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Examining naloxone access and interest in secondary naloxone distribution on an American Indian Reservation in the Northern Midwest of the United States

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HIGHLIGHTS

- 20 % of all participants and 40 % of PWUD had received naloxone in the past 6 months.
- 63 % of all participants were interested in participating in secondary naloxone distribution.
- Secondary naloxone distribution is promising for Tribes where cultural connectedness is high.

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ABSTRACT

Background: Indigenous communities in the United States experience disproportionate rates of overdose morbidity and mortality due to a range of historical traumas and ongoing oppression. Limited health and harm reduction service access on some Tribal lands exacerbate these challenges. To date, little is known about naloxone access on tribal reservation lands.

Methods: We used cross-sectional survey data from community members on the reservation lands of a northern Midwest Tribe in the United States. We explored the prevalence and correlates of recent (past 6-month) naloxone receipt and interest in secondary naloxone distribution among all participants and people who used drugs (PWUD) recently. Correlates included sociodemographics, cultural identity and spirituality, witnessing overdoses, stigma, and drug use characteristics.

Results: Among 227 Indigenous participants, the average age was 45, 62 % were women, 53 % were single, 29 % were not working, 29 % had experienced recent hunger, and 8 % considered themselves homeless. 91 % said that Indigenous spiritual values were important to them. Sixteen percent had witnessed a recent non-fatal overdose, and 6 % had witnessed a fatal one. Twenty-four percent of the overall sample had recently received naloxone, and 40 % of PWUD had received it. Witnessing both fatal ($p<0.001$) and nonfatal overdoses ($p=0.001$) were associated with receiving naloxone. Further, 63 % of participants were willing to distribute naloxone.

Conclusions: Innovative strategies to expand naloxone access that are culturally relevant and responsive are needed in Indigenous communities. Cultural connectedness and shared identity are key strengths of Indigenous communities that can potentially be leveraged to implement secondary naloxone distribution programs.

1. Introduction

Globally, Indigenous populations that have suffered the harms of colonialism are disproportionately affected by the addiction and overdose crisis. Among First Nations peoples in Canada, literature has documented high levels of prescription opioid misuse and other

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substance use among both youth and adults (Firestone et al., 2015; Russsell et al., 2016; Spillane et al., 2023). Recent data from Australia has documented similar inequities, with First Nations people being 2.3 times as likely to have used amphetamines and 2.2 times as likely to have used opioids for nonmedical purposes in the past 12 months as compared to non-Indigenous Australians (Australian Institute of Health and Welfare., 2024). Overdose mortality rates have increased continuously among Indigenous populations in the United States (US) since the 1990s, mirroring trends in the broader US population (Qeadan et al., 2022). Indigenous Peoples in the US had the highest rates of drug overdose deaths of all racial and ethnic subgroups in the US in both 2019 and 2020 (Hedegaard et al., 2021). These inequities continued in 2021 for both Indigenous men and women when stratifying by gender (Han et al., 2022). From 2019–2020, overdose fatality rates increased 39 % among Indigenous Peoples (Kariisa et al., 2022). This resulted in Indigenous Peoples experiencing overdose at a 31 % higher rate than White Americans (Friedman and Hansen, 2022). These heightened substance use inequities are rooted in historical traumas from colonization and continued oppression, including land dispossession, cultural loss, and federal bans on cultural practices until the 1970s in the US (King et al., 2009; Pomerville and Gone, 2019; Warne and Frizzell, 2014). It is a public health priority to address these inequities and work toward sustained, culturally relevant strategies to prevent overdose.

Indigenous communities on reservation lands face several challenges to overdose prevention. Many are geographically remote, introducing a range of challenges with health and social service access. Rural communities in general have limited access to key health services, including hospitals, specialty providers, and pharmacies, due to a range of geographic, financial, and staffing challenges (Cyr et al., 2019; Douthit et al., 2015; Franco et al., 2021; Hays et al., 2020; Merwin et al., 2006). Rural communities have been impacted by increasing rural hospital closures (Kaufman et al., 2016; McCarthy et al., 2021; Mullens et al., 2023), which has increased emergency medical service activation and transport times (Miller et al., 2020) as well as led communities to rely on lower quality critical access hospitals instead (Joynt et al., 2011). The more geographically remote a community is, the more these challenges are exacerbated. For example, a study in South Dakota found that individuals living on a reservation were significantly less likely to have a primary care provider and to have received the medical and mental health care they required (Davis et al., 2016). Similarly, rural areas often lack access to harm reduction services such as syringe services programs, which are critical distributors of naloxone (Bixler et al., 2018; Canary et al., 2017; Pollini et al., 2021; Sisson et al., 2019). The low availability of naloxone perpetuates overdose mortality in these communities, as bystanders are unable to effectively intervene without the medication. Tribal communities are also uniquely impacted by the broader context of the "data genocide", where data from Indigenous participants involved in studies are regularly excluded or homogenized across racial groups (Friedman et al., 2023; Urban Indian Health Institute., 2021). As a result, communities often lack timely and accurate data to address overdose locally.

At the same time, Indigenous communities have key strengths that can facilitate overdose prevention programming and naloxone distribution. In particular, many Indigenous communities have a strong sense of cultural connectedness and kinship that encourages mutual aid and holistic support for community members (Bourke et al., 2018). As a result, interpersonal overdose prevention strategies, like secondary naloxone distribution where lay persons give naloxone to other community members, may be particularly useful. Secondary naloxone distribution strategies leverage social connectedness to reach individuals who would not access overdose prevention resources and services on their own, which is critical given that peers are often the first responders during an overdose (Mamdani et al., 2024). Secondary distribution strategies have the potential to efficiently expand naloxone distribution efforts and prevent overdoses (Keane et al., 2018).

Data on naloxone distribution in Indigenous communities is scant. Of the few existing studies that have documented any information on naloxone in Indigenous communities, most focus on interventions with professional groups (e.g., emergency medical technicians, pharmacists), high level program descriptions, or relevant Tribal legal actions (Duvivier et al., 2017; McGee et al., 2022; Seven Directions: A Center for Indigenous Public Health., 2019). Without accurate and locally relevant data to understand the current prevalence and key correlates of naloxone access, it is challenging for Tribal leaders to effectively address needs and enhance services for underserved groups within their communities. Thus, we explore naloxone receipt and interest in distributing naloxone among people from a remote, northern Midwest Indigenous community.

2. Methods

2.1. The Our Stories Matter Study

The *Our Stories Matter* Study aimed to better understand the scale of substance use in two Indigenous communities, one in the northern Midwest and the other in the southern Midwest of the United States. This analysis focuses on data from the northern Midwest community. We utilized a community based participatory research (CBPR) orientation to ensure cultural congruency and leverage local expertise and wisdom throughout our approach. We worked with a Community Research Council (CRC) as an equal partner throughout the study, including study design, developing the survey instrument, implementation, and analysis. The CRC was comprised of Indigenous community leaders, service providers, and people with lived or living experience. All data were collected on the reservation lands of a rural woodlands Tribal Nation located in the northern Midwest, US. Data collection took place in September 2022 at several locations, including during a local powwow, at a casino operated by the tribe, and at a supportive housing facility.

Potential participants encountered in these locales were approached by study staff, asked if they were interested in completing a health survey, and then screened for eligibility. Individuals had to be at least 18 years old and have ever used any drug in their life to participate. The inclusion criterion for drug use was intentionally broad as participants were being recruited in public spaces and may have been hesitant to disclose stigmatized behaviors. We did not require "drug use" to be of illicit drugs, so participants who conceptualized use or misuse of prescription medications as "drug use" were allowed to participate. All participants provided oral informed consent. The surveys took approximately 15 minutes to complete. Participants received either a $20 Amazon or Visa gift card as an incentive. Surveys were conducted via audio computer-assisted self-interview (ACASI). This study was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. The study was also reviewed and approved by the collaborating Tribe's Tribal Council.

2.2. Measures

2.2.1. Sociodemographic characteristics

Participants reported their age (in years), gender (options were man, women, transgender, two-spirit, and "I use another term", which we categorized as man, woman, other), sexual orientation (categorized as heterosexual, any sexual minority), education level (less than high school, high school or equivalent, some college or more), relationship status (categorized as single or in a relationship), and employment status (not working, working full-time, working less than full time). Participants also indicated if they considered themselves homeless (yes/no), if they currently had health insurance (yes/no), and how often they went to bed hungry due to a lack of food (categorized as ever/never).

2.2.2. Indigenous cultural factors

We included two measures of Indigenous cultural constructs: Indigenous Spirituality and Cultural Identification. Perceived importance of

Indigenous spirituality was assessed by a single item indicator: "How important are traditional Indigenous spiritual values to the way you lead your life?" We created a binary variable from the four response options (very important/somewhat important and not too important/not at all important). Cultural identification was a 7-item scale adapted from Leach and colleagues (Leach et al., 2008). This scale included questions about connectedness to and pride in participants' Indigenous identities (e.g., "I feel proud to be Indigenous", "I feel a bond with other Indigenous people"). Responses were measured on a four-point Likert scale (3- strongly agree, 2 - agree, 1- disagree, 0 - strongly disagree). We created a sum score of these responses (possible range: 0–21). One participant was missing responses to the Indigenous values scale.

2.2.3. Naloxone

Participants reported if they had received naloxone to carry with them in the past 6 months (yes/no). Among persons who had received naloxone, participants reported if they currently had naloxone (yes/no). Then, participants were asked if they had used naloxone to reverse an overdose in the past 6 months (yes/no). Finally, participants were asked if they would be willing to distribute naloxone among people that they know who use drugs (yes/no).

2.2.4. Witnessing overdoses

Participants reported on their experiences of witnessing overdoses in the past 6 months. Participants reported the numbers of non-fatal and fatal overdoses they witnessed in the past 6 months. From these numbers, we generated two binary indicators for if a person had witnessed any non-fatal or fatal overdoses in the past 6 months. One participant was missing responses to these variables.

2.2.5. Drug use and stigma

We included measures of the type and route of drug use in this analysis. We created three binary indicators for any use of opioids (heroin, fentanyl, prescription opioids, methadone), stimulants (cocaine, methamphetamine, prescription stimulants), and other drugs (benzodiazepines, sedatives/tranquilizers, Suboxone/buprenorphine, hallucinogens, non-specific prescription pills, other unspecified drugs) in the past 6 months. Participants who reported combined use of different drugs were coded as having used the associated drug types (e.g., participants who reported speedball use were coded as having used opioids and stimulants). We did not include cannabis in the other drugs category given that it is legally available for medicinal and recreational purposes. We also included binary indicators for if participants smoked, snorted, swallowed, and injected drugs. PWUD also answered an 8-item drug use stigma scale (response options: 3- very much, 2 – somewhat, 1 – just a little, 0 – not at all) (Ahern et al., 2007; Latkin et al., 2013). We created a sum score for this scale (possible range: 0–24).

2.3. Analysis

We restricted our analysis to surveys from individuals that self-identified as American Indian or Indigenous, alone or in combination with another racial category (N=227). First, we estimated descriptive statistics for all naloxone variables for the overall sample and then for people who used drugs (PWUD) in the past 6 months. We removed individuals who reported only using cannabis from the PWUD category, leaving a total of 55 PWUD. We then assessed bivariate associations between receiving naloxone in the past 6 months and sociodemographic characteristics, drug use, witnessing overdoses, indigenous spirituality, cultural identity, and stigma among all Indigenous participants and PWUD separately. We used Chi-squares for categorical variables, as well as Fisher's Exact tests for variables that had small sample sizes. We used t-tests and Mann-Whitney tests for continuous variables, as some variables were highly skewed. We then repeated this analytic process for willingness to distribute naloxone to PWUD. Given the relatively modest sample sizes, especially among PWUD, we did not conduct adjusted analyses.

3. Results

The average age of the sample was 45 years old (Table 1). The sample was predominantly comprised of women (57 %). Eleven percent identified as a sexual minority. Most participants had a high school education (41 %) or higher (47 %). About half of participants were single (53 %). Most participants were working full- (52 %) or less than full time (19 %). Nearly all participants had health insurance (92 %). Eight percent of participants self-identified as being currently homeless, and 29 % experienced hunger in the past 6 months. Among PWUD in the past 6 months, the average age was 41, 49 % were women, 18 % identified as a sexual minority, 84 % had a high school education or higher, 82 % had health insurance, 67 % were single, 35 % were working full time, 38 % were working less than full time, 18 % self-identified as homeless, and 56 % experienced hunger in the past 6 months.

In the overall sample, 16 % had witnessed a non-fatal overdose in the past 6 months and 6 % had witnessed a fatal overdose in the past 6 months. Among PWUD, 24 % had witnessed a non-fatal overdose and 11 % had witnessed a fatal overdose in the past six months. Mean cultural identity scores were high in this sample ($\bar{X} = 18.2$; maximum score = 21). Further, 91 % indicated that Indigenous spiritual values were somewhat or very important to them. Among PWUD, 38 % smoked drugs, 53 % snorted drugs, 65 % swallowed drugs, and 25 % injected drugs in the past six months. Slightly less than half (45 %) of PWUD reported recent opioid use, 55 % reported stimulant use, and 47 % reported use of other drugs.

Overall, 24 % of participants had received naloxone in the past 6 months and 63 % were willing to distribute naloxone to PWUD. The prevalence of having received naloxone was higher among PWUD (38 %), and the prevalence of being willing to distribute naloxone (62 %) was similar to the overall sample. In the overall sample, witnessing a fatal ($p<0.001$) or non-fatal ($p=0.001$) overdose was associated with being more likely to have received naloxone. The association between the importance of Indigenous spirituality and receiving naloxone approached statistical significance ($p=0.051$). Among PWUD, the associations between witnessing non-fatal overdoses ($p=0.020$) and receiving naloxone was statistically significant but for fatal overdoses it was not ($p=0.193$). However, the overall pattern was in the same direction as the larger sample. Several drug use characteristics were associated with being more likely to have received naloxone, including smoking drugs ($p=0.009$) and using stimulants ($p=0.014$). PWUD who had received naloxone reported higher drug use stigma scores than persons who had not received it ($p=0.031$). There were no significant sociodemographic correlates of receiving naloxone for either the overall or PWUD samples. There were no significant bivariate associations with willingness to distribute naloxone in the overall or PWUD samples (Table 2).

4. Discussion

In this analysis, we explored naloxone receipt and willingness to distribute naloxone among Indigenous persons recruited in the northern Midwest of the US. Overall, naloxone coverage was low as only 24 % of all participants and 38 % of PWUD reported receiving naloxone in the past 6 months. Further, only 33 % of those who had witnessed a non-fatal overdose and 19 % of those who had witnessed a fatal overdose had received naloxone. These data demonstrate a clear need for expanded naloxone access. At the time of data collection, only one naloxone distribution program served this community. The importance of ensuring sufficient naloxone coverage in this, and other similar communities, is amplified by the remote location. In some areas of the reservation, there is little to no cellular telephone network coverage, making it difficult to contact emergency medical services during an overdose. Emergency medical service response times are often long and

Table 1
Sample characteristics and bivariate associations with receiving naloxone in the past 6 months.

	Full Sample				PWUD			
	All n=227	Received Naloxone			All n=55	Received Naloxone		
		Yes n=54; 23.8 %	No n=173; 76.2 %	p		Yes n=21; 38.2 %	No n=34; 61.8 %	p
Sociodemographic Characteristics								
Age, M (SD)	45.3 (14.7)	42.5 (12.9)	46.1 (15.1)	0.118	41.1 (12.2)	41.0 (9.4)	41.1 (13.8)	0.984
Gender				0.588[a]				0.192[a]
Men	91 (40.1 %)	19 (20.9 %)	72 (79.1 %)		25 (45.5 %)	8 (32.0 %)	17 (68.0 %)	
Women	130 (57.3 %)	33 (25.4 %)	97 (74.6 %)		27 (49.1 %)	13 (48.1 %)	14 (51.9 %)	
Other	6 (2.6 %)	2 (33.3 %)	4 (66.7 %)		3 (5.5 %)	0 (0.0 %)	3 (100.0 %)	
Sexual Minority Status				0.805[a]				0.070[a]
No	202 (89.0 %)	49 (24.3 %)	153 (75.7 %)		45 (81.8 %)	20 (44.4 %)	25 (55.6 %)	
Yes	25 (11.0 %)	5 (20.0 %)	20 (80.0 %)		10 (18.2 %)	1 (10.0 %)	9 (90.0 %)	
Education				0.296				0.395[a]
Less than High School	28 (12.3 %)	8 (28.6 %)	20 (71.4 %)		9 (16.4 %)	2 (22.2 %)	7 (77.8 %)	
High School Equivalent	92 (40.5 %)	17 (18.5 %)	75 (81.5 %)		18 (32.7 %)	6 (33.3 %)	12 (66.7 %)	
Some College or More	107 (47.1 %)	29 (27.1 %)	78 (72.9 %)		28 (50.9 %)	13 (46.4 %)	15 (53.6 %)	
Self-Identified Homelessness				0.405[a]				0.725[a]
No	208 (91.6 %)	48 (23.1 %)	160 (76.9 %)		45 (81.8 %)	18 (40.0 %)	27 (60.0 %)	
Yes	19 (8.4 %)	6 (31.6 %)	13 (68.4 %)		10 (18.2 %)	3 (30.0 %)	7 (70.0 %)	
Health Insurance				0.770				1.000[a]
No	19 (8.4 %)	4 (21.1 %)	15 (78.9 %)		10 (18.2 %)	4 (40.0 %)	6 (60.0 %)	
Yes	208 (91.6 %)	50 (24.0 %)	158 (76.0 %)		45 (81.8 %)	17 (37.8 %)	28 (62.2 %)	
Relationship Status				0.577				0.563[a]
In a Relationship	106 (46.7 %)	27 (25.5 %)	79 (74.5 %)		18 (32.7 %)	8 (44.4 %)	10 (55.6 %)	
Single	121 (53.3 %)	27 (22.3 %)	94 (77.7 %)		37 (67.3 %)	13 (35.1 %)	24 (64.9 %)	
Employment				0.300				0.687[a]
Not working	66 (29.1 %)	20 (30.3 %)	46 (69.7 %)		15 (27.3 %)	7 (46.7 %)	8 (53.3 %)	
Full time	119 (52.4 %)	24 (20.2 %)	95 (79.8 %)		19 (34.5 %)	6 (31.6 %)	13 (68.4 %)	
Less than full time	42 (18.5 %)	10 (23.8 %)	32 (76.2 %)		21 (38.2 %)	8 (38.1 %)	13 (61.9 %)	
Any Hunger in the Past 6 months				0.223				1.000[a]
No	162 (71.4 %)	35 (21.6 %)	127 (78.4 %)		24 (43.6 %)	9 (37.5 %)	15 (62.5 %)	
Yes	65 (28.6 %)	19 (29.2 %)	46 (70.8 %)		31 (56.4 %)	12 (38.7 %)	19 (61.3 %)	
Witnessed Overdoses (past 6 months)								
Witnessed Any Non-Fatal Overdoses[#]				0.001[a]				0.020[a]
No	191 (84.5)	36 (18.8 %)	155 (81.2 %)		41 (75.9 %)	12 (29.3 %)	29 (70.7 %)	
Yes	35 (15.5 %)	18 (51.4 %)	17 (48.6 %)		13 (24.1 %)	9 (69.2 %)	4 (30.8 %)	
Witnessed Any Fatal Overdoses[#]				<0.001[a]				0.193[a]
No	213 (94.2 %)	44 (20.7 %)	169 (79.3 %)		48 (88.9 %)	17 (35.4 %)	31 (64.6 %)	
Yes	13 (5.8 %)	10 (76.9 %)	3 (23.1 %)		6 (11.1 %)	4 (66.7 %)	2 (33.3 %)	
Indigenous Values								
Importance of Indigenous Spirituality				0.051[a]				0.232[a]
Not at all/Not too Important	20 (8.8 %)	1 (5.0 %)	19 (95.0 %)		7 (12.7 %)	1 (14.3 %)	6 (85.7 %)	
Somewhat/Very Important	207 (91.2 %)	53 (25.6 %)	154 (74.4 %)		48 (87.3 %)	20 (41.7 %)	28 (58.3 %)	
Cultural Identity Scale Score, M (SD)[#]	18.2 (3.3)	18.9 (2.2)	17.9 (3.5)	0.384[b]	17.9 (3.5)	18.6 (2.3)	17.4 (4.0)	0.678[b]
Drug Use Characteristics and Stigma								
Smoked Drugs								0.009[a]
No	–	–	–		34 (61.9 %)	8 (23.5 %)	26 (76.5 %)	
Yes	–	–	–		21 (38.1 %)	13 (61.9 %)	8 (38.1 %)	
Snorted Drugs								0.051[a]
No	–	–	–		26 (47.3 %)	6 (23.1 %)	20 (76.9 %)	
Yes	–	–	–		29 (52.7 %)	15 (71.4 %)	14 (41.2 %)	
Swallowed Drugs								0.773[a]
No	–	–	–		19 (35.5 %)	8 (42.1 %)	11 (57.9 %)	
Yes	–	–	–		36 (65.5 %)	13 (36.1 %)	23 (63.9 %)	
Injected Drugs								1.000[a]
No	–	–	–		41 (74.5 %)	16 (39.0 %)	25 (61.0 %)	
Yes	–	–	–		14 (25.5 %)	5 (35.7 %)	9 (64.3 %)	
Any Opioids								1.000[a]
No	–	–	–		30 (54.5 %)	11 (35.7 %)	19 (63.3 %)	
Yes	–	–	–		25 (45.5 %)	10 (40.0 %)	15 (60.0 %)	
Any Stimulants								0.014[a]
No	–	–	–		25 (45.4 %0	5 (20.0 %)	20 (80.0 %)	
Yes	–	–	–		30 (54.6 %)	16 (53.3 %)	14 (46.7 %)	
Any Other Drugs (except cannabis)								1.000[a]
No	–	–	–		29 (52.7 %)	11 (37.9 %)	18 (62.1 %)	
Yes	–	–	–		26 (47.3 %)	10 (38.5 %)	16 (61.5 %)	
Stigma Sum Score, M (SD)	–	–	–		7.0 (5.9)	9.2 (6.2)	5.6 (5.3)	0.031[b]

[#] n=1 missing; [a] indicates use of a Fischer's Exact test; [b] indicates use of a Mann-Whitney test

Table 2
Bivariate associations with being willing to distribute naloxone to PWUD.

	Willingness to Distribute Naloxone to PWUD					
	Full sample (n=227)			PWUD (n=47)		
	Yes n=142; 62.6 %	No n=85; 37.4 %	p	Yes n=34; 61.8 %	No n=21; 38.2 %	p
Sociodemographic Characteristics						
Age, M (SD)	42.5 (12.9)	46.1 (15.1)	0.118	41.2 (11.2)	40.9 (14.0)	0.912
Gender			0.149[a]			0.807[a]
Men	50 (54.9 %)	41 (45.1 %)		14 (56.0 %)	11 (44.0 %)	
Women	88 (67.7 %)	42 (32.3 %)		18 (66.7 %)	9 (33.3 %)	
Other	4 (66.7 %)	2 (33.3 %)		2 (66.7 %)	1 (33.3 %)	
Sexual Minority Status			0.209[a]			0.725[a]
No	124 (61.4 %)	78 (38.6 %)		27 (60.0 %)	18 (40.0 %)	
Yes	18 (72.0 %)	7 (28.0 %)		7 (70.0 %)	3 (30.0 %)	
Education			0.314[a]			0.074[a]
Less than High School	19 (67.9 %)	9 (32.1 %)		3 (33.3 %)	6 (66.7 %)	
High School Equivalent	52 (56.5 %)	40 (43.5 %)		10 (55.6 %)	8 (44.4 %)	
Some College or More	71 (66.4 %)	36 (33.6 %)		21 (75.0 %)	7 (25.0 %)	
Self-Identified Homelessness			0.144[a]			0.287
No	127 (61.1 %)	81 (38.9 %)		26 (57.8 %)	19 (42.2 %)	
Yes	15 (78.9 %)	4 (21.1 %)		8 (80.0 %)	2 (20.0 %)	
Health Insurance			0.631[a]			0.287[a]
No	13 (68.4 %)	6 (31.6 %)		8 (80.0 %)	2 (20.0 %)	
Yes	129 (62.0 %)	79 (38.0 %)		26 (57.8 %)	19 (42.2 %)	
Relationship Status			0.197			0.139[a]
In a Relationship	71 (67.0 %)	35 (33.0 %)		14 (77.8 %)	4 (22.2 %)	
Single	71 (58.7 %)	50 (41.3 %)		20 (54.1 %)	17 (45.9 %)	
Employment			0.699			0.445[a]
Not working	44 (66.7 %)	22 (33.3 %)		11 (73.3 %)	4 (26.7 %)	
Full time	73 (61.3 %)	46 (38.7 %)		12 (63.2 %)	7 (36.8 %)	
Less than full time	25 (59.5 %)	17 (40.5 %)		11 (52.4 %)	10 (47.6 %)	
Any Hunger in the Past 6 months			0.685			0.781[a]
No	100 (61.7 %)	62 (38.3 %)		14 (58.3 %)	10 (41.7 %)	
Yes	42 (64.6 %)	23 (35.4 %)		20 (64.5 %)	11 (35.5 %)	
Witnessed Overdoses (past 6 months)						
Witnessed Any Non-Fatal Overdoses[#]			0.182[a]			0.746[a]
No	116 (60.7 %)	75 (39.3 %)		25 (61.0 %)	16 (39.0 %)	
Yes	26 (74.3 %)	9 (25.7 %)		9 (69.2 %)	4 (30.8 %)	
Witnessed Any Fatal Overdoses[#]			0.381[a]			1.000[a]
No	132 (62.0 %)	81 (38.0 %)		30 (62.5 %)	18 (37.5 %)	
Yes	10 (76.9 %)	3 (23.1 %)		4 (66.7 %)	2 (33.3 %)	
Indigenous Values						
Importance of Indigenous Spirituality			0.097[a]			0.408[a]
Not at all/Not too Important	9 (45.0 %)	11 (55.0 %)		3 (42.9 %)	4 (57.1 %)	
Somewhat/Very Important	133 (64.3 %)	74 (35.7 %)		31 (64.6 %)	17 (35.4 %)	
Cultural Identity Scale Score, M (SD)[#]	18.2 (3.3)	18.1 (3.3)	0.846[b]	18.1 (3.3)	17.6 (3.8)	0.802[b]
Drug Use Characteristics and Stigma						
Smoked Drugs						0.776[a]
No	–	–		20 (58.8 %)	14 (41.2 %)	
Yes	–	–		14 (66.7 %)	7 (33.3 %)	
Snorted Drugs						0.589[a]
No	–	–		15 (57.7 %)	11 (42.3 %)	
Yes	–	–		19 (65.5 %)	10 (34.5 %)	
Swallowed Drugs						1.000[a]
No	–	–		12 (63.2 %)	7 (36.8 %)	
Yes	–	–		22 (61.1 %)	14 (38.9 %)	
Injected Drugs						0.755[a]
No	–	–		26 (63.4 %)	15 (36.6 %)	
Yes	–	–		8 (57.1 %)	6 (42.9 %)	
Any Opioids						0.788[a]
No	–	–		18 (60.0 %)	12 (40.0 %)	
Yes	–	–		16 (64.0 %)	9 (36.0 %)	
Any Stimulants						0.578[a]
No	–	–		14 (56.0 %)	11 (44.0 %)	
Yes	–	–		20 (66.7 %)	10 (33.3 %)	
Any Other Drugs (except cannabis)						0.589[a]
No	–	–		19 (65.5 %)	10 (34.5 %)	
Yes	–	–		15 (57.7 %)	11 (42.3 %)	
Stigma Sum Score, M (SD)	–	–		7.3 (5.3)	6.5 (6.9)	0.385[b]

[#] n=1 missing; [a] indicates use of a Fischer's Exact test; [b] indicates use of a Mann-Whitney test

can be lengthened by seasonal conditions (e.g., extreme cold, snow) in the northern Midwest. Thus, lay-responder naloxone administration is the most expedient overdose response. Improving naloxone coverage in Tribal communities requires a multi-pronged, culturally informed approach that includes both social-network driven and place-based distribution strategies.

Secondary naloxone distribution through community members may be a viable strategy to expand naloxone access, and interest in distributing naloxone to PWUD in the community was reported by a majority of the sample (63 %). Participants also reported high levels of positive cultural identity and that Indigenous spiritual values were important to them. Cultural reclamation and revitalization efforts include widespread attention to Indigenous cultural strengths (including spirituality and identity), values, and activities as central to Indigenous wellbeing (Bassett et al., 2012). Indigenous authors and CRC members for this study suggest that cultural values–including an overall commitment to community and respect for individuals–could manifest in greater willingness to distribute naloxone. However, our findings revealed no significant differences in naloxone distribution willingness by cultural variables. This counterintuitive finding might be explained by multiple factors. First, cultural protective factors exist alongside lingering stigma and stereotypes rooted in use of drugs and alcohol as tools of colonial subjugation (Leland, 1976). In response, Indigenous communities across North America are reclaiming relational approaches to addressing substance use risks, including movements to Indigenize harm reduction (Levine et al., 2021). Second, attempts to operationalize Indigenous "culture" are limited by the vast multidimensionality of this construct and the complexity of capturing cultural strengths amidst culturally relevant stressors like discrimination and historical trauma (Walls et al., 2016). Current measurement approaches are inadequate to tap the true power of culture as a community building, protective mechanism, particularly in the face of ongoing oppressive contexts. In our case, resource constraints meant we restricted operationalization of culture to two basic measures, further underscoring the limitations of our measurement approach. A third factor to consider is the lack of variability in cultural measures for the current sample. Most participants rated cultural variables highly, potentially impacting ability to capture statistically significant trends.

The implementation of place-based naloxone distribution strategies, such as public health vending machines, throughout the community could help address gaps in naloxone coverage. Public health vending machines, sometimes called harm reduction vending machines, are evidence-based interventions, where a variety of health promoting supplies (e.g., naloxone, sterile drug use equipment, first aid supplies, safer sex products) are made available for free through a vending machine (Islam and Conigrave, 2007; McDonald, 2009). Such machines have been implemented in a range of countries and have been associated with reductions in substance use morbidity and mortality (Allen et al., 2022; Islam et al., 2008; Moatti et al., 2001; Obadia et al., 1999). These vending machines also expand access to harm reduction services outside the typical hours programs are available, allowing PWUD to access the materials they need at any time (Cama et al., 2014; McDonald, 2009; Russell et al., 2023). Public health vending machines are well suited to remote contexts like the one studied here, as they can enhance naloxone access in remote areas of the community where it is not currently readily available. Notably, the collaborating Tribe for this study recently implemented two public health vending machines that offer naloxone, sterile injection equipment, pregnancy tests, HIV self-test kits, and other supplies. Given that the tribe is one of the first in the United States to launch public health vending machines and that our study data indicate gaps in naloxone coverage, subsequent studies should examine the extent to which vending machines enhanced naloxone coverage at the population-level.

Other naloxone distribution strategies that leverage preexisting systems within Indigenous communities can further supplement place-based approaches. Members of the CRC described previous efforts to mail care packages that contained naloxone and other health-related supplies and information to every household within the reservation. This strategy has the key disadvantage that it would only serve housed individuals. Nonetheless, using household-based strategies can help supplement other forms of naloxone distribution and are uniquely suited to Indigenous communities where complete community rosters exist. Further, tribes have a range of cultural events where naloxone distribution may be possible. Incorporating naloxone training and distribution activities into powwows and other cultural gatherings, when deemed as appropriate and with permission from the community, can serve to increase naloxone coverage and normalize naloxone carrying across a community.

In developing efforts to expand naloxone, it is essential to address stigma about drug use and PWUD in the community. Stigma is a well-documented barrier to accessing services for PWUD across communities in the scientific literature (Ayon et al., 2018; Biancarelli et al., 2019; Cernasev et al., 2021; Davis et al., 2022; Hammarlund et al., 2018; Livingston, 2020; Luoma, 2011; Paquette et al., 2018; Shirley-Beavan et al., 2020). Our findings in this analysis contrasted this literature, as drug use stigma was associated with being more likely to have received naloxone. This finding may be partially explained by how naloxone is dispensed on the reservation lands where this project occurred. Specifically, there is an active, widely known effort to enhance naloxone access led by persons with lived experience. They may be highly effective at increasing naloxone access among persons who have been heavily stigmatized at other, more traditional, venues that dispense naloxone (e.g., healthcare facilities).

Additionally, experiential information from community partners indicated that stigma was indeed a barrier to naloxone access in this setting, contrasting the quantitative results. Members of the CRC shared that many PWUD choose to seek naloxone and other substance use related services (e.g., treatment) outside of their local community to avoid being identified as someone who uses drugs, despite the inconvenience and long travel time associated with doing so. These experience are similar to previously documented experiences in rural communities, where the small community size increased concerns about confidentiality and being identified as someone who uses drugs when seeking services (Townsend, 2009; Warner et al., 2005). It is possible that the quantitative data did not capture the full impact of stigma on naloxone access, as the measure was a simply binary question about any naloxone receipt. Given the robust existing literature on the negative impacts of stigma on health, reducing stigma remains an important public health goal even in light of these unexpected findings. Indigenous members of this research team note that there are a variety of ways that cultural activities can serve to actively include PWUD and combat stigma through engagement with traditional cultural and healing practices. For example, Indigenous approaches to harm reduction emphasize the intergration of Indigenous teachings and activities into "mainstream" services. This can include connection or reconnection to Indigenous languages, lands, teachings, and certain ceremonial spaces, all of which can swerve to reduce isolation and stigma and promote connection to culturally grounded health promoting factors (National Harm Reduction Coalition; Stronger Circles., 2019). The specifics of these cultural factors vary between Tribes as each Tribe has its own history and cultural practices. Despite this, there are lessons from the experiences in the community studied here that can be shared across Tribal communities.

The primary limitation of this analysis is the modest sample size, especially for the PWUD sub-sample. Due to this small sample size, we were unable to conduct adjusted analyses to further understand naloxone receipt and interest in secondary exchange in this population. As this data was collected in a small, rural community with a reservation population less than 2000, a modest sample size is to be expected. Although the sample size is small, the uniqueness of the sample and recruitment strategies are a key strength. Recruitment was conducted entirely on reservation lands at a range of locations, including a casino

and a powwow. As Indigenous-focused overdose prevention research is scant, even findings from a small study are an important contribution to the literature. We used a broad measure of drug use as an inclusion criterion for this study, which likely resulted in significant heterogeneity of experience in the overall sample. This may make the results less generalizable to other populations of people with histories of drug use and may instead mean that they are more reflective of a general population sample from a reservation context. The measure of interest in secondary naloxone distribution was limited to one question. As a result, we did not capture information about practical or interpersonal factors that would facilitate or inhibit secondary distribution. We also do not have information about how well networked the participants who did not use drugs were with PWUD in the community, which has important implications for the effectiveness of secondary distribution for enhancing naloxone access. Fortunately, our CBPR approach and partnership with the CRC, who helped craft locally relevant questions and provided insight into the findings, supplemented our ability to meaningfully interpret these findings. Future research is needed to address these issues and expand on our understanding of the potential utility of secondary distribution in underserved, remote communities with high overdose rates. This is especially critical in the case of diverse Tribal cultures and reservation contexts; indeed, some reservation communities are innovating in their responses to the opioid crisis (Magarati et al., 2020).

5. Conclusion

Overall, naloxone coverage was low in this sample. Expansions of harm reduction services are needed to address this gap. Secondary naloxone distribution is one potential avenue for expanding naloxone coverage in this community, as two-thirds of participants were willing to give out naloxone. Place based naloxone distribution strategies, such as public health vending machines, may also be useful in supplementing social network strategies. A multi-pronged approach to naloxone distribution is needed to combat the high rates of overdose in Indigenous communities.

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Contributors

KES and STA conceptualized the manuscript. KES conducted the analysis. All authors contributed to the framing, drafting, and revision of the manuscript. MC contributed to the project coordination and administration. STA and MW obtained funding and supervised the overall study.

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CRediT authorship contribution statement

Molly C. Reid: Writing – review & editing, Data curation. **Maisie Conrad:** Writing – review & editing, Project administration. **Sean T. Allen:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Funding acquisition, Conceptualization. **Allison O'Rourke:** Writing – review & editing, Data curation. **Kristin E Schneider:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Melissa Walls:** Writing – review & editing, Supervision, Investigation, Funding acquisition. **Toni Wakemup:** Writing – review & editing. **Andrea Medley:** Writing – review & editing. **Pamela Hughes:** Writing – review & editing. **Laura Palombi:** Writing – review & editing.

Declaration of Competing Interest

None.

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