but not negligible, among adolescents in five large, urban school districts from 2005 through 2017. Our findings underscore that the ongoing opioid crisis in the US affects youth as well as adults, and urban adolescents in particular. Given the high addictive liability of heroin and inequities in access treatment for opioid use disorder, there is a clear need for programs and structural interventions to prevent initiation and escalation of heroin use and IDU among adolescents in large, US cities.[10–11]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

- [1]. Substance Abuse and Mental Health Services Administration (SAMHSA). Public Online Data Analysis System (PDAS), National Survey on Drug Use and Health, 2018. Available at: <https://www.datafiles.samhsa.gov/info/analyze-data-nid6>. Accessed Sept. 2, 2020.
- [2]. Centers for Disease Control and Prevention, Division of Adolescent & School Health, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Youth Risk Behavior Survey Data Summary & Trends Report 2007–2017 Available at: <https://www.cdc.gov/healthyyouth/data/yrbs/pdf/trendsreport.pdf>. Accessed April 27, 2020.
- [3]. Brighthaupt SC, Schneider KE, Johnson JK, et al. Trends in adolescent heroin and injection drug use in nine urban centers in the U.S., 1999–2017. *J Adolesc Health* 2019; 65:210–215. [PubMed: 31331542]
- [4]. Jones AA, Schneider KE, Brighthaupt SC, et al. Heroin and nonmedical prescription opioid use among high school students in urban school districts. *Drug Alcohol Depend* 2019; 205: 107664. [PubMed: 31707272]
- [5]. Substance Abuse and Mental Health Services Administration (SAMHSA). Key Substance Use and Mental Health Indicators in the United States: Results from the 2018 National Survey on Drug Use and Health (HHS Publication No. PEP19–5068, NSDUH Series H-54); 2019. Rockville, MD: Center for Behavioral Health Statistics and Quality, SAMHSA. Retrieved from <https://www.samhsa.gov/data/>. Accessed Sept. 2, 2020.
- [6]. Sable J, Plotts C, Mitchell L. Characteristics of the 100 Largest Public Elementary and Secondary School Districts in the United States: 2008–09 (NCES 2011–301) U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office. Available at: <https://nces.ed.gov/pubs2011/2011301.pdf>. Accessed Sept. 2, 2020.
- [7]. Milam AJ, Johnson RM, Nesoff ED, Reboussin BA, Furr-Holden CD. Evaluating Nighttime Observational Measures of Neighborhood Disorder: Validity of the Nighttime NIfETY Assessment. *J Environ Psychol* 2016;45:97–102. [PubMed: 28979058]
- [8]. Godette DC, Headen S, Ford CL. Windows of opportunity: fundamental concepts for understanding alcohol-related disparities experienced by young Blacks in the United States. *Prev Sci* 2006;7(4):377–387. [PubMed: 16807791]

- [9]. Mennis J, Stahler GJ, Mason MJ. Risky Substance Use Environments and Addiction: A New Frontier for Environmental Justice Research. *Int J Environ Res Public Health* 2016;13(6). doi:10.3390/ijerph13060607
- [10]. Park JN, Rouhani S, Beletsky L, Vincent L, Saloner B, Sherman SG. Situating the continuum of overdose risk in the social determinants of health: A new conceptual framework. *Milbank Q* 2020;98:700–746. [PubMed: 32808709]
- [11]. Copeland-Linder N, Lambert SF, Chen Y-F, Ialongo NS. Contextual stress and health risk behaviors among African American adolescents. *J Youth Adolesc* 2011;40(2):158–173. [PubMed: 20213481]
- [12]. Fagan AA, Wright EM, Pinchevsky GM. A multi-level analysis of the impact of neighborhood structural and social factors on adolescent substance use. *Drug Alcohol Depend* 2015;153:180–186. [PubMed: 26049206]
- [13]. Brener ND, Kann L, Shanklin SL, Kinchen S, Eaton DK, Hawkins J, Flint KH. Methodology of the Youth Risk Behavior Surveillance System—2013. *MMWR Recomm Rep* 2013; 62:1–20.
- [14]. Kann L, Olsen EO, McManus T, et al. Sexual identity, sex of sexual contacts, and health-related behaviors among students in grades 9–12 - United States and selected sites, 2015. *MMWR Surveill Summ* 2016;65:1–202.
- [15]. Centers for Disease Control and Prevention (CDC). Conducting Trend Analyses of YRBS Data Available at: https://www.cdc.gov/healthyyouth/data/yrbs/pdf/2017/2017_YRBS_Conducting_Trend_Analyses.pdf. Accessed Sept. 2, 2020. https://www.cdc.gov/healthyyouth/data/yrbs/2017_tables/introduction.htm#t2_down.
- [16]. Blanco C, Wiley TRA, Lloyd JJ, et al. America’s opioid crisis: the need for an integrated public health approach. *Transl Psychiatry* 2020;10:167. doi:10.1038/s41398-020-0847-1 [PubMed: 32522999]
- [17]. Alinsky RH, Hadland SE, Matson PA, et al. Adolescent-serving addiction treatment facilities in the United States and the availability of medications for opioid use disorder. *J Adolesc Health* 2020; S1054–139X (20) 30106–3.

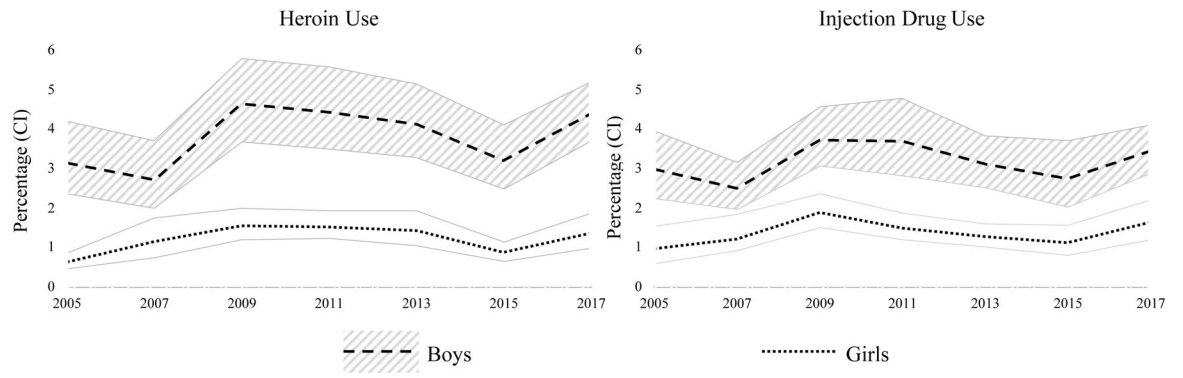


Figure. Site-pooled prevalence (and 95% confidence interval) of lifetime heroin use and injection drug use by sex, among high school students in five urban school districts (2005–2007)
Note. Lines indicate site-pooled prevalence estimates, 95% confidence intervals are shown in the shaded areas.

Demographic characteristics, heroin use, and injection drug use (IDU) among high school students in five US urban school districts, by year ($n=98,911$)

Table.

	Survey Year							
	2005	2007	2009	2011	2013	2015	2017	
No. sites	4	4	4	5	3	3	4	
No. students	11,855	12,765	15,073	16,412	13,820	13,397	15,589	
Sex								
Boys	49.2%	47.9%	49.0%	49.3%	50.5%	49.5%	49.3%	
Girls	50.8%	52.1%	51.0%	50.7%	49.5%	50.5%	50.7%	
Grade Level								
Ninth	35.2%	32.3%	31.9%	30.7%	28.7%	28.9%	27.6%	
Tenth	28.3%	28.1%	27.0%	26.8%	26.5%	26.1%	26.4%	
Eleventh	19.6%	20.7%	21.5%	22.2%	22.5%	22.8%	23.3%	
Twelfth	17.0%	18.9%	19.6%	20.4%	22.3%	22.3%	22.7%	
Race/Ethnicity								
Black	36.0%	37.2%	29.5%	28.8%	24.3%	23.0%	23.4%	
Hispanic/Latino	38.1%	31.8%	48.8%	46.7%	50.3%	47.5%	47.4%	
White	11.3%	14.3%	10.8%	12.6%	11.8%	11.6%	12.8%	
All Other	14.6%	13.7%	10.9%	12.0%	13.7%	17.9%	16.4%	
Site-Pooled Prevalence Estimates, % (95% CI)								
Heroin	1.86 (1.45,2.39)	1.89 (1.45,2.46)	3.04 (2.51,3.68)	2.95 (2.44,3.56)	2.77 (2.30,3.33)	2.01 (1.61,2.51)	2.85 (2.39,3.40)	
IDU	1.95 (1.47,2.58)	1.86 (1.52,2.29)	2.79 (2.36,3.29)	2.56 (2.08,3.14)	2.18 (1.81,2.63)	1.91 (1.49,2.44)	2.51 (2.10,3.00)	

Note. The sample sizes for heroin use and IDU for all years combined were 93,614 and 97,113, respectively.