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## Acceptability of pre-exposure prophylaxis and vaginal rings for HIV prevention among female sex workers in Baltimore, MD

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### Abstract

Biomedical HIV prevention tools including oral pre-exposure prophylaxis (PrEP) and vaginal microbicide rings hold unique value for high-risk women who may have limited capacity for condom negotiation, including the key populations of sex workers and drug users. Commercial sex is a PrEP indicator in CDC guidelines, yet little is known about female sex workers' (FSWs) knowledge of and attitudes toward PrEP or the newly developed monthly vaginal microbicide rings. We describe knowledge and attitudes toward PrEP and microbicide rings in a sample of 60 mostly drug-using FSWs in Baltimore, Maryland, a high HIV-prevalence US city. Just 33% had heard of PrEP, but 65% were interested in taking daily oral PrEP and 76% were interested in a microbicide vaginal ring. Self-efficacy for daily oral adherence was high (79%) and 78% were still interested in using PrEP even if condoms were still necessary. Women who had experienced recent client-perpetrated violence were significantly more interested in PrEP (86% vs 53%,  $p=0.009$ ) and microbicide rings (91% vs 65%,  $p=0.028$ ) than women who had not recently experienced violence. No differences were observed by demographics nor HIV risk behaviors, suggesting broad potential interest in daily PrEP and monthly-use vaginal microbicides in this high-risk population.

## Keywords

sex workers; people who inject drugs; pre-exposure prophylaxis; vaginal rings; microbicides; violence

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## Introduction

Thirty years into the HIV epidemic, a new generation of biomedical prevention tools holds promise for protecting high-risk women from HIV acquisition. Oral pre-exposure prophylaxis (PrEP) reduces heterosexual HIV acquisition in women by approximately 60–70%,<sup>1,2</sup> while PrEP reduced acquisition among drug-using women by 79% and was more effective among women than among men.<sup>3</sup> A monthly dapivirine-containing vaginal ring, the first longer-acting prophylaxis option for women, was recently shown to reduce infection by 27–31%, though with significant variation by age.<sup>4,5</sup>

While the efficacy of oral PrEP is established, its real-world effectiveness rests on adherence. Low adherence to daily oral PrEP or microbicides nullified the potential for significant findings in the Fem-PrEP and VOICE trials.<sup>6,7</sup> Monthly rings obviate the need for daily adherence, though they present different challenges. While levels of adherence were higher in ASPIRE than in VOICE or Fem-PrEP, women sometimes removed the rings, and adherence was lowest among younger women, among whom the ring lacked efficacy.<sup>8</sup> Little is known about acceptability of a monthly dapivirine ring among female sex workers (FSWs).

Key populations in the HIV epidemic, including FSWs<sup>9</sup> and drug users<sup>10</sup>, stand to benefit significantly from pre-exposure prophylaxis. Globally, FSWs are at elevated risk of HIV infection<sup>9</sup> and approximately 15% of women infected are sex workers.<sup>11</sup> FSWs who use drugs are doubly at risk for acquisition. Modeling suggests that PrEP could reduce HIV incidence in FSWs by 40%.<sup>12</sup> User-controlled HIV prevention is critical for FSWs, as their HIV risk is shaped by structural factors including limited control over condom usage as well as violence.

Within the US, FSW-specific HIV surveillance is lacking,<sup>13</sup> however National HIV Behavioral Surveillance System data reveals prevalent sex trade (16.6%) among high-risk heterosexuals, and elevated HIV prevalence (3.7% vs. 2.1%) among sex workers.<sup>14</sup> A recent review identified a 17% HIV prevalence among FSWs in the US.<sup>15</sup> Consistent with World Health Organization recommendations,<sup>16</sup> the US Centers for Disease Control and Prevention<sup>17</sup> recommend PrEP for individuals involved in commercial sex.

PrEP uptake has been limited in the US, particularly for women. PrEP prescriptions are declining for women; by 2015 women represented only 11% of new PrEP.<sup>18</sup> Despite high acceptability of PrEP among FSW internationally,<sup>19,20</sup> little is known about PrEP and vaginal ring acceptability among FSW in the US. Among mostly drug-using FSWs from Baltimore, Maryland, we describe indicators of awareness of, attitudes toward, and acceptance of oral PrEP and microbicide rings.

## Methods

Data were collected for the INSPIRE study, a feasibility evaluation of a violence prevention and response intervention for FSWs. Participants were recruited from two sites of a mobile health service that provides needle exchange and sexual/reproductive health services in Baltimore, Maryland, home to the third-highest HIV incidence of any US city. Available services on the van include referral to drug treatment programs, overdose response training, and naloxone distribution, assistance in obtaining personal identification, medroxy-progesterone injections and emergency contraception, birth control prescriptions, pregnancy testing, free condoms, Pap tests, HIV/STI testing, and STI treatment. Eligible female participants were at least 18 years old, had sold or exchanged sex in the past 3 months, and were clients of the city's mobile health services. Women (N=60) were recruited following their receipt of mobile services. They then completed a self-administered baseline survey. Participants received a \$25 gift card and information for local services.

To assess PrEP *awareness*, participants were asked, "HIV Pre-exposure prophylaxis, or PrEP, is a way for people who do not have HIV to *prevent* HIV infection by taking a pill **every day**. Have you heard of HIV PrEP before today?" To assess *acceptability*, participants were asked, "How interested would you be in taking a pill every day to prevent HIV infection?" Acceptability of a microbicide ring was assessed with "Researchers are developing a microbicide (e.g. can kill viruses) vaginal ring that could protect against HIV infection. The ring would be changed **monthly**. How interested would you be in a microbicide vaginal ring that could prevent HIV infection?" *Self-efficacy at adherence* to daily PrEP was assessed with, "How easy would it be for you to take a pill each day, to prevent HIV infection?" Potential for *risk compensation* was assessed with the question, "Would you take PrEP if you still had to use condoms to be fully protected from HIV?" Physical violence from clients was ascertained by asking, "Have you been hit, punched, slapped or otherwise physically hurt by a client?", and sexual violence from clients was ascertained in a series of four questions eliciting whether they had either been physically forced or pressured into vaginal or anal sex by a client against their will. To assess willingness to participate in a biomedical study to study PrEP or microbicide rings in this population, participants were asked, "How willing would you be to provide a self-collected vaginal swab for a research study like this?" and "How willing would you be to provide a blood sample for a research study like this?" Questions were adapted from published studies.<sup>21,22</sup>

We conducted descriptive analysis of key indicators; denominators fluctuate to accommodate missing data. We explored how interest in oral PrEP and microbicide rings, respectively, varies across demographics (including age, race, and partnership status) and HIV risk factors (including sexual risk, injecting drug use, HIV testing history, and experiences of violence) via Chi-square and Fisher's exact tests.

## Results

Women in the sample were largely white (72%) or black (16%), with a mean age of 35.5 years. The majority (90%) reported ever injecting drugs.

Only 33% had heard of PrEP, but 65% were somewhat or very interested in taking PrEP when it was described to them (Table 1). Four out of five (79%) said it would be somewhat or very easy for them to take a daily pill, 78% said they would take PrEP even if they had to wear condoms for full protection from HIV. There was greater interest in a microbicide vaginal ring, with three in four women (76%) very or somewhat interested. Of the 52 women who answered both questions, 12% were interested in PrEP but not a microbicide ring, while 19% were interested in the ring but not PrEP, and 56% indicated interest in both methods. There was high willingness to provide self-collected vaginal swabs and give blood samples for future research studies.

Women who had recently experienced physical or sexual violence from clients were more likely to be interested in PrEP (86% vs 53%,  $p=0.009$ ) and microbicide rings (91% vs 65%,  $p=0.028$ ; Table 2) than women who had not recently experienced violence. Two factors were marginally significant: Women younger than 35 were somewhat more interested in PrEP than older women (77% vs 53%,  $p=0.07$ ) and women reporting a female partner were somewhat more interested in a vaginal ring than those who did not have a female partner (100% vs 70%,  $p=0.06$ ).

## Discussion

In some of the first data to explore the acceptability of daily oral PrEP and monthly microbicide rings among FSWs in the US, this study found strong interest in these user-controlled prevention tools. Participants were confident that they could use these tools regularly and in conjunction with condoms. Despite low initial awareness of PrEP and microbicide rings, participants were interested in these tools upon explanation, suggesting that outreach and education may increase demand for these relatively low-cost and low-threshold HIV prevention methods. Given the high acceptability of vaginal swabs and blood samples, clinical trials including biomedical monitoring for drug adherence appear feasible in this population. Interventions to promote oral PrEP should be evaluated in high-risk subsets of women, including FSWs. While vaginal rings have not been approved in the US for HIV prevention, they were even more acceptable than daily oral PrEP in our sample; further research should evaluate their efficacy and evaluate interventions to promote adherence among FSWs.

Findings also speak to the importance of continuing to develop a variety of user-controlled prevention methods, as 31% of women were only interested in either oral PrEP or the microbicide ring, but not the other. Just as having a wide variety of contraceptive methods has proven important in making birth control accessible to more women, having a diverse HIV prevention method mix with varied dosing strategies and delivery mechanisms that meet women's diverse needs, including those of FSWs, will prove important.<sup>23</sup>

Interest in daily PrEP and the monthly microbicide ring was significantly higher among FSWs who had recently experienced client violence, affirming the value of user-controlled HIV prevention tools to buffer against structural sources of HIV risk, particularly when ability to negotiate condom use may be limited in light of prevalent client violence. Interest did not vary significantly by demographics or HIV risk behavior, suggesting generalized

acceptability of PrEP and vaginal rings in this population. Further work is needed to extend beyond the limitations of our study, which include small sample size and a single geographic location.

Our study offers direction for community-based PrEP engagement and implementation. Study recruitment was successful at public mobile clinics providing reproductive health and needle exchange services. Such clinics have the potential to serve as a mechanism for identification and referral of high-risk women who could benefit from biomedical HIV prevention tools when they are implemented more broadly. Because the mobile clinic is also staffed by medical professionals, prescription and monitoring of PrEP could potentially occur in conjunction with existing outreach services, bypassing issues of engaging these marginalized women in traditional primary care settings.

Among this sample of largely drug-using FSWs in a US city with a high prevalence of HIV, there was strong acceptability, interest, and self-efficacy in taking daily oral PrEP as well as interest in microbicides for user-controlled HIV prevention. While transactional sex is an indication for PrEP use within CDC guidelines, only a minority of FSWs in this study were aware of PrEP. Efforts to increase access to user-controlled tools through mobile clinic services may be particularly promising in engaging these high-risk women. Our initial evidence on acceptability, interest and perceived self-efficacy in using these prevention tools among US FSW provide a foundation for efforts to support timely expansion of PrEP and microbicides into this population.

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**Table 1**

Attitudes toward PrEP, microbicide rings, and participating in biomedical research studies among female sex workers

	% (n)
<b>Knowledge and awareness</b>	
HIV Pre-exposure prophylaxis, or PrEP, is a way for people who do not have HIV to <i>prevent</i> HIV infection by taking a pill every day. Have you heard of HIV PrEP before today?	
Yes	33% (20)
No	58% (35)
Unsure	8% (5)
<b>Interest/acceptability</b>	
How interested would you be in taking a pill every day to prevent HIV infection? (n=58)	
Very interested	43% (25)
Somewhat interested	22% (13)
Somewhat disinterested	9% (5)
Very disinterested	26% (15)
Researchers are developing a microbicide (e.g. can kill viruses) vaginal ring that could protect against HIV infection. The ring would be changed monthly. How interested would you be in a microbicide vaginal ring that could prevent HIV infection? (n=53)	
Very interested	59% (31)
Somewhat interested	17% (9)
Somewhat disinterested	4% (2)
Very disinterested	21% (11)
Interest by method type (n=52)	
PREP only	12% (6)
Ring only	19% (10)
Both	56% (29)
Neither	13% (7)
<b>Self-efficacy for adherence</b>	
How easy would it be for you to take a pill each day to prevent HIV infection? (n=59)	
Very easy	59% (35)
Somewhat easy	20% (12)
Somewhat difficult	8% (5)
Very difficult	12% (7)
<b>Potential for risk compensation</b>	
Would you take PrEP if you still had to use condoms to be fully protected from HIV? (n=58)	
Yes	78% (46)
No	22% (13)
<b>Willingness to participate in biomedical research studies</b>	
Willingness to provide self-collected vaginal swab for a research study (n=57)	
Very willing, willing, or somewhat willing	93% (53)
Not willing	5% (3)

	% (n)
Unsure	2% (1)
Willingness to provide blood sample for a research study (n=57)	
Very willing, willing, or somewhat willing	98% (56)
Not willing	0% (0)
Unsure	2% (1)

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**Table 2**

Associations with being “very” or “somewhat interested” in taking daily oral PrEP or using a monthly vaginal microbicide ring

	Sample proportion with characteristic% (n/N) Total N=60	Interested in PrEP% (n <sub>1</sub> /n) Total n=58	Interested in ring% (n <sub>2</sub> /n) Total n=53
Demographics			
<b>Age</b>			
<35	47% (27/58)	<b>77% (20/26)</b> *	78% (18/23)
>=35	53% (31/58)	<b>53% (16/30)</b> *	75% (21/28)
<b>Race</b> *			
White	72% (41/57)	72% (28/39)	73% (27/37)
Black	16% (9/57)	67% (6/9)	75% (6/8)
Hispanic	4% (2/57)	0% (0/2)	100% (1/1)
Asian	2% (1/57)	0% (0/1)	100% (1/1)
Other	7% (4/57)	50% (2/4)	100% (4/4)
<b>Other source of income besides sex work</b>			
Yes	59% (34/58)	73% (24/33)	71% (22/31)
No	41% (24/58)	57% (13/23)	85% (17/20)
<b>HIV test in past 12 months</b>			
Yes	77% (46/60)	61% (27/44)	73% (30/41)
No	23% (14/60)	79% (11/14)	83% (10/12)
<b>Have primary female partner</b>			
Yes	16% (10/60)	60% (6/10)	<b>100% (9/9)</b> *
No	84% (50/60)	67% (32/48)	<b>70% (31/44)</b> *
<b>Have primary male partner</b>			
Yes	29/60 (48%)	63% (17/27)	72% (18/25)
No	31/60 (52%)	68% (21/31)	79% (22/28)
Sexual and drug-related HIV risk behavior			
<b>Any unprotected vaginal sex with client, past 30 days</b>			
Yes	35% (19/55)	68% (13/19)	65% (11/17)
No	65% (36/55)	71% (24/34)	77% (24/31)
<b>Any unprotected vaginal sex with partner, past 30 days</b> *			
Yes	37% (22/60)	65% (13/20)	72% (13/18)
No	63% (38/60)	66% (25/38)	77% (27/35)
<b>Anal sex with clients</b>			
No anal sex with client	60% (34/57)	67% (22/33)	73% (22/30)
Only protected anal sex with client	25% (14/57)	69% (9/13)	83% (10/12)

	Sample proportion with characteristic% (n/N) Total N=60	Interested in PrEP% (n <sub>1</sub> /n) Total n=58	Interested in ring% (n <sub>2</sub> /n) Total n=53
Any unprotected anal sex with client	16% (9/57)	67% (6/9)	75% (6/8)
<b>Injecting drug use</b>			
In the past 3 months	87% (52/60)	68% (34/50)	77% (36/47)
More than 3 months ago	3% (2/60)	0% (0/2)	0% (0/1)
Never	10% (6/60)	67% (4/6)	80% (4/5)
<b>Share syringes, past 3 months*</b>			
Ever	35% (21/60)	71% (15/21)	83% (15/18)
Never	65% (39/60)	62% (23/37)	71% (25/35)
Structural risk factors:Violence and coercion			
<b>Any physical or sexual violence from clients, past 3 months</b>			
Yes	37% (22/60)	<b>86% (19/22)***</b>	<b>91% (20/22)**</b>
No	63% (38/60)	<b>53% (19/36)***</b>	<b>65% (20/31)**</b>
<b>Confident in refusing unprotected sex with clients</b>			
Yes	71% (41/58)	64% (25/39)	71% (25/35)
No	29% (17/58)	71% (12/17)	82% (13/16)
<b>IPV from a primary male partner, past 3 months</b>			
Yes	34% (20/58)	75% (15/20)	79% (15/19)
No	66% (38/58)	61% (22/36)	75% (24/32)

\*  
p<0.1\*\*  
p<0.05\*\*\*  
p<0.01