Zovich *et al. Harm Reduction Journal* (2024) 21:199
https://doi.org/10.1186/s12954-024-01117-4

Harm Reduction Journal

RESEARCH Open Access

Identifying barriers to hepatitis B and delta screening, prevention, and linkage to care among people who use drugs in Philadelphia, Pennsylvania, USA

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Abstract

Background People who use drugs (PWUD) are at increased risk for blood-borne viruses, including hepatitis B (HBV) and delta (HDV). Despite the public health threats both viruses present, awareness remains low among at-risk communities and providers who serve them. This study assessed barriers to HBV and HDV prevention, diagnosis, and linkage to care, evaluated existing levels of knowledge, and identified educational needs and preferences among both PWUD and service providers.

Methods For this mixed-methods study, data were collected through an anonymous online provider-focused survey, and interviews with PWUD, non-medical staff, and healthcare providers at a harm reduction organization in Philadelphia, PA, USA. Convenience sampling was used for recruitment of both key informants and survey respondents. Survey respondents were categorized according to their type of practice. For the interviews, a codebook was created for qualitative analysis. Data were subsequently organized into thematic categories.

Results The top provider-related barriers limiting HBV screening were identified as confusion about insurance coverage (48%) and competing priorities (45%). Barriers to vaccination included patient hesitancy (52%) and challenges with administering multiple doses (39%). Respondents indicated low knowledge of HDV tests (62%) and cited guideline complexity (31%) as barriers to HDV testing. HBV and HDV awareness within the community and among staff was poor. Findings demonstrated that stigma related to drug use and harm reduction posed a significant barrier to care. Participants recommended awareness campaigns tailored for the PWUD community that are non-stigmatizing and non-judgmental, clear, factual, digestible, and interactive, with empowering steps to protect health.

Conclusion This study identified major gaps in HBV and HDV service delivery for PWUD, including poor basic knowledge, the need to address this through culturally appropriate, non-stigmatizing and tailored educational programming, and challenges with access to vaccination and testing. Continued initiatives are needed to close disparities, and to continue to provide financial and political support for harm reduction organizations, a frequently

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cited facilitator of healthcare access for PWUD. Significant efforts are essential to address lack of vaccination, testing, and linkage to care, and to improve health outcomes among PWUD.

Keywords Hepatitis B, Hepatitis delta, Harm reduction, People who inject drugs, People who use drugs

Background

Around the world, more than 15.6 million people inject drugs, many of whom also live with serious health conditions [1]. In the United States (U.S.), the number of individuals who have injected drugs in their lifetime is more than 6.5 million [2]. The population of people who use drugs (PWUD), and particularly people who inject drugs (PWID), is especially vulnerable to infection with bloodborne viruses, as unsafe injection practices increase one's risk of exposure to viral infections [3]. The most serious virological threats confronting this group are human immunodeficiency virus (HIV) and hepatitis B, C, and delta [4]. PWUD have a heightened risk for developing infection with chronic hepatitis B virus (HBV) and hepatitis delta virus (HDV) in particular, due to decreased immune functioning from long-term drug use and co-infections with hepatitis C virus (HCV) and HIV [5, 6]. Studies with PWID have found that HBV prevalence ranges between 4% and 12% in the U.S. and stands at 9.1% in the global PWID population [1, 7].

Since 2009, an increase in both opioid misuse and injection drug use has resulted in a rise in acute HBV cases. In 2015, 30.3% of people newly infected with HBV reported a history of injection drug use [5, 8]. Epidemiological data for HDV among PWID are limited, but a recent systematic review of global HDV prevalence indicates that PWID do have increased odds of HDV seropositivity compared to the general population [9]. Despite the significance of HBV and HDV as major public health concerns, levels of awareness of both viruses among both at-risk communities and healthcare providers remain low [10, 11]. Literature has demonstrated that only about one third of individuals in the U.S. are aware of their HBV infection and even fewer receive treatment [12, 13].

Although guidelines from the American Association for the Study of Liver Disease (AASLD) recommend screening for HBV for all groups considered to be at high risk, including people who use drugs, and screening for HDV among all PWUD who test positive for hepatitis B surface antigen (HBsAg), diagnosis and prevention of infection with both viruses remain infrequent in these communities, due to a wide variety of barriers among both PWUD and the providers who serve them at the systemic, interpersonal, and individual levels [14]. The aim of this mixed-methods study was to identify barriers and facilitators to HBV and HDV screening, prevention, diagnosis, and linkage to care, assess knowledge and awareness of both viruses, and understand educational needs and preferences among PWUD and providers who serve them.

Methods

This cross-sectional, mixed-methods study employed an anonymous online survey of healthcare providers who self-reported providing HBV services, and qualitative interviews with key informants specifically in a harm reduction setting in Philadelphia, PA, USA from March through June 2023. The English language survey was informed by literature review and key opinion leaders and was distributed to the Hepatitis B Foundation (HBF)'s listservs, partner members, and hepatitis B Project ECHO (Extension for Community Health Outcomes) network, as well as to providers within a large, academic health system. The survey was housed on SurveyMonkey™ and was aimed at U.S.-based providers. Estimated time for completion was 10 min, and the survey remained open for three months. Only one survey response was allowed per person. All survey questions are available in Addendum 1.

A total of 18 interviews were also conducted at a harm reduction organization (HRO) in Philadelphia, PA, U.S., among staff, health care providers and participants with lived experience. To be eligible to participate in key informant interviews, participants were required to be at least 18 years of age, reporting current or any drug use, or currently providing services for individuals engaging in these behaviors, and able to provide consent for participation in English. Research staff identified and invited eligible people to participate. Convenience sampling was used to recruit eligible interview participants at the HRO, and the response rate was 100%.

Before each interview, trained research staff obtained informed consent for participation and audio-recording purposes. After consenting, all participants with lived experience completed a demographic survey, which included questions about age, race/ethnicity, gender identity, sexual orientation, primary language, and drug use behaviors. All interview guides used for this process were informed by the literature. All participants were compensated $10 cash for their time. Interview guides and demographic survey questions are available in Addendum 2.

This study was approved by Heartland IRB (Project Number 02202023-457) and by the City of Philadelphia Department of Public Health Institutional Review Board (Project Number: 2023-33).

Data analysis

Quantitative

After the provider survey data were collected, the results were exported into a Microsoft Excel file. Participants were categorized into three roles based on responses: public health and community workers (case managers, community outreach specialists, peer support providers, etc.), clinicians (advanced practice providers, general practitioners, and hepatologists), and researchers (Table 1). The main outcome variables measured were (1) barriers to screening for HBV and HDV, (2) knowledge of HBV and HDV, (3) services provided for HBV and HDV, and (4) level of confidence of different providers in explaining test results and counseling patients. Barriers to screening were measured using a "check all that apply" question with various reasons why HBV or HDV screening may be difficult. Participants could also write in their own responses. Percent values were assigned to each response to determine salience of the option choice among the study population. To capture differences in confidence levels in explaining and counseling patients on HBV and HDV test results, two independent-sample Kruskal-Wallis (KS) Tests were run to determine if there was a statistically significant difference in distribution of scores between the three categories of roles. Participants with missing responses to confidence questions were excluded from KS analysis.

Table 1 Provider demographics

Category	Frequency	% of total (*N*=56)
Role		
Public Health and Community Workers	20	35.7
Clinical Medicine	35	62.5
Research	1	1.7
Years in Role		
0–5 years	25	44.6
6–10 years	11	19.6
11–15 years	5	8.9
16–20 years	3	5.3
More than 20 years	12	21.4
Location of Work		
Academic Institution	29	51.7
Federally Qualified Health Center	1	1.7
For-Profit Hospital	1	1.7
Non-Profit Hospital	7	12.5
Private Practice	3	5.3
Public Health Department	4	7.1
Public Hospital	2	3.5
Specialist Clinic	2	3.5
Other	12	21.4

Table 1 outlines the demographic characteristics of providers who participated in the online survey

Qualitative

All interviews were audio-recorded and transcribed verbatim, using DataGain Services. The data were analyzed using qualitative techniques by creating a codebook for data organization; codes were developed by review of the literature (a priori) and through the line-by-line reading of a subsample of transcripts [15]. Each code was assigned a specific definition to ensure coding accuracy and improve inter-coder reliability (ICR). Data coding and analysis were facilitated through NVivo 14 software (QRS International, Doncaster, Australia). All data were independently double coded by two researchers to ensure coding accuracy. The analysis team met throughout the coding process to discuss and resolve differences in coding. ICR was assessed repeatedly using the kappa coefficient to identify coding discrepancies. Based on the kappa analysis, the coding agreement ranged from moderate to almost perfect agreement between coders (range 0.58 to 0.91). After coding was complete, data were reviewed and organized into thematic categories. Findings from this portion of the study were used to inform the creation of a culturally appropriate and tailored educational campaign to improve knowledge and awareness of HBV and HDV within the PWUD community for both community members and providers.

Results of provider-focused surveys

Provider demographics

This study consisted of 56 participants from various fields of healthcare. Years in practice, location of work, and respondent roles were captured (Table 1). Of those working within clinical medicine (*N*=34), most (44%) had five or fewer years of experience and 24% had worked in the field for more than 20 years. Of those working as public health or community workers (*N*=21), 48% had five or fewer years of experience, while 29% had worked in the field for 6–10 years. Non-profit hospitals, academic institutions, and public health departments were the most common settings for public health and community workers (*N*=13, 62%), while clinicians were most likely to be working within academic institutions (*N*=24, 74%).

Provider barriers to screening

A number of barriers to providing HBV and HDV care were identified (Table 2). Among study participants who provided an answer to this question (*N*=46), 63% (*N*=29) reported barriers to HBV screening (15 clinicians and 14 community and public health workers). The two most commonly reported barriers were "Not knowing if insurance will cover screening for specific patient populations," indicated by 48.3% (*N*=14) of respondents *(5* clinicians and 9 community and public health workers), and "competing priorities/limited time or availability," selected by 44.8% (*N*=13) of respondents (8 clinicians

Table 2 Provider barriers to screening and vaccination

Barriers	Frequency	% of total (*N* = 55) *
HBV Screening Barriers	29	52.73
Insurance	14	25.4
Competing Priorities	13	23.6
Guideline Complexity	8	14.5
Concern for Patient Infection Management	7	12.7
Difficulty Discussing Risk Factors	7	12.7
HBV Vaccination Barriers	35	63.6
Patient Hesitancy	24	43.6
Challenges with Multiple Doses	18	32.7
Insurance	10	18.2
Cost	6	10.9
Competing Priorities	6	10.9
HDV Screening Barriers	29	52.7
Knowledge of Tests	18	32.7
Insurance	10	18.2
Guideline Complexity	9	16.4

Table 2 outlines barriers reported by providers in provision of various aspects of HBV and HDV care. * Research role excluded from these results

and 5 community and public health workers). Over half of participants who responded to a question about barriers to HBV vaccination (*N*=46), 52.2% (*N*=24) identified “patient hesitancy/reluctance” as a barrier (14 clinicians and 10 community and public health workers). Furthermore, over one third of participants felt there are “challenges with completing the full vaccine series” (39.1%, *N*=18−11 clinicians and 7 community and public health workers). Other common obstacles that may impede providing HBV vaccines are concerns related to insurance coverage (21.7%, *N*=10−7 clinicians and 3 community and public health workers), the high cost of the vaccine (13%, *N*=6−4 clinicians and 2 community and public health workers), and competing priorities (13%, *N*=6−3 clinicians and 3 community and public health workers). Most providers reported experiencing barriers to HDV screening (76.3%, *N*=29, out of 38 total respondents to this question). The most common barrier to screening for HDV was limited understanding of accurate lab testing (62.1%, *N*=18−11 clinicians and 7 community and public health workers). Two other frequently cited screening barriers for HDV included concerns with insurance coverage (34.5%, *N*=10−6 clinicians and 4 community and public health workers) and complexity of guidelines (31%, *N*=9−6 clinicians and 3 community and public health workers).

Table 3 Provider knowledge and screenings provided

Knowledge Category	Frequency Correct	% of Total (*N* = 56)
Groups most at risk for HBV	4	7.1
Appropriate HBV screening tests	35	62.5
Implications of HDV diagnosis	25	44.6
Tests needed to diagnose HDV	22	39.3
All HBV infections need HDV testing	34	60.7
Services Provided		
Yes HDV Screening	23	41.0
No HDV Screening	21	37.5
Declined to Answer	12	21.4

Table 3 outlines existing knowledge among providers of HBV and HDV risk factors and testing practices, as well as current provision of screening for HDV

Provider knowledge-based questions and screenings provided

The first knowledge-based question assessed participants’ understanding of which groups are most at risk for HBV. Fifty-five respondents answered this question. Nineteen participants (34.5%) answered correctly. Of these, 13 were clinicians, 5 were public health or community workers, and 1 was a researcher. Thirty-five (64.8%) responded correctly by selecting appropriate screening tests for HBV, out of 54 total responses. Responses to other knowledge-based questions revealed that almost all participants (*N*=43, out of 44 total responses, or 97.7%) understood HDV coinfection can cause faster progression to severe liver disease. Only 22 participants out of 35 total responses (62.9%) identified appropriate tests needed for HDV diagnosis, but over three quarters (76.7%, *N*=33 out of 43 total responses) knew those with HBV infection needed HDV testing. Over half of respondents (72.1%, *N*=31 out of 43 total responses) answered the question about which groups should be screened for HDV with “Persons born in regions with reported high HDV endemicity,” and 76.7% (*N*=33) answered “Individuals with HBV with elevated ALT or AST despite low or undetectable HBV DNA”. When asked about current HDV screening practices, 52.3% (*N*=23) of respondents out of 44 total responses reported they do screen for HDV, while 47.7% (*N*=21) do not, and 12 respondents (27.3%) did not answer this question. Of those who screened for HDV, 20 (87%) were clinicians, and 3 (13%) were public health and community workers. (Table 3)

Explanatory and counseling confidence

When assessing differences in overall confidence levels of providers across different roles in explaining HBV test results to patients, there was evidence that at least one of the groups’ distribution of scores differs significantly from the others (p=.005). The median rating for confidence in explaining test results was 3.5 among public health and community workers, while the median value for clinicians was five (out of five). When conducting pairwise comparisons of the different roles, it was found that difference in median values between public health and community workers and clinicians is statistically significant (p=.011). Because there was only one data point for the researcher role, this value could not be included. Of note, 33% of respondents (n=14) did not answer this question about overall confidence in communicating HBV test results and their implications to patients. Of the participants who did not answer, eight were public health and/or community workers and six were clinicians, which may have contributed to the group differences.

Similarly, there was evidence of a significant difference in confidence levels between study groups in counseling patients on their HDV test results (p=.021). The median rating for counseling patients on HDV test results was one for public health and community workers, while the median value for clinicians was four. When conducting pairwise comparisons of the two roles, however, the difference between the two was not as strong (p=.082). The researcher role was again excluded as there was only one data point. For this question, 40% (n=16) of respondents declined to answer. Of those who declined to answer, eight were public health and/or community workers and eight were clinicians, which again may have contributed to the group differences, as above.

In addition, there is no evidence of a statistically significant difference in confidence levels in explaining to patients either HBV (p=.121) or HDV test results (p=.142) between providers practicing at different types of settings (academic institutions, federally qualified health centers, etc.). Likewise, there is no evidence of a statistically significant difference in confidence levels in counseling patients on HBV test results when accounting for the number of years the participant has worked in their role (p=.314). However, when assessing differences in comfort levels around counseling patients about their HDV test results across different years of experience, evidence was found that at least one of the group's distribution of scores differs significantly from the others (p=.034). Through pairwise comparisons, it was demonstrated that there are statistically significant differences in median confidence scores between those that have been in their role for 0 to 5 years (median=2) and those that have been in their role for more than 20 years (median=3.5) (p=.033). There is also a statistically significant difference in median confidence scores between those that have been in their role 0 to 5 years (median=2) and those that have been in their role 11 to 15 years (median=5) (p=.003).

Table 4 Key informant demographics

Category	Frequency	% of total (N=8)
Race		
White/Caucasian	8	100
Ethnicity		
Hispanic/Latino	1	12.5
Gender Identity		
Male	5	62.5
Female	3	37.5
Sexual Orientation		
Heterosexual	7	87.5
Bisexual	1	12.5
Primary Language		
English	8	100
History of Injection Drug Use		
More than 10 years of use	3	37.5
Between five and 10 years of use	1	12.5
Between one and five years of use	2	25
Between six months and one year of use	1	12.5
No current use	1	12.5
History of Sharing Injection Equipment		
Yes	5	62.5
No	3	37.5
Access to Cell Phone or Tablet		
Yes	6	75
No	2	25

Table 4 outlines the demographic characteristics of PWUD community member interviewees

Results of key informant interviews

Key informant interviews were conducted with four non-medical staff (case managers and drop-in center staff); eight individuals with lived experience from the PWUD community; and six healthcare providers (all of which were conducted virtually via Zoom to accommodate schedules). Of the eight individuals with lived experience who participated in key informant interviews, ages ranged from 34 to 54, with a mean age of 44 years. A majority of clients served by this organization were described as having "high risk backgrounds," being "unhoused," "having a substance use disorder," "without income," and/or "living with HIV" (Table 4).

Knowledge and awareness of hepatitis B and delta

Overall, there was lack of awareness of both HBV and HDV, among both community members and non-medical staff in the harm reduction space. The community interviews revealed considerable confusion about the different types of viral hepatitis, as well as frequent conflation of HBV with hepatitis C. As one community member stated, *"Honestly, I don't know much about it, and I would like to know more…it's a scary thing and it's real. The only thing I really know about is hep C. I don't know about any other hepatitis."* Knowledge of symptoms, transmission, and severity of HBV was varied, and different perceptions of risk were found. One community member noted *"Yes,* *I've heard some bad things like it could be very harmful. I don't really know to what extent, but I know it's to a really bad extent."* In terms of knowledge of HDV specifically, one medical provider shared, "*I find that a lot of my patients don't understand or haven't heard of the difference between the different forms of hepatitis and how they're transmitted…what vaccines exist. Most people I talk to have never heard of [hepatitis] delta patient-wise*." When pointedly asked if they believed they were at risk for HDV, another community member explained, "*I am at risk then because I don't know…Because if I don't know what it is, then I'm at risk for something*."

There was some existing knowledge that intravenous drug use and housing instability are risk factors for viral hepatitis. In some cases, the presence and threat of HIV in this population seemed to have sparked increased awareness of and behavioral changes related to viral hepatitis. As one participant remarked, "*Yeah. I'm definitely more aware now because the HIV thing. I'm scared. Like I make sure I [cap] all my needles…you know what I mean?*" Individuals who received or provided HIV pre-exposure prophylaxis (PrEP) services did generally appear to have increased understanding of HBV. Two persistent misconceptions were that HBV is transmitted in a similar manner as hepatitis A, through fecal and oral contamination, and that HBV can be passed through casual contact and through the air. Additionally, some non-medical staff members believed that HBV might turn into HDV if left untreated. In comparison, accurate knowledge about the prevalence, symptoms, transmission, and risk of hepatitis C was quite high.

Among medical providers, a lack of awareness was frequently cited. One interviewee stated "*I think people who aren't infectious disease or like hepatologists don't necessarily know about hep B as well and how to like monitor it, and that you need to screen for hepatitis delta, that you need to do liver cancer screening*." Another provider indicated "*I know we're not thinking [of] injection drug users for hep B*." According to provider interviewees, testing for HDV occurs rarely and there was a general deficit in knowledge of HDV prevalence in PWUD communities, and mixed levels of awareness about the need for enhanced testing.

Some specific concerns that were mentioned by providers included a lack of understanding about HBV and HDV epidemiology and geographical prevalence, and an overall low prevalence in the U.S., which presents further challenges and uncertainty about the need for testing. Additionally, many felt that screening guidelines can be unclear (as one provider shared, "*So, for example, we were told at one point, you shouldn't screen everybody for hepatitis B. Now we should just vaccinate. We should revaccinate all adults…But how we should be thinking about it in our particular context, I don't think we have any guidance on that*.").

Stigma around hepatitis B and delta

Throughout the interviews, providers mentioned challenges surrounding stigma within the harm reduction space, which impacted service delivery. One provider shared, *"I would say there's a lot of…fighting against harm minimization…just a lot of…people thinking that [harm reduction sites are] enabling drug addiction [by] providing funding or providing space for the harm minimization."* The provider went on to say, *"I have a lot of even patients who live in the area who think that [the harm reduction organization] is the reason that there's so much drug use."*

There were mixed opinions about the stigma surrounding HBV and HDV. Some medical providers, non-medical staff, and participants stated that they did not believe that HBV or HDV carries stigma for various reasons, including lack of awareness about the two viruses, a greater awareness of hepatitis C and HIV among community members, and the attitude that they are "just another disease" among many others that are transmitted through intravenous drug use. However, other interviewees felt that stigma around HBV and HDV is present. Participants made clear that judgment from others and feelings of embarrassment are aspects of diagnosis: As one individual shared, *"…I guess, it just seems like people judge and look down on people who have hepatitis no matter what kind it is, A, B, C, D, doesn't matter. I feel judged because I have hep C."* One participant stated, *"It's embarrassing…Just the fact that, you know, it's sexually transmitted. It could be drug-related."* Another participant noted, "*I feel like when people learn that [I have hepatitis], they look at me differently. It sucks, it hurts… It's just because being an addict and an IV drug user, they look down on me for that*." One non-medical staff member noted that hepatitis stigma is internalized, stating, *"People just feel like they're dirty or that they've made a mistake…And that can sometimes affect people's willingness to do treatment at that time… So I think the counseling that happens at diagnosis is really important."*

The PWID community also faces stigma related to the wounds and abscesses that result from intravenous drug use, and that can impede testing for viruses. One medical provider noted, "*Yeah, I think the biggest stigma…is the lab draws. Oftentimes [PWID] also have wounds or abscesses on their arm, so they don't want to go to a commercial lab.*" A participant stated, "*All the people that you see out here with open wounds. I've seen exposed wounds and people aren't going to the hospital.*"

Trust in healthcare providers

There appeared to be some mistrust among PWUD participants towards medical providers and social services staff. Some community members feel that their private information is not kept confidential and therefore their trust in providers and staff is undermined. One participant noted that they have encountered their private medical information being spread among other community members and fear that confidentiality among providers and social services staff is deficient: "*Like most of the people that work [at this harm reduction site], very confidentiality and all like that. But then I've heard people saying, 'oh, I told [a medical provider or staff member private information] and it got out'...they already have trust issues obviously and then that just makes it harder for them.*" Another participant noted that they feel medical providers do not listen to them or take their concerns seriously, stating, "*I've in the past tried to explain things to doctors and even ask questions and they seem like they don't want to be bothered. They don't care. It seems like just a job to them and that's it.*" One provider shared, *"I think people also have a lot of trauma around doctors and in the medical field oftentimes substance users are very much mistreated, they're right. So I think that trauma very much negates people wanting to engage in care."* Another participant stated that they would like to see a provider who is "*... knowledgeable and just one that doesn't make you feel like a piece of crap.*"

Prevention

While there is a general understanding among medical providers, non-medical staff, and participants at HROs that an effective HBV vaccine exists and protects against infection, interview participants identified barriers to prevention including vaccine hesitancy and access to the vaccine. All participants reported their awareness of a multi-dose vaccine, but there was some confusion as to the number of doses required and the necessary schedule for those doses.

Vaccine acceptability was variable among HRO participants. One medical provider reported lasting effects of the COVID-19 pandemic and explained, *"I think since the pandemic, adults are pretty vaccine-weary. So, I have more refusal now than I did before."* Another reason cited for hesitancy around vaccination is bodily autonomy. A staff member discussed that *"PWUD may sometimes choose not to vaccinate because they feel they get to exercise some type of agency over what they are putting in their body, which is taken away from them a lot of times in the drug supply they are given."*

Accessibility of the HBV vaccine can pose a significant challenge in this space. One medical provider shared, *"It's really, really, really hard to get hep B vaccines at a low cost... Our patients frequently don't have outside primary care providers and they're not able to afford the copays for hepatitis B vaccines like at a pharmacy. Right now we're paying for all of our hep B vaccines out of pocket at astronomical cost."* Additionally, even when supplies are made available, there are unique difficulties in engaging the PWUD population in the ongoing effort to maintain immunity. *"The primary focus is a place to eat and a place to sleep. So, until we as a nation improve ways for people to maintain secure housing, I don't see vaccination being a priority for that population."* Even if participants prioritize vaccination, the multiple doses required for effective immunity leaves opportunity for confusion and loss to follow up for this population. A provider explained that continuation of care is *"harder with a population that has difficulty keeping appointments or remembering and reminding them [is difficult] because they often don't have phones,"* and another provider confirmed that *"the chances that they'll get all three [doses] is sometimes slim, especially with the street medicine population, because a lot of times they disappear. We might not see them for months and it's really hard to track."*

Current landscape of screening practices and barriers to screening & linkage to care

A variety of factors at the individual, interpersonal, and systemic levels were identified as barriers to effectively and consistently conducting screening for HDV in particular. Most interview participants at HROs mentioned being tested for HBV, HCC and HIV previously, while none mentioned receiving HDV testing. All providers interviewed mentioned some degree of challenges associated with HDV testing, while they felt that HBV testing was more accessible. The two providers who conduct onsite medical services mentioned that if someone tests positive for HBV, the next steps would include checking viral load for HBV and then testing for HDV. However, providers mentioned that testing for HDV through commercial labs was frequently difficult with only antibody testing readily available. When asked what would help to improve HDV testing, one provider mentioned, "*I think having better availability for hepatitis delta viral loads - it feels like that's a problem that everyone sees.*"

Providers not conducting medical services or screenings on site noted that individuals are referred elsewhere for HBV testing. This presents unique obstacles in that *"...getting people, specifically our patients, to like another hospital system and getting them in and having them make the appointment is a challenge. Then sometimes it's hard for people to keep appointments if they're unhoused and have other priorities to take care of."* One interviewee shared that "*There is movement towards offering co-located care and there's no reason in my mind that that could not be expanded to hepatitis B...If there was a centralized blood draw place where people could -- when they were moved to be screened, they could show up on their own time when they're ready and then some care management or something could follow.*" The lack of prioritization given to health among community members and the urgent need to address concerns related to immediate survival emerged as a common theme, with another provider expressing *"So if you don't have a stable person, including the housing and food and medical needs who's really having a chance to like calm their life down and get insight and work on staying sober, then they're certainly not going to work on treating or reducing the risks [of hepatitis]."*

Phlebotomy also was identified as a challenge as there can *"sometimes be a wait and folks leave before doing labs."* Another provider similarly mentioned *"Getting IV drug users in particular or with our MOUD [Medication for Opioid Use Disorder] program, getting them to get their blood drawn is usually the main barrier."* Provider time and capacity were also cited as a concern. As one medical provider mentioned that *"Hepatitis delta testing is insane, it's a lot of leg work that a lot of times providers don't have time for."* Another voiced that overwork and strict requirements for programs conducting street medicine and other outreach in disenfranchised communities can hinder screening practices. *"I think more often people just aren't screening. If you don't know, you don't have to do anything."*

Recommendations and needs from the community

All interview participants expressed enthusiasm about the design and dissemination of a culturally appropriate communication campaign, targeted specifically for PWUD communities and those serving them. Participants described important messaging and themes to highlight, including the fact that viral hepatitis can affect anyone in any circumstances, the differences between the various forms of viral hepatitis (as one participant expressed, *"Like this hepatitis delta thing…I've never heard that before. Now I'm curious, where did that come from? Why is it upgrading? And is it stemming from Hepatitis A, B, or C or is it a mix?"*), and clear information about transmission, risk factors, viable testing practices, and behaviors that can (and cannot) prevent the spread of HBV and HDV specifically.

Participants also requested materials that would specifically address the differences between fact and fiction in terms of some of the most common hepatitis myths, especially those related to modes of transmission and disease severity. As one non-medical staff member noted, *"…factual information for sure, how people can be infected, how it can impact their lives if they're not treated…written literature to probably feel empowered to have conversations."* It is also necessary to find a balance between presenting information that is factual in terms of listing injection drug use as a risk factor for HBV and HDV, but also not stigmatizing. Community members felt it was important to emphasize the consequences of risky behaviors, but also noted the need to refrain from overly negative or judgmental messaging, and to maintain an overall positive and hopeful tone. As one key informant phrased it, *"Don't put it out like that, like call me out in a different way… We already know, we know, and we don't want to be told again. We know."*

In terms of the types of resources that would be most useful for building an effective communications campaign about HBV and HDV in the PWUD community, many participants mentioned the efficacy of flyers, pamphlets, brochures, and fact sheets. The utility of wall posters on-site, as well as palm cards included in outreach materials and syringe exchange kits was also discussed. One community member stated *"I know the people around here they like to read. They like knowledge and reading."* A case manager who was interviewed remarked *"Yeah, I don't think it's a one-size-fits-all approach, but some people do love the brochure and you'll see some people take it and read it front to back which is great."* Adding hepatitis information to existing fact sheets that provide education about safe injection practices was also thought to be useful. There was a preference for information that is *"visual and verbal…so I could see it and read it…or a person or a doctor in front of me…telling me and showing me that what they are trying to teach me."*

Provider interviewees mentioned that having both digital and physical materials available would be helpful for staff members: *"And this goes online as well, but the physical resources…would be helpful for staff. So you send fact sheets, quick bite sized information, things like that. Okay, with Power Point files, infographics, either of those [would] be helpful."* Staff members were also enthused about the possibility of small educational and interactive presentations about HBV and HDV, potentially including pre- and post-tests to assess base-level knowledge and knowledge gained.

Discussion

Study findings demonstrate lack of knowledge about HBV and HDV within the harm reduction space, as well as stigma experienced by community members related to both accessing healthcare services and to perceptions of the community itself. While there are clear gaps in knowledge, there are also major barriers experienced by healthcare professionals and community members, which can impact overall health outcomes and access to services related to HBV and HDV. Overcoming identified barriers and limited knowledge within this community will require tailored and thoughtful education and awareness efforts to the PWUD community and providers that serve them.

Previous research supports the finding that poor awareness of HBV and HDV and proper screening protocols, particularly among providers, is directly linked to lower screening rates [16]. Strategies to mitigate this could include provider training. Awareness of HDV infection is low among primary care physicians in particular; in one 2022 study, most screening requests (about 80%) came from an academic hospital and very few came from primary care centers despite test availability [17]. The knowledge and awareness deficits related to HBV and HDV among PWUD and the providers who serve them demonstrate a large unmet need for more educational resources in this space, as well as clearer and more consistent screening and management guidelines.

The widespread stigma around harm reduction and injection drug use captured in this study aligns with existing literature on this topic [1, 10, 18]. Previous research has found that stigma in healthcare settings can deter individuals from seeking necessary care [6, 19, 20]. Harris and colleagues found that PWID who were diagnosed with HCV felt that their concerns were overlooked by their providers (2018), a sentiment that was expressed in this study as well [20]. Stigmatizing beliefs and stereotypes about PWID have been shown to produce a lower quality of care and contribute to internalized stigma and feelings of shame and embarassment [21, 22]. Responses from these interviews confirmed that stigma in healthcare facilities can be rooted in personal and intersectional vulnerabilities, often causing PWUD to reject needed care. Additionally, the belief that harm reduction services enable drug use remains commonplace. Given the serious implications of decreased quality of care and continued marginalization and exclusion of PWUD populations, the need for consistent financial and political support of HROs is critical for maintaining public health and improving health outcomes among this vulnerable community [23].

An additional challenge in the provision of adequate HBV and HDV care identified in this study involves access to vaccination. Medical providers mentioned challenges in accessing financial resources to purchase and store HBV vaccination. This is consistent with previous research, which found that approximately one quarter of surveyed healthcare providers cited inadequate reimbursement as a reason for not recommending or stocking hepatitis A or B vaccines [24]. Reducing financial barriers for providers is included in the United States Department of Health and Human Serivces's plan for improving hepatitis vaccination coverage and preventing new infections [25]. Providers in the present study also underscored the importance of a "one stop shop" model where the first dose of vaccination is administered at the same time as screening. The efficacy of this approach would increase significantly with introduction of a rapid point-of-care test for HBV and HDV, which would deliver almost immediate results and determine the need for vaccination or linkage to care without risking loss to follow-up. Partnership with local health departments for vaccination procurement and administration at HROs was another suggestion offered by providers, which could have positive implications for increasing vaccine uptake in this community. In general, improved funding for HROs to support comprehensive healthcare services is necessary.

This study elucidates the multi-level barriers that prevent equitable access to HBV and HDV screening and linkage to care and perpetuate disparities across the HBV care continuum. Existing literature echoes this study's findings that long wait times, geographic distance from specialty care, and the often rigid requirements for specialist appointments impede PWUD's access to care [19, 26]. Time constraints and challenges with screening and vaccine reimbursement, administration, and documentation are some of the major barriers to HBV and HDV screening and vaccination at the provider level [26, 27]. Recommendations to overcome some of these barriers include advocating for the United States Preventive Services Task Force (USPSTF) to follow the example of the CDC in recommending universal one-time HBV screening for all adults in the United States, as well as vaccination for all adults ages 19–59, as insurance companies typically follow the recommendations of this body when making coverage determinations [28, 29]. Having wider availability of HDV testing at commercial labs around the country would be helpful, as would adjusting the guidelines put forth by professional societies, such as AASLD to include reflex HDV testing for all individuals testing positive for hepatitis B surface antigen. Additionally, more supportive and comprehensive social services for those struggling with drug dependence and its frequently co-occurring challenges, such as unstable housing and financial difficulties, would help a great deal in allowing PWUD the space to escape general survival mode and prioritize their health.

As this study's findings showed, members of both the PWUD community and the professional workforce that serves them are interested in communication campaigns about HBV and HDV. Previous research has found that educational interventions can play a pivotal role in improving disease awareness and accurate knowledge as well as screening uptake. Informational messaging that is centered around the lived experience of injection drug use can allow PWID to feel supported while also learning about possible health risks when injecting drugs. Targeted education, screening and linkage to care in PWUD populations that have been effective for HCV can be combined with HBV and HIV screening for added benefit [30]. In the present study, multiple community members mentioned that they received health information while in rehabilitation programs, so expanding outreach to these settings in the future may also be of value.

Limitations and lessons learned

This study had several limitations and lessons learned. The results from this study are not generalizable to the broader population due to the small sample size of key informants and survey participants. Additionally, the presence of multiple medical centers serving PWUD in Philadelphia is unique, even among large urban centers in the U.S., so the fact that this study took place in an HRO that offers medical services may make the sample of both community members and providers less representative of the broader PWUD population. However, the study results are still transferable to other populations with similar characteristics, such as other PWUD communities, HROs, and healthcare providers in large urban areas. The use of a convenience sampling strategy for participant recruitment may pose a threat to the study's internal validity as demographic diversity may have been limited among participants. Additionally, given the biological dependence of HDV on HBV, and the extremely limited knowledge of either virus in this community, the qualitative data about the two viruses was not separated for this study. Future work should explore differences in stakeholder knowledge and perception between the two infections. Finally, the providers responding to the survey were recruited through large email listservs and were likely to have increased knowledge surrounding HBV and HDV, as they are connected to the HBF and educational resources related to both diseases.

Conclusion

HBV and HDV viruses pose serious health threats to people who use drugs. There is limited existing research on HDV in general, and limited documentation of barriers and facilitators to incorporating HBV- and HDV-related services within high-risk communities. Despite the longstanding status of PWUD as a group at high-risk for HBV and HDV, diagnosis and prevention of both viruses remain low in these communities, due to a wide variety of barriers among both PWUD and the providers who serve them at the systemic, interpersonal, and individual levels. The barriers identified in this study include lack of awareness and knowledge about HBV and HDV, confusion about testing processes and guidelines, pernicious stigma around harm reduction practices, lack of financial and logistical support for administering screening and vaccination, lack of provider time and capacity, and under-prioritization of healthcare in the PWUD community, given the greater urgency of meeting basic needs for survival. There is much evidence to support the utility and efficacy of educational interventions, especially those delivered in HRO settings. More education and awareness for providers are also in order, as are broader public health initiatives to support both PWUD communities and HROs, given that funding and resources are available for this. As more data emerge about disease prevalence in this disenfranchised community, efforts to close disparities in screening, prevention, diagnosis, and linkage to care for HBV and HDV in PWUD populations will hopefully continue to grow and prove effective in identifying cases, halting transmission, and treating these dangerous viruses, thus lowering mortality and improving quality of life.

Abbreviations

AASLD	American Association for the Study of Liver Disease
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
DHHS	Department of Health and Human Services
ECHO	Extension for Community Health Outcomes
FQHC	Federally qualified health center
ICR	Inter-coder reliability
IRB	Institutional Review Board
IV	Intravenous
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HDV	Hepatitis D virus
HIV	Human immunodeficiency virus
HRO	Harm reduction organization
MOUD	Medication for opioid use disorder
PWID	People who inject drugs
PWUD	People who use drugs

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12954-024-01117-4.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Supplementary Material 5

Acknowledgements

This project was only made possible by the staff and participants at Prevention Point Philadelphia, and we appreciate their ongoing support to make this project possible.

Author contributions

Conceptualization, B.Z., C.F., F.B.J., and C.C.; methodology, B.Z., C.F., C.C., A.J., and R.H.; validation, B.Z., C.F., C.C., A.J., and R.H.; formal analysis, B.Z., C.F., H.M., K.S., A.Q., and Q.P.; investigation, B.Z., C.F., and K.S.; resources, B.Z., C.F., A.J., and R.H.; data curation, B.Z., C.F., H.M., K.S., and Q.P.; writing—original draft preparation, B.Z., C.F., H.M., K.S., and Q.P.; writing—review and editing, F.B.J., R.H., A.J., and C.C.; visualization, B.Z., C.F., H.M., and Q.P.; supervision, C.C.; project administration, B.Z. and C.F.; funding acquisition, B.Z., C.F., and C.C. All authors have read and agreed to the published version of the manuscript.

Funding

This research was funded by Gilead Sciences Inc., protocol number IN-US-980-6671.

Data availability

Data is provided within the manuscript and supplementary information files.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of the City of Philadelphia Department of Public Health (Project Number: 2023-33) on August 7th, 2023, and Heartland IRB (Project Number: 02202023-457) on February 20th, 2023.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results. The Hepatitis B Foundation receives program and research grants from Gilead Sciences, VBI Vaccines, GSK, and Genentech. Beatrice Zovich has received compensation for serving on an advisory committee for Gilead Sciences, Inc. Chari Cohen sits on a patient advocacy advisory committee for GSK (with funds going to the Foundation).

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Received: 10 May 2024 / Accepted: 1 November 2024

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