Drug and Alcohol Dependence Reports 14 (2025) 100317

Contents lists available at ScienceDirect

Drug and Alcohol Dependence Reports

journal homepage: www.elsevier.com/locate/dadr

Association of safer smoking supply distribution with participant encounters and naloxone distribution from syringe services programs: Findings from the National Survey of Syringe Services Programs in the United States

Esther O. Chung [a,*,1], Sheila V. Patel [a], Lynn D. Wenger [a], Jamie L. Humphrey [b], Amang Sukasih [c], Ricky N. Bluthenthal [d], Hansel E. Tookes [e], Don C. Des Jarlais [f], Sara N. Glick [g], Paul A. LaKosky [h], Stephanie Prohaska [h], Laura Guzman [i], Alex H. Kral [a], Barrot H. Lambdin [a,j,k]

[a] Community Health and Implementation Research Program, RTI International, Research Triangle Park, NC, USA
[b] Advanced Methods Development, RTI International, Research Triangle Park, NC, USA
[c] Center for Statistics, RTI International, Research Triangle Park, NC, USA
[d] Department of Population and Public Health Sciences, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA
[e] Miller School of Medicine, University of Miami, Miami, FL, USA
[f] School of Global Public Health, New York University, New York, NY, USA
[g] Division of Allergy and Infectious Diseases, School of Medicine, University of Washington, Seattle, WA, USA
[h] Dave Purchase Project, North American Syringe Exchange Network, Tacoma, WA, USA
[i] National Harm Reduction Coalition, San Francisco, CA, USA
[j] Department of Epidemiology & Biostatistics, University of California San Francisco, San Francisco, CA, USA
[k] Department of Global Health, University of Washington, Seattle, WA, USA

HIGHLIGHTS

- In 2022, 44 % of syringe service programs (SSPs) distributed safer smoking pipes.
- More community-based organizations distributed pipes than public health or healthcare programs.
- Service delivery, urbanicity, and Census division were also associated with pipe distribution.
- Distribution of safer smoking pipes was associated with more participant encounters.

ARTICLE INFO

Keywords:
Safer smoking supplies
Syringe services program
Harm reduction
Naloxone

ABSTRACT

Background: In response to the recent and growing shift from injecting heroin to smoking fentanyl, an increasing number of syringe services programs (SSPs) in the United States are distributing safer smoking supplies. There is a lack of research on whether safer smoking supply distribution is associated with increased SSP engagement and naloxone distribution from SSPs. Therefore, we aimed to assess predictors of safer smoking supply distribution by SSPs and estimate associations between safer smoking supply distribution and scale of harm reduction services.
Methods: We used cross-sectional data from the National Survey of Syringe Services Programs, which surveyed SSPs from March and August 2023 about services delivered in 2022. We examined factors associated with safer smoking supply distribution and estimated associations between smoking supply distribution and the number of participant encounters and naloxone doses distributed.
Results: Of the 429 SSPs included, 187 (44.1 %) distributed safer smoking supplies to participants. SSP organizational type, service delivery method, urbanicity, and regional Census divisions were associated with safer smoking supply distribution. Compared to SSPs that did not distribute safer smoking supplies, those that did

* Corresponding author.
E-mail address: echung@rti.org (E.O. Chung).
[1] 300 Frank Ogawa Plaza, Suite 280, Oakland, CA 94612.

https://doi.org/10.1016/j.dadr.2024.100317
Received 5 September 2024; Received in revised form 5 December 2024; Accepted 30 December 2024
Available online 31 December 2024

reported more participant encounters (aRR=1.62, 95 % CI: 1.19–2.20) and naloxone doses distributed (aRR=1.26, 95 % CI: 0.91–1.74).
Conclusions: SSPs distributing safer smoking supplies had greater participant engagement and naloxone distribution. To maximize their full individual and population-level health benefits, SSPs should be supported technically, legally, and financially to implement safer smoking supply distribution for their participants.

1. Introduction

Since 1999, over one million people in the United States (U.S.) have died of a drug overdose (Centers for Disease Control and Prevention, 2023). In 2022, there were over 100,000 drug overdose fatalities and opioids were involved in over 75 % of overdose deaths (Ahmad et al., 2024). Since 2015, synthetic opioids, including fentanyl and fentanyl analogs, have comprised the majority of opioid overdose deaths, while deaths due to heroin have decreased (Spencer et al., 2023). Furthermore, in 2022, roughly 1 in 14 HIV diagnoses in the U.S. were attributable to injection drug use (Centers for Disease Control and Prevention, 2024b), and the estimated rate of new hepatitis C virus (HCV) cases among people who inject drugs was 2.2 per 100,000 population (Centers for Disease Control and Prevention, 2024a).

Patterns of injecting and smoking drugs vary by region and type of drug. Recent studies have documented changes from injecting to smoking opioids, particularly along the West Coast of North America, as illegally-manufactured fentanyl entered the unregulated drug market (Kral et al., 2021; Parent et al., 2021; Kingston et al., 2022; Megerian et al., 2024; Eger et al., 2024; Tanz et al., 2024). People who use drugs (PWUD) reported preferring smoking over injecting substances for a variety of reasons, including lower financial costs of fentanyl compared to heroin, reduced stigma, improved health benefits (e.g. fewer skin and soft tissue infections), and perceived lower risk of overdose compared to injecting (Kral et al., 2021; Ivsins et al., 2024; Ciccarone et al., 2024). A recent study in California found a 40 % higher prevalence of non-fatal overdose among people who inject fentanyl compared to people who smoke fentanyl (Megerian et al., 2024). However, the transition to smoking is not limited to those using opioids. People who use stimulants, such as methamphetamine and cocaine, have also reported switching to smoking, primarily due to fears of overdose when non-prescribed fentanyl entered the unregulated drug market (Ciccarone et al., 2024; Ivsins et al., 2024). As the prevalence of polysubstance use involving fentanyl and methamphetamine rises (Friedman and Shover, 2023), it is crucial that service organizations adapt to the growing needs of PWUD.

Distributing safer smoking supplies can reduce harms associated with substance use (Tapper et al., 2023). Safer smoking pipes for people who use crack cocaine have been shown to reduce the frequency of injections and risky smoking practices (e.g. pipe sharing, using broken pipes), and improve health outcomes, such as fewer burns and cuts (Leonard et al., 2008; Frankeberger et al., 2019; Prangnell et al., 2017). Interventions that provide safer smoking supplies for opioid use have also found similar benefits for PWUD (Pizzey and Hunt, 2008; Stöver and Schäffer, 2014; Dunleavy et al., 2021; Fitzpatrick et al., 2022). However, access to safer smoking supplies remains a persistent barrier (Tapper et al., 2023).

Syringe services programs (SSP) are proven, effective, and low-threshold prevention programs that distribute safe drug use supplies, such as new or sterile needles or smoking supplies like new pipes or aluminum foil, with the goal of reducing the health-related harms associated with drug use (Fernandes et al., 2017; Platt et al., 2017; Jakubowski et al., 2023). In addition to providing safe drug use supplies, SSPs often provide other evidence-based interventions, such as overdose education and naloxone distribution (OEND), infectious disease testing and management, and linkage to other healthcare and social services. Given SSPs are trusted by PWUD (MacNeil and Pauly, 2011), they are ideal programs for distributing safer smoking supplies.

As the pattern of smoking opioids becomes more prevalent, it is important for SSPs to identify strategies to maintain or increase participant engagement. One approach may be the distribution of safer smoking supplies. Offering safer smoking supplies can meet the needs of a wider group of PWUD and expand the reach of the population that SSPs serve. A recent report suggested that distribution of safer smoking supplies could lead to increases in participant volume by engaging with newer and different populations that would not normally seek their services, including people of color and people who smoke methamphetamine and do not inject drugs (National Association of County and City Health Officials, 2023).

Engaging PWUD through the distribution of safer smoking supplies at SSPs could also provide more opportunities for engagement with other evidence-based interventions, such as naloxone. Naloxone is a critical, life-saving intervention that is highly effective at reversing opioid overdoses. Since 1996, SSPs have led efforts to provide evidence-based OEND programs that train laypeople, including PWUD, family members, and peers, to respond to overdose events (Wheeler et al., 2015; Bennett and Elliott, 2021). As pioneers of community-level naloxone distribution, SSPs reach people at high risk of witnessing or experiencing an opioid overdose and people most often involved in reversing overdoses (Kingston, 2021; Centers for Disease Control and Prevention, 2024d; Lambdin et al., 2023). Extrapolating from this literature, safer smoking supply distribution at SSPs may increase engagement with a broader population of PWUD and in turn, increase naloxone distribution, which may ultimately reduce opioid overdose rates among SSP participants.

While some SSPs have provided safer smoking supplies for years (e.g. new glass pipes, aluminum foil, pipe covers), more SSPs started providing such supplies in response to the shift towards smoking drugs. Emerging research from Seattle, Washington show a high interest and need for safer smoking supplies among SSP participants (Fitzpatrick et al., 2022; Reid et al., 2023; Kingston et al., 2024). However, there remains a dearth of research on safer smoking supply distribution in other parts of the U.S., especially within the context of people transitioning from injection to smoking. To address existing knowledge gaps, we aimed to assess the relationship of the distribution of safer smoking pipes by SSPs with participant engagement and naloxone distribution using the National Survey of Syringe Services Programs (NSSSP).

2. Methods

2.1. Data source

Our primary data source was the 2023 NSSSP (Lambdin et al., 2023), an annual cross-sectional survey fielded by RTI International to understand the health and social services delivered by SSPs. SSPs were defined as community-based programs that, at minimum, provide free drug use supplies (e.g., new or sterile syringes, smoking equipment, and other safe use supplies) to PWUD with the goal of reducing harms associated with substance use. SSPs often provide other health and social services, such as drug checking, naloxone distribution, access to medications for opioid use disorder, and linkage to other medical care and social support services. RTI International and the North American Syringe Exchange Network (NASEN) collaborated to develop the full sampling frame of U. S. SSPs (Lambdin et al., 2023; Patel et al., n.d.). NASEN's dataset included SSPs that agreed to be publicly listed in their directory; SSPs that did not wish to be publicly listed but agreed to be contacted for research purposes; SSPs that belonged to NASEN's Buyer's Club that

were not part of the directory; and other known SSPs that were not in NASEN's directory or did not participate in their Buyer's Club. RTI's dataset included SSPs that responded to prior NSSSPs and SSPs that were proactively identified through SSP networks and partner agencies, including the National Harm Reduction Coalition and state health departments. RTI and NASEN merged their datasets of known SSPs, removed duplicates, and identified non-operational SSPs.

For the present study, we used data from the 2023 NSSSP, which measured services delivered in 2022. All SSPs known to be operating in 2022 were invited to voluntarily participate in an online survey between March and August 2023 and received $125 as compensation. Respondents provided information about their SSP in 2022 on the following topics: organizational characteristics, community support and opposition, drug use supply distribution, overdose prevention, and other service provision among other topics. Out of the 626 SSPs known to be operating in 2022, 471 (75 %) responded to the 2023 NSSSP survey.

2.2. Measures

There were three key variables for this study. The first was whether SSPs distributed safer smoking pipes to participants in 2022 (yes/no). Data on the type of safer smoking pipes were not available. The second and third key variables were the number of participant encounters and number of naloxone doses provided. For participant encounters, respondents were asked "How many participant contacts occurred at your SSP in 2022? By participant contacts, we mean the number of encounters / participant visits made to your SSP during 2022." For naloxone doses, respondents were asked "How many naloxone doses did your syringe services program distribute in 2022?"

Informed by findings from prior research (Lambdin et al., 2020; Facente et al., 2024; Ray et al., 2024), we selected the following covariates a priori to include in our models: SSP organizational type, total annual budget, weekly operating hours, service delivery methods, service restrictions or disruptions from local government or law enforcement, urbanicity, opioid overdose mortality rates, and U.S. regional Census divisions. We classified SSP organizational type into community-based organization (CBO) vs. another type of organization, such as departments of public health (DPH), health care organizations (HCO), or other. Total annual budget was classified into the following categories: $<$ $50,000, $50,000 - $149,999, $150,000 - $499,999, $500,000 - $999,999, and $>$ $1,000,000. Due to sample size restrictions, we further categorized budget into $<$ $150,000 vs. $\geq$ $150,000 in multivariable models to obtain relatively even groups. Total number of weekly operating hours was reported across an entire SSP and could include multiple locations. Service delivery methods included brick and mortar building; mobile unit; tent or outdoor area; home delivery; "backpack" delivery; mail order; vending machine; and other. We classified SSPs into (1) Fixed only (brick and mortar building or vending machine); (2) Community-based method only (mobile unit, tent or outdoor area, home delivery, "backpack" delivery, or mail order); or (3) Combination (Fixed and at least one community-based method). Service restrictions or disruptions from local government or law enforcement was defined as any endorsement of the following: active police harassment/arrest of program participants; program operations disrupted by government or law enforcement; or local policy/law that disrupts or restricts program services. We also constructed a county-level measure of urbanicity (Parker et al., 2018) based on the SSP's headquarters with three categories: urban, suburban, and rural. We operationalized opioid overdose mortality rates per 100,000 as a standardized measure with mean of zero and standard deviation of one. We used rates from 2021 as a proxy measure for the level of need in the community (Rossen et al., 2022). Finally, we classified each SSP into regional U.S. Census divisions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific). SSPs operating in Puerto Rico were grouped with South Atlantic.

2.3. Statistical analyses

We used the limited-use NSSSP dataset, which included survey weights to account for potential non-response bias from SSPs that did not complete the survey entirely. Organizational and county-level characteristics were used to create weights for survey respondents to represent non-respondents. Survey weights were used in all analyses. Additionally, we had missingness on certain items within the survey. We imputed missing data using multiple imputation by chained equations (MICE) (Van Buuren and Groothuis-Oudshoorn, 2011; White et al., 2011; Graham, 2009) and generated 50 datasets (see Appendix Methods for further details).

We first summarized the data using descriptive statistics, with continuous variables presented as weighted medians and 25th and 75th percentiles and categorical variables presented as weighted percentages.

To understand factors associated with whether SSPs distributed pipes, we conducted weighted multivariable modified Poisson models with robust standard errors to estimate prevalence ratios and 95 % confidence intervals (CI). We included the following variables: SSP organizational type, budget, weekly operating hours, service delivery method, service restrictions or disruptions from local government or law enforcement, urbanicity, opioid overdose mortality rate per 100,000, and regional Census divisions.

We then estimated adjusted rate ratios (aRR) and 95 % CI of the total effect of SSP pipe distribution on number of participant encounters and naloxone doses distributed using weighted multivariable negative binomial models. We adjusted for SSP organizational type, budget, weekly operating hours, service delivery method, service restrictions or disruptions from local government or law enforcement, urbanicity, and opioid overdose mortality rate per 100,000. We included fixed effects for regional Census divisions to account for clustering.

The multiply imputed datasets were used in the multivariable analyses using the "mice" package in R and estimates were pooled across datasets. Based on prior recommendations to improve model precision (Von Hippel, 2007; White et al., 2011), we restricted the analytic sample to SSPs with complete information with regards to the outcome (SSP pipe distribution: n = 453; participant encounters and naloxone doses: n = 429). Statistical analyses were conducted using Stata 18 (College Station, TX) and R, version 4.3.2 (R Core Team, 2023).

3. Results

3.1. Sample characteristics

Across our sample (Table 1, n = 429), the median annual number of participant encounters was 1440 (Interquartile range (IQR): 285 – 4325) and the median annual number of distributed naloxone doses was 2337 (IQR: 588 – 6062). The majority of SSPs were classified as CBOs (59.3 %). Over one third of SSPs operated on an annual budget less than $150,000. Most SSPs were headquartered in suburban areas (48.6 %). Our sample included SSPs in each of the nine U.S. Census divisions, with the greatest number concentrated in the Mountain (19.0 %), South Atlantic (19.0 %), and Pacific (18.1 %) regions.

A total of 187 SSPs (44.1 %) reported distributing pipes to participants (Table 1). A greater proportion of SSPs that distributed pipes were CBOs, used community-based methods of service delivery, experienced service restrictions or disruptions from local government or law enforcement and were headquartered in urban areas. Among the nine Census divisions, SSPs in the Pacific region had the greatest proportion that distributed pipes.

3.2. Associations between community and organizational factors and pipe distribution

In our multivariable model, compared to SSPs classified as CBOs, those classified as DPH, HCO, or other had half the prevalence of pipe

Table 1
Sample characteristics, National Survey of Syringe Services Programs, 2023[a].

	Overall	Pipe distribution[b]	
		Distributed pipes	Did not distribute pipes
	(N = 429)	(N = 187)	(N = 240)
Participant encounters			
Median [Q1 - Q3]	1440 [285 - 4325]	2599 [794 - 7116]	933 [136 - 2682]
Naloxone doses distributed			
Median [Q1 - Q3]	2237 [588 - 6062]	4129 [1800 - 10000]	1057 [200 - 4114]
SSP organizational type			
CBO	249 (59.3 %)	149 (60.2 %)	99 (39.8 %)
DPH	135 (31.7 %)	22 (16.7 %)	113 (83.3 %)
HCO/Other	45 (9.0 %)	16 (36.6 %)	28 (63.4 %)
Total annual budget			
< $50,000	84 (19.2 %)	38 (45.7 %)	45 (54.3 %)
$50,000 - $149,999	69 (15.8 %)	28 (40.1 %)	40 (59.9 %)
$150,000 - $499,999	89 (21.3 %)	48 (54.4 %)	41 (45.6 %)
$500,000 - $999,999	32 (8.0 %)	21 (64.8 %)	11 (35.2 %)
> $1 million	26 (6.6 %)	18 (68.9 %)	8 (31.1 %)
Missing	129 (29.1 %)	34 (27.0 %)	95 (73.0 %)
Weekly operating hours			
Median [Q1-Q3]	32 [14 - 40]	35 [18 - 40]	30 [10 - 40]
Missing	11 (2.6 %)	3 (30.0 %)	8 (70.0 %)
Service delivery method			
Fixed only	85 (19.6 %)	19 (21.8 %)	66 (78.2 %)
Community-based only	110 (25.9 %)	67 (60.8 %)	43 (39.2 %)
Combination (Fixed and community-based)	233 (54.3 %)	100 (44.3 %)	131 (55.7 %)
Missing	1 (0.2 %)	1 (100 %)	0 (0 %)
Service restrictions/ disruptions from local government or law enforcement			
None	219 (50.1 %)	73 (34.2 %)	146 (65.8 %)
Any	198 (47.0 %)	111 (56.5 %)	85 (43.5 %)
Missing	12 (2.9 %)	3 (22.6 %)	9 (77.4 %)
Urbanicity			
Suburban	209 (48.6 %)	86 (42.2 %)	121 (57.8 %)
Rural	104 (23.0 %)	27 (25.6 %)	77 (74.4 %)
Urban	113 (27.7 %)	73 (63.9 %)	40 (36.1 %)
Missing	3 (0.7 %)	1 (28.9 %)	2 (71.1 %)
Opioid overdose death rate per 100,000 (2021)			
Median [Q1-Q3]	37.7 [28.5 - 50.0]	33.9 [27.1 - 46.8]	40.1 [31.0 - 54.8]
Missing	12 (2.8 %)	3 (30.3 %)	7 (69.7 %)
Census divisions			
Pacific	80 (18.1 %)	50 (64.1 %)	29 (35.9 %)
New England	29 (7.0 %)	22 (76.1 %)	7 (24.0 %)
Middle Atlantic	26 (6.7 %)	17 (64.8 %)	9 (35.2 %)
East North Central	67 (14.6 %)	31 (47.5 %)	36 (52.5 %)
West North Central	21 (4.5 %)	13 (60.9 %)	8 (39.1 %)
South Atlantic	75 (19.0 %)	28 (38.4 %)	46 (61.6 %)
East South Central	29 (7.5 %)	3 (9.1 %)	26 (90.9 %)
West South Central	14 (3.5 %)	8 (57.7 %)	6 (42.3 %)
Mountain	88 (19.0 %)	15 (17.4 %)	73 (82.6 %)

Abbreviations: Quartile 1 (Q1); Quartile 3 (Q3); Syringe services program (SSP); Community-based organization (CBO); Department of Public Health (DPH); Health care organization (HCO)

[a] We present weighted medians, percentiles, and percentages that were observed prior to multiple imputation. Statistics were weighted to account for potential non-response bias.

[b] Two SSPs were missing information on pipe distribution and were not included in the stratification by pipe distribution.

distribution (Table 2, aPR: 0.51, 95 % CI: 0.37–0.68). SSPs using only community-based methods of service delivery had a higher prevalence of pipe distribution compared to SSPs using only fixed methods (aPR: 1.76, 95 % CI: 1.16–2.67). Similar associations were found comparing SSPs using a combination of fixed and community-based methods and pipe distribution (aPR: 1.61, 95 % CI: 1.07–2.43). SSPs operating in urban environments had a higher prevalence of pipe distribution compared to suburban areas (aPR: 1.25, 95 % CI: 1.03–1.52). We also found relationships between service restrictions or disruptions from local government or law enforcement and regional Census divisions with pipe distribution (Table 2). There were no differences in pipe distribution by annual budget, operating hours, or areas with higher opioid overdose death rates.

3.3. Associations between pipe distribution and harm reduction services

SSPs that distributed pipes had a higher median number of participant encounters and naloxone doses distributed than those that did not distribute pipes (Table 1). SSPs that distributed pipes reported more participant encounters, compared to SSPs that did not distribute pipes (Fig. 1, aRR=1.62, 95 % CI: 1.19–2.20), after adjusting for SSP organizational type, budget, weekly hours, service delivery method, service restrictions or disruptions from local government or law enforcement, urbanicity, overdose mortality rates in 2020, and regional Census divisions. Furthermore, we found SSPs that distributed pipes reported more naloxone dose distribution than those that did not distribute pipes (Fig. 1, aRR=1.26, 95 % CI: 0.91–1.74), though this finding was not statistically significant.

Table 2
Associations of organizational and community characteristics with SSP pipe distribution, 2023 NSSSP.

	aPR	95 % CI
SSP organizational type		
CBO	ref	ref
DPH/HCO/Other	0.51	0.37–0.68
Total annual budget		
< $150,000	ref	ref
≥ $150,000	1.05	0.83–1.34
Weekly operating hours	1.00	1.00–1.00
Service delivery method		
Fixed only	ref	ref
Community-based only	1.76	1.16–2.67
Combination (Fixed and community-based)	1.61	1.07–2.43
Service restrictions/disruptions from local government or law enforcement		
None	ref	ref
Any	1.40	1.15–1.70
Urbanicity		
Suburban	ref	ref
Rural	0.98	0.71–1.35
Urban	1.24	1.02–1.51
Opioid overdose death rate per 100,000 (2021)	0.95	0.84–1.08
Census divisions		
Pacific	ref	ref
New England	1.16	0.88–1.52
Middle Atlantic	0.82	0.60–1.13
East North Central	0.86	0.63–1.19
West North Central	0.95	0.66–1.37
South Atlantic	0.56	0.41–0.77
East South Central	0.20	0.07–0.52
West South Central	0.76	0.53–1.09
Mountain	0.38	0.23–0.61

We ran weighted multivariable modified Poisson models with robust standard errors within each of the multiply imputed datasets (m=50) and pooled results. Abbreviations: Adjusted prevalence ratio (aPR); Confidence interval (CI); Syringe services program (SSP); Community-based organization (CBO); Department of Public Health (DPH); Health care organization (HCO)

We also ran two sensitivity analyses: (1) limiting to only complete cases (n = 286) and (2) using the fully imputed dataset (n = 470). Results from sensitivity analyses did not qualitatively change our findings (Appendix Tables A.3 and A.4).

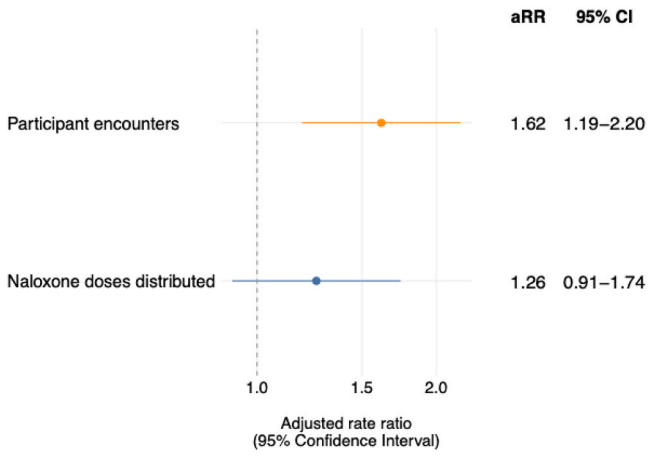

Fig. 1. Comparison of rates in participant encounters and naloxone doses distributed between SSPs that did and did not distribute safer smoking pipes, NSSSP 2023. Multivariable negative binomial models were conducted within each of the multiply imputed datasets (m=50) and results were pooled. Models adjusted for SSP organizational type, annual budget, weekly hours, service delivery method, service restrictions or disruptions from local government or law enforcement, urbanicity, overdose mortality rates in 2021, and regional U.S. Census divisions. Abbreviations: Adjusted rate ratio (aRR); Confidence interval (CI).

4. Discussion

Using data from the 2023 NSSSP, the largest sample of U.S. SSPs collected to date, we found 44 % of SSPs reported distributing pipes for smoking. SSPs that offered pipes to their participants had a 62 % higher rate of participant encounters compared to SSPs that did not offer pipes. Given SSPs can reduce transmission of HIV and hepatitis C virus (Fernandes et al., 2017; Platt et al., 2017), reduce overdose fatalities (Lambdin et al., 2020), and improve entry into substance use disorder treatment or clinical care (Jakubowski et al., 2023), implementation of pipe distribution by SSPs represents a critical public health approach that could increase participant visits and reach a broader population of PWUD at risk for infectious disease or overdose, namely those who smoke and do not inject drugs. Our findings align with previous work showing that safer smoking supply distribution at SSPs was associated with increased participant volume by engaging with new populations (National Association of County and City Health Officials, 2023). In the same report, SSPs also described that providing safer smoking supplies deepened their engagement with PWUD, allowing them to reach participants that did not previously use their services. As SSPs are trusted by PWUD (MacNeil and Pauly, 2011), it follows that bringing more people to SSPs more often has the potential to improve population-level health benefits. This approach may be especially important in the era of fentanyl, as recent research suggests people who only smoked fentanyl experienced non-fatal overdoses, infectious diseases, and hospitalization less often than people who injected fentanyl (Megerian et al., 2024). SSPs offering pipes could help people adopt safer drug use practices by facilitating a transition from injection to smoking. To help inform the development and implementation of safer smoking supply distribution at SSPs, future studies should explore program challenges, such as neighborhood pushback, and adjustments, such as staffing needs or outreach efforts.

Research has shown a shifting trend from injecting toward smoking opioids since 2020, especially along the West Coast (Kral et al., 2021; Parent et al., 2021; Kingston et al., 2022; Megerian et al., 2024; Eger et al., 2024; Tanz et al., 2024). Some SSPs were providing smoking supplies prior to this shift, while others more recently implemented safer smoking supply distribution to meet emerging needs and maintain participant engagement. However, access to and distribution of safer smoking supplies remain controversial, especially the distribution of smoking pipes. U.S. federal law prohibits the use of federal funds to purchase safer smoking supplies (Centers for Disease Control and Prevention, 2024c; US Department of Health and Human Services, 2016). The introduction of safer smoking supplies by SSPs was met with considerable public opposition, including the Cutting Rampant Access to Crack Kits (CRACK) Act by Senator Marco Rubio (R-FL) and the Preventing Illicit Paraphernalia for Exchange Systems (PIPES) Act by Senators Rubio and Manchin (D-WV) (Rubio, 2022a, 2022b). This public opposition culminated in the Biden administration revising its policies and disallowing SSPs from using federal funding for harm reduction to procure smoking supplies (Becerra and Gupta, 2022). In contrast to the public response to prescription opioid use primarily among White people (Netherland and Hansen, 2017), the political opposition against the distribution of smoking pipes appears to be a negative externality of the racially motivated War on Drugs, which has primarily targeted Black and Brown communities in the U.S. for the past 50 years (Cohen et al., 2022). The federal ban and political opposition have forced SSPs that are distributing safer smoking supplies to patch together different funding sources—individual donations, private funding, state grants, etc.—to support implementation. SSP funding levels already do not meet minimum benchmarks, and insufficient funding threatens the implementation of evidence-based interventions (Facente et al., 2024; Akiba et al., 2024). Our findings highlight how critical it is to financially support SSPs to implement safer drug use supplies in the evolving political context and shifting drug use patterns.

SSPs classified as DPHs, HCOs, or other distributed pipes for smoking

less often than SSPs classified as CBOs. Recent research found CBO SSPs provided a greater number of syringes, naloxone doses, fentanyl test strips, and buprenorphine compared to DPH SSPs (Ray et al., 2024). Given the federal ban on purchasing pipes, DPH SSPs may experience greater legal and financial obstacles for pipe distribution compared to CBO SSPs. Furthermore, CBO SSPs tend to adopt innovative approaches more quickly than DPHs or HCOs (Wenger et al., 2021), including mail-based harm reduction supplies, low-barrier buprenorphine, vaccinations during the COVID-19 pandemic, and delivering HIV pre-exposure prophylaxis (PrEP) (Wenger et al., 2021; Aronowitz et al., 2021; Behrends et al., 2022; Hood et al., 2020; Heidari et al., 2024; Bartholomew et al., 2022). We also found differences in pipe distribution across Census divisions, with SSPs in the Pacific having the highest proportion of pipe distribution. This finding may reflect how SSPs responded to the shift to smoking fentanyl along the West coast as well as more political and legal support for harm reduction services compared to other U.S. regions. For instance, safer smoking supply distribution by SSPs is legal in California and Washington.(Office of AIDS, n.d.; Wash. Rev. Code § 69.50.4121., 2023)

While not statistically significant, we found SSPs that distributed pipes had a 26 % higher rate of naloxone dose distribution than SSPs that did not distribute pipes. Distributing safer smoking pipes could be a strategy for SSPs to increase naloxone distribution in the community by engaging a wider population of PWUD. For instance, SSPs described that providing safer smoking pipes allowed them to engage people who primarily use stimulants about the risk of fentanyl contamination in non-opioid drugs and provide risk reduction education (National Association of County and City Health Officials, 2023). Supported by this report, our results suggest that safer smoking pipe distribution may increase naloxone distribution at SSPs by expanding their reach to a wider population of PWUD, which, in turn, could reduce opioid overdose deaths. Despite large expansions in OEND by SSPs (Des Jarlais et al., 2015; Lambdin et al., 2020), there remain important implementation gaps in naloxone saturation at the community level (Lambdin et al., 2018, 2020). Distribution of safer smoking supplies could be an opportunity for SSPs to not only increase participant engagement, but also provide naloxone to the people most likely to prevent an opioid overdose from becoming fatal.

Our findings have important policy implications. State paraphernalia laws, which criminalize possession and sale of items used to consume non-prescribed drugs, prevent many SSPs across the country from legally distributing safer drug use supplies, including syringes and smoking equipment, as well as drug checking kits including items such as fentanyl test strips. Advocates, supported by years of research, have called for the repeal of these paraphernalia laws to allow PWUD to access more comprehensive and culturally appropriate health and social services at SSPs (Davis et al., 2019; Singer and Heimowitz, 2022). SSPs have also experienced a recent surge in community and law enforcement harassment related to the distribution of smoking supplies (Ovalle, 2024). In our sample, 47 % of SSPs reported experiencing service restrictions or disruptions due to local government or law enforcement. Policymakers, public health officials, and law enforcement agencies should be informed about the emerging evidence showing that transitioning people from injection to smoking could have positive health benefits (Megerian et al., 2024). Our study supports this research by adding that safer smoking pipe distribution was positively associated with participant engagement and naloxone distribution at SSPs. Based on our findings, policymakers should create supportive legal and funding environments for implementing safer drug use supplies so that community opposition and law enforcement harassment do not compromise the full public health benefits of SSP services.

Our findings should be interpreted in light of potential methodological limitations. First, this was a cross-sectional survey, representing a snapshot in time, and our exposure was not randomized between our two comparison groups. While we attempted to adjust for possible confounders, the potential for residual confounding from unmeasured or mismeasured variables remain. Future longitudinal studies are necessary to understand changes over time before and after implementation of safer smoking supply distribution. Second, it is possible SSPs that did not respond to the survey could be less resourced and in unsanctioned environments, meaning experiences from these types of SSPs could be underrepresented. However, our overall response rate of 75 % is very robust, and our analyses used survey weights to minimize potential non-response bias. Third, some survey items were missing, though we used multiple imputation to impute missing values and minimize potential selection bias. Fourth, NSSSP data are self-reported by SSP staff, often with the assistance of programmatic records; however, responses are still subject to recall bias and may lead to measurement error. Lastly, the 2023 NSSSP only asked whether SSPs distributed pipes to participants and did not ask about the number of pipes distributed or the types of pipes or other smoking supplies, such as foil. Future studies should capture more detailed information to understand the diversity and volume of safer smoking supplies distributed by SSPs.

5. Conclusions

The U.S. is currently experiencing its third decade of an overdose crisis. This study found SSPs implementing safer smoking pipe distribution had more participant encounters and distributed more naloxone doses. To maximize their full individual and population-level health benefits, SSPs should be supported technically, legally, and financially to implement safer smoking supply distribution for their participants. Policymakers, federal agencies, and state and county health departments should be informed about the potential public health benefits of safer smoking supply distribution and address barriers to implementing this important service.

Funding

This study was supported by Arnold Ventures (20-05172). The funders had no role in the data analysis, decision to publish, or manuscript preparation.

CRediT authorship contribution statement

Esther O. Chung: Writing – review & editing, Writing – original draft, Visualization, Formal analysis, Conceptualization. **Sheila V. Patel:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Data curation. **Lynn D. Wenger:** Writing – review & editing, Data curation. **Jamie L. Humphrey:** Writing – review & editing, Validation, Methodology, Data curation. **Amang Sukasih:** Writing – review & editing, Methodology. **Ricky N. Bluthenthal:** Writing – review & editing, Data curation. **Hansel E. Tookes:** Writing – review & editing, Data curation. **Don C. Des Jarlais:** Writing – review & editing, Data curation. **Sara N. Glick:** Writing – review & editing, Data curation. **Paul A. LaKosky:** Writing – review & editing, Data curation. **Stephanie Prohaska:** Writing – review & editing, Data curation. **Laura Guzman:** Writing – review & editing, Data curation. **Alex H. Kral:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Barrot H. Lambdin:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors are deeply grateful to the syringe services programs and

their representatives for participating in the National Survey of Syringe Services Program (NSSSP). The authors thank other members of the NSSSP Team—which includes partners at RTI International (Erica Browne) and the Centers for Disease Control and Prevention (Monica Adams, Aleta Christensen, Ryan Drab, Talia Pindyck) —who contributed substantially to the planning and implementation of the NSSSP. In addition to partnering with CDC and NASEN to administer the NSSSP, RTI collaborated with National Harm Reduction Coalition (NHRC) and National Alliance of State & Territorial AIDS Directors (NASTAD) to refine the instrument and promote the NSSSP to their networks of harm reductionists. The authors also thank other team members at RTI who supported survey administration and recruitment including Erin Erickson, Kathryn Greenwell, Terry Morris, and Abigail Rinderle.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.dadr.2024.100317.

Data availability

Presented data are available upon reasonable request from the corresponding author.

References

Ahmad, F.B., Cisewski, J.A., Rossen, L., Sutton, P., 2024. Provisional drug overdose death counts. National Center for Health Statistics. ⟨https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm⟩.

Akiba, C.F., Smith, J., Wenger, L.D., Morris, T., Patel, S.V., Bluthenthal, R.N., Tookes, H. E., LaKosky, P., Kral, A.H., Lambdin, B.H., 2024. Financial barriers, facilitators, and strategies among syringe services programs in the U.S., and their impact on implementation and health outcomes. SSM - Qual. Res. Health 5, 100421. https://doi.org/10.1016/j.ssmqr.2024.100421.

Aronowitz, S.V., Engel-Rebitzer, E., Lowenstein, M., Meisel, Z., Anderson, E., South, E., 2021. We have to be uncomfortable and creative: Reflections on the impacts of the COVID-19 pandemic on overdose prevention, harm reduction & homelessness advocacy in Philadelphia. SSM - Qual. Res. Health 1, 100013. https://doi.org/10.1016/j.ssmqr.2021.100013.

Bartholomew, T.S., Andraka-Cristou, B., Totaram, R.K., Harris, S., Doblecki-Lewis, S., Ostrer, L., Serota, D.P., Forrest, D.W., Chueng, T.A., Suarez, E., Tookes, H.E., 2022. "We want everything in a one-stop shop": acceptability and feasibility of PrEP and buprenorphine implementation with mobile syringe services for Black people who inject drugs. Harm Reduct. J. 19 (1), 133. https://doi.org/10.1186/s12954-022-00721-6.

Becerra, X., & Gupta, R. 2022. Statement by HHS Secretary Xavier Becerra and ONDCP Director Rahul Gupta [Text]. U.S. Department of Health and Human Services. ⟨https://www.hhs.gov/about/news/2022/02/09/statement-hhs-secretary-xavier-becerra-and-ondcp-director-rahul-gupta.html⟩

Behrends, C.N., Lu, X., Corry, G.J., LaKosky, P., Prohaska, S.M., Glick, S.N., Kapadia, S. N., Perlman, D.C., Schackman, B.R., Des Jarlais, D.C., 2022. Harm reduction and health services provided by syringe services programs in 2019 and subsequent impact of COVID-19 on services in 2020. Drug Alcohol Depend. 232, 109323. https://doi.org/10.1016/j.drugalcdep.2022.109323.

Bennett, A.S., Elliott, L., 2021. Naloxone's role in the national opioid crisis—Past struggles, current efforts, and future opportunities. Transl. Res.: J. Lab. Clin. Med. 234, 43–57. https://doi.org/10.1016/j.trsl.2021.03.001.

Centers for Disease Control and Prevention.2023.Drug Overdose Deaths | Drug Overdose | CDC Injury Center.⟨https://www.cdc.gov/drugoverdose/deaths/index.html⟩.

Centers for Disease Control and Prevention. 2024a. 2024 Viral Hepatitis National Progress Report. ⟨https://www.cdc.gov/hepatitis/policy/npr/2024/index.htm⟩

Centers for Disease Control and Prevention. 2024c. Funding for Syringe Services Programs. ⟨https://www.cdc.gov/syringe-services-programs/php/funding/index.html⟩

Centers for Disease Control and Prevention. 2024d. Syringe Services Programs. Syringe Services Programs (SSPs). ⟨https://www.cdc.gov/syringe-services-programs/php/index.html⟩

Centers for Disease Control and Prevention. (2024b). Estimated HIV Incidence and Prevalence in the United States, 2018–2022. 29(1). https://stacks.cdc.gov/view/cdc/156513/cdc_156513_DS1.pdf.

Ciccarone, D., Holm, N., Ondocsin, J., Schlosser, A., Fessel, J., Cowan, A., Mars, S.G., 2024. Innovation and adaptation: the rise of a fentanyl smoking culture in San Francisco. PLoS One 19 (5), e0303403. https://doi.org/10.1371/journal.pone.0303403.

Cohen, A., Vakharia, S.P., Netherland, J., Frederique, K., 2022. How the war on drugs impacts social determinants of health beyond the criminal legal system. Ann. Med. 54 (1), 2024–2038. https://doi.org/10.1080/07853890.2022.2100926.

Davis, C.S., Carr, D.H., Samuels, E.A., 2019. Paraphernalia laws, criminalizing possession and distribution of items used to consume illicit drugs, and injection-related harm. Am. J. Public Health 109 (11), 1564–1567. https://doi.org/10.2105/AJPH.2019.305268.

Des Jarlais, D.C., Nugent, A., Solberg, A., Feelemyer, J., Mermin, J., Holtzman, D., 2015. Syringe service programs for persons who inject drugs in urban, suburban, and rural areas—United States, 2013. Mmwr. Morb. Mortal. Wkly. Rep. 64 (48), 1337–1341. https://doi.org/10.15585/mmwr.mm6448a3.

Dunleavy, K., Hutchinson, S.J., Palmateer, N., Goldberg, D., Taylor, A., Munro, A., Shepherd, S.J., Gunson, R.N., Given, S., Campbell, J., McAuley, A., 2021. The uptake of foil from needle and syringe provision services and its role in smoking or snorting heroin among people who inject drugs in Scotland. Int. J. Drug Policy 98, 103369. https://doi.org/10.1016/j.drugpo.2021.103369.

Eger, W.H., Abramovitz, D., Bazzi, A.R., Bórquez, A., Vera, C.F., Harvey-Vera, A., Friedman, J.R., Strathdee, S.A., 2024. Changes in injecting versus smoking heroin, fentanyl, and methamphetamine among people who inject drugs in San Diego, California, 2020–2023. Drug Alcohol Depend. 259, 111318. https://doi.org/10.1016/j.drugalcdep.2024.111318.

Facente, S.N., Humphrey, J.L., Akiba, C., Patel, S.V., Wenger, L.D., Tookes, H., Bluthenthal, R.N., LaKosky, P., Prohaska, S., Morris, T., Kral, A.H., Lambdin, B.H., 2024. Funding and delivery of syringe services programs in the United States, 2022. Am. J. Public Health 114 (4), 435–443. https://doi.org/10.2105/AJPH.2024.307583.

Fernandes, R.M., Cary, M., Duarte, G., Jesus, G., Alarcão, J., Torre, C., Costa, S., Costa, J., Carneiro, A.V., 2017. Effectiveness of needle and syringe Programmes in people who inject drugs – an overview of systematic reviews. BMC Public Health 17 (1), 309. https://doi.org/10.1186/s12889-017-4210-2.

Fitzpatrick, T., McMahan, V.M., Frank, N.D., Glick, S.N., Violette, L.R., Davis, S., Jama, S., 2022. Heroin pipe distribution to reduce high-risk drug consumption behaviors among people who use heroin: a pilot quasi-experimental study. Harm Reduct. J. 19 (1), 103. https://doi.org/10.1186/s12954-022-00685-7.

Frankeberger, J., Cepeda, A., Natera-Rey, G., Valdez, A., 2019. Safer crack kits and smoking practices: effectiveness of a harm reduction intervention among active crack users in Mexico City. Subst. Use Misuse 54 (4), 592–600. https://doi.org/10.1080/10826084.2018.1528460.

Friedman, J., Shover, C.L., 2023. Charting the fourth wave: geographic, temporal, race/ethnicity and demographic trends in polysubstance fentanyl overdose deaths in the United States, 2010–2021. Addiction 118 (12), 2477–2485. https://doi.org/10.1111/add.16318.

Graham, J.W., 2009. Missing data analysis: making it work in the real world. Annu. Rev. Psychol. 60 (1), 549–576. https://doi.org/10.1146/annurev.psych.58.110405.085530.

Heidari, O., Meyer, D., Lowensen, K., Patil, A., O'Conor, K.J., LaRicci, J., Hunt, D., Bocek, A.P., Cargill, V., Farley, J.E., 2024. Colocating syringe services, COVID-19 vaccination, and infectious disease testing: Baltimore's experience. Health Aff. 43 (6), 883–891. https://doi.org/10.1377/hlthaff.2024.00032.

Hood, J.E., Banta-Green, C.J., Duchin, J.S., Breuner, J., Dell, W., Finegood, B., Glick, S. N., Hamblin, M., Holcomb, S., Mosse, D., Oliphant-Wells, T., Shim, M.-H.M., 2020. Engaging an unstably housed population with low-barrier buprenorphine treatment at a syringe services program: lessons learned from Seattle, Washington. Subst. Abus. 41 (3), 356–364. https://doi.org/10.1080/08897077.2019.1635557.

Ivsins, A., Bonn, M., McNeil, R., Boyd, J., Kerr, T., 2024. A qualitative study on perceptions and experiences of overdose among people who smoke drugs in Vancouver, British Columbia. Drug Alcohol Depend., 111275 https://doi.org/10.1016/j.drugalcdep.2024.111275.

Jakubowski, A., Fowler, S., Fox, A.D., 2023. Three decades of research in substance use disorder treatment for syringe services program participants: a scoping review of the literature. Addict. Sci. Clin. Pract. 18 (1), 40. https://doi.org/10.1186/s13722-023-00394-x.

Kingston, S. 2021. WA State Project to Prevent Prescription Drug/Opioid Overdose: Final Report on Naloxone Distribution, September 1, 2016 – August 31, 2021. Addictions, Drug & Alcohol Institute (ADAI), University of Washington.

Kingston, S., Newman, A., Banta-Green, C., & Glick, S. 2022. Results from the 2021 WA State Syringe Service Program Health Survey. University of Washington. ⟨https://adai.uw.edu/syringe-survey-2021/⟩

Kingston, S., Newman, A., Banta-Green, C., & Glick, S.N. 2024. Results from the 2023 WA State Syringe Services Program Health Survey. Addictions, Drug & Alcohol Institute, Department of Psychiatry & Behavioral Sciences, School of Medicine, University of Washington. ⟨https://adai.uw.edu/download/9208/⟩

Kral, A.H., Lambdin, B.H., Browne, E.N., Wenger, L.D., Bluthenthal, R.N., Zibbell, J.E., Davidson, P.J., 2021. Transition from injecting opioids to smoking fentanyl in San Francisco, California. Drug Alcohol Depend. 227, 109003. https://doi.org/10.1016/j.drugalcdep.2021.109003.

Lambdin, B.H., Bluthenthal, R.N., Wenger, L.D., Wheeler, E., Garner, B., LaKosky, P., Kral, A.H., 2020. Overdose education and naloxone distribution within syringe service programs—United States, 2019. Mmwr. Morb. Mortal. Wkly. Rep. 69. https://doi.org/10.15585/mmwr.mm6933a2.

Lambdin, B.H., Patel, S.V., Humphrey, J.L., Wenger, L.D., Saunders, M.E., Strack, C.N., Browne, E.N., Rodriguez Borja, I., Smith, J., Pindyck, T., Christensen, A., Adams, M., & Kral, A.H. 2023. Program and Operational Characteristics of Syringe Services Programs—Data from the National Survey of Syringe Services Programs (Anonymized), 2022 [Dataset]. RTI International. https://doi.org/10.5281/ZENODO.11371985

Lambdin, B.H., Wenger, L., Bluthenthal, R., Bartholomew, T.S., Tookes, H.E., LaKosky, P., O'Neill, S., Kral, A.H., 2023. How do contextual factors influence

naloxone distribution from syringe service programs in the USA: a cross-sectional study. Harm Reduct. J. 20 (1), 26. https://doi.org/10.1186/s12954-023-00755-4.
Lambdin, B.H., Zibbell, J., Wheeler, E., Kral, A.H., 2018. Identifying gaps in the implementation of naloxone programs for laypersons in the United States. Int. J. Drug Policy 52, 52–55. https://doi.org/10.1016/j.drugpo.2017.11.017.
Leonard, L., DeRubeis, E., Pelude, L., Medd, E., Birkett, N., Seto, J., 2008. I inject less as I have easier access to pipes. Int. J. Drug Policy 19 (3), 255–264. https://doi.org/10.1016/j.drugpo.2007.02.008.
MacNeil, J., Pauly, B., 2011. Needle exchange as a safe haven in an unsafe world. Drug Alcohol Rev. 30 (1), 26–32. https://doi.org/10.1111/j.1465-3362.2010.00188.x.
Megerian, C.E., Bair, L., Smith, J., Browne, E.N., Wenger, L.D., Guzman, L., Kral, A.H., Lambdin, B.H., 2024. Health risks associated with smoking versus injecting fentanyl among people who use drugs in California. Drug Alcohol Depend. 255, 111053. https://doi.org/10.1016/j.drugalcdep.2023.111053.
National Association of County and City Health Officials. 2023. Smoking Supplies: The Local Public Health Perspective on an Emerging Harm Reduction Strategy. ⟨https://www.naccho.org/blog/articles/smoking-supplies-the-local-public-health-perspective-on-an-emerging-harm-reduction-strategy⟩
Netherland, J., Hansen, H., 2017. White opioids: pharmaceutical race and the war on drugs that wasn't. BioSocieties 12 (2), 217–238. https://doi.org/10.1057/biosoc.2015.46.
Office of AIDS. (n.d.). Issue Brief: Smoking Supplies for Harm Reduction. California Department of Public Health. Retrieved February 27, 2024, from ⟨https://www.cdph.ca.gov/Programs/CID/DOA/CDPH%20Document%20Library/IssueBrief_SmokingSupplies_Web_ADA.pdf⟩
Ovalle, D. 2024. Fentanyl users get free smoking gear in some cities. Now there's pushback. The Washington Post. ⟨https://www.washingtonpost.com/health/2024/05/29/fentanyl-smoking-injecting/⟩
Parent, S., Papamihali, K., Graham, B., Buxton, J.A., 2021. Examining prevalence and correlates of smoking opioids in British Columbia: opioids are more often smoked than injected. Subst. Abus. Treat. Prev. Policy 16 (1), 79. https://doi.org/10.1186/s13011-021-00414-6.
Parker, K., Horowitz, J., Brown, A., Fry, R., Cohn, D., Igielnik, R., 2018. What unites and divides urban, suburban and rural communities. Pew Research Center.
Patel, S.V., Wenger, L.D., Pindyck, T., Adams, M., Browne, E., Humphrey, J.L., Saunders, M.E., Smith, J., Christensen, A., Ertl, A., Rodriguez Borja, I., Prohaska, S., LaKosky, P.A., Bluthenthal, R.N., Des Jarlais, D.C., Glick, S.N., Tookes, H.E., Kral, A.H., & Lambdin, B.H. (n.d.). Program and Operational Characteristics of Syringe Services Programs—National Survey of Syringe Services Programs, 2022. Under Review.
Pizzey, R., Hunt, N., 2008. Distributing foil from needle and syringe programmes (NSPs) to promote transitions from heroin injecting to chasing: an evaluation. Harm Reduct. J. 5 (1), 24. https://doi.org/10.1186/1477-7517-5-24.
Platt, L., Minozzi, S., Reed, J., Vickerman, P., Hagan, H., French, C., Jordan, A., Degenhardt, L., Hope, V., Hutchinson, S., Maher, L., Palmateer, N., Taylor, A., Bruneau, J., Hickman, M., 2017. Needle syringe programmes and opioid substitution therapy for preventing hepatitis C transmission in people who inject drugs. Cochrane Database Syst. Rev. 2017 (9). https://doi.org/10.1002/14651858.CD012021.pub2.
Prangnell, A., Dong, H., Daly, P., Milloy, M.J., Kerr, T., Hayashi, K., 2017. Declining rates of health problems associated with crack smoking during the expansion of crack pipe distribution in Vancouver, Canada. BMC Public Health 17 (1), 163. https://doi.org/10.1186/s12889-017-4099-9.
R Core Team. 2023. R: A Language and Environment for Statistical Computing [Computer software]. R Foundation for Statistical Computing. ⟨https://www.R-project.org/⟩
Ray, B.R., Humphrey, J.L., Patel, S.V., Akiba, C.F., Bluthenthal, R.N., Tookes, H., LaKosky, P.A., Wenger, L.D., Kral, A.H., Lambdin, B.H., 2024. Comparing harm reduction and overdose response services between community-based and public health department syringe service programmes using a national cross-sectional survey. Lancet Reg. Health - Am. 34, 100757. https://doi.org/10.1016/j.lana.2024.100757.
Reid, M.C., Oliphant-Wells, T., Moreno, C., Ketchum, J., Fitzpatrick, T., McMahan, V.M., Glick, S.N., 2023. High levels of interest in access to free safer smoking equipment to reduce injection frequency among people who inject drugs in Seattle, Washington. Drug Alcohol Depend. Rep. 7, 100163. https://doi.org/10.1016/j.dadr.2023.100163.
Rossen, L., Bastian, B., Warner, M., Khan, D., & Chong, Y. 2022. County-level Drug Overdose Mortality: United States, 2003–2021. National Center for Health Statistics. ⟨https://www.cdc.gov/nchs/data-visualization/drug-poisoning-mortality/index.htm⟩
Rubio, M. 2022a. Rubio, Senate Republicans Introduce Crack Act. ⟨https://www.rubio.senate.gov/rubio-senate-republicans-introduce-crack-act/⟩
Rubio, M. 2022b. Rubio, Manchin Introduce Bipartisan Bill to Prohibit Federal Purchasing of Crack Pipes and Needles for Illicit Drug Use. ⟨https://www.rubio.senate.gov/rubio-manchin-introduce-bipartisan-bill-to-prohibit-federal-purchasing-of-crack-pipes-and-needles-for-illicit-drug-use/⟩
Singer, J.A., & Heimowitz, S. 2022. Drug Paraphernalia Laws Undermine Harm Reduction: To Reduce Overdoses and Disease, States Should Emulate Alaska (Policy Analysis no. 929). Cato Institute. ⟨https://www.cato.org/policy-analysis/drug-paraphernalia-laws-undermine-harm-reduction-reduce-overdoses-disease-states⟩
Spencer, M., Garnett, M., & Miniño, A. 2023. Drug Overdose Deaths in the United States, 2002-2022 (491; NCHS Data Brief). National Center for Health Statistics (U.S.). https://doi.org/10.15620/cdc:135849
Stöver, H.J., Schäffer, D., 2014. SMOKE IT! promoting a change of opiate consumption pattern—from injecting to inhaling. Harm Reduct. J. 11 (1), 18. https://doi.org/10.1186/1477-7517-11-18.
Tanz, L.J., Gladden, R.M., Dinwiddie, A.T., Miller, K.D., Broz, D., Spector, E., O'Donnell, J., 2024. Routes of drug use among drug overdose deaths—United States, 2020–2022. Mmwr. Morb. Mortal. Wkly. Rep. 73 (6), 124–130. https://doi.org/10.15585/mmwr.mm7306a2.
Tapper, A., Ahern, C., Graveline-Long, Z., Newberger, N.G., Hughto, J.M.W., 2023. The utilization and delivery of safer smoking practices and services: a narrative synthesis of the literature. Article 1. Harm Reduct. J. 20 (1). https://doi.org/10.1186/s12954-023-00875-x.
US Department of Health and Human Services. 2016. Department of Health & Human Services implementation guidance to support certain components of syringe services programs, 2016. ⟨https://www.cdc.gov/syringe-services-programs/media/pdfs/2024/04/cdc-hiv-syringe-exchange-services.pdf⟩
Van Buuren, S., Groothuis-Oudshoorn, K., 2011. Mice: multivariate imputation by chained equations in R. J. Stat. Softw. 45, 1–67.
Von Hippel, P.T., 2007. Regression with missing Ys: an improved strategy for analyzing multiply imputed data. Sociol. Methodol. 37 (1), 83–117. https://doi.org/10.1111/j.1467-9531.2007.00180.x.
Wash. Rev. Code § 69.50.4121. (2023). ⟨https://app.leg.wa.gov/rcw/default.aspx?cite= 69.50.4121⟩
Wenger, L.D., Kral, A.H., Bluthenthal, R.N., Morris, T., Ongais, L., Lambdin, B.H., 2021. Ingenuity and resiliency of syringe service programs on the front lines of the opioid overdose and COVID-19 crises. Transl. Res. 234, 159–173. https://doi.org/10.1016/j.trsl.2021.03.011.
Wheeler, E., Jones, T.S., Gilbert, M.K., Davidson, P.J., Centers for Disease Control, Prevention (CDC), 2015. Opioid overdose prevention programs providing naloxone to laypersons—United States, 2014. Mmwr. Morb. Mortal. Wkly. Rep. 64 (23), 631–635.
White, I.R., Royston, P., Wood, A.M., 2011. Multiple imputation using chained equations: issues and guidance for practice. Stat. Med. 30 (4), 377–399. https://doi.org/10.1002/sim.4067.