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COVID-19 vaccine deliberation among people who inject drugs

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ABSTRACT

Background: People who inject drugs (PWID) are at greater risk for severe morbidity and mortality associated with COVID-19 due to comorbid, chronic, medical conditions and structural inequities associated with housing instability and incarceration. As such, they are a population that would greatly benefit from COVID-19 vaccination.

Methods: We surveyed 350 syringe exchange clients between March 2021 and June 2021 to collect information on vaccine uptake among PWID, facilitators and barriers to vaccination, and demographic correlates of vaccine hesitancy.

Results: Findings highlight that among PWID, vaccination access was remarkably low with only 10% of the sample receiving a COVID-19 vaccine. Vaccine acceptability among people who were unvaccinated was 42% highlighting barriers to access. Motivation for vaccination included a desire to keep family members and other community members safe and a desire to feel safe around other people. Barriers to vaccination included concerns about vaccine side effects, lack of concern surrounding the effects of COVID-19, and insufficient information about how the vaccine works, along with general distrust of the vaccine development and deployment process.

Conclusions: There is a need for structural interventions and individual behavioral interventions to improve COVID-19 vaccine access and uptake among PWID. Limitations and implications for next steps and future directions are discussed.

1. Introduction

Widespread vaccination is an important milestone in limiting the spread of COVID-19 in the United States, yet the nation fell short in achieving high vaccination rates, particularly in the early stages of vaccine roll out. Predictive models suggested that a nationwide vaccination rate of 70 percent would halt the spread of SARS-CoV-2 infection and pave the way to herd immunity (Randolph and Barreiro, 2020). However, at the time of writing, the United States was still far below this metric, with only 59.3% of the population fully vaccinated (Mayo clinic vaccine tracker; accessed SEPT 15, 2021), despite the full FDA approval of the Pfizer mRNA vaccine in August 2021. Low rates of vaccination uptake not only hinder population-level herd immunity but may create an evolutionary environment that promotes viral evolution toward higher transmissibility (Anderson and May 1982). Given the important role vaccines play in preventing the spread of pathogens, understanding the facilitators and barriers to vaccine access and uptake is integral to developing strategies to achieve higher rates of vaccination both in the present day and for future efforts. These strategies are especially important — and can be complex — in subpopulations with increased vulnerability to disease.

People who inject drugs (PWID) are unlikely to be vaccinated for preventable infectious diseases due to structural barriers to access such as lack of insurance coverage, transportation challenges, and medical stigmatization. Congregate living settings and sharing of equipment also put PWID at greater risk for transmission of SARS-CoV-2 (Vasylyeva et al., 2020). Early in vaccination roll out it is probable that widescale efforts to disseminate the vaccine did not meet the needs of PWID given the previously described barriers. PWID are also especially at risk for severe morbidity due to COVID-19 and mortality because they are more likely to have underlying medical conditions (Iversen et al., 2021). These conditions include infectious diseases such viral hepatitis A, B, and C; human immunodeficiency virus (HIV); and sexually transmitted infections as well as cardiovascular and respiratory conditions (Aldridge et al., 2018; Bradshaw et al., 2005; Hagan et al., 2005; Koslik et al., 2020). PWID may also have lower vaccine acceptance compared to the general population. In December 2020, prior to vaccine availability, 100 PWID in Australia were asked about their hypothetical likelihood of receiving a COVID-19 vaccine. They reported a lower like-

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lihood of vaccine uptake than persons in the general population, with 57% of PWID reporting they were likely to get vaccinated compared to 77% in the general Australian population (Dietze et al., 2021). Safety concerns were the most frequently cited reasons for vaccine avoidance.

Although others have called for an urgent need to provide COVID-19 vaccines to PWID (Zard et al., 2021), to our knowledge, there have been no studies that have examined facilitators and barriers to COVID-19 vaccination access and uptake among PWID, aside from the hypothetical data collected from PWID in Australia (Dietze et al., 2021). Understanding COVID-19 vaccine uptake among PWID during vaccine roll out will help inform future efforts towards vaccination for PWID. The purpose of this study was: 1) to determine the uptake of COVID-19 vaccines among PWID during the early phase of COVID-19 vaccination efforts, 2) examine facilitators and barriers to vaccination among PWID, and 3) to investigate the demographic correlates of vaccine acceptability and hesitancy.

2. Methods

2.1. Design, setting, participants

This study was part of a larger project designed to implement a SARS-CoV-2 testing program at syringe exchange programs in Oregon as part of the National Institutes of Health Rapid Acceleration of Diagnostics for Underserved Populations initiative (RADx-UP). We partnered with an Oregon-based non-profit to implement a SARS-CoV-2 testing program at nine syringe exchange programs across the state of Oregon, representing four counties (two rural, two small urban). As part of the testing program, data characterizing vaccine deliberation/hesitancy were routinely collected from each individual tested. Thus, participants were syringe exchange clients who utilized the SARS-CoV-2 testing program between March 3, 2021 and June 22, 2021 ($N = 350$ unique individuals). For participants who utilized the testing program multiple times, the individual's most recent data were analyzed to incorporate the most current individual information.

Syringe exchange clients had to be 18 years or older to participate in the survey. People who were not syringe exchange clients but engaged in testing at an exchange were excluded from analyses (e.g., staff, people who were utilizing other services on site). Individuals provided informed consent prior to participation and were given a $10 gift card for their participation in the survey and testing. The survey included information on demographics and common data elements required by the funding agency on vaccine status and vaccine deliberation. This study was approved by the University of Oregon Institutional Review Board.

2.2. Measures

2.2.1. Demographics

Participants self-reported their demographic characteristics, see Table 1. These included age, race and ethnicity, gender identity, education, housing status, employment status, insurance coverage, and income. Age was included as a continuous variable in the regression analysis. Clients could select multiple options for race and ethnicity. In the regression analysis, race and ethnicity were coded as White versus non-White due to low counts for each demographic group. Clients could select multiple options for gender identity. Gender identity was included in the regression analysis as a binary predictor coded as female versus male. Given small counts, those who identified as something other than male or female were excluded from analyses. Educational background was included in the regression analysis as a binary predictor with a high school diploma or more (0) and less than high school diploma or GED (1). Housing status was included in the regression analysis as a binary predictor with permanent housing (0) and temporary housing or unhoused (1). Employment status was included in the regression analysis as a binary predictor with employed, student, retired, or homemaker (0) and unemployed (1). Insurance coverage was included in the regression analysis as a binary predictor with private or public insurance (0) and uninsured (1). Income was coded as a categorical variable in the analyses with $40,000–$74,999; $75,000–$99,999; and $100,000 and above recoded as $40,000 or more.

Table 1
Participant Demographic Characteristics.

Variable	Valid *n*	*M* (*SD*) or %
Age	350	43.8 (11.6)
Gender	343	
Non-binary		1%
Woman		34%
Man		62%
Other		<1%
Prefer not to answer		3%
Transgender	350	1%
Hispanic	350	4%
Race	339	
Native Hawaiian or Pacific Islander		1%
White		78%
Indigenous		9%
Black or African American		2%
Middle Eastern/North African		<1%
Asian		1%
More than one race		1%
Other		4%
Prefer not to answer		3%
Educational background	346	
Have never gone to school		1%
5th grade or less		1%
6th to 8th grade		3%
9th to 12th grade		16%
High school graduate or GED completed		32%
Some college level / technical / vocational		39%
Bachelor's degree		7%
Other advanced degree		2%
Housing status	344	
Unhoused		70%
Temporary housing		13%
Permanent housing		13%
Prefer not to answer / Don't know		5%
Employment status	331	
Working now		6%
Temporarily laid off, sick or maternity leave		3%
Looking for work, unemployed		38%
Retired		6%
Disabled, permanently or temporarily		24%
Student		<1%
Other		5%
Prefer not to answer / Don't know		18%
Health insurance status	345	
None		9%
Oregon Health Plan (Medicaid)		74%
Medicare		6%
Tricare		1%
VA Insurance		3%
Private		1%
Don't know / Prefer not to answer		6%
Income	310	
Less than $15,000		78%
$15,000 - $19,999		10%
$20,000 - $24,999		4%
$25,000 - $29,999		2%
$30,000 - $34,999		2%
$35,000 - $39,999		2%
$40,000 or more		3%
Received COVID-19 vaccine	340	
No		88%
Yes		10%
Don't know / Prefer not to answer		2%
Intentions to get vaccinated scale score	290	3.1 (1.8)

Note. The sample included 350 participants. Intentions to get vaccinated were only assessed for the 306 participants who were not already vaccinated. Rates of missing data ranged from 0% to 11% for income.

Table 2
Summary of Reasons For and Against COVID-19 Vaccination among Vaccine-Hesitant and Vaccine-Interested Participants.

Reasons	Vaccine-Hesitant		Vaccine-Interested	
	Count	Percent of Cases[†]	Count	Percent of Cases
Reasons for COVID-19 Vaccination…				
I don't want to get really sick from COVID-19	11	15%	35	29%
I want to keep my family safe	9	12%	79	65%
I believe life won't go back to normal until people get a COVID-19 vaccine	7	9%	21	17%
I want to keep my community safe	5	7%	55	45%
I want to feel safe around other people	5	7%	38	31%
I have a chronic health problem, like asthma or diabetes	4	5%	33	27%
My doctor told me to get a COVID-19 vaccine	2	3%	15	12%
Reasons against COVID-19 Vaccination…				
I'm concerned about side effects from the vaccine	27	36%	33	27%
I'm not concerned about getting really sick from COVID-19	23	30%	14	12%
I don't know enough about how well a COVID-19 vaccine works	21	28%	30	25%
I don't believe the COVID-19 pandemic is as bad as some people say it is	20	26%	11	9%
I don't think vaccines work very well	13	17%	6	5%
I don't like needles	8	11%	13	11%
I don't want to pay for it	8	11%	12	10%
I'm allergic to vaccines	5	7%	6	5%
Other	29	38%	15	12%

Note. Vaccine-Hesitant participants indicated that they were "not at all likely" or "definitely not getting the vaccine" (n = 78). Vaccine-Interested participants indicated that they were "very likely" or "fairly likely" to get the vaccine (n = 122). [†]Two Vaccine-Hesitant participants indicated no reasons for or against vaccination.

2.2.2. Vaccination status/uptake and intentions to get vaccinated

Participants were asked, "Have you ever received a COVID-19 vaccine?" Participants who were unvaccinated were asked, "How likely are you to get an approved COVID-19 vaccine when it becomes available?" Response options were: *very likely* (1), *fairly likely* (2), *don't know* (3), *not too likely* (4), *not at all likely* (5), *definitely not* (6), and *prefer not* (coded as missing). Thus, higher scores indicated greater vaccine hesitancy or lower intentions to get vaccinated. For subgroup analyses, we defined Vaccine-Interested and Vaccine-Hesitant participants. Vaccine-Interested participants indicated that they were "very likely" or "fairly likely" to get the vaccine (n = 122). Vaccine-Hesitant participants indicated that they were "not at all likely" or "definitely not getting the vaccine" (n = 78). Participants who responded "not too likely" (n = 34), "don't know" (n = 56), "prefer not to answer" (n = 13), or did not respond (n = 47) were excluded from subgroup analyses.

2.2.3. Facilitators and barriers towards vaccination

Participants who had not yet been vaccinated were also asked questions about facilitators and barriers for getting vaccinated. For facilitators, participants were asked, "Why would you get a COVID-19 vaccine?" Participants could select multiple responses and could also indicate *other* and write-in other facilitators for getting vaccinated. See Table 2 for response options.

For barriers, participants were asked, "Why would you NOT get a COVID-19 vaccine?". Participants could select multiple responses and could also indicate *other* and write-in other barriers to vaccination.

2.2.4. Statistical analyses

We used a multiple response analysis to describe the various reasons participants cited for and against COVID-19 vaccination uptake. Univariate descriptive statistics were examined for all other study variables. We estimated a series of regression models to examine demographic correlates of vaccine hesitancy, with standardized regression coefficients (βs) reported as measures of effect size. We first examined each predictor separately to estimate unadjusted associations with vaccine hesitancy, then entered all statistically significant predictors simultaneously to obtain adjusted associations. Alpha was set to 0.05 and all analyses were performed in SAS version 9.4 (SAS Institute, 2017). We assessed whether there was evidence of multicollinearity in the adjusted model, as evidenced by tolerance values greater than 0.1 and variance inflation values less than 10 (Aiken and West, 1991; Cohen and Cohen, 2003).

3. Results

3.1. Descriptive statistics and vaccine uptake

Sample characteristics and study variables are reported descriptively in Table 1 and are presented as a valid percent for categorical variables or means and standard deviations for continuous variables. Overall, 34 (10%) study participants indicated that they had received a COVID-19 vaccine. Among the participants who had not yet received a vaccine and responded to subsequent survey items, 122 (42%) reported a desire to get vaccinated (i.e., *very likely* or *fairly likely to get vaccinated*), and 78 (17%) were hesitant (i.e., *not at all likely* or *definitely not getting a vaccine*).

3.2. Facilitators and barriers to vaccination

The left column of Table 2 summarizes reasons why Vaccine-Interested participants (n = 122) would and would not get the vaccine. All 122 Vaccine-Interested participants provided at least one reason for or against vaccination. The most common reasons endorsed in favor of vaccination among this subgroup were "I want to keep my family safe" (65%, n = 79), "I want to keep my community safe" (45%, n = 55), and "I want to feel safe around other people" (31%, n = 38). The most common reasons endorsed in opposition of vaccination among the Vaccine-Interested subgroup were "I'm concerned about side effects from the vaccine" (27%, n = 33) and "I don't know enough about how well a COVID-19 vaccine works" (25%, n = 30).

The right column of Table 2 summarizes reasons why Vaccine-Hesitant participants (n = 78) would and would not get the vaccine. Among the 78 Vaccine-Hesitant participants, 76 provided at least one reason for or against vaccination. The most common reasons endorsed in favor of vaccination among this subgroup were "I don't want to get really sick from COVID-19″ (15%, n = 11) and "I want to keep my family safe" (12%, n = 9). The most common reasons endorsed in opposition of vaccination among the Vaccine-Hesitant subgroup were "Other" (38%, n = 29), "I'm concerned about side effects from the vaccine" (36%, n = 27), "I'm not concerned about getting really sick from COVID-19″ (30%, n = 23), "I don't know enough about how well a COVID-19 vaccine works" (28%, n = 21), and "I don't believe the COVID-19 pandemic is as bad as some people say it is" (26%, n = 20).

Table 3
Results of Regressing Vaccine Hesitancy (as contrasted to Vaccine-Interest) on Demographic Characteristics.

Predictor	Unadjusted Results			Adjusted Results	
	n	*β*	*p-value*	*β*	*p-value*
Age	290	−0.13	.0279	−0.18	.0457
Non-White	277	.02	.6964		
Female	278	.05	.4320		
Less than high school diploma or GED	289	−0.06	.2891		
Unhoused or temporary housing	273	.12	.0446	.02	.8166
Unemployed	146	.22	.0086	.11	.2493
Uninsured	275	.03	.6101		
Income	262	−0.03	.5988		

Note. β = standardized regression coefficient. Unadjusted results are based on separate regression models for each predictor. n = number of participants with data for each predictor variable. Adjusted results are based on a model with age, housing status, and employment as simultaneous predictors, and included 125 participants with valid values for all predictors.

3.3. Demographic correlates of vaccine acceptability and hesitancy

We found several significant correlations between sociodemographic characteristics and vaccine hesitancy (Table 3). In unadjusted analyses, vaccine hesitancy was significantly associated with age ($\beta = -0.13$, $p = .0279$), housing status ($\beta = 0.12$, $p = .0446$), and employment status ($\beta = 0.22$, $p = .0086$). Participants who were younger, in temporary housing or unhoused (versus permanent housing), and unemployed reported greater levels of vaccine hesitancy. In adjusted analyses, age was the only predictor that explained unique variance in vaccine hesitancy ($\beta = -0.18$, $p = .0457$). There was no evidence of multicollinearity in this adjusted model.

4. Discussion

The purpose of this study was to: 1) to determine the uptake of COVID-19 vaccines among PWID during the early phase of COVID-19 vaccination efforts, 2) examine facilitators and barriers to vaccination among PWID, and 3) to investigate the demographic correlates of vaccine acceptability and hesitancy. We collected surveys from syringe exchange clients across the state of Oregon from March through June, and we found vaccine access was low among this population given 42% of PWID desired to become vaccinated but only 10% of PWID had received the COVID-19 vaccine . We also found that the main facilitators for wanting a vaccine were a desire to keep family and community members safe as well as a desire to feel safe around other people. The main barriers to vaccination were concerns about vaccine side effects, lack of concern about the effects of COVID-19, and insufficient information about how the vaccine works, along with general distrust of the vaccine development and deployment process. Finally, younger age, experiencing homelessness, and being unemployed were associated with greater vaccine hesitancy; however, only age was associated with vaccine hesitancy in the adjusted model. Findings have implications for the uptake of additional vaccines relevant for PWID including the existing vaccines for hepatitis B and hepatitis A and future vaccines for HCV, HIV, and sexually transmitted infections.

Limitations of this study included the temporal effects of study participation and vaccine rollout. Specifically, at the beginning of March 2021, approximately 665,000 people in Oregon had been vaccinated, representing just 19.5% of the adult population, whereas, by the end of August 2021, approximately 2461,000 people were vaccinated, representing 72.3% of the adult population in Oregon (Oregon Health Authority, n.d.). Thus, individual data from March may have reflected lower or higher social acceptance early on during vaccine roll out. Regardless, low vaccine uptake across this time frame is an indication that syringe exchange clients were not well reached, which is acutely problematic, given the increased risk for severe disease morbidity and mortality among this population. Additionally, assessing vaccine uptake at the time of vaccine rollout clarifies the limited access to vaccines experienced by PWID during this time period. An additional limitation is that data were collected as part of SARS-CoV-2 testing offered on site; it is unclear whether this population may be more, less, or equally as willing to get vaccinated compared to syringe exchange clients who did not participate in SARS-CoV-2 testing. Our sample size may have resulted in low power to detect the significance of unstable housing and employment in the adjusted regression model. Finally, because the population of Oregon is less racially diverse than other parts of the country and there was insufficient data to disaggregate racial and ethnic groups to look at between group differences (~22% non-White), we are not able to generalize to more diverse samples of syringe exchange clients. This is relevant because previous research suggests that non-White populations, particularly people who identify as Black, are less likely to receive vaccinations (Fisher et al., 2020; Kreps et al., 2020; Masson et al., 2021) compared to people than those who identified as White.

Limitations notwithstanding, this study provides important information regarding vaccine uptake, facilitators and barriers to uptake, and correlates of vaccine hesitancy. Specifically, from March through June, vaccine uptake was remarkably low among PWID (10%). However an additional 42% of unvaccinated people had a desire to be vaccinated. These statistics highlight that PWID have fewer opportunities for vaccine access given there were no systematic efforts to provide vaccines to PWID at syringe exchange during the study time frame, as reported by the partner organization. Prior research on hepatitis A and hepatitis B vaccines suggests that immediate access to vaccines is an effective strategy for increasing vaccine utilization among PWID (Campbell et al., 2007). Thus, offering COVID-19 vaccines at syringe exchange programs could be an effective strategy for increasing vaccination rates.

Additionally, of those who were unvaccinated, there was a high degree of uncertainty and some hesitancy with 41% *unsure* and 17% classified as Vaccine-Hesitant. Only 42% endorsed that they were *fairly likely* or *very likely* to receive the vaccine if available. This is much lower than general vaccine acceptability among the United States, which at the time of writing was estimated at approximately 79% using similar measures (Khubchandani et al., 2021). However, this is similar to another study among people with substance use disorders finding that only 39.5% of people trusted that the COVID-19 vaccine would be safe and effective (Masson et al., 2021). These findings demonstrate that although PWID are at greater risk for morbidity and mortality associated with COVID-19, they are less likely to find vaccination acceptable.

To identify potential solutions to improve vaccine acceptance, we examined factors contributing to vaccine acceptance and hesitancy. We found that the main facilitators for vaccine acceptability were: were

a desire to keep family safe, a desire to keep other community members safe, and a desire to feel safe around other people. We found that the main barriers to uptake were: concerns about vaccine side effects, a lack of concern about getting COVID-19, not knowing enough about how the vaccine works, and general distrust of the vaccine development and deployment process. This was true for both Vaccine-Interested and Vaccine-Hesitant participants who had not yet been vaccinated. These findings are consistent with findings among similar demographics, such as people living with HIV, experiencing homelessness, and individuals affected by substance misuse. (Masson et al., 2021; Rodriguez et al., 2021; Vallée et al., 2021). The reasons for hesitancy among PWID also mirror reasons for hesitancy among the general population (Cascini et al., 2021). They also mirror facilitators and barriers to vaccination for available vaccines such as influenza, hepatitis B, and pneumococcal vaccines among PWID (Campbell et al., 2007; Lum et al., 2003; McGregor et al., 2003; Price et al., 2021; Stancliff et al., 2000).

Behavioral interventions for overcoming individual barriers for COVID-19 and other vaccines may include direct education, motivational interviewing, and/or financial incentives (Campbell et al., 2007; Finney Rutten et al., 2021; Lum et al., 2003; Wake, 2021). Given the heightened medical vulnerability of this population, direct educational interventions to improve vaccine acceptance and address hesitancy (e.g., concerns about side effects) should be nested within the intersectional experiences of living with chronic illness, such as HIV, HCV, and substance use (HIV Medicine Association, 2021). Additional intervention considerations may include using peers or street outreach workers to engage PWID in vaccination (Lum et al., 2003; McGregor et al., 2003; Price et al., 2021; Stancliff et al., 2000). Identifying ways to build trust in healthcare providers through healthcare provider training may also lead improved vaccine acceptance (Mellis et al., 2021).

Finally, younger age, experiencing homelessness, and being unemployed were associated with greater vaccine hesitancy. Although these are useful indicators for intervention targets, the proportion of variance explained by each of these predictors is low, suggesting that beyond demographic correlates, there are likely other targets for intervention that would be more efficient for increasing vaccination uptake among PWID. These may include addressing structural barriers to access by providing vaccines in a more convenient location such as at syringe exchange sites, coming to clients where they are via mobile van, or establishing pop-up clinics near where clients live for those living in tent camps (Arcadepani et al., 2021; Campbell et al., 2007; Rodriguez et al., 2021). These strategies could be leveraged for COVID-19 vaccinations, including booster immunizations, and for other vaccinations that may be of particular value for PWID.

5. Conclusion

There is an apparent need to provide immediate access to vaccines for PWID and to address barriers to vaccine uptake. During a period of vaccine urgency, uptake did not match willingness. The barriers to vaccine uptake expressed and experienced among PWID during the COVID-19 pandemic have implications for the uptake of additional vaccines relevant for this population including the existing vaccines for hepatitis B and hepatitis A and future vaccines for HCV, HIV, and sexually transmitted infections. Future efforts to reach vulnerable populations must prioritize reach to vulnerable populations through co-location at sites where individuals are already receiving services.

6. Contributors

Camille Cioffi, Anne Marie Mauricio, Hannah Tavalire, and Derek Kosty were involved in the study design and obtaining funding for the project and contributed to manuscript development. Sarah Nachbar and Christopher Capron contributing to drafting the manuscript. All authors contributed to the work and have reviewed and approved the submitted manuscript.

Declaration of Competing Interest

None of the authors have a conflict of interest to declare.

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