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TRENDS IN INJECTION DRUG USE IN TEXAS TREATMENT FACILITY ADMISSIONS

CARA DAHLHAUSEN

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by

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APPROVED:

A handwritten signature in black ink, appearing to read 'Steven H. Kelder', written over a horizontal line.

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School of Public Health, 2020

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BACKGROUND

Injection Drug Use

Common recreational drugs, such as heroin, methamphetamine, cocaine, and ketamine are injected into the body using syringes/needles subcutaneously, intravenously, and intramuscularly (National Institute on Drug Abuse, 2020). The practice of injection drug use introduces a significantly higher risk of receiving and transmitting infectious diseases such as HIV and hepatitis C due to practices such as sharing syringes, needles, and drug preparation supplies (Centers for Disease Control, n.d.). Injection drug use is the second riskiest behavior associated with new HIV infections, and 68% of hepatitis C diagnoses in 2016 can be attributed to injection drug use (Centers for Disease Control, 2018) (Centers for Disease Control, n.d.).

Injection Drug Use Distribution in United States

A meta-analysis study estimated that in 2014, 2.6% of the U.S. population injected drugs recreationally (Lansky et al., 2014). At the national level, trends in injection drug use in the United States have been relatively stable for the past 20 years, but have steadily risen in some subpopulations, including adolescents and African Americans (Harrison & Blonigen, 2017). While trends of injection drug use are seemingly stable at the national level, there is much variability at the regional level, often due to regional differences in the preference of certain recreational drugs (Harrison & Blonigen, 2017). A report based on the National Drug Use and Health Survey found that individuals injecting drugs in southern and western regions favored stimulant drugs such as cocaine and methamphetamines, while their mid-western and

northeastern counterparts were primarily injecting depressant substances, such as heroin (Substance Abuse and Mental Health, 2007).

Injection Drug Use Distribution in Texas

Information on the prevalence and distribution of injection drug use in the state of Texas is relatively limited, although some state surveillance systems such as the National Drug Early Warning System (NDEWS) and Dallas, Texas' National HIV surveillance System (NHBS) aim to provide point estimates. A state-level summary analysis of the 2016 Treatment Episodes Data Set (TEDS) admissions data reported that 33% of all patients admitted into public Texas treatment facilities injected drugs (Maxwell, 2017). The NDEWS reported 85% of heroin users, 31% of methamphetamine users, and 2% of cocaine users in Texas treatment facilities were primarily using injection as their preferred method of administration (National Drug Early Warning System, 2018). In regards to the type of drugs being injected, the 2012 Dallas NHBS reported that the most commonly injected drug in Texas is heroin, followed by speedball (cocaine-heroin combination), and cocaine (Texas Department of State, 2012). Literature regarding trends and characteristics of injection drug users in Texas is overall limited making it difficult for Texas treatment programs and facilities to make decisions about their patient population.

Public Health Significance

Injection drug use is now the most common mode of transmission for hepatitis C (Centers for Disease Control, 2020a). Hepatitis C is an infection of the liver caused by the pathogenic virus, hepatitis C (HCV), which is transmitted via blood to blood contact, most commonly through shared needles. Acute hepatitis C is a short-term illness caused by HCV and is

characterized by jaundice, nausea/vomiting, abdominal pain, and joint pain. However, only 20%-30% of individuals with acute hepatitis C will develop symptoms; leaving the majority of cases unidentified and untreated. Approximately 75-85% of individuals with acute hepatitis C will develop a chronic hepatitis C infection (Centers for Disease Control, 2020a). Chronic hepatitis C that is left untreated can lead to severe health problems including cirrhosis of the liver, liver failure, liver cancer, and death (Centers for Disease Control, 2020a). Approximately 10%-20% of those infected with HCV will develop cirrhosis, and 3-6% of those with cirrhosis will go into liver failure (Centers for Disease Control, 2020a).

There are an estimated 205,800 persons living with HCV in Texas, where the rate of HCV is 1,040 cases per 100,000 persons (National Institute on Drug Abuse, 2019). Of those who have HCV in Texas, 50-90% are co-infected with HIV and inject drugs (Texas Department of State, 2018). In the wake of the U.S. opioid crisis, while the public and programs are focused primarily on the prevalence of drug use and overdose, chronic illnesses, such as hepatitis C from injection drug, are often overlooked. Because injection drug use is the largest risk factor for HCV, it is important to assess the magnitude and trends of injection drug use in order to evaluate resources for PWID and HCV. As of 2017, only 35% of all substance use treatment facilities screen for HCV (Substance Abuse and Mental Health, 2017a). A recent survey of Texas STD/HIV clinics, federally qualified health centers and treatment facilities found that 61% of surveyed facilities reported not providing hepatitis testing because of capacity and lack of funding (Texas Department of State, 2018). Evaluating proportions and trends of injection drug use may provide insight into the types of services and resources that treatment facilities may need to provide such as HCV testing.

Challenges with Injection Drug Use Data

Some of the major challenges of tracking injection drug use is its illicit status, reporting bias due to stigma, and the transient nature of the people who use drugs (Harrison & Blonigen, 2017). While these limitations exist, federal surveillance systems aim to provide valid estimates of use. A meta-analysis of the National Survey of Drug Use and Health (NSDUH), National Health and Nutrition provide Examination Survey (NHANES), and the National Survey of Family Growth (NSFG) provided estimates of the proportion of people who inject drugs (**Table 1**) (Lansky et al., 2014). While nationally representative surveys aim to provide point estimates at the national level, the estimates are highly variable by region and state and cannot be relied upon to represent estimates of PWID in Texas. In this thesis, the Treatment Episodes Data Set-Admissions (TEDS-A) will be utilized to estimate the proportions of injection drug use. Unlike other national surveys, the TEDS-A data can be analyzed at the state level, and is one of the few data sources that provide data specific to people who use drugs; a population that is otherwise difficult to reach. TEDS-A data cannot provide commentary on the trends of the drug using population as a whole, it can provide some context for the population being treated in publicly funded Texas treatment facilities, and can be leveraged to modify and fund programs accordingly.

Aims and Objectives

The overall objective of this thesis is to establish a trend in the prevalence of injection drug use among individuals admitted into publicly funded Texas treatment facilities. The analysis was conducted using data from SAMSHA's TEDS-A system from 2013 to 2017. To

provide further context, analyses were stratified by race, ethnicity, gender, age, and by the three most commonly injected drugs in the U.S.: heroin, methamphetamine, and cocaine.

METHODS

Study Design

This is a serial cross-sectional secondary analysis of drug treatment admissions records from the TEDS-A from years 2013-2017. The prevalence of injected drug use was calculated for each year and analyzed across the five-year period using a chi-square test to determine the presence of significant change in injection drug use from 2013 to 2017. Prevalence of injection drug use also will be calculated for each year by drug type (heroin, methamphetamine, and cocaine), age, sex, ethnicity and race, and will be analyzed for trends using a chi-square test.

Study Setting

TEDS-A data obtained from the state of Texas were examined. The number of Texas treatment facilities receiving public funds varies by year (**Table 2**) (Substance Abuse and Mental Health, n.d.a). Patients in TEDS-A records can be admitted into these treatment facilities through self-referral, healthcare providers, employee assistance programs, schools, drug/alcohol care providers, community referrals, or by court order (Center for Behavioral Health Statistics and Quality, n.d.)

Study Subjects

Study subjects (n= 191,878) are individuals in Texas who have been admitted to a publicly funded treatment facility for drug and/or alcohol abuse and are over the age of 12 years. Records in TEDS-A datasets are not per individual, but are per admission episode. Admissions entries in Texas in which the primary route of drug administration was injection were examined.

In 2017 this included n= 38,819 admission episodes, in 2016 n=36,528 admission episodes, in 2015 n= 37,370 admission episodes, in 2014 n= 39,485 admission episodes, and in 2013 n= 39,676 admission episodes.

Data Source

This thesis utilized the TEDS-A dataset, which is derived from the parent dataset, TEDS (Treatment Episode Data Set). The TEDS series is a national database that collects state-reported data and administrative records that are abstracted from publicly funded substance use treatment facilities. The primary purpose of TEDS is to provide data on substance use facility services, client demographics, and client substance use at the state and national level. TEDS-A Dataset is one of two subsets of the parent dataset, Treatment Episodes Data Set (TEDS). The other sub-set of TEDS, TEDS-D (Discharge), includes only discharge data from treatment facilities. TEDS dataset is the only database that collects and publishes substance abuse treatment at the client level, and is often leveraged for program and policy decision-making (Substance Abuse and Mental Health, n.d.b). TEDS-A data comes from record abstracts and because TEDS-A is a subset of TEDS, discharge and length of stay information can be linked for a complete admission/discharge episode. Data are entered by treatment facilities staff members and submitted to SAMHSA. The list of variables utilized in this thesis can be found in **Table 3**.

Data Analysis

The prevalence estimates and confidence intervals (95%) of injection drug use were calculated for each year (n=5) for every category of interest. The prevalence estimates were then used to compute a chi-square test to determine if there was a statistically significant difference

between one or more of the prevalence estimates in each category. The chi-square test was chosen for significance testing because the primary route of administration use was calculated into a binary field (inject/no inject) and was compared to the other categorical variable, year of admission. Categories that yielded a significant p-value ($p < 0.05$) with the chi-square test were then examined more closely to determine in which years the prevalence significantly increased or decreased. Significant differences between two prevalence estimates were determined by reviewing the confidence interval overlap. When the 95% confidence intervals between two proportions did not overlap, significance ($p < 0.05$) was assumed. This assumption can be made because an estimate with confidence intervals outside of the 95% confidence intervals of another estimate are outside of the null (the estimate) at a significance level of $p = 0.05$. Confidence intervals that overlapped cannot be assumed as not-significant due to a higher risk of type II error, so prevalence estimates with overlapping confidence intervals were tested using a two-sample test of proportions. Throughout the analysis, the chi-square test acted as an initial screening for significant changes, followed by the year-to-year prevalence comparison which provided a more detailed narrative of those changes.

RESULTS

All Injection Drug Use

The calculated prevalence estimates and confidence intervals (95%) can be seen in **Table 4**. The chi-square test for injection drug yielded a significant p-value ($p = 0.000$), suggesting that one or more of the prevalence estimates significantly differed. The prevalence in injection drug use significantly increased between 2013 (17.56%) and 2014 (18.16%) ($p = 0.0251$), and between 2014 and 2015 (20.82%) with no confidence interval overlap ($p < 0.05$). The difference in injection drug use between 2015 (20.82%) and 2016 (20.80%) was negligible with no

significant difference ($p=0.9466$). However, the prevalence of injection drug use then decreased significantly from 2016 (20.80%) to 2017 (19.13%) with no confidence interval overlap ($p < 0.05$).

Injection Drug Use by Demographics

Injection drug use among males increased significantly between 2013 (17.71%), 2014, (18.99%), and 2015 (21.72%) with no overlapping confidence intervals ($p < 0.05$). The prevalence in injection drug use for males decreased between 2015 ($p= 0.295$) and 2016 (21.31%), and then significantly dropped in 2017 (19.62%) with no confidence interval overlap ($p < 0.05$). Injection drug use among females decreased between 2013 (17.34%) and 2014 (16.98%) ($p=0.3904$), but then significantly ($p < 0.05$) increased from 2014 (16.98%), 2015 (19.46%), and 2016 (20.05%), followed by a significant decrease in 2017 (18.41%) with no confidence interval overlaps. All categories of race experienced significant changes in injection drug use between 2013 and 2017 with the exception of Asian and Multi-racial admissions. Overall, White admissions had the highest prevalence of injection drug use compared to other categories of race. The overall prevalence of injection drug use in Black admissions was lower than any other racial category, and was the only category of race that shows a significant decline in injection drug use between 2015 (6.15%) and 2016 (4.81%) with no confidence interval overlap ($p < 0.05$) (**Figure 1**). The pattern of injection drug use in Native Americans was dissimilar to other racial categories and the overall trend in injection drug use. Between 2015 and 2016, injection drug use in other race categories experienced a slight decrease, but in Native Americans, injection drug use increased significantly by 8.27% ($p < 0.05$) (**Figure 1**). Injection drug use for both Hispanics and non-Hispanics changed significantly between 2013 and 2017 ($p= 0.000$). Injection drug use for Hispanics and non-Hispanics followed the same pattern of

trend with the exception of a significant decline in injection drug use in Hispanic admissions between 2013 (17.97%) and 2014 (14.49%) ($p < 0.05$). The age groups with the highest overall prevalence in injection drug use were those ages 20-29 and 30-39 (**Figure 2**). In contrast, the age groups with the lowest prevalence in injection drug use were those ages 12 - 19.

Injection Drug Use by Drug Type

The chi-square test only yielded significant results for heroin ($p = 0.000$) and for methamphetamines ($p = 0.001$). Injection drug use in those who were admitted primarily for heroin use significantly increased from 2013 (76.92%) to 2014 (78.38 %) ($p = 0.0528$), and from 2014 to 2015(80.93%) with no confidence interval overlap ($p < 0.05$). The prevalence of injection drug use in those admitted primarily for methamphetamines did not change significantly until 2016 to 2017, when the prevalence declined from 32.10% to 30.14% ($p = 0.0238$) (**Figure 3**).

DISCUSSION

The trend in overall injection drug use was representative of the trend in injection drug use in the observed sub-categories: prevalence increased between 2013 and 2015, followed by a decline between 2015 and 2017. While not all year-to-year change was significant for each category, almost all categories of interest followed this same pattern. One of the potential explanations for the increase between 2013 and 2015 is the introduction of illicitly manufactured fentanyl (IMF), a synthetic opioid that was introduced to the markets in 2013, and is commonly cut with heroin (Centers for Disease Control, 2020b). The introduction of IMFs in 2013 may have had the strongest influence on the trend of injection drug use as heroin admissions made up about 67.48% of all primary injection drug use between 2013-2017. The cause of the decline in

injection drug use between 2016 and 2017 is difficult to ascertain, but it may be the result of harm reduction efforts outside of treatment facilities. At the individual level, harm reduction refers to interventions and practices aimed to reduce the negative health and social consequences of drug use without the cessation of drug use (Canadian Pediatric Society, 2008). Harm reduction interventions specifically for people who inject drugs aim to mitigate physical injury due to injections and the transmission of hepatitis C and HIV (*Guidelines for the Screening*, 2014). Harm reduction intervention methods that may cause a decrease in injection drug use include the promotion of non-injection routes of administration, injection cessation, intermittent injections, and educating users about the HCV and HIV risk (United Nations, 2007). Methods such as these have been shown to be effective in reducing HIV and hepatitis C infections in people who inject drugs, and may become more widely accepted and practiced as the research continues to develop (Page et al., 2013).

Compared to national-representative prevalence estimates from SAMHSA's TEDS-A reports, the prevalence estimates of injection drug use in Texas were consistently higher than that of the national estimates from 2013 and 2017 (Department of Health and Human Services, n.d.). This was especially true for injection drug use among heroin admissions in which the prevalence of injection drug use in Texas was 14.58% higher than the national estimate in 2017 (Substance Abuse and Mental Health, 2019). Reasons for variability in injection drug use could be dependent on region and the chemical properties of the drugs available in that region. Heroin is the best example of this; heroin that is salt-based (i.e. black tar or columbian-sourced powder) can easily be injected while other forms that are not salt-based are not easily injectable and are more often smoked (Mars, Ondocsin, & Ciccarone, 2018). Heroin that is most available in Texas

as of 2017 is Mexican black tar and powdered brown heroin, both of which are salt-based and most easily administered through injection (Maxwell, 2017).

One of the more interesting injection drug use trends among the demographics examined in this analysis was the significant increase in injection drug use among Native Americans between 2015 and 2016. This 14.27% increase greatly differed from other categories of race that either declined or changed insignificantly. By 2017, the race category with the highest prevalence of injection drug use were those who were white (22.27%), followed by those who were multi-racial (21.82%) and those who were Native American (19.39%). While the cause of the increase of injection drug use in Native Americans is unclear, it may be an indicative of the need for an at-risk public health intervention.

The present prevalence estimates and trends in injection drug use may provide supportive evidence for program planning or determining funding allocations for treatment facilities. The opportunity to evaluate funding and a facilities capacity to expand services, such as hepatitis C testing, generally happens on a 2-year cycle based on the Substance Abuse Prevention and Treatment Block Grant (Substance Abuse and Mental Health, 2017b). With approximately 1/3 of all admissions to treatment facilities primarily injecting drugs, treatment facilities should consider offering or expanding hepatitis C testing because of the risk associated with injection drug use. While injection drug use decreased between 2016 and 2017, the prevalence in 2017 is still 1.57% higher than it was in 2013. Yet, the proportion of treatment facilities offering hepatitis C testing in Texas has not changed accordingly between 2013 (35.8%) and 2017 (35.5%) (Substance Abuse and Mental Health, n.d.a). Treatment facilities are one of the few places that can systematically identify people who inject drugs because of TEDS-A reporting, and therefore can identify those who may need hepatitis C testing upon admissions. The

accessibility of hepatitis C testing is also important because a large majority of admissions (85% as of 2017) are uninsured and are unlikely getting tested and treated prior to their admission.

While the TEDS-A data presented in this thesis can be useful in describing the characteristics of admitted patients, it is not representative of the drug using population outside of treatment facilities. The results in the present study cannot be extended to the general public or even to private funded treatment facilities because those populations are simply not represented in this data-set. Despite its limitations, it is important that Texas and other states regularly surveil TEDS-A data and leverage it accordingly to better serve their patients. The focus of future research may be determining what has prompted the recent decline in injection drug use, or determining if there are successful harm reduction interventions that could be more widely implemented.

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APPENDIX

Table 1.

National Survey	Est. Proportion of PWID (%) (CI 95%)
National Survey of Drug Use and Health	0.22 (0.19, 0.25)
National Health and Nutrition Provide Examination Survey	0.34 (0.24, 0.48)
National Survey of Family Growth	0.36 (0.27, 0.46)
Combined Estimate	0.30 (0.19, 0.41)

Table 2.

Publicly Funded Treatment Facilities in Texas by Year		
Year	No.	% of total facilities
2017	230	53.4%
2016	245	50.2%
2015	228	51.6%
2014	*	*
2013	253	54.9%

* Data not available

Table 3.

TEDS-A Variables	
Route of administration (primary, secondary, tertiary)	Oral
	Smoking
	Inhalation
	Injection
	Other
Sex	Male
	Female
Race	Alaska Native (Aleut, Eskimo, Indian)
	American Indian (Other than Alaska Native)
	Asian or Pacific Islander
	Black or African American
	White
	Other single race
	Two or more face
	Native Hawaiian or Other Pacific Islander

Ethnicity	Puerto Rican
	Mexican
	Cuban or other specific Hispanic
	Not of Hispanic or Latino origin
	Hispanic or Latino, specific origin not specified
Substance Use (primary, secondary, tertiary)	None
	Alcohol
	Cocaine/Crack
	Marijuana/Hashish
	Heroin
	Non-Prescription Methadone
	Other Opiates and Synthetics
	PCP
	Other Hallucinogens
	Methamphetamines
	Other Amphetamines
	Other Stimulants
Benzodiazepines	

	Barbiturates
	Other non-Barbiturate sedatives or hypnotics
	Inhalants
	Over-the-counter Medications
	Other
Age	12-14 years
	15-17 years
	18-20 years
	21-24 years
	25-29 years
	30-34 years
	35-39 years
	40-44 years
	45-49 years
	50-54 years
	55-64 years
	65 + years

Table 4.

Prevalence of Injection Drug Use by Year						
CI 95%, Chi-Square p-values						
	2013	2014	2015	2016	2017	P-value
Injection Drug Use						
	.1756 (.1719, .1794)	.1816 (.1779, .1855)	.2082 (.2041, .2123)	.2080 (.2039, .2122)	.1913 (.1874, .1952)	0.000
Gender						
Male	.1771 (.1722, .1820)	.1899 (.1849, .1950)	.2172 (.2118, .2227)	.2131 (.2077, .2186)	.1962 (.1911, .2014)	0.000
Female	.1734 (.1676, .1793)	.1698 (.1640, .1757)	.1946 (.1883, .2010)	.2005 (.1941, .2070)	.1841 (.1782, .1903)	0.000
Race						
White	.2001 (.1957, .2046)	.2091 (.2047, .2136)	.2362 (.2315, .2410)	.2371 (.2323, .2419)	.2227 (.2181, .2273)	0.000
Black	.0464 (.0415, .0517)	.0422 (.0374, .04756)	.0615 (.0554, .0680)	.0481 (.0426, .0541)	.0395 (.0349, .0445)	0.000
Native American	.1702 (.1315, .2148)	.1265 (.0927, .1671)	.1184 (.0795, .1676)	.2606 (.2028, .3254)	.1939 (.1479, .2470)	0.000
Asian	*	.0778 (.0421, .1294)	.104 (.0565, .1713)	.0986 (.0550, .1599)	.1186 (.0756, .1735)	0.778
Multi-racial	*	.2680 (.1997, .3455)	.2394 (.1719, .3182)	.1759 (.1276, .2333)	.2182, (.1779, .2628)	0.186
Ethnicity						
Hispanic	.1797 (.1751, .1844)	.1449 (.1387, .1513)	.1710 (.1641, .1781)	.1673 (.1603, .1745)	.1545 (.1477, .1614)	0.000
Non-Hispanic	.1663 (.1600, .1727)	.1985 (.1938, .2034)	.2241 (.2191, .2292)	.2251 (.2200, .2303)	.2060 (.2013, .2108)	0.000
Age						

12-19	.1279 (.1215, .1345)	.0459 (.0407, .0516)	.0632 (.0563, .0704)	.0551 (.0485, .0622)	.0439 (.0383, .0499)	0.012
20 - 29	.2274 (.2204, .2344)	.2293 (.2217, .2370)	.2598 (.2517, .2680)	.2544 (.2462, .2627)	.2194 (.2117, .2272)	0.000
30 - 39	.1774 (.1690, .1861)	.2270 (.2193, .2349)	.2526 (.2446, .2609)	.2514 (.2435, .2594)	.2387 (.2312, .2463)	0.000
40 - 49	.1369 (.1277, .1457)	.1580 (.1490, .1673)	.1712 (.1617, .1810)	.1953 (.1851, .2058)	.1926 (.2828, .2027)	0.000
> 50	.1598 (.1439, .1768)	.1463 (.1361, .1569)	.1638 (.1529, .1751)	.1466 (.1360, .1568)	.1498 (.1391, .1609)	0.099
Drug Type						
Heroin	.7692 (.7684, .7797)	.7838 (.7733, .7941)	.8093 (.7996, .8187)	.8143 (.8045, .8239)	.7948 (.7846, .8047)	0.000
Methamphetamine	.3382 (.3238, .3524)	.3280 (.3147, .3415)	.3302 (.3171, .3434)	.3210 (.3089, .3333)	.3014 (.2895, .3135)	0.001
Cocaine	.0270 (.0223, .0323)	.0274 (.0224, .0331)	.0255 (.0204, .0316)	.0211 (.0163, .0270)	.0196 (.0148, .0234)	0.145

Figure 1.

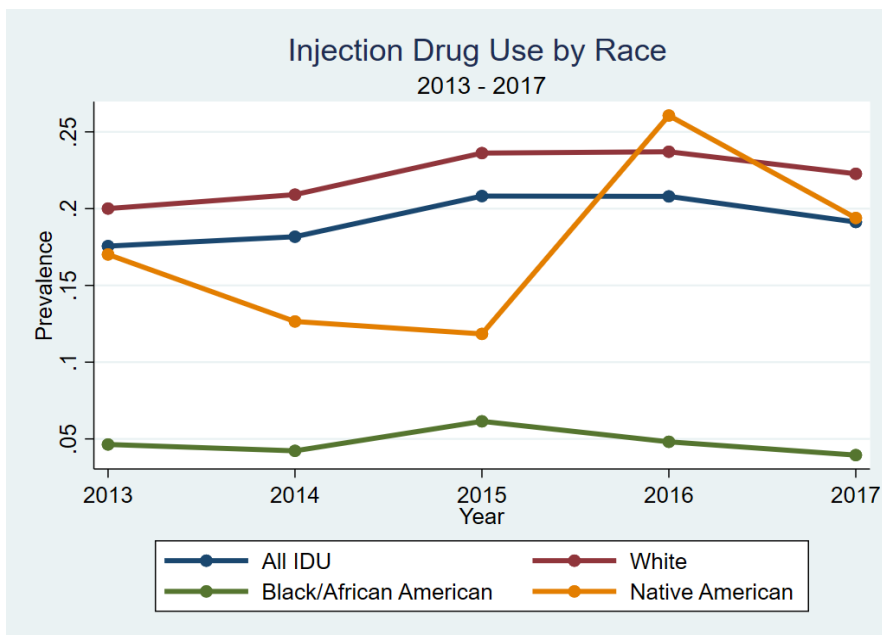


Figure 2.

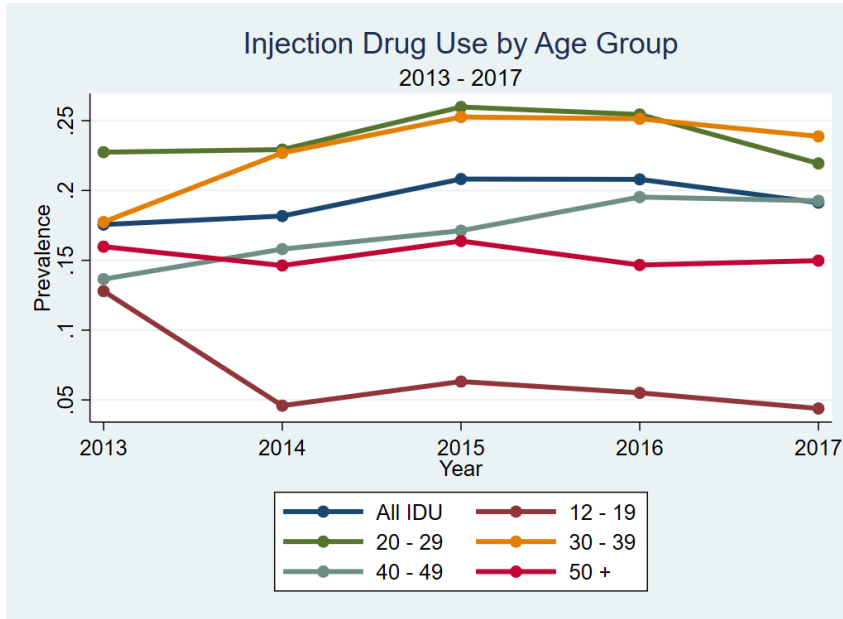


Figure 3.

