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ORIGINAL PAPER

# A Capacity-Strengthening Intervention to Support HIV Pre-exposure Prophylaxis (PrEP) Awareness-Building and Promotion by Frontline Harm Reduction Workers in Baltimore, Maryland: A Mixed Methods Evaluation

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## Abstract

Pre-exposure prophylaxis (PrEP) is a promising but underutilized HIV prevention tool among people who inject drugs (PWID). We developed and piloted an intervention to bolster PrEP promotion competencies among frontline harm reduction workers (FHRW) serving PWID clients in Baltimore, Maryland. Between December 2021 and February 2022, we developed and facilitated four trainings, which included didactic and practice-based/role-playing components, with 37 FHRW from four organizations. FHRW completed three structured surveys (pretest, posttest, 6-week posttest) and in-depth interviews ($n = 14$) to measure changes in PrEP promotion competencies attributable to training participation. PrEP knowledge and self-efficacy increased significantly ($p < 0.001$) from pretest to posttest, sustained through 6-week posttest. The proportion of FHRW discussing PrEP with clients doubled during the evaluation period (30–67%, $p = 0.006$). Feeling empowered to discuss PrEP and provision of population-tailored PrEP information were facilitators of PrEP promotion, while limited client interaction frequency/duration, privacy/confidentiality concerns, and anticipated PrEP stigma by clients inhibited PrEP promotion. Our capacity-strengthening intervention successfully increased PrEP knowledge, self-efficacy, and promotion among FHRW, affirming the adaptability and feasibility of integrating our training toolkit into FHRW practice across implementation settings.

**Keywords** HIV prevention · People who inject drugs · Formative research · Doer/non-doer analysis · Pilot study · United States

## Abbreviations

CBO Community-based organization
FHRW Frontline harm reduction workers
PrEP Pre-exposure prophylaxis
PPT PrEP Promotion Training
PWID People who inject drugs
WWID Women who inject drugs

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## Introduction

Despite remarkable reductions in HIV incidence in the U.S. over the last two decades, the HIV burden remains substantial among people who inject drugs (PWID), who account for one in 10 new HIV diagnoses [1]. Concentrated HIV outbreaks among PWID in recent years, like those observed in Scott County, Indiana, and Hamilton County, Ohio [2], reveal the speed with which HIV can spread in injection drug use networks, particularly in the absence of harm reduction services like syringe services programs. This underscores the urgent need for tailored HIV prevention approaches for PWID.

Pre-exposure prophylaxis (PrEP) is a biomedical HIV prevention tool offering alternative or additional protection against both sexual and injection-mediated HIV acquisition. However, in the U.S., PrEP remains under-prescribed to and under-utilized by PWID, who may benefit from PrEP in the context of receptive syringe sharing and/or high-risk sexual behavior [3]. Among healthcare providers, limited PrEP knowledge, discomfort prescribing PrEP, and stigmatizing attitudes towards drug use constrain PrEP accessibility for PWID [4–6]. Likewise, low PrEP awareness stymies PrEP interest, willingness, and uptake among PWID [7–10].

Frontline harm reduction workers (FHRW) are trusted points of service entry for PWID and are, thus, uniquely well-positioned to promote PrEP to this impacted population [11–13]. Studies have shown that PWID who access harm reduction services exhibit higher PrEP awareness relative to service-disengaged PWID [12, 14, 15]. While there is a noteworthy dearth of published interventions integrating PrEP promotion and referral infrastructure into harm reduction services accessed by PWID, the few described show promising results. In response to a burgeoning HIV outbreak in West Virginia, FHRW disseminated PrEP information to PWID and facilitated referrals to an expanded network of PrEP services, resulting in a dramatic growth in PrEP coverage (from 15 to 127) in a 1-year period [16]. Another intervention integrating PrEP into drop-in services at a major syringe services program in Philadelphia reported high PrEP uptake (~66%) among women who were offered PrEP onsite [17].

Despite the reported benefits of leveraging FHRW to educate, counsel, and refer PWID to PrEP services, there has been insubstantial scholarly attention to the evaluation of interventions that nest PrEP promotion activities into community-based harm reduction services. In response, we developed and piloted a workforce development intervention, in consultation with a harm reduction-oriented community-based organization (CBO), to bolster PrEP knowledge, promotion self-efficacy, and referral capacity among FHRW in Baltimore City, Maryland.

## Methods

### The PrEP Promotion Training: Development and Implementation

**O**ptimizing **P**rEP Engagement **a**mong Women **L**iving in Baltimore City (OPAL) is a multi-phase formative research study aiming to develop and pilot a strategy elevating PrEP awareness, interest, and uptake among women who inject drugs (WWID). We first facilitated four virtual focus groups with 20 HIV and substance use service providers to characterize the PrEP implementation environment in Baltimore. Next, we conducted semi-structured in-depth interviews with 27 WWID to explore facilitators and barriers to PrEP willingness in the context of their substance use, healthcare engagement, and access to harm reduction services. Findings from a literature review, focus groups, and interviews revealed the acceptability and perceived benefits of co-located provision of harm reduction services alongside healthcare delivery, from opioid use disorder treatment to Hepatitis C care. Given the strong existing rapport between FHRW and PWID, we identified harm reduction services as optimal venues through which to promote PrEP to PWID.

We partnered with a CBO providing harm reduction services to develop the training intervention to bolster PrEP promotion skills and service referral capacity among harm reduction service providers. Working in consultation with two FHRW from the partner organization, we developed an intervention prototype, the PrEP Promotion Training (PPT), a two-hour training with didactic practice components. The didactic component distilled information on PrEP effectiveness, use requirements, eligibility, and service delivery, all tailored to the health needs and priorities of the client populations of harm reduction organizations in Baltimore (i.e., PWID, transgender women, people who sell sex). The second hour of the training involved activities using fictional client personas and roleplay exercises, designed to build FHRW's self-efficacy and skills introducing PrEP into conversations with clients, answering anticipated client questions about PrEP, and facilitating referrals to PrEP services (see Fig. 1). We also shared resource materials (i.e., frequently asked questions, flyers advertising PrEP resources and services in Maryland) with CBOs to reinforce content presented in the trainings and facilitate PrEP promotion by FHRW. We printed flyers for participating CBOs and instructed FHRW to indiscriminately distribute flyers to clients. We generated de novo content and material for the PPT, in response to expressed needs of FHRW during early consultative meetings.

In addition to the partner organization, we approached three additional Baltimore-based CBOs offering mobile (street-based) and drop-in (fixed site) harm reduction services, but without in-house PrEP prescribing capacity, to participate in the PPT pilot. We facilitated one in-person training, two virtual synchronous trainings, and one virtual asynchronous (recorded) training, with the shift to virtual training delivery occurring in January 2022 due to local COVID-19 case surges attributed to the Omicron variant [18]. In total, we facilitated four trainings with FHRW from four CBOs between December 2021 and February 2022.

### Evaluation Design

To evaluate potential impacts of PPT implementation on FHRW's PrEP promotion competencies, we leveraged an

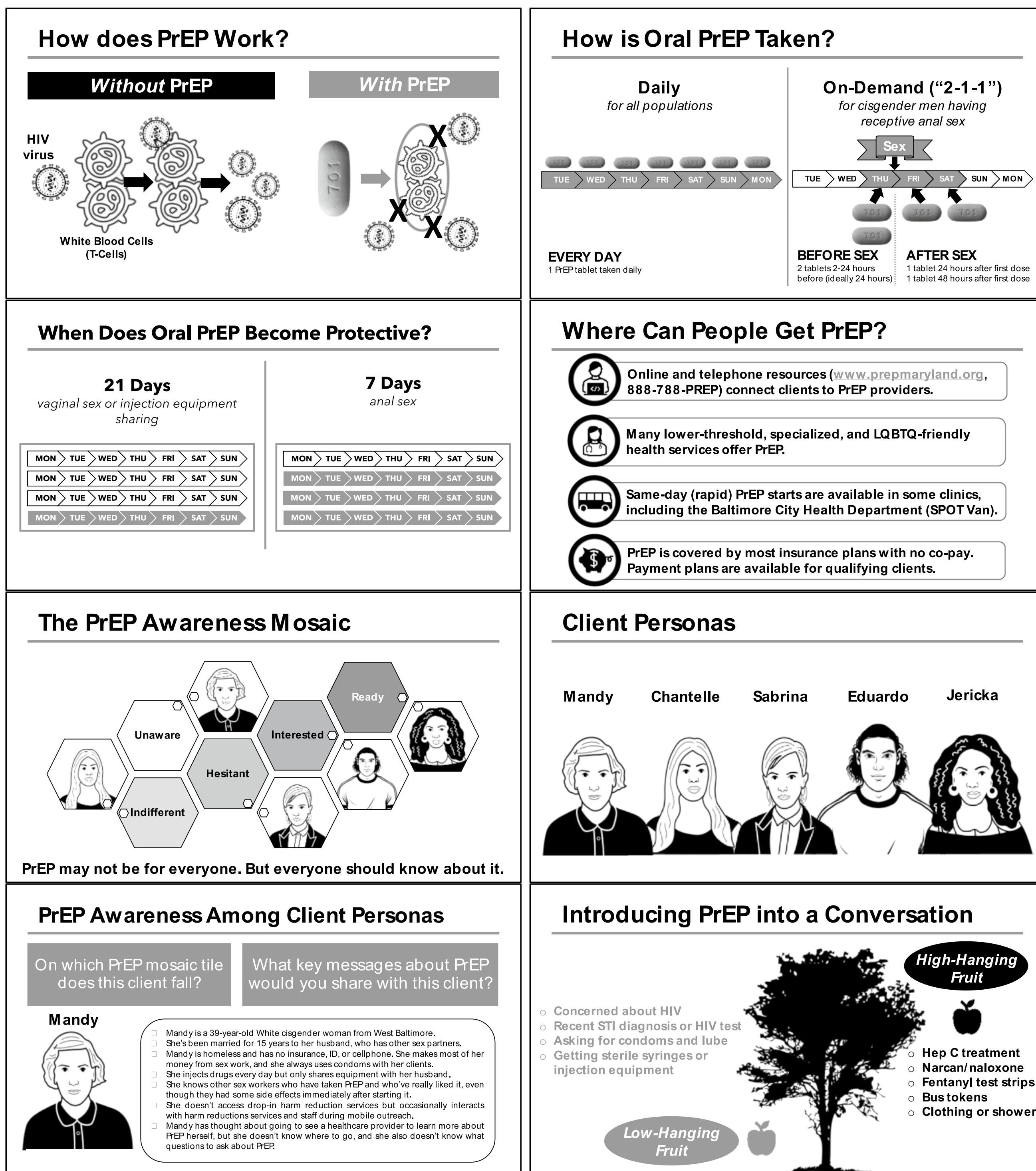


**Fig. 1** Sample of training material included in the PrEP Promotion Training (PPT) for frontline harm reduction workers (FHRW) in Baltimore City, Maryland

explanatory, sequential mixed methods design consisting of longitudinal quantitative surveys and post-intervention in-depth interviews with FHRW (see Fig. 2) [19]. All training attendees were eligible and included as evaluation participants if they: (1) were aged ≥ 18 years; (2) attended any live or recorded PPT sessions; (3) completed a structured assessment before and immediately after the training; and (4) provided verbal informed assent prior to completing

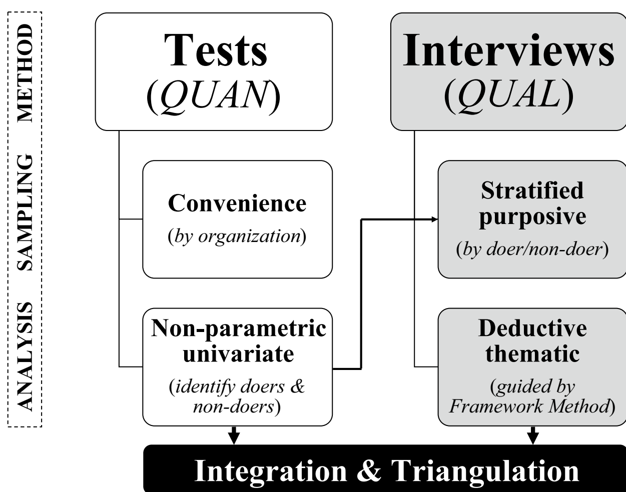


**Fig. 2** Mixed methods pilot evaluation design

any evaluation procedures. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed and deemed the study protocol as non-human subjects research. Participants received up to $65 in prepaid gift cards for completing all evaluation procedures.

Figure 3 illustrates the sequence of pilot activities and evaluation procedures. Evaluation participants completed up to three brief (~ 10 min) quantitative self-assessments before (baseline pretest), immediately following (baseline posttest), and 6 weeks after (endline posttest) the training. Assessments measured FHRW's PrEP knowledge; attitudes towards PrEP promotion; self-efficacy to discuss PrEP with clients and make PrEP service referrals; and practices related to discussing HIV prevention and PrEP with clients, including number of PrEP-related conversations with clients and number of referrals to PrEP services. We derived two items measuring PrEP-related attitudes (i.e., "People on PrEP are taking care of their health"; "There are easier ways for people to protect themselves from HIV than taking PrEP") from two validated PrEP stigma scales [20, 21]. Given the relative dearth of PrEP-related instruments validated in study populations like ours, the remaining de novo survey items were specifically crafted to measure content and material addressed in the PPT—a highly contextualized and tailored PrEP training curriculum for participating FHRW in Baltimore.

We dichotomized all self-reported measures of PrEP knowledge (categorical: "true" versus "false" or "unsure"/"don't know"), attitudes and self-efficacy (5-point ordinal: "agree"/"strongly agree" versus "neither agree nor disagree"/"disagree"/"strongly disagree"), and promotion practices (binary: "yes" versus "no" in the past month) (see Electronic Supplementary Materials, Table S1). We also measured the following demographic and professional characteristics of FHRW at baseline pretest: age (in continuous years); gender; race and ethnicity;

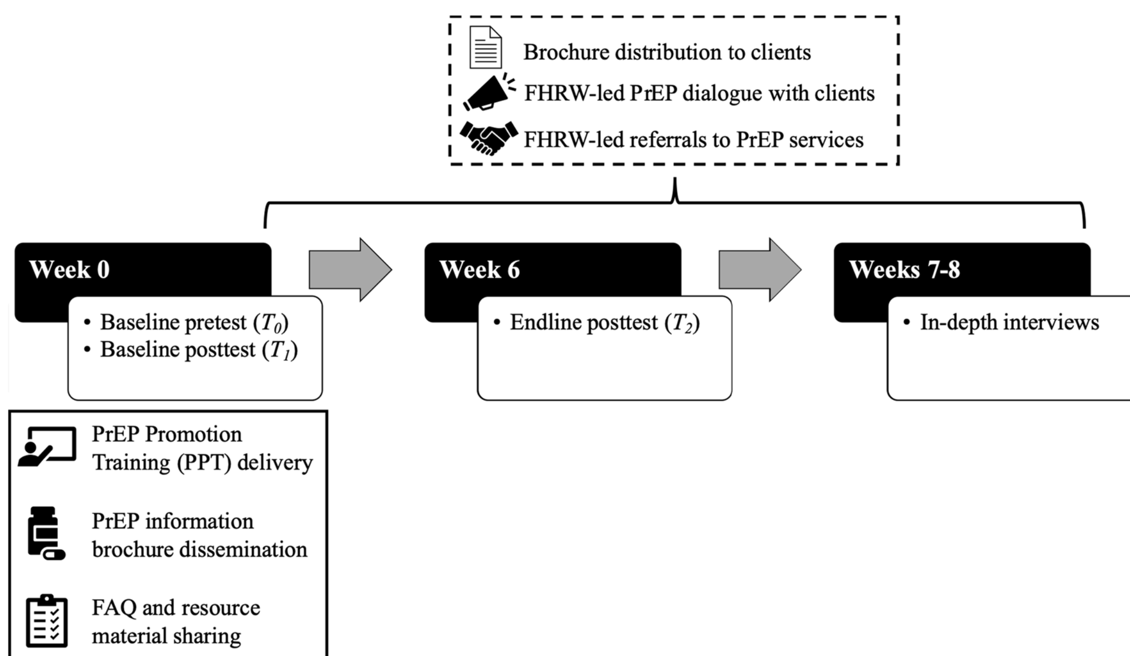


**Fig. 3** Timeline and sequence of PrEP Promotion Training (PPT) pilot and evaluation activities. *Notes* Solid black box represents intervention activities implemented by the study/evaluation team. Dashed black box represents activities and practices to be implemented by pilot evaluation participants following delivery of intervention activities at Week 0

and occupational cadre (outreach/client navigation, case management, or administrative/senior leadership).

After endline posttest, we invited evaluation participants to complete 20–30-min interviews exploring motivations and barriers to PrEP promotion, as well as perceived successes and challenges translating training content and skills into practice. We designed our semi-structured interview guides to specifically enhance quantitative findings by eliciting the mechanisms, including enabling and constraining factors, underpinning FHRW PrEP knowledge, attitudes, self-efficacy, and promotion practices. We purposively recruited evaluation participants based on their classification as "doers" (i.e., discussed PrEP with any client in the month preceding endline posttest) or "non-doers" (i.e., did not discuss PrEP with any clients in the past month). In addition to stratified recruitment by doer/non-doer status, our interview sampling approach sought variation by training delivery modalities, social identities, and professional roles represented in the evaluation study population.

### Data Analysis and Integration

Guided by our mixed methods evaluation design (see Fig. 2), we analyzed quantitative and qualitative data separately, then integrated insights across strands for enhancement [19]. First, we ascertained whether changes in PrEP knowledge, attitudes, self-efficacy, and promotion practices over the evaluation period were statistically significant ($p < 0.05$) using non-parametric McNemar's tests (for paired nominal data) and Mann–Whitney U tests (for paired count/ordinal data). To evaluate whether participant attrition during the evaluation period may have biased results, we conducted a sensitivity analysis comparing differences in demographics, professional characteristics, and PrEP-related measures at baseline posttest between participants completing endline posttest and those lost to follow-up using Fisher's exact tests (see Electronic Supplementary Materials, Table S2). Applying doer/non-doer analysis methodology [22], we implemented Fisher's exact tests to compare characteristics of FHRW who discussed ("doers") to those who did not discuss PrEP ("non-doers") with any client in the past month at endline posttest to identify factors associated with PrEP promotion practices (see Electronic Supplementary Materials, Table S3). We managed and analyzed quantitative data in Stata/IC 15.1 (StataCorp LLC, College Station, TX).

After transcribing interviews verbatim, we developed a data abstraction template, organized by themes identified deductively (a priori) from interview guides, to facilitate thematic analysis [23]. We used overarching categories from the interview guides (i.e., successes/challenges promoting PrEP, client receptiveness towards PrEP promotion, recommendations for training modification) to organize the data abstraction template into standalone thematic domains, or parent codes. Working in pairs (one senior mixed methods researcher with HIV prevention expertise and one project manager with over 2 years of experience in qualitative methods and community-based participatory research), we read transcripts line-by-line and generated a list of key concepts/themes emerging in each interview. We discussed and refined (i.e., aggregated/collapsed) these themes into subcodes, which we nested within parent codes in the abstraction template. Working in pairs, we piloted the abstraction template on two transcripts (one doer, one non-doer) and revised the template accordingly. An abstract template was independently populated for each interview. We used abstraction templates to synthesize and distill key themes from each interview, extract supporting text segments, reassemble key themes across interviews into standalone topics, and identify salient themes and thematic patterns across doer and non-doer interviews [24, 25].

Lastly, we used joint displays to facilitate data triangulation and integration across quantitative and qualitative strands (see Electronic Supplementary Materials, Table S4) [26]. We organized quantitative results by domains of measures included in the structured assessments. We then mapped salient themes from qualitative interviews onto complementary quantitative domains (i.e., PrEP knowledge, attitudes, self-efficacy, promotion practices), enhancing findings obtained independently from each data collection method.

We begin by describing characteristics of our evaluation study population. We then summarize quantitative results of PrEP knowledge, attitudes, and self-efficacy, contextualizing each of these domains in qualitative findings related to motivations to promote PrEP and perceived compatibility of PrEP promotion with client and institutional priorities. We then identify changes in PrEP promotion practices potentially attributable to PPT implementation, which we situate in emerging qualitative insights regarding the context and frequency of FHRW's PrEP interactions with clients. Lastly, we describe FHRW perspectives on PPT implementation and recommendations for improving training content, structure, and delivery.

## Results

### Sample Characteristics

Figure 4 summarizes evaluation recruitment and retention outcomes. Of the 39 training attendees, 37 (95%) met eligibility criteria and were included in the evaluation. Thirty ($n = 30$) participants completed all three quantitative surveys, yielding an 81% retention rate. Comparing FHRW retained through endline posttest with those lost to follow-up, we found no significant differences in terms of demographics, professional characteristics, or PrEP-related indicators (see

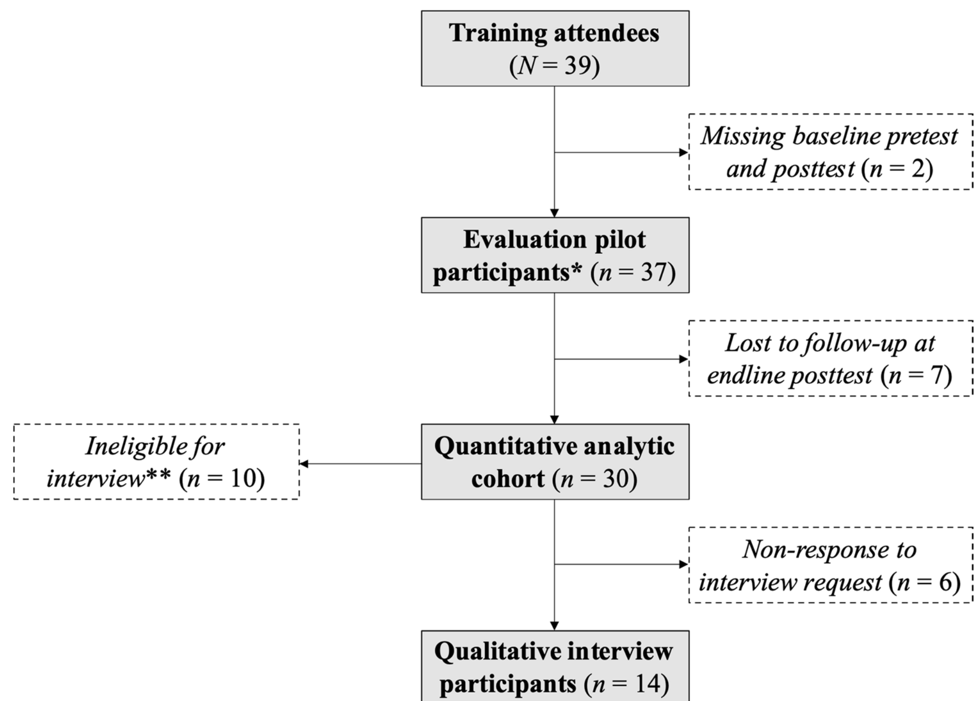


**Fig. 4** Flow chart of PrEP Promotion Training (PPT) pilot evaluation recruitment and participation. *Notes* *To be eligible for the pilot evaluation, participants must have: (1) attended any of the face-to-face or virtual trainings *and* (2) completed a baseline pretest and baseline posttest. **Indicates participants were ineligible for interviews because they did not complete the endline posttest ($T_3$) within 1 week

Electronic Supplementary Materials, Table S2). Of the 20 participants eligible for in-depth interviews, 14 (70%) completed an interview.

Table 1 presents demographic and professional characteristics of evaluation participants, including those completing post-intervention interviews. Most participants attended a virtual synchronous training (60%), followed by in-person (24%) and virtual asynchronous (17%) delivery modalities. The mean age was 36 years (*std. dev*. 10 years). The gender composition was as follows: cisgender women (47%), cisgender men (19%), transgender women (17%), non-binary/genderqueer (11%), and transgender men (6%). Most identified as non-Hispanic Black (65%) and reported professional roles involving outreach activities and client navigation services (62%). Prior to the training, only two-thirds of participants were familiar with PrEP (65%). The characteristics of interviewed doers ($n=10$) and non-doers ($n=4$) were comparable to those of the overall evaluation study population.

## PrEP Knowledge

From baseline pretest to baseline posttest, we observed significant increases (*range* 46–68 percentage points (pp), McNemar's test $p<0.001$) across all seven PrEP knowledge indicators included in the self-assessments; all observed increases were sustained through endline posttest (see Table 2).

Interviewees emphasized how the population-tailored PrEP information included in the PPT rendered content memorable for participants. Doers, specifically, discussed

**Table 1** Descriptive baseline characteristics of frontline harm reduction workers participating in the PrEP Promotion Training (PPT) pilot evaluation ($N=37$) and in-depth interviews ($N=14$)

| Characteristics | Evaluation participants | | Interview participants | |
|---|---|---|---|---|
| | *n* | % | *n* | % |
| Training delivery modality | | | | |
| Face-to-face | 9 | 24.3 | 3 | 21.4 |
| Virtual synchronous | 22 | 59.5 | 8 | 57.2 |
| Virtual asynchronous | 6 | 16.2 | 3 | 21.4 |
| Age, in years (*mean*, *std. dev.*) | 35.8 | 9.6 | 36.6 | 8.8 |
| Gender* | | | | |
| Cisgender woman | 17 | 47.2 | 7 | 50.0 |
| Cisgender man | 7 | 19.4 | 3 | 21.4 |
| Transgender woman | 6 | 16.7 | 2 | 14.3 |
| Transgender man | 2 | 5.6 | 0 | *n/a* |
| Non-binary/genderqueer | 4 | 11.1 | 2 | 14.3 |
| Race and ethnicity | | | | |
| Non-Hispanic Black | 24 | 64.9 | 9 | 64.3 |
| Non-Hispanic White | 10 | 27.0 | 4 | 28.6 |
| Asian, Hispanic, or multiracial | 3 | 8.1 | 1 | 7.1 |
| Occupational cadre | | | | |
| Outreach/client navigation | 23 | 62.2 | 11 | 78.6 |
| Case management | 8 | 21.6 | 2 | 14.3 |
| Administrative/senior leadership | 6 | 16.2 | 1 | 7.1 |
| Ever heard of PrEP | | | | |
| No | 13 | 35.1 | 5 | 35.7 |
| Yes | 24 | 64.9 | 9 | 64.3 |

*One evaluation participant refused to disclose gender, yielding 1 missing observation

**Table 2** PrEP knowledge, attitudes, and self-efficacy indicators at baseline pretest ($N=37$), baseline posttest ($N=37$), and endline posttest ($N=30$)

| PrEP indicators | Baseline pretest ($T_0$) & baseline posttest ($T_1$) | | | | Baseline posttest ($T_1$) & endline posttest ($T_2$) | | | |
|---|---|---|---|---|---|---|---|---|
| | $T_0$ (%) | $T_1$ (%) | % point change | McNemar's test ($p$ value) | $T_1$ (%) | $T_2$ (%) | % point change | McNemar's test ($p$ value) |
| Knowledge | | | | | | | | |
| Taking PrEP at the same time as birth control or gender-affirming hormones is not bad for people's health† | 40.5 | 91.9 | **▲ 51.4** | **17.19 (< 0.001)** | 91.9 | 96.7 | △ 4.8 | 0.00 (1.000) |
| PrEP does not interact with medications used in drug treatment (i.e., methadone, buprenorphine) | 13.5 | 81.1 | **▲ 67.6** | **25.00 (< 0.001)** | 81.1 | 86.7 | △ 5.6 | 1.80 (0.063) |
| People must have a negative HIV test before being prescribed PrEP by a healthcare provider | 37.8 | 83.8 | **▲ 46.0** | **17.00 (< 0.001)** | 83.8 | 76.7 | ∇ 7.1 | 0.33 (1.000) |
| Some places in Baltimore City offer a starter pack of PrEP on the same day a person first visits a provider | 40.5 | 89.2 | **▲ 48.7** | **18.00 (< 0.001)** | 89.2 | 93.3 | △ 4.1 | 0.33 (1.000) |
| I know of information sources I could share with clients when they want to learn more about PrEP | 48.7 | 97.3 | **▲ 48.6** | **18.00 (< 0.001)** | 97.3 | 96.7 | ∇ 0.6 | 0.00 (1.000) |
| I know of information sources I could consult when I myself have questions about PrEP | 46.0 | 100 | **▲ 54.0** | **20.00 (< 0.001)** | 100 | 96.7 | ∇ 3.3 | 1.00 (1.000) |
| I know places where I could refer clients if they wanted to start PrEP | 54.1 | 100 | **▲ 45.9** | **17.00 (< 0.001)** | 100 | 93.3 | ∇ 6.7 | 2.00 (0.500) |
| Attitudes | | | | | | | | |
| People on PrEP are taking care of their health | 59.5 | 73.0 | △ 13.5 | 2.27 (0.227) | 73.0 | 76.7 | △ 3.7 | 0.00 (1.000) |
| There might not be easier ways for people to protect themselves from HIV than taking PrEP† | 10.8 | 24.3 | △ 13.5 | 5.00 (0.063) | 24.3 | 23.3 | ∇ 1.0 | 0.20 (1.000) |
| PrEP should be offered to anyone who's interested, even if they have trouble adhering to medication | 46.0 | 78.4 | **▲ 32.4** | **9.00 (0.004)** | 78.4 | 80.0 | △ 1.6 | 1.00 (0.625) |
| PrEP should be offered to people who use drugs, even if their HIV risk behaviors increase after starting PrEP | 64.9 | 81.1 | △ 16.2 | 3.00 (0.146) | 81.1 | 86.7 | △ 5.6 | 0.00 (1.000) |
| PrEP should be promoted and offered to all people, regardless of their HIV risk, behaviors, priorities, or health needs | 56.8 | 83.8 | **▲ 27.0** | **7.14 (0.013)** | 83.8 | 80.0 | ∇ 3.8 | 0.50 (0.727) |
| People taking PrEP should still use condoms to prevent sexually transmitted infections | 73.0 | 89.2 | △ 16.2 | 4.50 (0.070) | 89.2 | 96.7 | △ 7.5 | 0.33 (1.000) |
| People taking PrEP should still use sterile syringes and injection equipment to prevent Hepatitis C | 75.7 | 89.2 | △ 13.5 | 3.57 (0.125) | 89.2 | 100 | △ 10.8 | 3.00 (0.250) |

**Table 2** (continued)

| PrEP indicators | Baseline pretest ($T_0$) & baseline posttest ($T_1$) | | | | Baseline posttest ($T_1$) & endline posttest ($T_2$) | | | |
|---|---|---|---|---|---|---|---|---|
| | $T_0$ (%) | $T_1$ (%) | % point change | McNemar's test ($p$ value) | $T_1$ (%) | $T_2$ (%) | % point change | McNemar's test ($p$ value) |
| Promoting PrEP is equally a priority for me to making sure my clients have access to other services[†] | 35.1 | 62.2 | **▲ 27.1** | **7.14 (0.013)** | 62.2 | 46.7 | ∇ 15.5 | 3.60 (0.109) |
| Discussing PrEP with my clients is not a distraction from their other priorities[†] | 67.6 | 78.4 | △ 10.8 | 1.33 (0.388) | 78.4 | 76.7 | ∇ 1.7 | 1.00 (0.508) |
| Self-efficacy | | | | | | | | |
| I have the knowledge and skills to talk with clients about PrEP as an HIV prevention method | 24.3 | 89.2 | **▲ 64.9** | **20.57 (< 0.001)** | 89.2 | 96.7 | △ 7.5 | 0.33 (1.000) |
| I am confident in my ability to answer questions about PrEP that clients might ask me | 24.3 | 89.2 | **▲ 64.9** | **24.00 (< 0.001)** | 89.2 | 90.0 | △ 0.8 | 0.33 (1.000) |
| I am confident in my ability to share different messages about PrEP, based on how aware and interested clients might be in PrEP | 35.1 | 89.2 | **▲ 54.1** | **20.00 (< 0.001)** | 89.2 | 80.0 | ∇ 9.2 | 2.67 (0.219) |

Bold values are statistically significant ($p < 0.05$)

[†]Indicates items were reverse coded in analysis for consistency

how information related to medication interactions (e.g., gender-affirming hormones, Hepatitis C treatment) was especially enlightening and facilitated meaningful client dialogues about PrEP.

> Before, when clients—especially our transgender population—would ask me things like, "How does PrEP affect...hormones?" Initially, I would say, "I don't know, but here's this PrEP brochure."...But since the training, being able to say, "It's not going to affect any of those things." I think that's very useful when talking to people instead of saying you don't know. (Doer, Outreach/Client Navigation, Black Cisgender Woman)

Some non-doers, by comparison, attributed their PrEP promotion reticence to diminished confidence in their PrEP knowledge relative to other FHRW, whom they perceived as PrEP promotion champions.

> My knowledge of PrEP is not as high as a couple other colleagues of mine. It's equal to a lot of them, but there are two co-workers that really know more about PrEP than the rest of us. (Non-Doer, Outreach/Client Navigation, Black Cisgender Man)

## Attitudes Towards PrEP

We observed noteworthy increases in supportive PrEP-related attitudes from baseline pretest to baseline posttest (*range* 11–32 pp); only three indicators, however, increased significantly during the baseline pretest–posttest period (see Table 2): (1) "PrEP should be offered to anyone who's interested, even if they have trouble adhering to medication" (46–78%, McNemar's test: 9.00, $p = 0.004$); (2) "PrEP should be promoted and offered to all people, regardless of their HIV risk, behaviors, priorities, or health needs" (57–84%, McNemar's Test: 7.14, $p = 0.013$); and (3) "Promoting PrEP is equally a priority for me to making sure my clients have access to other services" (35–62%, McNemar's test: 7.14, $p = 0.013$). All significant increases reported above were sustained through endline posttest.

Interviewed doers, notably those without prior PrEP knowledge at baseline pretest, reported advocating for PrEP after PPT participation, explaining how the information and resources presented in the training inspired them to enthusiastically promote and "preach" PrEP to their clients. Even for FHRW who had been discussing PrEP with clients prior to training participation, they described the training as effective in reaffirming their commitment to PrEP promotion.

> What changed for me was the conviction to talk about PrEP. I guess I felt a deeper connection to PrEP, what it stood for, and the possibilities it provides. (Doer, Outreach/Client Navigation, Black Cisgender Woman)

Nevertheless, perceived effectiveness of PrEP, specifically the evidence around the protectiveness of PrEP for cisgender women, shaped some FHRW's decision-making surrounding

which clients they would prioritize in their PrEP promotion efforts. For instance, the perceived lack of evidence surrounding PrEP's effectiveness for cisgender women discouraged some FHRW from extensively discussing or promoting PrEP to their cisgender women clients.

> As a woman, if I had the option of taking PrEP, I probably wouldn't...I feel like there's not enough evidence around women taking it...I provide the information, and I tell them [clients] how it could be helpful, especially when I'm talking to women...But when I'm talking to men...I feel completely comfortable pushing PrEP...I feel completely comfortable sharing it and saying, "I think this is good for you." (Doer, Outreach/Client Navigation, Black Cisgender Woman)

## PrEP Promotion and Referral Self-efficacy

All three measures of PrEP promotion and referral self-efficacy increased significantly from baseline pretest to posttest (*range* 54–65 pp, McNemar's test $p<0.001$), and self-efficacy gains were maintained through endline posttest (see Table 2).

Self-efficacy among interviewed doers and non-doers was strong, with many doers attributing heightened capacity and confidence in their ability to discuss PrEP with clients to their training attendance.

> I just feel so empowered. It's like I'm wearing a PrEP bulletproof vest...I feel like I can talk the A to Z on PrEP. (Doer, Outreach/Client Navigation, Black Cisgender Woman)

Importantly, pre-existing skills in motivational interviewing and resilience in the context of discussing sensitive information with clients may have predisposed some FHRW to discuss PrEP with clients after participating in the training.

> Worst case scenario, you're going to offend someone, which compels people to grow. We need to give them [clients] the information, and if it in fact offends them, then it's on them...You have to practice having these conversations, and if somebody's like, "I can't believe you asked me about this," you've got to be tough but professional. (Doer, Outreach/Client Navigation, White Cisgender Woman)

Nevertheless, some doers also reflected on the limitations of virtual PPT delivery, particularly for the practice-oriented components of the training designed to bolster FHRW confidence in their PrEP promotion skills. These doers specifically advocated for in-person training delivery, in which practice session (i.e., role-playing with client personas) would be more closely aligned with how client interactions unfold in their workplaces.

> I think in-person would have been a lot better because conversations on Zoom and in-person are completely different. We could be saying the same exact things to each other in-person and on Zoom, but the experience could be completely different...I think the role-play scenarios would be a lot better in-person. (Doer, Outreach/Client Navigation, White Non-Binary Person)

Non-doers, by comparison, expressed that the training session did not provide sufficient time to solidify their knowledge and confidence in promoting PrEP. While they found the PPT informative and engaging, they ultimately characterized the PPT as an activity building a solid foundation for PrEP information and communication, from which supplemental trainings could reinforce and expand their PrEP promotion skills.

> I'm not as quick a grasper of stuff as everyone else...I would have to probably take the training like three times. One time isn't going to do it for me. (Non-Doer, Outreach/Client Navigation, Black Cisgender Man)

## PrEP Promotion Practices

Figure 5 illustrates the proportion of FHRW reporting PrEP-related promotion practices in the past month at baseline pretest and endline posttest. The proportion of FHRW reporting PrEP discussions with any client doubled during the evaluation period (30–67%, McNemar's test: 8.33, $p=0.006$). This corresponded to a cumulative increase of 140 self-reported PrEP conversations (from 139 at baseline pretest to 279 at endline posttest, Mann–Whitney U test: 2.65, $p=0.008$).

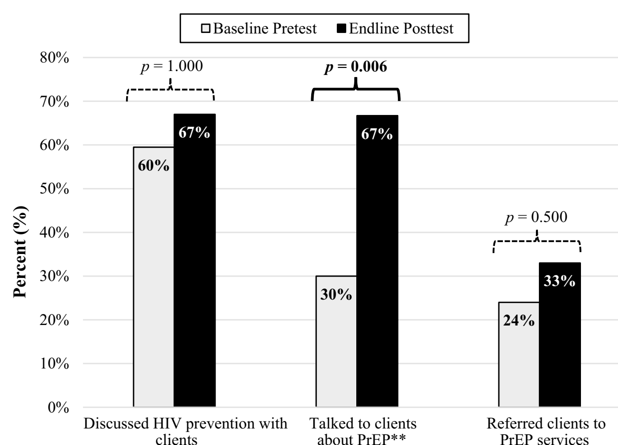


**Fig. 5** Changes in PrEP-related promotion practices from baseline pretest ($N=37$) to endline posttest ($N=30$) among PrEP Promotion Training (PPT) pilot evaluation participants. *Notes* **Indicates significant difference in PrEP-related behavior from baseline pretest ($T_0$) to endline posttest ($T_2$) at the $p<0.01$ level using McNemar's test

While the proportion of FHRW discussing HIV prevention methods with clients (60–67%, McNemar's test: 0.11, $p = 1.000$) and referring clients to PrEP services (24–33%, McNemar's test: 2.00, $p = 0.500$) increased from baseline pretest to endline posttest, neither increase was statistically significant. These promotion practices, nevertheless, resulted in 127 self-reported referrals to PrEP services in the post-intervention period, up from 56 in the month preceding training implementation (Mann–Whitney U test: 0.88, $p = 0.377$), and eight known PrEP initiations among clients.

At endline posttest, doers were more likely than non-doers to have outreach/client navigation roles (80% vs. 40%, Fisher's exact $p = 0.048$) and reported discussing HIV prevention with any client in the month prior to baseline pretest (80% vs. 30%, Fisher's exact $p = 0.015$) (see Electronic Supplementary Materials, Table S3). However, we found no significant differences in PrEP knowledge, attitudes, self-efficacy, or history of PrEP promotion practices comparing doers to non-doers.

In most cases, doers explained that initiating PrEP conversations with clients was predicated upon having institutionally standardized or streamlined processes for introducing PrEP into client interactions, such as integrating PrEP information into post-HIV test counseling or including PrEP-related questions in a client intake form.

> After they're tested for HIV, and I've given them their negative result, I let them know the outcome. Then I say, "As a woman, I found that there's this drug that is really effective when having anal sex."...That's how I break the ice. (Doer, Outreach/Client Navigation, Black Cisgender Woman)

Interviewed doers reported typically brief interactions with clients about PrEP, expressing that most clients do not engage in extensive conversations where FHRW are inquiring about clients' awareness or interest in PrEP.

> Nobody's expressed particular interest in it [PrEP], even when I say, "This is an easy pill you can take that will prevent you from getting HIV." Even when I mention that, people are like, "Oh, okay." And then they move on with their day...They're very quick, short interactions. (Doer, Case Management, Asian Non-Binary Person)

Doers explained that the flyers distributed following the PPT effectively facilitated PrEP conversations by grabbing clients' attention and providing basic PrEP information to clients without having to engage in extensive or lengthy conversations. This was particularly helpful in contexts or situations that were not amenable to more prolonged client interactions, such as during mobile outreach activities.

> Having the literature out and available has been useful for planting the seed in people's head and having them [clients] ask about it [PrEP]...We have the brochures set up such that PrEP is right next to numbers for shelters...It's been instrumental for getting conversations off the ground. (Doer, Outreach/Client Navigation, White Non-Binary Person)

Non-doers, by contrast, attributed their lack of PrEP conversations with clients to numerous factors, including HIV prevention falling outside the formal scope of FHRW's professional duties and anticipated client sensitivities surrounding discussions of HIV risk and prevention methods.

> That's something that we don't ask about on our assessment and treatment plan...It's something that naturally doesn't come up in our intake and our day-to-day conversations with clients. (Non-Doer, Case Management, White Cisgender Woman)
> It's tough...talking about HIV, HIV testing, PrEP. It's confidential, so some people really don't like to talk about it. I can't say, "Hey, you want an HIV test? You want to talk about PrEP?" (Non-Doer, Outreach/Client Navigation, Black Transgender Woman)

Anticipated client reservations to discussing HIV prevention, in fact, remained a salient constraint to engaging clients in conversations about PrEP even among doers, who attributed these concerns to persistent HIV-related stigma.

> For the majority of clients that I serve, we have not talked about it [PrEP]...If I come in too hot, I can freak them out...Some people seem offended that I would even bring it up to them...There's this element that can feel insulting...It's almost like taboo. (Doer, Outreach/Client Navigation, White Non-Binary Person)

Nevertheless, doers indicated that interactions in which clients expressed disinterest or resistance to PrEP did not discourage PrEP promotion by FHRW, who derived intrinsic motivation from educating and informing their clients about harm reduction tools.

> There will be personal success on my end because I had taught someone something...Even if I can't get follow-up information, once I get it out, I have...been an informer. And I get gratification from that...I have educated someone who maybe had no prior knowledge of it [PrEP], and now, they can explore it. (Doer, Outreach/Client Navigation, Black Cisgender Woman)

## Discussion

Our capacity-strengthening intervention, the PPT, significantly increased PrEP knowledge, supportive attitudes, communication self-efficacy, and promotion practices among FHRW in Baltimore City. In a short 6-week window, the proportion of FHRW discussing PrEP with clients doubled, from 30% at baseline pretest to 67% at endline posttest. These activities resulted in 127 self-reported referrals to PrEP services, including 8 known client PrEP initiations. Insights from qualitative interviews revealed that FHRW participating in the PPT felt empowered to discuss PrEP, motivated by the clinically distilled, client-tailored information presented in, and skills reinforced during, the training. Importantly, numerous FHRW initiating PrEP conversations with clients ("doers") alluded to existing motivational interviewing skills and institutional contexts (i.e., work duties, settings/types of client encounters), which provided a strong foundation for comfort and skills related to communicating PrEP information and resources to clients. Of note, PrEP doers and non-doers alike reported benefits from PPT participation. Prioritizing client-interfacing cadres among FHRW in future trainings could maximize the potential impacts of the PPT if implemented elsewhere.

Our findings challenge conventions surrounding how "successful" PrEP encounters are classically defined. We observed significant increases in FHRW-reported PrEP dialogues in the post-intervention period, but some doers qualitatively noted the brevity of these interactions—explaining that most clients did not engage extensively or request PrEP referrals during these conversations. While many counseling and peer-based interventions document client PrEP initiations as indicators of program effectiveness [17, 27, 28], increased PrEP awareness among clients of FHRW would be a sufficient outcome of our pilot. Studies of PWID and other populations who use drugs in Baltimore City underscore how low PrEP awareness constrains PrEP uptake [5, 8, 29]. Without awareness or accurate knowledge of its potential, PWID cannot consider PrEP as an HIV prevention tool. The focus of our pilot was, therefore, to leverage the existing rapport between FHRW and their clients to increase PrEP awareness among PWID. Although we did not incorporate measures of client PrEP awareness into our evaluation design, increased PrEP knowledge, supportive attitudes, and promotion practices among FHRW are likely to benefit their service delivery clients. Future research should consider the impacts of PPT implementation on the clients of participating FHRW.

Our experiences also reinforced the importance of complementary pedagogical tools (i.e., PrEP flyers and brochures) and the critical role of place and space in facilitating PrEP conversations. FHRW endorsed the printed flyers as an effective strategy for initiating conversations about PrEP as well as providing information that could be consumed by clients well after their encounter with harm reduction services ended. Doers also emphasized the role of the flyers as passive reminders to discuss PrEP with clients. Likewise, the flyers provided FRHWs opportunities to discreetly offer clients PrEP information, especially in the context of limited privacy during drop-in and outreach encounters. Given the persistence of HIV-related stigma and the importance of affirming spaces to confidentially sensitize clients towards PrEP [5, 30], these strategies must be considered in future implementation of PPT and comparable interventions.

Despite observed increases in supportive attitudes towards PrEP, some FHRW's preconceived notions about PrEP persisted and impacted decision-making surrounding when and with whom to discuss PrEP. Some FHRW, for instance, expressed greater discomfort discussing PrEP with cisgender women clients. While the PPT emphasized PrEP's effectiveness in populations other than cisgender men, a single two-hour session was likely insufficient to dismantle preconceptions of PrEP, notably its perceived effectiveness in cisgender women [7]. This could reflect the hegemony of cisgender men's presence in PrEP-related research and persistent underinvestment in PrEP interventions focused on cisgender women [31], highlighting a need for additional data and dissemination to various populations beyond cisgender men. Because FHRW ultimately make decisions about the clients to whom they promote PrEP, impacting the magnitude of benefits clients can receive from the PPT, these findings also allude to the potential role of values clarification and alignment activities to address and harmonize preconceptions of PrEP and PrEP users among training participants.

One constraint of our evaluation design was the condensed observation timeline. Because our evaluation period concluded approximately 8 weeks after PPT implementation (see Fig. 3), we only assessed whether changes in PrEP-related indicators persisted for approximately 2 months after training delivery. Thus, it remains unclear how our findings would differ with a more prolonged observation window. Importantly, some FHRW, notably those that did not discuss PrEP with clients in the post-intervention period ("non-doers"), advocated for supplemental trainings to reinforce PrEP knowledge and promotion skills. Activities that facilitate continuous engaged learning could address FHRW concerns regarding knowledge and skills attrition. Strategies promoting knowledge/skills reinforcement, including those empowering FHRW to take ownership of training materials and facilitate re-trainings within their CBOs, should be explored.

Our findings are subject to several other limitations. First, the study's small sample likely limited statistical power to detect significant differences in PrEP indicators over time

or by participant strata (e.g., doers and non-doers). Nevertheless, confirmation of the quantitative findings in qualitative interviews reinforced the credibility of quantitative results, further affirming the strength of our mixed methods approach in generating valuable insights to guide training modifications and future scale-up of pilot activities. Second, we developed most survey items measuring PrEP knowledge, attitudes, and self-efficacy for this specific evaluation, given the absence of validated instruments for the domains of interest in our evaluation and study population. The construct validity of the quantitative items we developed is, therefore, unknown. Third, the unplanned transition to virtual training delivery in January 2022 resulted in FHRW participating in the same training but through different delivery modalities, which could have affected observed changes in PrEP-related indicators and the overall training experience. Fourth, the implementation and evaluation of our pilot coincided with both winter holidays and COVID-19 case surges; the volume of client interactions with CBOs was likely lower than expected and, therefore, minimized opportunities for FHRW to promote PrEP to clients. Fifth, we exclusively ascertained PPT feasibility, acceptability, and satisfaction using qualitative methods; we did not measure these domains quantitatively. Future evaluations should include quantitative measures of these domains, which may complement or enhance insights gleaned from qualitative interviews with FHRW. Sixth, although desirability in FHRW responses cannot be discounted, we invited and received critical feedback during PPT implementation and interviews with FHRW, indicating participants felt welcome to earnestly share their insights and opinions on the pilot. Furthermore, participation incentives were not intrinsically linked to positive or negative appraisals of the PPT. Lastly, we designed the PPT centering the expressed needs of FHRW, the resources and capacities of the CBOs for which they worked, and the client populations they served; this highly localized and contextualized approach, therefore, may be required to effectively tailor the PPT if introduced into other practice settings.

## Conclusions

Findings from our pilot study affirm the effectiveness of leveraging trusted service delivery platforms to communicate PrEP information and facilitate PrEP service referrals for PWID. Our results underscore the feasibility of integrating content presented in the PPT into FHRW practice, the adaptability of the PPT across different harm reduction venues, and the importance of institutionalizing PrEP counseling into harm reduction services (through trainings or standard operating procedures) to sustain PrEP promotion activities. Future implementation and evaluation activities should focus on downstream PPT effectiveness and impact measures in client populations, as well as approaches for expanding the PPT to support FHRW and clients along the entire PrEP care continuum, including adherence and persistence.

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**Author Contributions** JGR, LZ, DP, and JLG generated content for the intervention, conceptualized the study design, and developed the data collection instruments. JNP secured funding for the study. JGR, LZ, and JLG implemented intervention activities. JGR and LZ collected, managed, and analyzed data under the supervision of JLG. JGR prepared the first draft of the manuscript. All authors reviewed, contributed to, and approved the final manuscript submitted for publication.

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**Data Availability** Anonymized data underlying the present study are available from the senior author (JLG) upon reasonable request.

**Code Availability** Not applicable.

## Declarations

**Competing Interests** The authors have no competing interest to disclose.

**Ethical Approval** The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed and deemed the study protocol as non-human subjects research.

**Consent to Participate** All evaluation participants provided verbal informed assent prior to completing evaluation activities.

**Consent for Publication** Not applicable.

## References


1. Centers for Disease Control and Prevention (CDC). Monitoring selected national HIV prevention and care objectives by using surveillance data, United States and 6 dependent areas, 2019. Atlanta: CDC; 2021. p. 1–158. Report no.: vol. 26, no. 2. Available from: https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-vol-26-no-2.pdf.
2. Lyss SB, Buchacz K, McClung RP, Asher A, Oster AM. Responding to outbreaks of human immunodeficiency virus among persons who inject drugs—United States, 2016–2019: perspectives on recent experience and lessons learned. J Infect Dis. 2020;222(Supplement_5):S239-49.
3. Hojilla JC, Hurley LB, Marcus JL, Silverberg MJ, Skarbinski J, Satre DD, et al. Characterization of HIV preexposure prophylaxis use behaviors and HIV incidence among US adults in an integrated health care system. JAMA Netw Open. 2021;4(8): e2122692.
4. Biello KB, Bazzi AR, Mimiaga MJ, Biancarelli DL, Edeza A, Salhaney P, et al. Perspectives on HIV pre-exposure prophylaxis (PrEP) utilization and related intervention needs among people who inject drugs. Harm Reduct J. 2018;15(1):1–12.
5. Glick JL, Jivapong B, Russo R, Pelaez D, Piser R, Footer K, et al. Cultivating PEARL (promoting empowerment and risk reduction): formative research for a PrEP intervention among female sex workers in Baltimore. Maryland AIDS Behav. 2022;26(8):2664–75.
6. Pleuhs B, Mistler CB, Quinn KG, Dickson-Gomez J, Walsh JL, Petroll AE, et al. Evidence of potential discriminatory HIV pre-exposure prophylaxis (PrEP) prescribing practices for people who inject drugs among a small percentage of providers in the U.S. J Prim Care Community Health. 2022;13:21501319211064000.
7. Glick JL, Russo R, Jivapong B, Rosman L, Pelaez D, Footer KHA, et al. The PrEP care continuum among cisgender women who sell sex and/or use drugs globally: a systematic review. AIDS Behav. 2020;24(5):1312–33.
8. Sherman SG, Schneider KE, Park JN, Allen ST, Hunt D, Chaulk CP, et al. PrEP awareness, eligibility, and interest among people who inject drugs in Baltimore, Maryland. Drug Alcohol Depend. 2019;195:148–55.
9. Walters SM, Kral AH, Simpson KA, Wenger L, Bluthenthal RN. HIV pre-exposure prophylaxis prevention awareness, willingness, and perceived barriers among people who inject drugs in Los Angeles and San Francisco, CA, 2016–2018. Subst Use Misuse. 2020;55(14):2409–19.
10. Schneider KE, White RH, O'Rourke A, Kilkenny ME, Perdue M, Sherman SG, et al. Awareness of and interest in oral pre-exposure prophylaxis (PrEP) for HIV prevention and interest in hypothetical forms of PrEP among people who inject drugs in rural West Virginia. AIDS Care. 2021;33(6):721–8.
11. Treloar C, Rance J, Yates K, Mao L. Trust and people who inject drugs: the perspectives of clients and staff of Needle Syringe Programs. Int J Drug Policy. 2016;27:138–45.
12. Roth AM, Aumaier BL, Felsher MA, Welles SL, Martinez-Donate AP, Chavis M, et al. An exploration of factors impacting preexposure prophylaxis eligibility and access among syringe exchange users. Sex Transm Dis. 2018;45(4):217–21.
13. Hershow RB, Gonzalez M, Costenbader E, Zule W, Golin C, Brinkley-Rubinstein L. Medical providers and harm reduction views on pre-exposure prophylaxis for HIV prevention among people who inject drugs. AIDS Educ Prev. 2019;31(4):363–79.
14. Walters SM, Reilly KH, Neaigus A, Braunstein S. Awareness of pre-exposure prophylaxis (PrEP) among women who inject drugs in NYC: the importance of networks and syringe exchange programs for HIV prevention. Harm Reduct J. 2017;14(1):40.
15. Walters SM, Coston B, Neaigus A, Rivera AV, Starbuck L, Ramirez V, et al. The role of syringe exchange programs and sexual identity in awareness of pre-exposure prophylaxis (PrEP) for male persons who inject drugs. Int J Drug Policy. 2020;77: 102671.
16. Furukawa NW, Weimer M, Willenburg KS, Kilkenny ME, Atkins AD, Paul McClung R, et al. Expansion of preexposure prophylaxis capacity in response to an HIV outbreak among people who inject drugs-Cabell County, West Virginia, 2019. Public Health Rep. 2022;137(1):25–31.
17. Roth AM, Tran NK, Felsher M, Gadegbeku AB, Piecara B, Fox R, et al. Integrating HIV preexposure prophylaxis with community-based syringe services for women who inject drugs: results from the Project SHE Demonstration Study. J Acquir Immune Defic Syndr. 2021;86(3):e61-70.
18. Khandia R, Singhal S, Alqahtani T, Kamal MA, El-Shall NA, Nainu F, et al. Emergence of SARS-CoV-2 Omicron (B.1.1.529) variant, salient features, high global health concerns and strategies to counter it amid ongoing COVID-19 pandemic. Environ Res. 2022;209:112816.
19. Creswell JW, Clark VLP. Designing and conducting mixed methods research. Thousand Oaks: Sage; 2011.
20. Klein H, Washington TA. The pre-exposure prophylaxis (PrEP) stigma scale: preliminary findings from a pilot study. Int Public Health J. 2019;11(2):185–95.
21. Siegler AJ, Wiatrek S, Mouhanna F, Amico KR, Dominguez K, Jones J, et al. Validation of the HIV pre-exposure prophylaxis stigma scale: performance of likert and semantic differential scale versions. AIDS Behav. 2020;24(9):2637–49.
22. Davis Jr. TP. Barrier analysis facilitator's guide: a tool for improving behavior change communication in child survival and community development programs. Washington, D.C.: Food for the Hungry; 2004. Available from: https://coregroup.org/wp-content/uploads/media-backup/Tools/Barrier_Analysis_2010.pdf.
23. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Med Res Methodol. 2013;13(1):117.
24. Yin RK. Qualitative research from start to finish. New York: Guilford Press; 2010.
25. Ayres L, Kavanaugh K, Knafl KA. Within-case and across-case approaches to qualitative data analysis. Qual Health Res. 2003;13(6):871–83.
26. Fetters MD. The mixed methods research workbook: activities for designing, implementing, and publishing projects. Thousand Oaks: SAGE Publications; 2019.
27. Reback CJ, Clark KA, Rünger D, Fehrenbacher AE. A promising PrEP navigation intervention for transgender women and men who have sex with men experiencing multiple syndemic health disparities. J Community Health. 2019;44(6):1193–203.
28. Blackstock OJ, Platt J, Golub SA, Anakaraonye AR, Norton BL, Walters SM, et al. A pilot study to evaluate a novel pre-exposure prophylaxis peer outreach and navigation intervention for women at high risk for HIV infection. AIDS Behav. 2021;25(5):1411–22.
29. Tomko C, Park JN, Allen ST, Glick J, Galai N, Decker MR, et al. Awareness and interest in HIV pre-exposure prophylaxis among street-based female sex workers: results from a US context. AIDS Patient Care STDS. 2019;33(2):49–57.
30. Pelaez D, Weicker NP, Glick J, Mesenburg JV, Wilson A, Kirkpatrick H, et al. The PEARL study: a prospective two-group pilot PrEP promotion intervention for cisgender female sex workers living in Baltimore, MD, U.S. AIDS Care. 2021;33(sup1):1–10.

31. Cernasev A, Walker C, Armstrong D, Golden J. Changing the PrEP narrative: a call to action to increase PrEP uptake among women. Women. 2021;1(2):120–7.

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