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Supportive environments during the substance use disorder epidemic in the rural United States: Provider support for interventions and expectations of interactions with providers

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ABSTRACT

Background: Harm reduction interventions, including SSP (Syringe Services Programs) and MAT (Medications for Addiction Treatment) have demonstrated the potential to help stem the epidemic of opioid use disorder. However, for that potential to be realized, people must expect that healthcare providers will be supportive if they ever seek care for substance use.

Methods: This cross-sectional study investigated perceptions of provider support for SSP and MAT in the general population of 14 states selected specifically for 50 percent of the sample to include participants from rural counties with high rates of non-medical opioid use and injection. A survey of 3096 adults in 14 states and 675 counties within the Appalachian and Midwestern regions of the United States (collected between November of 2019 and May of 2020) examined the association between perceptions of provider support for harm reduction interventions, community members' trust of community healthcare providers, and expectations for patient-provider interactions involving disclosure of non-medical drug use.

Results and conclusion: Path analysis supported the hypothesis that perceptions of provider support for harm reduction interventions predict positive expectations about patient-provider interactions and that trust in providers mediates this association. The model fit well among participants who reported past non-medical use of drugs and those who did not. In contrast to other research suggesting that trust in providers may be inconsequential during the initial stages of care, the current research suggests that trust may shape expectations about patient-provider interactions even before people use drugs. Communication of support for harm reduction interventions by providers may play an important role in promoting health care-seeking in populations that use drugs currently or who may use drugs in the future in high-risk rural areas of the United States.

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1. Introduction

IDU (Injection Drug Use) in the United States had ceased to be a major factor in new HIV (Human Immunodeficiency Virus) infections when the epidemic of opioid use disorder started. In 2014, outbreaks of HIV raised awareness of prevalent but previously unknown IDU in rural areas like Scott County, Indiana, where rates notoriously skyrocketed due to injection with opioids (Peters et al., 2016). These outbreaks led to identifying counties and states with similar vulnerability to the rapid dissemination of HIV and HCV (Hepatitis C Virus; Van Handel et al., 2016), many of which have been at the center of more recent outbreaks in rural Appalachia and the Midwest (Samoff et al., 2020). Given this widespread IDU in rural Appalachia and the Midwest, regions not previously at risk, it is important to understand their inhabitants' perceptions of provider support for interventions that reduce drug use harm (Neumann, 2020). This paper examined whether perceptions of provider support for harm reduction are associated with trust in providers and expectations that they would be supportive if their patients reported drug use.

Stigmatizing beliefs that people who use drugs (PWUD) are less valuable as human beings play a major role in social and behavioral aspects of public health (Pescosolido and Martin, 2015). These stigmatizing beliefs are prevalent and consequential in regions affected by the opioid use disorder epidemic, including among service providers and even among PWUD (Madden, 2019). Stigma produces exclusion from social networks and psychological distress coming from the social threat of being judged by community members (Quinn and Chaudoir, 2009), especially in rural areas (Ezell et al., 2020). This very stigma may also affect perceptions of support for harm reduction among providers such as medical doctors, nurse practitioners, and physicians assistants.

How healthcare is implemented plays a role in whether people decide to access harm reduction services, but how this happens is not entirely clear. For example, a randomized control trial of pharmacies found that a combination of in-depth harm reduction training for pharmacy staff and referral and information services for community members increases the odds of using sterile syringes (Lewis et al., 2015). Also, research documents instances of people who have a history of non-medical use of opioids facing stigma (Syvertsen et al., 2021) and distrusting medical providers (Muncan et al., 2020). Research in Appalachian Ohio, part of the geographic regions sampled from in the current research, has documented perceptions that medications for addiction treatment (MAT) is stigmatized partly because of a social emphasis on abstinence from substance use (Richard et al., 2020).

This research examines the association between trust in providers and expectations of supportive relationships with providers and potential disclosure of drug use. Reporting drug use to healthcare providers can put those who make the report in a position of unnecessary vulnerability if the healthcare providers are untrustworthy, a risk not worth taking if providers end up not supporting scientific interventions for drug use. For building trust, demonstrating responsiveness to the needs of patients (Fiscella et al., 2004), as well as honesty and care, is important above and beyond professional competence (for similar arguments about trust in the area of policing, see Mazerolle et al., 2013; Tyler and Lind, 1992; O'Brien et al., 2019; O'Brien and Tyler, 2019a). Hence, support for harm reduction policies may demonstrate care and induce community trust to expect positive interactions with their providers should one ever report drug use. In particular, SSP (Syringe Service Programs) can reduce the likelihood of transmitting infectious disease via injection drug use (Samoff et al., 2020). Likewise, MAT can help PWID (People who Inject Drugs) to slowly reduce non-medical drug use and also decrease their likelihood of overdose or transmission of infectious disease (Fullerton et al., 2014a,b). This paper addresses these issues.

1.1. Trust in healthcare providers is important for the general population in areas impacted by drug use

The COVID-19 pandemic has increased public conversation about trust in healthcare among the general population (Baker, 2020). Surveys document declines in public trust by more than 50% between 1966 and 2014, attributed partially to misinformation and real events such as deceptive practices by the pharmaceutical industry (Khullar, 2019). However, research has not offered a framework to study the antecedents and consequences of trust of healthcare providers within general communities with high levels of IDU.

A study of individuals recently infected with HIV found that although trust in their physician correlated with attendance to visits after initiating care, there was no relation between trust in their physician and attendance to the initial visit (i.e., linkage to care) following diagnosis (Graham et al., 2015). Whereas this particular study and several others found that trust is important in an ongoing patient-physician relationship, whether trust of providers plays a role before people are in care remains a question (Graham et al., 2015) to answer by studying general populations in areas with risk for injection drug use. In regions where dangers from injection drug use are salient, expectations may form long before people need to consult their providers for their drug use.

Research on law enforcement demonstrates that trust is an important determinant of whether people decide to initiate interactions and, for example, report information about crime to the police (O'Brien and Tyler, 2019; Tyler and Jackson, 2014). Moreover, trust in healthcare providers correlates with more healthcare utilization, including among PWID (Ostertag et al., 2006; Salamat et al., 2019). Trust in healthcare providers also correlates with more positive perceptions of care quality (Hong and Oh, 2020), as well as greater acceptance of (Altice et al., 2001) and adherence to antiretroviral therapy among people living with HIV (Blackstock et al., 2012).

Although healthcare providers are not necessarily the direct service providers of harm reduction interventions, they may recommend them when people disclose non-medical drug use. The Definition of what constitutes harm reduction can be contentious, but one definition appropriate for the current research is a set of techniques that "incorporates a spectrum of strategies that includes safer use, managed use, abstinence, meeting people who use drugs 'where they're at' and addressing conditions of use along with use itself" (National Harm Reduction Coalition, n.d.). One way of understanding this definition is that abstinence may be ideal but sets people up for failure. Therefore, an approach that facilitates safe forms of drug use such as safe injection sites is better than a rigid insistence on an often-unrealistic goal of abstinence.

Healthcare providers have a clear opportunity to use their position of authority to recommend harm reduction treatments. However, patients who report non-medical drug use risk judgment such as being perceived as having "blemishes of individual character …. for example … addiction" (Goffman, 1963, p. 4). In this context, although a key component of harm reduction is withholding judgment (National Harm Reduction Coalition, n.d.), potential candidates for harm reduction may fear that their healthcare providers oppose and stigmatize harm reduction services in rural areas (Corrigan and Nieweglowski, 2018). Qualitative interviews with PWID who use SSP have shown relatively negative expectations about how healthcare professionals outside of syringe service sites would treat them if they were to disclose non-medical drug use (Treloar et al., 2013). Concerns of trust may be particularly acute in rural areas, where "everyone knows everyone" (Ezell et al., 2020), and people avoid seeking care and disclosing their use of substances (for other concerns, including legal ones, see Kumar Mishra et al., 2020). Even professional service providers within such rural areas, including healthcare providers, sometimes hold stigmatizing beliefs demeaning people who use drugs (Madden, 2019).

1.2. Provider support for harm reduction interventions, trust, and expectations about interactions with providers

We hypothesized that expectations about provider interactions during disclosure of non-medical drug use and trust of providers might be related to providers' support for harm reduction programs. In particular, the public stigma surrounding opioid use disorder (Magnus et al., 2013; Neale et al., 2008; Rivera et al., 2014; Van Boekel et al., 2013a; more general issues about stigma in health care, see Penner et al., 2018) operates at multiple levels, including stigmatizing beliefs that community members hold, stigmatizing beliefs that providers hold (provider-based stigma), and people with a stigmatized identity or behavior anticipating stigma from others (anticipated stigma; Magnus et al., 2013; Neale et al., 2008; Rivera et al., 2014; Van Boekel et al., 2013a). The non-medical use of drugs could signal the second type of stigma as defined by Goffman, "blemishes of individual character … for example … addiction" (1958, p. 4). Beyond the stigma of the disorder itself, people also anticipate stigma for this disorder's medical treatment, leading to a Catch 22 (Madden, 2019). In areas where abstinence is valued, harm reduction could be stigmatized because anything less than abstinence is perceived as a character fault (Richard et al., 2020). On this note, patients report anticipating the negative judgment of providers if they need harm reduction interventions (Earnshaw et al., 2013; Paquette et al., 2018; Van Boekel et al., 2013), and even providers who prescribe MAT feel stigmatized by other providers for providing these medical services (Madden, 2019). Thus, the population's perception of provider support for harm reduction strategies among providers is likely to shape its trust of providers and expectations of positive interactions with them following eventual disclosure of non-medical drug use. This suggests a process in which the expectation of negative interactions causes people to avoid disclosing use (Biancarelli et al., 2019; Kumar Mishra et al., 2020). If a woman places trust in providers, then she should expect them to help her if she ever disclosed non-medical drug use, rather than stigmatizing her as frequently reported (Kumar Mishra

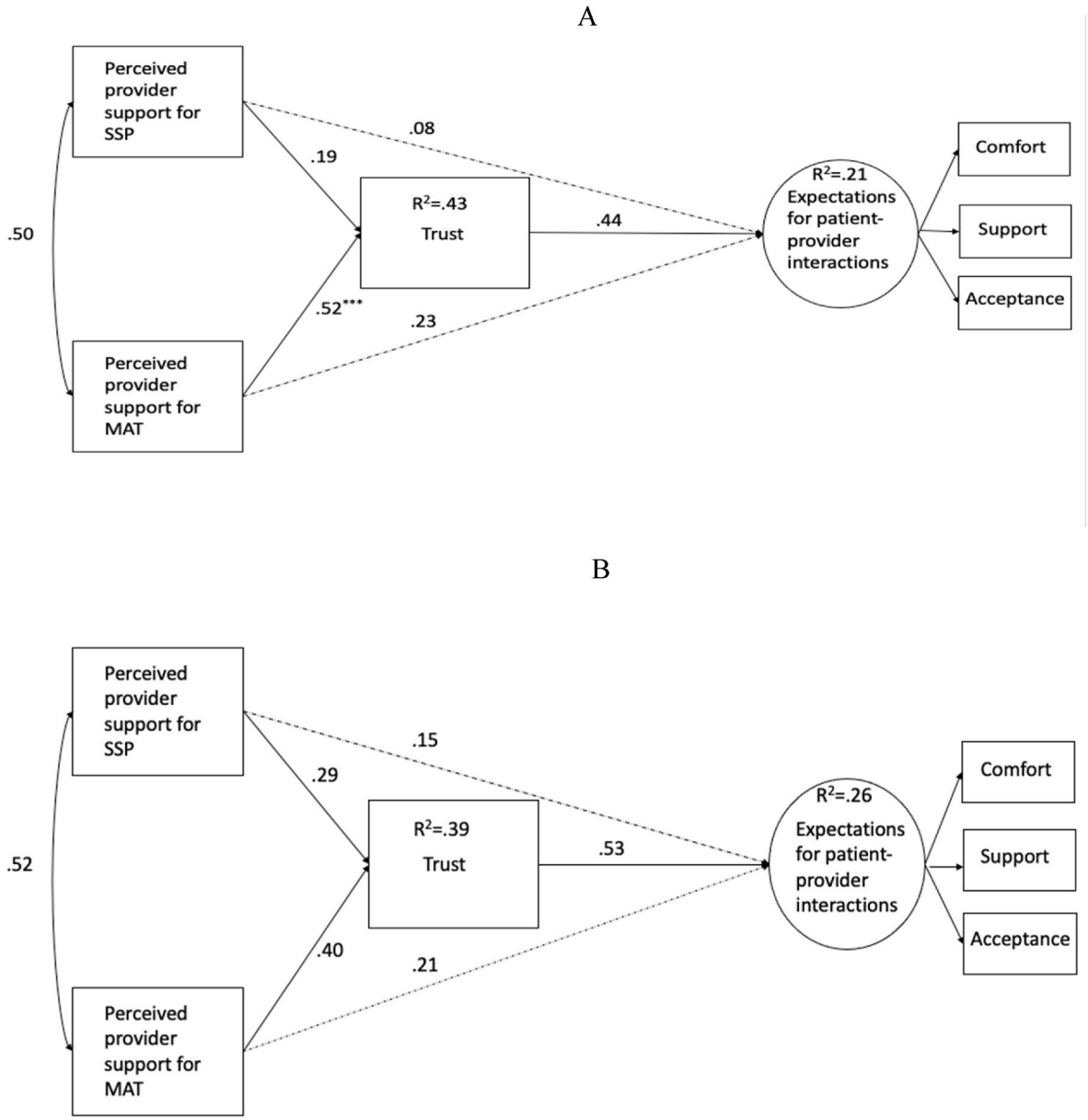

Fig. 1. A. Path model of perceived provider support for syringe services and perceived provider support for MAT shaping expectations for patient-provider interactions through trust of providers among those not reporting use. B. Path model of perceived provider support for syringe services and perceived provider support for MAT shaping expectations for patient-provider interactions through trust of providers among those reporting use.

et al., 2020). Hence, in this research, we tested a model in which perceptions of provider support for SSP and MAT (two harm-reduction interventions) predict trust in providers and trust in providers predicts expectations for patient-provider interactions involving the disclosure of non-medical drug use. This model appears in Fig. 1 and guided the research we report in this paper.

1.3. Current research

The present research was designed to assess the association between perceptions of provider support for SSP and MAT, community members' trust of providers, and expectations for patient-provider interactions, including disclosure of non-medical drug use (e.g., comfort with disclosing non-medical drug use and expectations of social acceptance from providers following non-medical drug use). To begin, we examined whether perceptions of providers' support for SSP and MAT are associated with trust in providers and, in turn, expectations for patient-provider interactions (see Fig. 1).

Testing a model to predict expectations for patient-provider interactions, including disclosure of non-medical drug use before concerns with drug use are in place, requires studying samples from the general population of a geographic area at risk, including those who do and do not report having engaged in non-medical drug use. We hypothesized that perceiving provider support for harm-reduction strategies would be associated with both greater trust in providers and more positive expectations for patient-provider interactions involving the disclosure of non-medical drug use. We also hypothesized that greater trust in providers would mediate the relation between perceptions of the two types of harm reduction interventions (i.e., perceptions of provider support for MAT and perceptions of provider support for SSP) and expectations of patient-provider interactions involving the disclosure of non-medical drug use.

We tested our hypotheses in 14 states that form the geographic region of the U.S. Midwest and Appalachia. We choose these 14 states because they include a large proportion of counties included among the top 5% of counties identified as vulnerable for infectious disease outbreaks due to injection drug use in the U.S. (Van Handel et al., 2016). These counties are especially relevant for our research goals because of the local impact that the epidemic of opioid use disorder and high concentration of rural areas in which issues of stigma may be salient (Ezell et al., 2020).

We also compared patterns between participants reporting non-medical drug use and those not reporting non-medical drug use. Although this comparison was not a primary research objective, one of our objectives was assessing the association between trust and expectations for patient-provider interactions involving the disclosure of non-medical drug use even before an ongoing patient-provider relationship begins, which led us to study those who have not yet had to decide whether to disclose non-medical drug use. If trust of providers was important only in ongoing care for a stigmatized condition and not important at the beginning stages of care (Graham et al., 2015), then the model in Fig. 1 may not be relevant for people who have not used drugs. We pre-registered predictions with Open Science Framework (O'Brien, 2020) and note deviations from these predictions in the Discussion.

2. Methods

2.1. Participants

Sample and target counties/states. We collected surveys from 3096 participants through Qualtrics Panels (*Online Panels: Get Responses for Surveys & Research | Qualtrics*, n.d.), an online survey platform and data collection company that collects representative samples with options for targeting specific populations. The platform uses online methods of recruitment for its panels through partners that distribute the surveys online, a method that has the advantage of facilitating access to a general population of internet users across a wide geographic region, not just those who are already seeking services in clinics. This number excluded the data of 168 participants not within our 14 target states, which were West Virginia, Virginia, Tennessee, Kansas, Kentucky, North Carolina, Georgia, Indiana, Illinois, Michigan, Missouri, Pennsylvania, Ohio, and Alabama. These target states were selected because each included several counties that a CDC study (recent at the time of data collection) had identified as being in the top 5% of vulnerability for HIV/HCV outbreaks due to infectious drug use, and because they shared a common region (U.S. Appalachia and the Midwest). The model from this study used county-level correlates of acute Hepatitis C infection including drug overdose mortality from 2012 to 2013, prescription opioid sales, mental health services, percent of the population without insurance coverage, and SES indicators (Van Handel et al., 2016). Within these states, we selected half of our respondents to come from counties that had been identified by the CDC as being in the top 5% of vulnerability in HIV/HCV outbreaks due to injection of drugs such as heroin or fentanyl, according to their model, and the other half to come from other counties in the same states, with the rationale that many other counties not in the 2016 study have experienced increases in drug use (Schalkoff et al., 2019). This study was approved by the (Blinded Review) Institutional Review Board.

Demographic composition and reporting of drug use. The mean age of our sample was 44.96 years (SD = 17.09; range 18–99). Table 1 breaks down the percentages of racial, ethnic, and sex groups in our sample between those reporting and not reporting recent non-medical drug use, alongside U.S. Census estimates (U.S. Census Bureau QuickFacts: United States, n.d.) for the states in our sample, created by averaging the data from the 14 states we surveyed. The data were collected between November 2019 and May 2020. The sample included 1867 females, 1209 males, seven people who reported "Other," and 13 who did not report sex. Of the 3096 participants, 1023 (33%) reported ever using either heroin, fentanyl, amphetamines, methamphetamine, hallucinogenic drugs (such as LSD), prescription opioids (Oxycontin, Vicodin, Norco, and Percocet are examples), and non-opioid prescriptions (e.g., Gabapentin) for pain either without a prescription or using more than prescribed. This includes 205 (6.62%) who reported using heroin, 423 who reported using amphetamines (13.66%), 193 who reported using fentanyl (6.23%), 326 (10.53%) who reported using methamphetamines, 340 (10.98%) who reported using hallucinogenic drugs, 708 who reported using opioid pills (22.87%), and 471 (15.21%) who reported using non-opioid pain relievers (Gabapentin was given as an example) more than prescribed or without a prescription. The number of people who reported non-medical drug use is particularly high

Table 1
U.S. 2019 Census estimates compared to sample.

	Survey sample not reporting use	Survey sample reporting use	2019 Census Estimate
White alone	85.51%	86.02%	78.84%
Black or African American alone	8.15%	7.62%	15.13%
American Indian (Native American) and Alaska Native alone	.63%	.59%	.61%
Asian alone	1.71%	1.47%	3.1%
Native Hawaiian and another Pacific Islander alone	0%	0%	.09%
Two or More Races	2.54%	2.64%	2.24%
Hispanic or Latino	3.97%	5.38%	7.29%
Non-Hispanic White alone	83.02%	82.21%	72.63%
Female	61.59%	51.71%	50.94%

Note. As presented in QuickFacts of census.gov (*U.S. Census Bureau QuickFacts*, n.d.), reference to a single racial category (the first six rows, before "Two or More Races" and the 9th row ("Non-Hispanic White") count those who identified with only one racial category. Identification as Hispanic or Latino is exclusive of this. "White alone" can include people who identify as Hispanic and those who do not because race and ethnicity are treated separately.

within our sample, perhaps because half of our sample live in counties that have been identified as vulnerable to infectious disease because of high levels of injection drug use (Van Handel et al., 2016). We did not distinguish in the questions whether medications had ever been prescribed. The exact wording of questions used to assess non-medical drug use is included in Appendix A.

2.2. Survey measures

Participants were informed that questions would refer to the participant's "community" as to where they live throughout the survey, and this could be a "town," "city," "county," "incorporated community," or "other," "whichever is most meaningful to you." We adopted this approach to ensure that questions referring to the participants' community would be meaningful to the participant and correspond to counties of interest. In asking participants' perceptions of harm reduction services, we choose to use words that describe what they actually would have done as part of the services, rather than technical terms. The exact wording of statements is provided in Appendix A. A pilot study of 229 participants from a general U.S. sample collected via Amazon's Mechanical Turk (Buhrmester et al., 2018), had been used to verify the reliability of our measures. For more details, see Appendix B. Although in this paper we use the term "non-medical drug use," the survey used the term "drug misuse" or "misuse drugs" to clarify the meaning for participants.

Perceived support for syringe services programs ($M = 3.34$, $SD = 1.10$). To measure participants' subjective perceptions, we asked participants to describe to what extent they agreed that healthcare providers in their community *are supportive or would be supportive of programs that provide ways for people who misuse drugs to stay safe (such as with clean needles to prevent spreading infection)* on a scale from "Strongly Disagree" (1) to "Strongly Agree" (5).

Perceived provider support *for MAT* ($M = 3.54$, $SD = 1.04$). To measure participants' subjective perceptions, we asked participants described to what extent they agreed that healthcare providers in their community *are supportive or would be supportive of treatment programs that use medication to help reduce drug addiction (*e.g.*, MAT)* on a scale from "Strongly Disagree" (1) to "Strongly Agree" (5).

Trust of healthcare providers ($r = 0.72$, $M = 3.61$, $SD = 1.03$). Participants stated their agreement with two statements about their trust of providers in their community: *I trust healthcare providers to do their best to take care of people in the community where I live*; *I trust healthcare providers to address people's healthcare needs*) on a Likert scale from "Strongly Disagree" (1) to "Strongly Agree" (5). These two items were averaged into a composite. This measure we adapted from measures of trust in the police (Tyler and Jackson, 2014) that focus on the relation between the authorities and community, rather than longer scales designed to measure specific dimensions of trust in physicians such as the Wake Forest Physician Trust Scale (Hall et al., 2002).

Expectations for patient-provider interactions ($\alpha = 0.85$, $M = 3.48$, $SD = 1.05$). The survey asked participants to describe their expectations for interactions with healthcare providers in their community in the condition that the participant was to "misuse drugs in the future." On a scale from "Definitely not" (1) to "Definitely yes" (5), participants reported how comfortable they would feel opening up about non-medical drug use to their healthcare providers, how likely healthcare providers would be to provide social support, and how likely healthcare providers would be to provide social acceptance in these circumstances.

Socioeconomic Status ($r = .44$, $M = 0$, $SD = 0.85$). The survey asked participants to describe their income with an option ranging from "Less than $10,000" (coded as 1) to "$150,000 or more" (coded as 12), and to categorize themselves among one of several educational categories ranging from "Less than high school degree" (coded 1) to "Professional degree (JD, MD)" (coded as 8). We transformed both measures to *z*-scores and used the mean of the two values to assess socioeconomic status. The full description of the measure appears in Appendix A.

2.3. Analytic plan

Following Table 1, which shows how our sample compares to Census estimates for the region, we compared descriptive statistics across participants who did and did not report using drugs without a prescription or more than prescribed in the past (Table 2). Next, also for exploratory purposes, we obtained bivariate correlations among our measures for each group and compared the strength of correlations using a Fisher's z-test (Table 3). Third, we used path analysis to test our main hypotheses that participants' perceptions of provider support for MAT and perceptions of provider support for SSP would predict expectations for patient-provider interactions involving the disclosure of non-medical drug use as a latent variable through trust. We tested this hypothesis separately among those who did not report having used drugs without a prescription or more than prescribed (Fig. 1, Table 4A) and those who did report use of drugs without a prescription or more than prescribed (Fig. 2, Table 4B).

We used multigroup structural equation modeling to test our mediation hypotheses (see Fig. 1) for both groups with the R lavaan package (Rosseel, 2012). To account for potential dependence in error within counties, we used cluster robust standard errors, specifying county as the cluster (Mansournia et al., 2020). To assess whether the model fit differed for those who did and did not report use, we used a multigroup model and obtained fit indices for both those who did not report use of non-medical drugs and those who reported use of non-medical drugs. This comparison was done to explore those dynamics across the two groups. The structural equation model specified sex, age, socioeconomic status, and political ideology as exogenous variables, predicting perceived provider support for syringe services programs and for MAT, and all of the aforementioned variables predicting trust as the mediating variable. All of these variables were set to predict the outcome, a latent variable including the indicators of comfort disclosing non-medical drug use, expectations of social support from providers following non-medical drug use, and expectations of social acceptance from providers following non-medical drug use. The model also introduced correlations between variables at the same stage, including the errors of exogenous variables; the perceptions of perceived provider support for SSP, and perceived provider support for MAT; and between the indicators of the latent outcome variable. After testing the model with direct effects, we removed direct effects of perceived support for SSP and perceived support for MAT predicting expectations for patient-provider interactions involving the disclosure of non-medical drug use. Finally, we compared the fit of this model to a model reversing the antecedent and mediating variables, such that trust of healthcare providers predicts expectations for patient-provider interactions indirectly through perceived support for SSP and MAT.

3. Results

Table 2 displays descriptive statistics for participants not reporting and reporting having used drugs without a prescription or more than prescribed. Sample characteristics appear in the methods subsection "demographic composition and reporting of drug use." As the table shows, mean levels were identical or nearly identical for perceived support for MAT, perceived support for SSP, and trust of providers. On average, participants in both groups rated about the midpoint, indicating positive responses. Those who reported using drugs reported significantly more positive expectations for patient-provider interactions involving the disclosure of non-medical drug use.

Table 3 presents bivariate correlations among those who did not (below diagonal) and did (above diagonal) report ever using drugs without a prescription or more than prescribed. All bivariate correlations were significant at $p < .001$ in both groups. The magnitude of some bivariate associations differed between the two groups. For participants who did not (vs. did) report use, the correlation between (a) perceived provider support for MAT and perceived support for SSP was stronger, as

Table 2
Descriptive statistics across participants reporting and not reporting use.

	Descriptive statistics for those not reporting use			Descriptive statistics for those reporting use			*t*	*p*
	M	SD	*N*	*M*	SD	*N*		
Perceived provider support for MAT	3.54	1.00	2016	3.54	1.11	1006	-.09	.925
Perceived provider support for SSP	3.34	1.07	2015	3.35	1.16	1005	-.08	.939
Trust of providers	3.61	1.02	2049	3.61	1.06	1023	-.08	.934
Expectations for patient-provider interactions	3.44	1.07	2045	3.55	1.02	1022	−2.71	.007

Note. Abbreviations for Mean, Standard Deviation, sample size, *t*-statistic, and *p*-value are *M*, *SD, N*, *t* and *p*.

Table 3
Bivariate correlations between survey measures among measures.

	1	2	3	4
1. Perceived provider support for syringe services programs	–	.46***	.49	.32
2. Perceived provider support for MAT	.55***	–	.56***	.39^{+}
3. Trust of providers	.47	.63***	–	.45^{+}
4. Expectations for patient-provider interactions	.27	.33^{+}	.39^{+}	–

Note. All bivariate correlations (within group) are significant at $p < .001$. ***, **, *, and+indicate $p < .001$, $p < .01$, $p < .05$, and $p < .100$, respectively, for a Fisher's z-test comparing the magnitude of correlations between the group not reporting use (below diagonal line), and the group reporting use (above diagonal line). We used the *R* package 'psych' to conduct the z-test (Revelle, 2020). The two panels split the sample between those who report non-medical drug use ($N = 1023$) and those not reporting non-medical drug use ($N = 2073$), including correlations (Pearson's *r*) below the dashed lines for those not reporting non-medical drug use, correlations above the dashed lines indicate bivariate correlations for those reporting non-medical drug use.

Table 4a
Estimates of all paths in structural equation model for those not reporting drug use.

Predicting perceived provider support for SSP					
Predictor variable	*B*	*SE*	*p*	LLCI	ULCI
Age	-.02	.02	.356	-.06	.02
Sex	.14	.05	.006	.04	.24
Political	-.04	.03	.081	-.09	.01
SES	.06	.03	.012	.01	.11
Predicting perceived provider support for MAT					
Age	.09	.02	<.001	.05	.14
Sex	.22	.05	<.001	.13	.32
Political	.00	.02	.971	-.05	.05
SES	.08	.02	<.001	.04	.12
Predicting trust of providers					
Age	.03	.02	.099	-.01	.06
Sex	.09	.04	.020	.01	.17
Political	.02	.02	.200	-.01	.06
SES	.06	.02	.002	.02	.09
SSP	.19	.03	<.001	.13	.25
MAT	.52	.03	<.001	.47	.57
Predicting expectations for patient-provider interactions					
Age	.10	.03	<.001	.04	.15
Sex	.14	.05	.007	.04	.24
Political	.03	.03	.181	-.02	.08
SES	.11	.03	<.001	.06	.16
Trust	.44	.03	<.001	.38	.51
Indirect paths predicting expectations for patient-provider interactions through trust					
SSP	.08	.02	<.001	.05	.11
MAT	.23	.02	<.001	.19	.27
$\chi^2(32) = 45.23$					

were the correlations (b) between trust and perceived provider support for MAT and (c) between expectations for patient-provider interactions involving the disclosure of non-medical drug use. As indicated in the analytic plan above, standard errors were clustered around the county of participants, thus accounting for the potential of non-random distribution of variances across counties.

3.1. Path analysis

We present a summary of the final path model for those not reporting use in Fig. 1A and statistics in Table 4A and for those reporting use in Fig. 1B with statistics in Table 4B. The unconstrained model and the model constraining just the regressions to be equal were of equal fit, and we decided to use the unconstrained model because constraining regressions would preclude the reader from examining differences in the path coefficients. There were 122 cases with missing values, or 4% of the 3096 participants.

The path model tested the hypothesis that perceived provider support for SSP and perceived provider support for MAT would each predict more positive expectations for patient-provider interactions involving the disclosure of non-medical drug use (represented by the latent variable including the three indicators) by increasing trust in healthcare providers. First, we fit the model including direct effects from perceived provider support for SSP and perceived provider support for MAT to expectations for patient-provider interactions, in addition to the indirect effects through trust. The model fit the data extremely well across groups, Robust $\chi^2(28) = 35.73$, $p = .150$, Robust *CFI* = 0.999; Robust SRMR = 0.008, Robust RMSEA = 0.014, [90% LLCI: 0.000, 90% ULCI: 0.027].

Next, because we hypothesized that trust would mediate the effect of perceived provider support for SSP and perceived provider support for MAT on expectations for patient-provider interaction expectations, we removed the direct paths from the exogenous variables. The estimates from this model are shown in Table 4A and Fig. 1A for the group not reporting use of non-medical drugs and in Table 4B and Fig. 1B for the group reporting non-medical use of drugs. The model still fit the data well across groups, Robust $\chi^2(32) = 105.58$, $p < .001$, Robust *CFI* = 0.989; Robust SRMR = 0.027, Robust RMSEA = 0.041, [90% LLCI: 0.033, 90% ULCI: 0.050].

For brevity, Fig. 1A–B presents just the estimates of each path, standard errors, and 95% confidence intervals pertinent to our hypotheses while omitting other variables (i.e., sex, age, ses, and political orientation) introduced as control variables. The coefficients for the paths from perceived provider support for SSP and perceived provider support for MAT to expectations for patient-provider interactions represent the estimated indirect effects via trust. As these paths show, perceiving that providers support SSP and perceiving that providers support MAT each predicted trust, and trust in turn predicted more positive expectations for patient-provider interactions.

To further test our mediational assumptions, we next tested a model in which trust predicts patient-provider interaction expectations indirectly through perceived provider support for SSP and perceived provider support for MAT, that is switching the antecedent and mediating variables. This model also fit the data well, Robust $\chi^2(30) = 179.84$, $p < .001$, Robust *CFI* = 0.978; Robust SRMR = 0.031, Robust RMSEA = 0.062, [90% LLCI: 0.053, 90% ULCI: 0.070]. Because the models in Fig. 1 and this alternative model are not nested, they could not be directly compared with the χ^2 statistic. However, we were able to compare the two models using the likelihood ratio tests in the methods that have been previously tested with SEM (Merkle, You and Preacher, 2016; Vuong, 1989) using the *R* package nonnest2 (Merkle and You, 2020). We made two adjustments to the estimations for the model

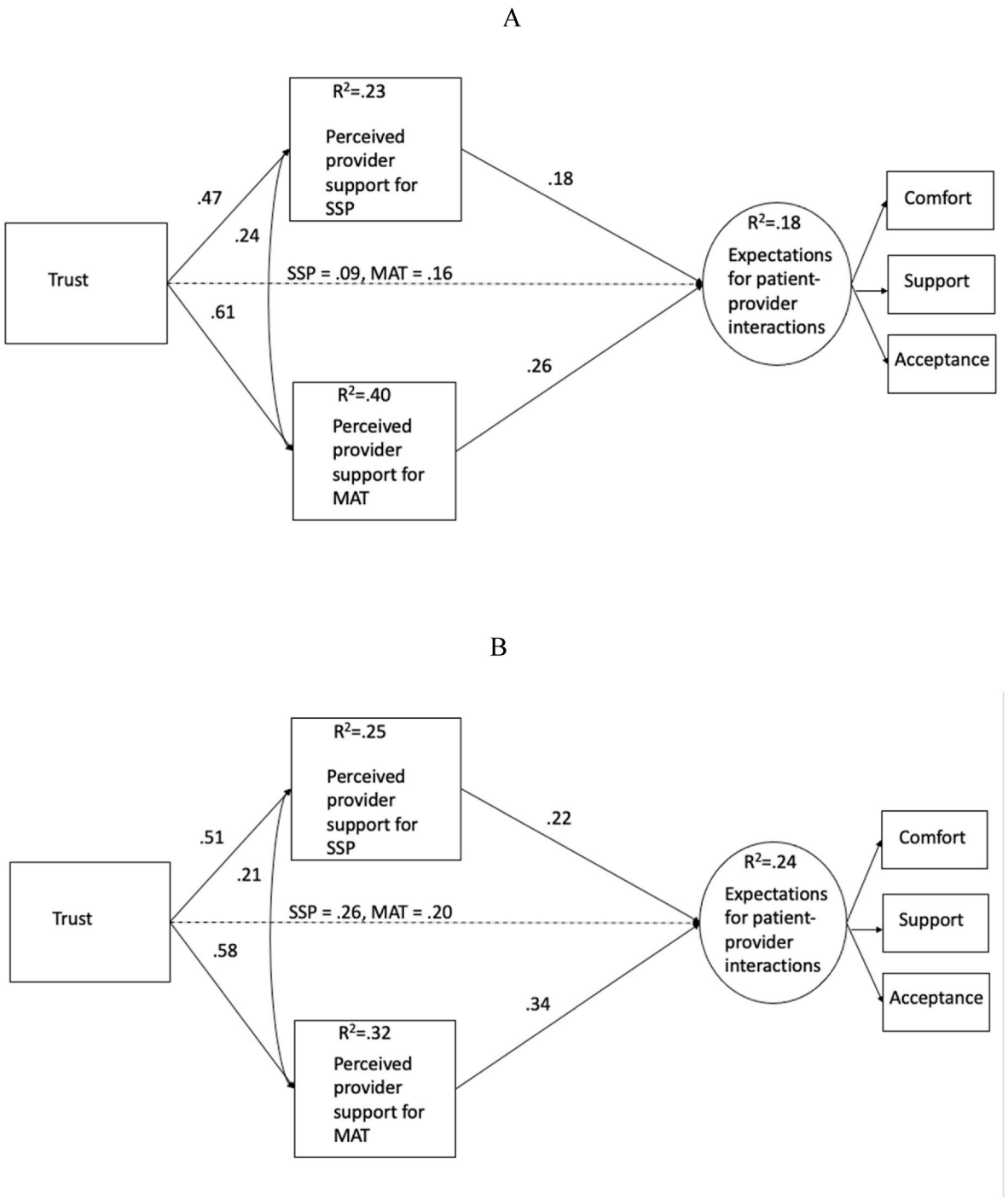

Fig. 2. A. Path model of trust shaping expectations of patient-provider interactions through perceived provider support for SSP and perceived provider support for MAT among those not reporting use. B. Path model of trust shaping expectations of patient-provider interactions through perceived provider support for SSP and perceived provider support for MAT among those reporting use.

comparison to fit the assumptions of the Voung test and to allow the function to work properly on R: (1) We did not use cluster-robust standard errors because the test assumes non-robust standard errors, and (2) we imputed means for missing data on continuous variables and the mode for the drug use grouping variable (imputing 122 values, or 4% of the data). This test indicates that the two models are distinguishable, $\omega^2 = 0.16$, $p < .001$ and $z = 2.13$, $p = <.017$, and that Model 1 (hypothesized model) fits the data better than Model 2 (the reverse model).

4. Discussion

In recent years, the U.S. has seen an epidemic of overdoses followed by spikes in HIV infections, which were new to rural (Peters et al., 2016) areas. Beyond predicting the location of future outbreaks (Van Handel et al., 2016), policymakers need to act to prevent them from happening. Although there are solutions that reduce infectious disease transmission by providing sterile syringes (Sawangjit et al., 2017) and SUD treatment (Fullerton et al., 2014), the stigma of both interventions (Madden, 2019) undermine their applicability. That is, people can more easily access MAT if it is prescribed to them. Although people could access methadone

Table 4b
Estimates of all paths in structural equation model for those reporting use.

Predicting perceived provider support for SSP					
Predictor variable	*B*	*SE*	*p*	LLCI	ULCI
Age	-.07	.04	.060	-.14	.00
Sex	.11	.08	.155	-.04	.26
Political	-.02	.04	.640	-.09	.05
SES	.03	.04	.500	-.05	.10
Predicting perceived provider support for MAT					
Age	.06	.04	.118	-.01	.13
Sex	.10	.08	.216	-.06	.25
Political	.01	.04	.692	-.06	.08
SES	.08	.04	.037	.01	.16
Predicting trust of providers					
Age	.10	.03	.001	.04	.15
Sex	.13	.05	.016	.02	.23
Political	.02	.03	.466	-.03	.07
SES	-.01	.03	.689	-.06	.04
SSP	.29	.03	<.001	.23	.35
MAT	.40	.03	<.001	.34	.46
Predicting expectations for patient-provider interactions					
Age	.04	.04	.383	-.05	.12
Sex	.10	.08	.188	-.05	.26
Political	.04	.04	.326	-.04	.11
SES	.15	.04	<.001	.07	.22
Trust	.53	.05	<.001	.43	.63
Indirect paths predicting expectations for patient-provider interactions through trust					
SSP	.15	.02	<.001	.11	.20
MAT	.21	.03	<.001	.16	.27
$\chi^2(32) = 60.35$					

The model also controls for covariance between all exogenous variables; perceived support for syringe services and MAT; and between the indicators of positive expectations for patient-provider interactions. Abbreviations for variable names include "political" for political ideology, "SSP" for perceived provider support for SSP, "MAT" for perceived provider support for MAT, and "Trust" for trust of providers. Abbreviations for standardized Beta, Standard Error, *p*-value, Lower-level Confidence Interval, and Upper-level Confidence Interval are *B*, *SE*, *p*, LLCI, and ULCI.

or buprenorphine illicitly, this medication is safer when accessed under a provider's care. In addition, although some may visit a syringe services site without their providers' recommendation, information about them will be more widely accessible if providers gave it.

Our study found that trust of providers mediated the relation between perceptions of providers' support for harm reduction strategies and positive expectations for patient-provider interactions. Whereas qualitative research has identified providers' negative perceptions about interventions as a barrier for PWID to access healthcare (Madden, 2019), the current research highlights the importance of reducing stigma to increase trust and ultimately improve positive expectations surrounding disclosure of non-medical drug use in patient-provider interactions. In contrast to past research that has largely taken a qualitative approach to examining treatment stigma as a barrier to access harm reduction services, our cross-sectional survey allowed us to test hypotheses regarding the role of perceptions and trust in predicting expectations about interactions with providers, and it allows us to examine these processes across samples that did and did not report non-medical drug use. This quantitative approach allows for predictions that future research can examine and build upon. Surveying the general population within areas that have been identified by the CDC as high-risk for opioid use allowed us to identify whether community members' trust in providers was associated with expectations before care. In contrast to past survey research suggesting that trust may only be important after care is initiated (Graham et al., 2015), the current research indicated that trust might be important for initial disclosure of non-medical drug use, particularly in the high-risk areas we examined (Kumar Mishra et al., 2020).

Across samples of those not reporting past use and those reporting past use, our research provides a possible framework for increasing trust and willingness to disclose non-medical drug use. Increasing perceptions of provider support for SSP and MAT may increase trust of providers and, more importantly, increase reliance on providers as a source of social support, acceptance, and health in the eventuality of non-medical drug use. Communities may be less vulnerable to the infectious sequelae of IDU if their members have positive expectations that providers will not devalue them for their non-medical use of drugs or for the treatment they may need.

The data showed minor but notable differences between those who did and did not report non-medical drug use. There were general differences suggesting that overall, those who reported use had more positive expectations of interactions with their providers, perhaps reflecting their actual experience disclosing use to providers. We suspect that those who were willing to report use on the survey may also be reporting it to their providers, when they have access. In contrast to the more positive expectations reported by those who reported drug use, we found slightly stronger associations between expectations of support for SSP and expectations of support for MAT , as well as between expectations of support for MAT and trust, among those who did not report use. These findings add support for the conclusion that trust is an important mechanism for seeking treatment before in addition to during treatment.

Our research was designed to examine the processes outlined in this paper, but inevitably not all of the crucial factors related to this stigma could be adequately addressed by a single study or even program of research. With regards to trust of healthcare providers and risks of disclosing non-medical drug use, our study did not address the key issue of racial disparities in both healthcare and enforcement of drug-related crime (Alexander, 2011; Williams and Mohammed, 2009). For people who identify as Black or African American, who have been disproportionately targeted, prosecuted, and punished for crimes related to drug use, this process is more complicated (Alexander, 2011; Moore and Elkavich, 2011). We explored descriptive differences on key measures within our sample, shown in Appendix C. Although both racial identity and socioeconomic factors likely play key roles in the interactions of African Americans with the health system, our study was not designed to examine these factors fully. In our own study, statistical power was low if including just African Americans, and studying the problem in this group will require a targeted sample of African Americans rather than a representative sample of the region. Future research should study a population of Black and African Americans and examine variability in ethnicity, age, income, education, and urban or rural place of residency.

Future research designed specifically to examine intersectional aspects of stigma, race, and socioeconomic status should address the role that these factors play in shaping trust and disclosure. Such future research may build onto qualitative research examining reasons why African Americans may have less access to harm reduction services (Eversman, 2015). Future work should also examine the intersecting roles of race and socioeconomic status in the proceses leading to interactions with providers and disclosure of non-medical drug use, as well as how these processes vary across geographic contexts.

Future research could also explore structural factors that may shape perceptions of support for harm reduction. For example, areas differ in how pharmacies dispense sterile syringes and the availability of syringe service programs. Past research in rural areas of Appalachia has documented low availability of needles and fear of arrest by law enforcement as reasons people do not access sterile needles (Davis et al., 2019). It is also possible that other factors related to law enforcement policies, such as arrest rates or prosecution practices in the county, may impact whether people feel comfortable disclosing non-medical drug use. In addition, people and regions differ in healthcare access, which may lead to providers being unavailable, pressed by time, or seemingly brash. These factors should also be analyzed in considering interactions with healthcare providers.

4.1. Key limitations

The main limitation of the study is the cross-sectional design, which limits causal inference. With the current data, our hypothesized model with trust as a mediator fit the data significantly better than an alternative model with trust preceeding perceived provider support for SSP and perceived provider support for MAT. Although our hypothesized model was a better fit, it is completely plausible that trust promotes perceptions that providers support SSP and MAT. Randomized controlled trials assigning participants to providers delivering messages that support harm reduction versus the standard of care could determine whether messages supportive of harm reduction enhance trust of providers and disclosure of non-medical drug use. Experiments varying exposure to harm reduction messages are necessary to ascertain what types of messages are most helpful.

4.2. Deviations from pre-registration

We pre-registered our hypotheses with Open Science Framework (O'Brien, 2020). However, we deviated from this registration. The original pre-registration used the broad term "authorities" to include government, healthcare providers, and religious leaders and discussed variables including community attributions and community trust, and "coercive forms of deterrence" as a contrast to support. We did not include all of these variables in our model. Our decision not to include these variables was because of parsimony and not a consequence of the data. We decided to test a parsimonious model that was theoretically sound, was in line with our original hypotheses, and that pertained to the topic of patient-provider interactions. In addition, we collected more data than initially intended, thus resulting in an *N* of 3096 rather than the pre-registered *N* of 2000.

5. Policy implications

How best to promote behaviors and expectations that reduce vulnerability to IDU-associated infections is a key policy question. Our study suggests that perceptions of healthcare provider support predict positive expectations about disclosing non-medical drug use, a key step in creating strategies that could promote use of harm reduction strategies more broadly (e.g., syringe services, naloxone education and provision) and SUD treatment. Such strategies may involve accountability for institutions and providers to proactively demonstrate their support for harm reduction strategies, thus undermining any perceptions of stigma for these strategies that may be a default assumption because of community norms. Our findings should encourage providers to promote the perception that regardless of public stigma or even stigma from professional peers, they will be supportive of evidence-based interventions, a gesture that appears essential for patients to take advantage of the full spectrum of care that providers can offer. Research on diversity in organizations suggests that subtle cues supporting diversity can increase feelings of safety for members of groups whose identities may be devalued in settings that do not value diversity (Purdie-Vaughns et al., 2008). Extrapolating from this research, one strategy to increase positive expectations among patients who engage in non-medical use of drugs might be to include posters or pamphlets de-stigmatizing MAT and syringe services, making such information visible to all patients. This future research would also establish specific actions that community members perceive as demonstrating that they do not support harm reduction services, perhaps building upon research framing conditions as malleable (McGinty et al., 2015).

Our results leave open the question of how best to promote support for such strategies, and thus this remains an important question for future research that could also demonstrate definitive causal evidence of the relation between support and disclosure behavior. Interventions may be tested at the institutional level, such as through educational institutions that may instill anti-stigma values in future physicians, physicians assistants, nurses, and medical assistants. Interventions that involve training of professionals delivering services or training to deliver services among, for example, medical students, have demonstrated efficacy in reducing stigmatizing attitudes towards people with substance or alcohol use disorder (Bland et al., 2001; Livingston et al., 2012; Meng et al., 2007; Ramirez-Cacho et al., 2007). Programs that train providers may also be effective in reducing provider-based stigma (Welsh et al., 2016). However, the research documenting these effects has not identified whether these interventions impact perceptions of stigma among the targets of the stigma (Pescosolido and Martin, 2015). Future research could test the efficacy of interventions that decrease both the provider-based stigma (Madden, 2019) and the perceived stigma among PWID. This research should also examine whether certain interventions reduce stigma among service providers and authorities across professional domains and organizations, as not all interventions are equally effective across different types of service providers (Welsh et al., 2016). Such interventions would need to be rigorously evaluated through randomized control trials with multiple follow–ups, measuring perceptions by both providers and patients. If causal relations between these perceptions and disclosure are established and interventions are successful, future research should also assess whether the interventions result in more access to harm reduction services and better health outcomes including lower transmissions of infectious disease (Sawangjit et al., 2017) and successful SUD treatment outcomes (Fullerton et al., 2014). Our research suggests that it may be helpful to the general population in communities, whether they currently inject drugs or not, if providers could actively indicate support of syringe services programs and SUD treatment to motivate disclosure now or in the future and maximize their potential to improve care.

Credit author statement

TCOB designed the survey and developed the research questions in consultation with JF and DA. The grant awarded to DA provided funding for the survey. TCOB conducted analyses with DA and received feedback from JF and RG. TCOB conceptualized the paper in consultation with all authors. TCOB drafted the paper with feedback and revisions from all authors. GROV provided consultation on factors affecting policy attitudes and the role of providers in our target counties. TCOB designed the survey and developed the research questions in consultation with JF and DA. DA provided funding for the survey. TCOB conducted analyses with feedback from JC and RG. TCOB conceptualized the paper in consultation with all authors. TCOB drafted the paper with feedback and revisions from all authors.

Declaration of competing interest

None.

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Appendix A. Supplementary data

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