

Overdose Deaths and Acute Hepatitis Infections among American Indians in North Carolina

Mary E. Cox, Nicole Dzialowy, Lillie Armstrong, Scott Proescholdbell

BACKGROUND Like the rest of the nation, North Carolina is experiencing the worst drug crisis in United States history, as deaths related to medication and drug overdoses are at an all-time high. Although the absolute numbers of deaths are highest among white populations, American Indians (AIs) experience disproportionately high rates.

METHOD Using death certificate data, death rates due to unintentional medication and drug overdose were calculated for various races and ethnicities. Acute hepatitis B (HBV) and acute hepatitis C (HCV) rates were also calculated across racial and ethnic groups using data from the North Carolina Electronic Disease Surveillance System.

RESULTS After adjusting for population size, AIs have as high or higher overdose death rates for all types of drugs except heroin, compared to other racial and ethnic groups. During the most recent 5 years of data (2012-2016), the highest rate of acute HCV infection occurred among AIs.

LIMITATIONS Race/ethnicity data recorded on death certificates is often provided by family members and is difficult to verify independently. Another potential limitation is use of small numbers to calculate rates. Additionally, HBV and HCV are thought to be underreported.

CONCLUSION Overdose death rates and rates of communicable diseases associated with injection drug use among AIs residing in North Carolina are as high as or higher than the overall North Carolina population. It is important to recognize and address these differences and provide prevention, harm reduction, and treatment services to all groups being impacted by the overdose epidemic.

North Carolina, like the rest of the nation, is experiencing an overdose epidemic that is severely impacting both morbidity and mortality across the state. To effectively combat the overdose epidemic, it is necessary to understand which populations are most affected by substance use-related morbidity and mortality. The impact of the opioid epidemic on white populations in the United States has received much attention. Headlines suggest that the current drug epidemic has garnered national responsiveness because, unlike other drugs, opioids, including heroin, are killing whites at higher rates than other races/ethnicities. This has resulted in a decrease in the life expectancy of US whites [1-3]. Despite national focus on this crisis, the impact of overdose deaths on minority populations, especially American Indians (AIs), is underreported.

It is critical for both federal and state governments to understand the burden of the opioid epidemic on special populations, like AIs. In June 2017, the North Carolina Department of Health and Human Services (NC DHHS) released the North Carolina Opioid Action Plan (NC OAP), a document that outlines multiple comprehensive strategies to combat the overdose epidemic in North Carolina. The plan has several focus areas to tackle the drug crisis including creating a coordinated infrastructure, reducing the oversupply of prescription opioids, reducing diversion of prescription drugs and the flow of illicit drugs, increasing community awareness and prevention, increasing availability of naloxone, and expanding access to treatment and care [4]. The

NC OAP details numerous actions to be led by multiple state and local agencies and partners across North Carolina and outlines 13 key metrics for tracking North Carolina's progress toward reducing substance use-related morbidity and mortality. The NC OAP highlights the needs of special populations like pregnant women and justice-involved persons; however, missing from the plan is any mention of the burden of this epidemic on AI populations in North Carolina.

According to 2016 US Census estimates, North Carolina has the 6th largest population of AIs in the country, and the largest population of any state east of the Mississippi River [5]. In 2016 there were over 120,000 AIs living in North Carolina, accounting for 1.2% of the state's total population [5]. There are 8 AI tribes recognized by the state of North Carolina: the Eastern Band of Cherokee (EBCI), Coharie Tribe, Haliwa-Saponi Indian Tribe, Sappony Tribe, Lumbee Tribe of North Carolina, Meherrin Indian Tribe, Occaneechi Band of the Saponi Nation, and Waccamaw-Siouan Tribe. EBCI is the only federally recognized tribe, and the only tribe served by the US Indian Health Services [6]. In order to better understand the impact of the overdose epidemic on the

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AI population in North Carolina, 2 key metrics from the NC OAP were chosen for further analysis: unintentional overdose deaths and hepatitis infections. These metrics were chosen because they address elements of both substance use-related morbidity and mortality and provide race and ethnicity variables in each dataset.

From 2000 to 2016, unintentional medication and drug overdose deaths increased 441% in North Carolina. Historically, most of these deaths were due to prescription opioid analgesics (hydrocodone, methadone, oxycodone), but in recent years heroin and other synthetic narcotics, like illicitly manufactured fentanyl and its analogues, have been involved in an increasing number of deaths. North Carolina is also experiencing a growing number of deaths involving cocaine [7]. Increasing rates of new infections of blood-borne illnesses are additional consequences of the opioid epidemic as nearly 55% of hepatitis C cases can be attributed to injection drug use (IDU) [8]. Rates of acute hepatitis B (HBV) and acute hepatitis C (HCV) have been rising in North Carolina, and rates of both acute HBV and HCV in the state have been higher than the national rates since 2008. In 2016, North Carolina's rate for acute HBV infection was 1.5 cases per 100,000 residents, while the US rate in 2016 was 1.0 cases per 100,000. North Carolina's 2016 rate of acute HCV infection was 1.8 cases per 100,000, higher than the 2016 US rate of 1.0 cases per 100,000 [9, 10]. While the burden of the overdose epidemic is felt well beyond these 2 metrics, death and acute HBV and HCV infections were the focus of this analysis as these data help quantify the direct impacts of the changing landscape of the overdose epidemic.

Methods

North Carolina State Center for Health Statistics (SCHS) Vital Records death certificate data were used to identify unintentional medication and drug overdose deaths with an *International Classification of Diseases, 10th Revision* (ICD-10) primary cause-of-death code of X40-X44 (eg, medication or drug). Deaths involving specific drugs were identified using underlying cause-of-death codes for cocaine (T40.5); commonly prescribed opioids, including medications like oxycodone, hydrocodone, codeine, and many others (T40.2 or T40.3); other synthetic narcotics, primarily fentanyl and fentanyl analogues (T40.4); and heroin (T40.1). All death data were limited to North Carolina resident deaths, and mortality rates were calculated by drug type involved, sex, age group, and race/ethnicity as stated on the death certificate for the study period of 2000-2016. Rates were also calculated over 5-year periods to examine trends over time.

Acute HBV and HCV cases from the last 5 complete years of data (2012-2016) were pulled on June 1, 2017, from the North Carolina Electronic Disease Surveillance System (NC EDSS), a web-based health surveillance and reporting system. NC EDSS is used by the Division of Public Health, the state's 85 local and multi-county district health depart-

ments (LHDs), and 7 HIV/STD Regional Offices. Following Centers for Disease Control and Prevention (CDC) guidelines for hepatitis surveillance, confirmed cases of acute HBV and HCV met both the clinical and serologic case definitions [9, 10]. Confirmed cases were combined to calculate overall rates and rates by race and ethnicity. Infection risk assessment data were also available in NC EDSS through the LHDs' investigation of new acute HBV and HCV infections. Overall population trends and the percent of HBV and HCV cases with exposure through IDU were calculated by race and ethnicity.

Both mortality and infection rates were calculated using the population estimates from the National Center for Health Statistics' US Census data [11]. Rates were not calculated for multiple race or unknown race and ethnicity groups due to the lack of overall population data. AI, Asian, white, and black populations are all non-Hispanic. Asian populations include both Asians and Pacific Islanders, and AI populations include both AIs and Alaskan Natives. All rates are reported as per 100,000 North Carolina residents and are suppressed when there are fewer than 5 cases. This analysis was conducted using SAS 9.4, and mapping was completed in ArcGIS 10.3.1.

Results

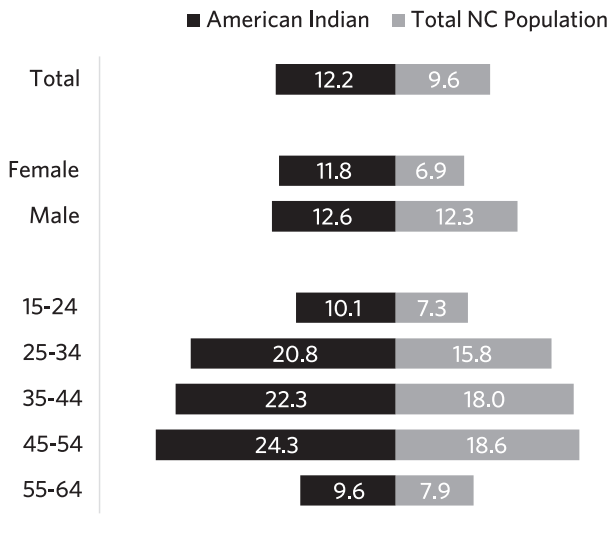
Overdose Deaths

From 2000 to 2016, the rate of deaths due to unintentional medication and drug overdose among AIs was 1.3 times greater than the rate among the total North Carolina population—12.2 and 9.6 cases per 100,000 residents, respectively. Among the total North Carolina population, overdose death rates were nearly twice as high among men (12.3 per 100,000) as among women (6.9 per 100,000). However, AI men and women had similar overdose rates of 12.6 per 100,000 among men and 11.8 per 100,000 among women. The highest rates of fatal overdose for both the total North Carolina population and AIs occurred among those aged 45-54, and rates in this age group were higher among AIs. Rates of overdose by sex and age for both populations are presented in Figure 1.

Overdose death rates during the study period were calculated by substance type across white, black, AI, Asian, and Hispanic populations. AIs and Whites had equal rates of overall unintentional medication and drug overdose deaths (12.2 per 100,000). Across all races and ethnicities, AIs had the highest overdose rates among deaths involving cocaine (3.4 per 100,000). AIs and whites had equally high rates of fatal overdose involving other synthetic narcotics (1.9 per 100,000). Although whites had the highest rate of deaths involving commonly prescribed opioids (6.6 per 100,000), AIs had a similarly high overdose rate (6.1 per 100,000). Table 1 provides all overdose death rates by substance type, race, and ethnicity.

Trends over 5-year time periods showed increased rates of unintentional overdoses involving commonly prescribed

FIGURE 1.
American Indian Unintentional Medication and Drug Overdose Rates per 100,000 North Carolina Residents Compared to the Total North Carolina Population Unintentional Medication and Drug Overdose Rates per 100,000 Residents, by Sex and Age, 2000-2016



opioids, heroin, other synthetic narcotics, and cocaine within the North Carolina AI population. Among the specific substance types, deaths involving commonly prescribed opioids saw the most dramatic increase, with a rate of 3.7 per 100,000 from 2002 to 2006 increasing to a rate of 8.5 per 100,000 from 2012 to 2016. Rates of deaths involving commonly prescribed opioids were highest across all 3 5-year time periods. Figure 2 depicts the change in AI overdose rates over time for each substance type.

Frequencies were calculated by residence county of AI unintentional medication and drug overdose decedents during

the most recent 5-year time period (2012-2016). Fifty percent (N = 46) of AI unintentional overdose deaths occurred among individuals residing in Robeson County. AI overdose deaths also occurred among residents of Jackson, Cumberland, Hoke, Scotland, Guilford, Durham, Forsyth, Moore, Sampson, Swain, Brunswick, Franklin, Gaston, Halifax, Harnett, Lee, Lincoln, Mecklenburg, Pender, Transylvania, and Wake counties but with much lower numbers (less than 8 cases for any listed county). In most instances, the numbers were too low to calculate a stable rate for accurate comparability across counties. A map of counts of AI overdose deaths during this time is presented in Figure 3.

Hepatitis Infections

There were 151 acute HBV cases diagnosed in North Carolina in 2016 (at a rate of 1.5 per 100,000), compared to 93 cases in 2012 (1.0 per 100,000). From 2012 to 2016, whites, blacks, and AIs had similar rates of acute HBV infection at 1.1, 1.1, and 1.0 per 100,000, respectively. There were 185 acute HCV cases diagnosed in North Carolina in 2016 (at a rate of 1.8 per 100,000), compared to 67 cases in 2012 (0.7 per 100,000). During the most recent 5 years of data (2012-2016), the highest rate of acute HCV cases occurred among AIs, with a rate of 3.8 per 100,000, over 3 times the overall North Carolina rate of 1.2 per 100,000. 2012-2016 rates of acute HBV and HCV infections by race/ethnicity are presented in Figure 4.

Acute HBV exposure through reported IDU has been increasing (7.5% in 2012 to 21.9% in 2016). Between 2012 and 2016, 78.0% of acute HBV cases reporting IDU were white, 16.5% had an unknown race/ethnicity, 3.3% were black, and 2.2% were AI. During this same time, 33.3% of AIs with acute HBV reported IDU compared to 21.5% of whites and 2.5% of blacks. No cases of acute HBV among Asians or Hispanics reported IDU from 2012 to 2016.

TABLE 1.
Unintentional Overdose Rates per 100,000 NC Residents, by Drug Type, Race and Ethnicity, 2000-2016^a

	All Medication and Drug		Commonly Prescribed Opioids		Heroin		Other Synthetic Narcotics		Cocaine	
	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000	N
Total NC Population	9.6	14,886	4.8	7,487	1.4	2,117	1.4	2,235	2.2	3,403
White ^c	12.2	12,810	6.6	6,951	1.7	1,824	1.9	1,992	2.2	2,305
Black ^c	4.8	1,619	1.0	335	0.7	227	0.5	169	2.9	970
American Indian ^c	12.2	228	6.1	114	0.6	12	1.9	36	3.4	64
Asian ^c	0.9	30	0.3	11	*	4	*	4	0.1 ^b	5
Hispanic	1.3	155	0.5	54	0.4	41	0.2	23	0.5	52

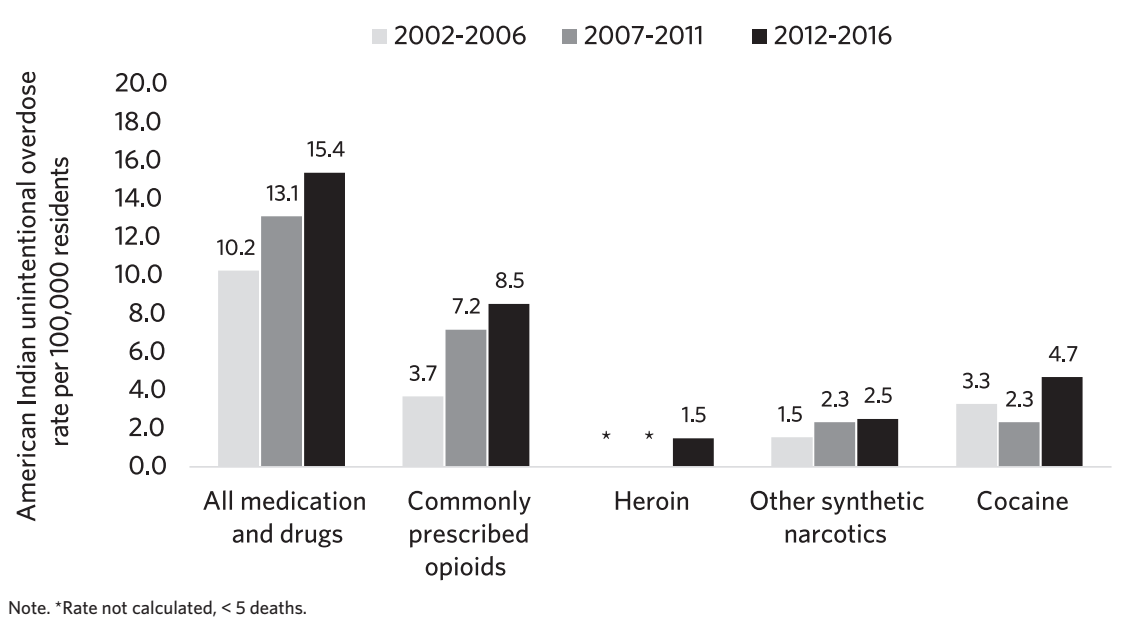
Note. ^aRate not calculated, < 5 deaths.

^bDrug type categories are not mutually exclusive; if a death involved multiple substances it will be included in each category. There are also additional drug type categories beyond those included here; the sum of commonly prescribed opioids, heroin, other synthetic narcotics and cocaine may not be the same as the overall medication and drug total.

^cInterpret with caution, < 10 deaths.

^dNon-Hispanic.

FIGURE 2.
American Indian Unintentional Overdose Rates per 100,000 North Carolina Residents by Drug Type over 5-Year Time Periods, 2002-2016



Acute HCV exposure through reported IDU has also been increasing (34.3% in 2012 to 43.2% in 2016). Between 2012 and 2016, 85.4% of acute HCV cases reporting IDU were white, 5.3% had an unknown race/ethnicity, 4.5% were black, and 3.2% were AI. During this same time, 39.7% of whites with acute HCV reported IDU compared to 39.1% of AI, 27.3% of Hispanics, and 22.2% of blacks. No cases of acute HCV among Asians reported IDU from 2012 to 2016.

Conclusions

Frequently, articles examining the racial and ethnic disparities of the overdose epidemic focus primarily on the outcomes of whites compared to blacks, and sometimes Hispanics. [1-3, 12]. While there are certainly important historical factors contributing to the disparate outcomes these racial/ethnic groups are experiencing, our analysis emphasizes the immense need to broaden the scope of prevention and response efforts to include AIs in addition to other racial and ethnic populations. During the 17-year study period for which death data was available (2000-2016), overdose death rates among whites were higher than rates among Asians and Hispanics across all substance types, and whites had higher rates than blacks across all substance types except cocaine. However, our results show that AIs had rates as high as or higher than white populations for every substance type, except heroin.

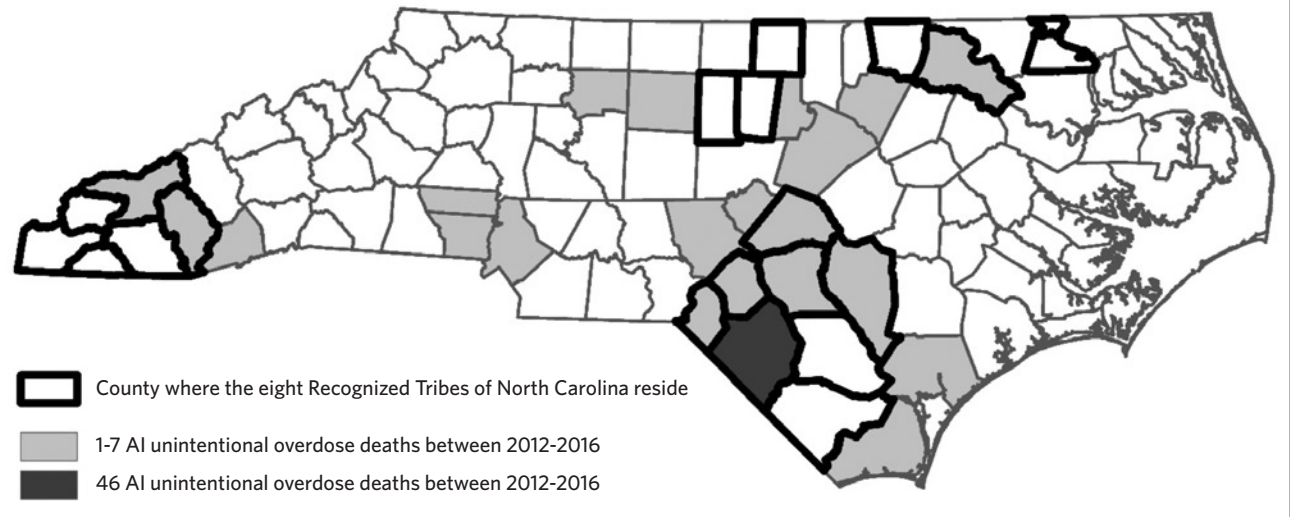
While the literature may suggest that the current drug epidemic is primarily affecting white men, the data show that AIs in North Carolina are also significantly impacted and have higher rates of unintentional medication and drug overdose than the overall state rate. These results suggest

a need for overdose prevention interventions tailored to the AI populations in our state. These interventions should take care to include both AI men and women since they have similarly high rates of overdose, unlike the overall North Carolina population rates, which show men having much higher rates of overdose than women.

Our analysis also revealed that over the last 5 years (2012-2016), 50% of AI unintentional medication and drug overdose deaths occurred among residents of Robeson County, where 44% of the state's AI population resides. Over 53,000, or 39%, of Robeson County residents are AIs, the majority of whom likely belong to the Lumbee Tribe of North Carolina. Though recognized as a tribe by the state of North Carolina, the Lumbee Tribe does not receive full federal recognition and therefore does not have the same access to health care and other benefits afforded to federally recognized tribes [13]. Due to the large population of AIs and the high number of overdose deaths, we encourage prioritizing AI overdose prevention efforts in Robeson County.

Rates were calculated whenever possible to ensure comparability between racial/ethnic groups. However, when examining one specific race/ethnicity and one substance type it was necessary to suppress some rates even when combining multiple years of data. It is worth noting that although numbers were not always high enough to report a rate, the frequencies of unintentional overdose across each race/ethnicity and each substance type did increase throughout the study period. In 2016, based on guidance from CDC, the case definition for acute HCV was updated to include both confirmed and probable cases; therefore, comparisons before and after this change should be made

FIGURE 3.
Unintentional Medication and Drug Overdose Deaths among North Carolina American Indians (N = 92), 2012-2016



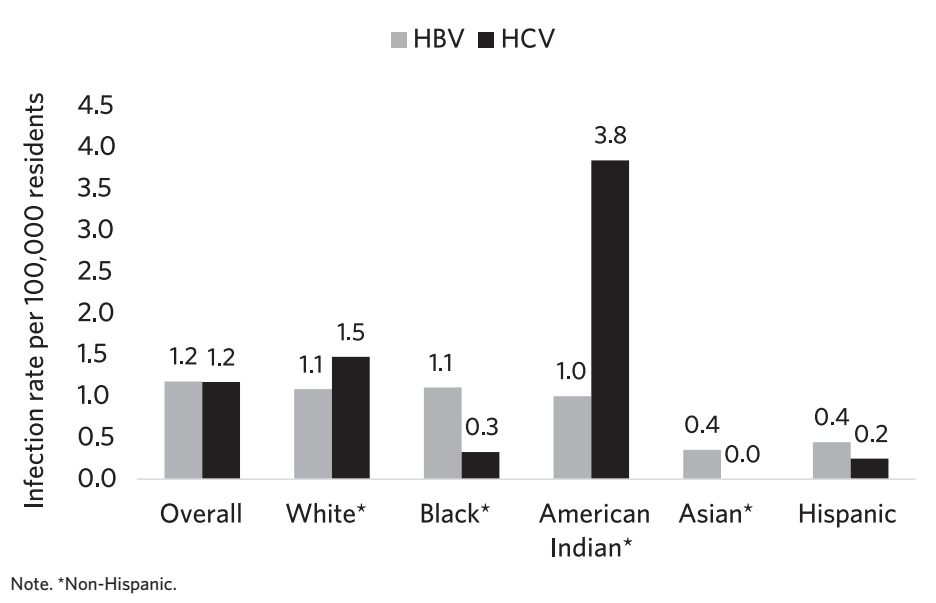
with caution [10]. Another limitation of our study was the number of cases of acute HBV and HCV infection with missing data, as 14% of HBV and 5% of HCV cases from 2012 to 2016 had an unknown race/ethnicity. Additionally, the CDC estimates that both acute HBV and HCV are underreported in the United States across all races and ethnicities [10]. While only 0.1% of unintentional medication and drug overdose deaths from 2000 to 2016 had an unknown race/ethnicity, race and ethnicity data recorded on death certificates are frequently provided by family members and are difficult to verify and validate independently, often leading to an underreporting of AI deaths. However, the limitations found in death certificate data are thought to be minimal for most other racial and ethnic groups [14, 15]. This analysis focused on all unintentional medication and drug overdose deaths, but only included the specific subcategories of commonly prescribed opioids, heroin, other synthetic narcotics, and cocaine. Future analyses should expand to include additional subcategories of medication and drug overdose, like benzodiazepines and prescription stimulants, as deaths from these substances may also vary across races and ethnicities. Broad movement toward illicit drugs, which are more likely to be injected than pharmaceutical drugs, necessitates further investigation of associated IDU health outcomes. Future work may benefit from racial/ethnic analyses of outcomes including, but not limited to, skin infections, endocarditis, and HIV infections.

While AIs in North Carolina are still most affected by unintentional overdose deaths due to commonly prescribed opioids, overdose rates involving heroin and other synthetic narcotics are also increasing, mirroring trends emerging across the country [16]. Our results show that rates of newly diagnosed acute HBV and HCV are increasing statewide, and AI populations have rates of acute HCV over 3 times as high as the rate in the overall North Carolina population.

These increased rates of acute HBV and HCV infection are likely linked to increased IDU within this population. There were no cases of acute HBV among AI in 2012, and in 2016 50% (N = 1) reported exposure through IDU; 0.0% of acute HCV cases among AI in 2012 reported IDU compared to 77.8% (N = 7) in 2016. The increase in reported IDU among AI with acute HBV and HCV highlights a need for inclusion of culturally appropriate prevention strategies to reduce substance use-related morbidity and mortality. This analysis is timely, as North Carolina works to adopt recommendations from the state Opioid Action Plan, developed in 2017. Though AIs are not named in the plan, the NC OAP identifies priority areas that can be implemented in culturally relevant ways, requiring further attention to how different racial/ethnic groups experience and respond to the overdose crisis. One recommendation is for the establishment of syringe exchange programs (SEPs), evidence-based interventions that help mitigate the harms associated with IDU and can embrace and respond to local trends and cultural practices. After the legalization of SEPs in July 2016 (GS 90-113.27), NC DHHS and community partners established the North Carolina Safer Syringe Initiative (NCSSI). NCSSI supports the development and operation of syringe exchange and harm reduction programs across the state through technical assistance and strategic partnerships.

Beyond providing unused syringes and supplies that reduce the health harms and risks associated with IDU, exchanges also provide overdose prevention education and resources, including naloxone training and distribution; education on preventing bloodborne disease infection and substance use disorder (SUD); and connections to mental health and SUD treatment, including medication-assisted treatment (MAT), as well as other social and medical services. People who inject drugs are at significant risk of HCV infection, but may be unwilling or unable to share risk fac-

FIGURE 4.
Rates of Newly Diagnosed Acute Hepatitis B (HBV) and New Diagnosed Acute Hepatitis C (HCV) per 100,000 North Carolina Residents by Race/Ethnicity, 2012-2016



tors with traditional health care providers [17]. Dedicated drug user health services that reduce stigma and judgment enable access to HCV prevention and care. Engagement through SEPs with people who inject drugs promotes information sharing and treatment for injection-related and general health conditions. Overdose prevention, naloxone access, and other community health services offered by SEPs are also available to people affected by or involved with drug use in different ways, including friends, family members, and partners of people who use drugs. A recent needs assessment of AI injection drug users in Montana revealed that 98% of participants would take advantage of a harm reduction program and 94% said they preferred a peer model for delivery of the program, highlighting the need to establish tribal SEPs as a method for providing culturally appropriate care to a population in our state that has been heavily impacted by the overdose epidemic [18].

In April 2017, NCSSI began working with EBCI located in Western North Carolina. Recent increases in acute HCV infection rates, incidence of needle-stick injuries, and improperly disposed syringes drove interest in establishing a tribal SEP. EBCI Public Health and Human Services (PHHS) held internal planning meetings to discuss program development, assignation of duties, and the integration of SEP services into a reorganized PHHS structure. During this process, NCSSI provided information on program establishment, EBCI participation in state reporting requirements, and existing tribal harm reduction programs. EBCI PHHS received preliminary support for the development of a program from the Tribal Council in June 2017 and received full approval in August 2017. The Tsalagi Public Health Syringe

Exchange Program at PHHS opened in March 2018. In addition to SEP services administered by PHHS, SEPs in Macon and Buncombe counties have reported serving EBCI residents.

The establishment of tribal SEPs is only one of many strategies necessary to combat negative health outcomes associated with the overdose epidemic. Continued inclusion of AI communities across North Carolina is needed to develop interventions tailored to the needs of a population often overlooked by prevention efforts, despite high rates of hepatitis infection and unintentional overdose death. Coordination and prevention activities are an essential component of the NC OAP, the state's primary prevention tool. The NC OAP acknowledges that it is a living document, leaving room to revise strategies based on the changing landscape of the epidemic; leadership should therefore consider expanding the plan to directly address prevention and treatment strategies to reduce future morbidity and mortality among American Indians in North Carolina. **NCMJ**

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