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Patterns and Correlates of Participant Retention in a Multi-City Pre-Exposure Prophylaxis Demonstration Project

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Abstract

Background—Safe and effective use of pre-exposure prophylaxis (PrEP) depends on retention in care after initial engagement

Setting—The United States PrEP Demonstration Project offered daily oral tenofovir/emtricitabine to participants in San Francisco, Miami, and Washington, D.C. for 48 weeks from 2012-2014

Methods—Demo Project participants' patterns of retention were assigned to one of three categories: early loss to follow-up (ELTF) within the first 12 weeks of the study, retention throughout the study, or intermittent retention in which missed or delayed visits resulted in gaps in medication availability. For each group, baseline characteristics were tabulated. A two-step multivariable analysis was performed

Results—Overall, 366/554 (66.1%) of enrolled participants were retained for all study visits, 127/554 (22.9%) had intermittent retention, and 61/554 (11.0%) early loss to follow-up (ELTF). In multivariable analysis Miami compared to San Francisco site was associated with ELTF rather than full retention (aOR 2.84; CI:1.24-6.47) and also with intermittent rather than full retention (aOR 2.70; CI:1.43-5.11). Younger age was associated with ELTF (aOR 1.80 for each 10-year decrement in age; CI:1.26- 2.57) and intermittent retention (aOR 1.47; CI:1.17-1.84) compared with full retention. Factors associated with ELTF (but not intermittent retention) compared with

full retention, were black race compared with white (aOR 3.32; CI:1.09-10.16), reported sex work (aOR 4.67; CI 1.49- 14.58), lack of regular employment (aOR 2.53; CI: 1.27-5.05), and lack of prior PrEP awareness (aOR 2.01; CI:1.01 -3.96)

Conclusion—Tailored interventions addressing causes and risk factors for loss from PrEP care may improve retention and consistency of PrEP use.

Keywords

HIV prevention; pre-exposure prophylaxis; retention-in-care; demonstration project; men who have sex with men

Background

Pre-exposure prophylaxis (PrEP) with daily oral tenofovir/emtricitabine is effective for HIV prevention [1]. PrEP has been shown to be acceptable to men who have sex with men (MSM) who are at increased risk for HIV infection, with high rates of PrEP uptake across all subgroups when offered as part of open label studies and demonstration projects [2, 3]. Administering PrEP in a real-world setting requires longitudinal follow-up for HIV testing, safety monitoring, counseling, and drug prescribing [4]. Retention in care among those taking PrEP medication is essential for continued access to medication, reinforcement of adherence, HIV and STI testing and treatment, and has been a challenge in some real world settings [5, 6]. Patterns of retention in PrEP care may vary; three clinically important categorizations of these patterns include those who are interested in PrEP but do not follow-up beyond the initiating visits, those who continue to follow-up but miss one or more visits resulting in less than complete coverage with PrEP medication, and those who follow-up regularly as scheduled. These patterns of retention may have different implications for safety and future engagement. Understanding individual and community-level characteristics of PrEP users who exhibit various patterns of retention in PrEP care may allow tailored interventions to improve retention. In this study we sought to describe patterns of retention in the multi-site United States National Institutes of Health PrEP Demonstration Project (The Demo Project) and to identify baseline and early characteristics that are associated with these three patterns of retention in PrEP care.

Methods

The Demo Project was a multi-site open-label demonstration project that enrolled 557 MSM and transgender women (TGW) with increased risk for HIV infection from two municipal sexually transmitted disease (STD) clinics (in San Francisco and Miami) and a community health center (in Washington, D.C.). Three individuals with detectable HIV-1 nucleic acid amplification at the first medication dispensation visit after non-reactive rapid tests were excluded from the analysis. One individual who experienced HIV seroconversion after loss-to-follow-up from the study was included in the analysis. Baseline characteristics and primary outcomes of the project have been previously reported [7, 8]. Baseline screening evaluation was conducted to assess eligibility and eligible individuals who elected to enroll in the project had a separate enrollment visit 1-2 weeks following the screening visit at which medication was dispensed. Scheduled follow-up visits were at 4-, 12-, 24-, 36-, 48-,

and 52-weeks post-enrollment. PrEP medication was dispensed directly to the participants at each follow-up visit with sufficient medication for daily dosing through the scheduling window for the next scheduled visit as follows: at the enrollment visit, one 30-pill bottle of medication was dispensed; at the 4-week visit two bottles were dispensed, and at the 12-, 24- and 36-week visits three bottles were dispensed. No medication was dispensed at the 48- or 52-week visits. Participants who had delayed or missed visits were dispensed the number of bottles required to provide daily medication until the next scheduled visit and lapses were noted. Assessment included pill counts, surveys, biological samples, health screenings including review for adverse events, physical examination, HIV and STI testing. Participants were encouraged to continue to attend appointments even if they had temporarily or permanently discontinued PrEP medication.

Dried blood spot (DBS) samples for tenofovir diphosphate (TFV-DP) levels were collected at all scheduled follow-up visits and any visit where PrEP medication was stopped. Samples were processed for 100 randomly selected participants from each site as well as for all black and transgender participants as these groups were underrepresented in the overall sample. DBS samples were analyzed for TFV-DP levels as previously described [3, 8, 9].

Participants were contacted by telephone in advance of all scheduled study visits. Contact was attempted at least three times with each participant who missed a scheduled study visit. All participants were required to provide alternate contact information at study enrollment; for participants not responding after three attempts contact through the alternative contact was attempted. These procedures were repeated each time a study visit time window opened. All contact and retention procedures were standardized across sites. Ongoing communication between study sites and comparison of contact logs occurred throughout the study to ensure uniformity in retention procedures.

Questionnaires were verbally administered by study personnel in English or Spanish depending on the participant's preference. Questions addressed demographics, employment, educational attainment, income, financial security (a response other than “never” to the question “in the past 6 months how often has there not been enough money in the household for rent, food, or utilities”), sexual behavior including number of partners, HIV-status of partners, and reported condom use, current substance use, PrEP awareness, depression (as measured by a Patient Health Questionnaire-2 (PHQ-2) screening instrument score of greater than 2) and HIV risk perception. Risk perception was assessed by asking, “if you were not receiving PrEP, what is the likelihood that you would acquire HIV within the next year,” with an answer scale of 0-100. Answers were categorized as “low” (0-49), “medium” (50), or “high” (51-100). The decision to categorize “medium” with a single value response was made due to a large spike in responses at the value “50.”

Patterns of Retention

After visual examinations of the patterns of follow-up three categories were created. We defined the *Early Loss-to-Follow-up* (ELTF) group (N=61) as those completing enrollment procedures and receiving at least a 30-day supply of medication but not attending the 12 week scheduled visit or any subsequent visits. The *Intermittent* group (N=127) included those participants completing enrollment and one or more study visits at 12-weeks or later,

but missing or delaying at least one follow-up visit during the study at which medication was to be dispensed, resulting in at least one month with medication coverage for <50% of days and therefore not considered to have continuous coverage with PrEP medication throughout the study period. Finally, the *Retained* group (N=366) included those enrolled and attending all scheduled follow-up visits at which medication was dispensed. As no medication was dispensed at the 48-week and 52-week visits, participants who completed all other visits were included in the *Retained* category regardless of attendance at these visits. Two participants who were enrolled in the study and received medication at enrollment but did not return for any subsequent visits until the 48-week visit (at which no medication was dispensed) were included in the ELTF group.

For each retention group, baseline and enrollment survey responses, demographics, and clinical characteristics were tabulated. Initially each potential predictor was assessed for relationships with the three retention groups using multinomial logistic regression adjusting for site only. Using this model we calculated odds ratios for ELTF vs Retained and Intermittent vs Retained groups. Due to high multicollinearity of measures within different domains (e.g. demographics, behaviors), we built our multivariate model in stages by domain. In the first stage, predictors were divided into demographic and behavioral domains and a multivariable model for each was created by adding in all variables within the domain in which $p < 0.05$ in the initial models. In the second stage, these two models were combined into a single model by including those predictors from these two intermediate models with $p < 0.05$. The three odds ratios were also calculated for each of the variables retained in the final multivariable model.

DBS were analyzed separately because they were only available on a subset of individuals. For DBS, protective levels of TFV-DP were defined as >700 fmol/punch based on available modeling data [10]. Levels were scored as protective or not protective at each visit where levels were obtained, and the percentage of samples with protective levels was reported for each retention group and compared across groups using a Wilcoxon test.

Results

Overall, 366/554 (66.1%) of enrolled participants in the Demo Project were retained for all study visits, 127/554 (22.9%) had intermittent retention, and 61/554 (11.0%) had early loss to follow-up (ELTF). Demographic and baseline characteristics of each group with chi-squared assessment of differences in characteristics between groups are described in table 1 (additional baseline characteristics are described in Supplemental Table 1).

Factors Associated with Retention in Bivariate Analysis (table 2)

Compared with the San Francisco and Washington, D.C. sites, the prevalence of ELTF was higher at the Miami site (table 2). Enrollment at the Miami site was significantly associated with both ELTF (vs. complete retention aOR 7.69; CI 4.17-14.28) and intermittent retention (vs. complete retention aOR 2.63; CI 1.64-4.17) compared with the San Francisco site, and with the Washington, D.C. site for ELTF (vs. complete retention aOR 7.69; CI: 2.94-20.00) and intermittent retention (vs. complete retention aOR 3.22; CI: 1.72-6.25). There were no

significant differences in retention between the Washington, D.C. and San Francisco sites. All further comparisons are adjusted for site.

Younger age and unstable housing were each significant predictors of both ELTF and intermittent retention compared with full retention. Black race, disabled or unemployed status, annual income less than \$20,000, financial insecurity, lack of prior PrEP awareness, reporting sex work (giving or receiving money or other things for sex), and lack of primary care physician were significantly associated with ELTF compared with full retention in the bivariate analysis (table 2). Drug use was not significantly associated with retention categories except for use of erectile dysfunction (ED) medication which was protective against ELTF compared with full retention (aOR 0.29; CI: 0.12-0.71). Reporting a lower number of known HIV-seropositive sexual partners was protective against ELTF compared with full retention (aOR 0.34; CI: 0.12-0.99) as was a lower number of known HIV-seronegative sexual partners (aOR 0.49; CI: 0.27-0.88).

Multivariate Adjusted Factors Associated with Patterns of Retention (Table 3)

The multivariate model included the following variables in relation to retention categories: site, age, race, sex work, prior PrEP awareness, reported number of known HIV-positive partners, and employment status. All comparisons reported in this section are adjusted for all the other variables in the model.

Factors Associated with Both ELTF and Intermittent Retention

In the multivariable model, Miami site compared to San Francisco site was associated with ELTF rather than full retention (aOR 2.84; CI: 1.24-6.47) and also with intermittent rather than full retention (aOR 2.70; CI: 1.43-5.11). Decrease in age by 10 years was significantly associated with both ELTF (aOR 1.80; CI: 1.26-2.57) and intermittent retention (aOR 1.47; CI: 1.67-1.84) compared with full retention (table 2).

Factors Associated with ELTF but not Intermittent Retention

Black race was associated with ELTF compared with full retention (aOR 3.32; CI: 1.09-10.16). Lack of PrEP awareness prior to study enrollment was associated with ELTF (aOR 2.01; CI: 1.01-3.96 for ELTF vs. full retention). Being disabled or unemployed versus working was associated with ELTF compared with full retention (aOR 2.53; CI: 1.27-5.05). Participating in sex work was also associated with ELTF compared with full retention (aOR 4.67; CI: 1.49-14.58).

Baseline Risk

Sexually transmitted infections were present at baseline for 23/61 (37.7%) of the ELTF group, 81/366 (22.1%) of the Retained group, and 39/127 (30.7%) of the Intermittent group; the difference was significant ($\chi^2=8.68$; $p=0.013$). When adjusted for reason for baseline visit ("to get PrEP" vs. "other") this difference was no longer significant.

Adverse Events

There were no significant differences between retention groups in total reported adverse events, adverse events attributed by participants to PrEP medication, or gastrointestinal

adverse events up to the 4-week visit. There were no differences in social harms or social benefits reported up to the 4-week visit across groups (data not shown).

Patterns of Drug Detection

Levels of TFV-DP were most consistently protective among those in the Retained group, with 257/314 (81.8%) having protective levels for all DBS samples obtained compared with 50/113 (44.2%) and 8/24 (33.3%) for the Intermittent and ELTF groups respectively. Of those who had blood drawn for TFV-DP levels in DBS at week 4, 174/191 (91.1%) were protective (>700 fmol/punch) for those subsequently retained for all visits compared with 10/24 (41.6%) for those who were in the ELTF group and 56/78 (71.8%) for those in the Intermittent group (Figure 1).

Discussion

The majority of participants in the PrEP Demo Project were retained in care throughout the study period. For those not fully retained, two patterns were examined: early loss before the 12-week visit, and intermittent retention throughout the study with gaps in PrEP medication coverage. These patterns may be driven by different factors. Individuals who dropped out of PrEP care early in the process may have made an early decision to terminate PrEP, may never have been committed to PrEP as a prevention strategy, may have been discouraged by lack of social support, or may have structural or logistical constraints that make PrEP care difficult or a lack of prior preparation for participation in an intervention that requires longitudinal engagement. Intermittent care, in contrast, indicates at least some continued interest in PrEP, but less-than-complete engagement may be a marker of fluctuating risk / risk perception, or may represent difficulty attending appointments due to scheduling, transportation, or other logistics.

These patterns of care may also have different implications for safety, monitoring, and protection from development of HIV Infection. For example, individuals who are intermittently engaged in care may be taking medication less than daily leading to drug levels below those expected to confer protection (and theoretically placing at risk for development of resistance, should HIV infection occur). Both those who intermittently engaged in care and those experiencing early loss to follow-up would have experienced periods of time without medication coverage, potentially leading to HIV infection risk, and less frequent HIV and STI testing.

While decision-making about PrEP use is complex and may depend on fluctuations in risk perception, changes in partners, and personal decision-making regarding prevention choices, these choices would ideally be made with appropriate monitoring and guidance from an experienced PrEP provider. Although risk perception has been previously associated with PrEP uptake and maintenance [11, 12] we did not find an association between reported baseline risk perception and pattern of retention in our study cohort. We did not measure risk perception over time and cannot rule out a change in risk perception leading to early discontinuation among some participants. However, the short timeframe between initiation and loss for the ELTF group would argue against perceived change in risk as a driver of loss from this group.

Study site and age were strong predictors of incomplete retention including ELTF as well as intermittent retention in our cohort. Community support and individual preparedness for embarking on PrEP care have been demonstrated in previous qualitative analyses to be important to PrEP adherence [13-15] and are likely to also impact retention. Qualitative data from retained and non-retained PrEP recipients in Mississippi reinforces the importance of social and relationship dynamics and stigma in decision-making regarding PrEP continuation [6]. As protocols for retention were standardized across sites, these observed differences might reflect differences in unmeasured variables such as stigma, social support, and community PrEP awareness and acceptability in the communities enrolling participants in the Demo Project.

Younger age was associated with ELTF as well as intermittent follow-up in our study; this is consistent with findings from the ATN 110 trial indicating that PrEP adherence declined among youth when follow-up intervals increased [16], and suggests that maintenance of close follow-up as well as additional counseling support may be beneficial for younger PrEP patients.

Black participants in our study cohort were more likely than white participants to experience ELTF than either full study retention or intermittent retention. This is consistent with previously published data from three PrEP-prescribing clinics indicating decreased retention in PrEP care at three months but not at six months for black clients compared with white clients [5]. As black gay and bisexual men are the demographic group most impacted by HIV in the U.S. [17], this finding is concerning and suggests the need for additional support early in PrEP engagement for black MSM. Other studies suggest that factors such as stigma in social networks, internalized homophobia, and lack of support from partners and community may have critical impact on PrEP engagement including uptake, adherence, and retention among black MSM in the U.S. [5, 18]. Strategies such as peer navigation and counseling to provide intensive support in the first three months of care may help to alleviate these observed disparities in retention in PrEP care.

PrEP awareness prior to study engagement was also associated with increased retention and protective against ELTF. As the Demo Project took place soon after FDA approval of TDF/FTC for PrEP, prior awareness may in some cases have been a proxy for highly motivated early adopters who actively sought PrEP in an environment where it was not widely available. Additionally, drawing on the Stages of Change / Transtheoretical model as has been applied to PrEP and termed the PrEP Motivational Cascade [19], individuals who learned about PrEP only at the time of study screening may not have had time to move through stages of contemplation and preparation, coming into PrEP care with ambivalence or less motivation / commitment to the process compared with those who were aware of PrEP prior to screening. While it is difficult to know what triggered early loss from the study, continued longitudinal follow-up with opportunities to address concerns and provide for reengagement at a later time may result in re-engagement of some of the participants who were initially lost to follow-up.

Employment status was a predictor of ELTF in our multivariate model. We theorize that employment status may be a marker for more consistency in daily routine and organization

as well as legal status in the U.S., factors that may also contribute to an individual's ability to stay in medical care and attend study visits. The role of individual-level economics in PrEP decision-making is likely complex and includes other unmeasured variables such as availability of transportation and opportunity costs related to attending PrEP study visits. Additional innovation to increase flexible and convenient access to PrEP may facilitate engagement with individuals with irregular or inconsistent schedules who may otherwise be lost from PrEP care. Exchanging sex for money or other goods was also a predictor of ELTF, again reinforcing the concern that those individuals who are most in need of prevention strategies may also have difficulty following up longitudinally as is currently required for PrEP care. Sex work has been associated with substance use, mental health issues, and childhood sexual trauma [20], as well as decreased access to healthcare [21]. A holistic approach to PrEP care including mental health interventions may be needed to facilitate retention in care for this vulnerable and stigmatized population. Innovative strategies including non-traditional placement in time and space for PrEP care (such as community-based clinics with extended hours, mobile clinics, and PrEP evaluation via telehealth) may allow those with alternative schedules and other constraints to engage successfully in care.

DBS drug levels for PrEP medication presented a complex picture. Early (4 week) drug levels strongly correlated with future retention. However, we note a group of participants who had inconsistent retention in PrEP care but demonstrated adherence with PrEP-taking during the time that they were in the study. Logistical difficulties may have made study follow-up difficult despite intentions to take PrEP, or self-selection for stopping PrEP (and not coming to subsequent study visits) may have occurred due to changes in risk behavior, risk perception, or other factors influencing perceived need or desire for PrEP. While early objective measures of adherence such as drug levels could allow intervention for those not taking PrEP medication consistently, additional evaluation for risk for loss from PrEP care may also be required. A careful appraisal of risk for loss-to-follow-up at the first PrEP follow-up visit and consideration of more close follow-up intervals (in person or remotely) for those with risk for loss from care may be beneficial to increasing retention.

Participants in the ELTF group reported sexual behavior conferring significant risk for HIV infection and had high rates of baseline STIs equal to those retained in the study when adjusted for reason for initial visit, indicating an urgent need for prevention services among those lost to follow-up. Interventions are needed for those with early loss from PrEP care to encourage reengagement with PrEP or, if PrEP is not desired, to facilitate access to other prevention services such as condoms, appropriate STI and HIV testing and prompt STI treatment as needed.

Our study has several limitations. The analyses in this study were exploratory; nevertheless, they provide important initial estimates of factors to be addressed in future research on PrEP adherence and continuation over time. The environment and support provided through a demonstration project are different from that offered in clinical practice; in particular, participants were provided with a stipend for participation and were directly dispensed medication at the study site. Additionally, those who elected to temporarily or permanently discontinue PrEP medication were encouraged to continue to follow-up and received HIV and STI testing quarterly. For these reasons, the retention described may be considered a

“best case scenario” for the timeframe of the study. The study environment, however, could also negatively and disproportionately influence engagement among groups with historical mistrust of medical research, and the longer visits required due to study procedures could also have influenced retention. Retention differed significantly by site and baseline characteristics of participants also differed significantly by site making cross-site comparisons challenging. While we cannot rule-out an unintended difference in site retention practices, attempts were made at all sites to standardize these procedures. The small number of black and transgender participants in the Demo Project precludes more nuanced conclusions about these subgroups based on our data. Further investigation of potential risk and protective factors for retention in PrEP care for these important groups are needed. Decision-making regarding retention in PrEP care may be in some cases linked to reduction in sexual risk or adoption of alternative prevention strategies that reduce the need for PrEP. We were not able to successfully query sufficient participants who were lost from the study to determine reasons for loss. While we note that baseline risk was similarly high in all categories of retention in our study, we do not have detailed follow-up risk information for those who were lost to follow-up or intermittently retained in the study. Further, the intermittently retained participants, while all having at least some missed days of PrEP medication, are a heterogeneous group with a wide range of patterns of missed or delayed visits, limiting closer analysis of this group.

In summary, we found that retention in the PrEP Demo Project was influenced by site but also varied by factors such as age, race, employment status, and prior PrEP awareness. Risk factors, as measured by partner number and STIs, were high in participants who were lost from care as well as those who were retained. Overall, our data reinforce previous observations [22-24] that effective PrEP delivery remains a challenge to high-priority geographic areas (e.g. the Southern U.S.), black MSM, and to individuals with low SES even within a highly favorable environment such as a demonstration project in which all visits, laboratory tests, and medication were provided free of charge, and participants received a stipend for participation. Addressing not only PrEP initiation but also in retention and persistence in PrEP care is essential to avoid perpetuation and worsening of racial, socioeconomic, and geographic disparities in the HIV epidemic [22, 25]. Early assessment for risk for loss from care and consideration of interventions to improve retention by enhancing education, motivation, and social / psychological support during early PrEP visits may enhance continuation in PrEP care. Key populations, such as black MSM and younger adults, are disproportionately lost in the first 12 weeks of PrEP care. Youth additionally require longitudinal support to avoid intermittent engagement in PrEP care. Focused interventions to retain these priority populations in PrEP care once initially engaged are urgently needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Bar graph demonstrating percentage of participants with TFV-DP levels considered protective (>700 fm/punch) of those who presented for each scheduled visit. The number of individuals in each group presenting for follow-up at each time point are listed in the table below.

Table 1
Baseline Characteristics of PrEP Demonstration Project Participants by Retention Category

	Complete Retention		ELTF		Intermittent Retention		Total	
	Median	%	Median	%	Median	%	Median	%
Site								
San Francisco	221	74.2%	16	5.4%	61	20.5%	298	53.8%
Miami	68	43.6%	39	25.0%	49	31.4%	156	28.2%
Washington	77	77.0%	6	6.0%	17	17.0%	100	18.1%
Age								
25%-75%	35	28.44	28	23.36	31	25.39	33	27.42
Race/Ethnicity								
White	199	75.1%	11	4.2%	55	20.8%	265	47.9%
Hispanic	109	57.1%	35	18.3%	47	24.6%	191	34.5%
Black	19	48.7%	11	28.2%	9	23.1%	39	7.1%
Asian	19	73.1%	1	3.8%	6	23.1%	26	4.7%
Other	20	62.5%	2	6.3%	10	31.3%	32	5.8%
Education								
High School	318	67.2%	45	9.5%	110	23.3%	473	85.4%
Some college or more	48	59.3%	16	19.8%	17	21.0%	81	14.6%
Current employment status								
Working full or part time	306	68.9%	39	8.8%	99	22.3%	444	80.1%
Disabled/ Unemployed	60	54.5%	22	20.0%	28	25.5%	110	19.9%
Annual income								
\$0-\$19000	95	52.2%	37	20.3%	50	27.5%	182	33.2%
\$20000 - \$39999	85	70.2%	11	9.1%	25	20.7%	121	22.1%
\$40000-\$59000	56	76.7%	6	8.2%	11	15.1%	73	13.3%
\$60000 +	126	73.3%	7	4.1%	39	22.7%	172	31.4%
Financial insecurity								
Never	279	70.5%	30	7.6%	87	22.0%	396	71.6%
Any Other Reply	86	54.8%	31	19.7%	40	25.5%	157	28.4%
Health insurance								

	Complete Retention		ELTF		Intermittent Retention		Total	
	Median	%	Median	%	Median	%	Median	%
No	122	59.2%	32	15.5%	52	25.2%	206	37.3%
Yes	244	70.3%	28	8.1%	75	21.6%	347	62.7%
Primary care provider								
No	151	57.9%	43	16.5%	67	25.7%	261	47.1%
Yes	215	73.4%	18	6.1%	60	20.5%	293	52.9%
Give/receive money for sex								
No	348	66.5%	54	10.3%	121	23.1%	523	94.6%
Yes	17	56.7%	7	23.3%	6	20.0%	30	5.4%
Depression (PHQ-2 score >2)								
No	278	65.9%	49	11.6%	95	22.5%	422	76.2%
Yes	88	66.7%	12	9.1%	32	24.2%	132	23.8%
Referral status								
Clinic Referred	162	58.7%	42	15.2%	72	26.1%	276	49.8%
Self-Referred	204	73.4%	19	6.8%	55	19.8%	278	50.2%
Prior PrEP knowledge								
No	69	49.3%	31	22.1%	40	28.6%	140	25.3%
Yes	297	71.7%	30	7.2%	87	21.0%	414	74.7%

Table 2
Univariate comparisons of factors potentially associated with patterns of retention
(comparisons with p<0.05 in bold type)

Comparison	ELTF vs. Full Retention OR	Intermittent vs. Full Retention OR
Site		
Washington vs. San Francisco	1.08(0.41,2.85)	0.80(0.44,1.45)
Washington vs. Miami	0.13(0.05,0.34)	0.31(0.16,0.58)
San Francisco vs. Miami	0.13(0.07,0.24)	0.38(0.24,0.61)
Younger age (for each 10 year decrease in age)	1.70(1.24,2.45)	1.43(1.14,1.78)
Race/Ethnicity (all OR compared with white)		
Black	4.96(1.72,14.31)	1.05(0.42,2.62)
Hispanic	2.33(0.99,5.47)	0.81(0.46,1.44)
Asian	1.00(0.12,8.27)	1.18(0.44,3.11)
Other	1.84(0.38,9.00)	1.81(0.79,4.12)
Bi, queer, etc. vs. gay identity	1.97(0.96,4.06)	1.57(0.89,2.77)
Education: high school or less vs. some college or more	1.43(0.71,2.87)	0.78(0.42,1.45)
Disabled/unemployed vs. working full- or part-time	2.27(1.21,4.25)	1.28(0.77,2.15)
Annual income		
Less than \$20K vs. more than \$60K	3.65(1.47,9.05)	1.18(0.69,2.01)
Less than \$20K vs \$40K-\$59.9K	2.63(1.01,6.89)	2.30(1.09,4.86)
Less than \$20K vs \$20K - \$39.9K	2.30(1.07,4.94)	1.54(0.86,2.74)
Unstable housing	2.50(1.33,4.72)	1.94(1.17,3.22)
Financial insecurity	2.46(1.36,4.45)	1.26(0.80,2.01)
No health insurance	1.12(0.60,2.10)	0.98(0.62,1.54)
No primary care physician	1.97(1.04,3.73)	1.21(0.78,1.87)
HIV testing behavior		
Over 6 months ago vs. within last 3 months	2.11(0.98,4.55)	1.53(0.81,2.91)
Over 6 months ago vs. 3-6 months ago	1.88(0.70,5.07)	1.18(0.54,2.59)
Reported Risk Perception		
High vs. low	1.89(0.87,4.08)	0.66(0.35,1.25)
High vs. medium	1.15(0.51,2.59)	0.89(0.43,1.83)
Some depression vs. none	1.36(0.66,2.84)	1.36(0.84,2.22)
Not self-referred for PrEP	1.51(0.80,2.85)	1.27(0.82,1.96)
No prior PrEP knowledge	2.05(1.07,3.95)	1.38(0.82,2.32)
Alcohol		
Heavy vs Light drinker	1.62(0.81,3.24)	0.78(0.44,1.40)
Intermediate vs Light drinker	0.91(0.45,1.83)	1.17(0.74,1.85)
Substance Use (all OR for users compared with non-users)		
Inhalants	0.48(0.25,0.92)	1.28(0.84,1.94)
Cocaine	1.23(0.62,2.45)	0.84(0.49,1.44)
Amphetamines	0.69(0.25,1.86)	0.85(0.46,1.55)

Comparison	ELTF vs. Full Retention	Intermittent vs. Full Retention
	OR	OR
Club drugs	1.10(0.50,2.03)	0.95(0.58,1.56)
Viagra	0.29(0.12,0.71)	0.81(0.52,1.29)
Reported giving/receiving sex for money/other	2.90(1.06,8.00)	1.03(0.39,2.71)
# anal sex partners by HIV status, past 3 months		
<2 known HIV-positive partners	0.34(0.12,0.99)	1.32(0.81,2.14)
<2 known HIV-negative partners	0.49(0.27,0.88)	1.03(0.67,1.57)
<2 HIV-unknown partners	0.67(0.37,1.23)	0.87(0.57,1.34)
# of HIV-negative or unknown status partners	1.00 (0.99,1.02)	1(0.99,1.02)
# of condomless HIV-positive partners	1.01(0.95,1.07)	0.99(0.94,1.04)
# of condomless HIV-negative partners	0.91(0.8,1.04)	0.96(0.9,1.02)
# of condomless partners of unknown HIV status	1.00 (0.96,1.04)	1.00 (0.98,1.03)

Table 3
Multivariable model of factors associated with patterns of retention

Characteristic	ELTF vs Complete Retention	Intermittent vs Complete Retention
	AdjOR	AdjOR
Site		
San Francisco vs. Washington	1.13(0.4,3.23)	1.32(0.71,2.45)
Miami vs. San Francisco *	2.84(1.24,6.47)	2.7(1.43,5.11)
Younger age (by 10 year intervals) *	1.8(1.26,2.57)	1.47(1.17,1.84)
Race/Ethnicity (all compared with White / Non-Hispanic)		
Other	1.76(0.34,9.15)	1.63(0.71,3.78)
Asian	0.92(0.11,8.11)	1.11(0.41,3.01)
Black *	3.32(1.09,10.16)	0.84(0.33,2.15)
Hispanic	1.96(0.79,4.84)	0.69(0.38,1.26)
Give/receive money/items for sex *	4.67(1.49,14.58)	0.96(0.35,2.64)
No prior PrEP knowledge *	2.01(1.01,3.96)	1.58(0.92,2.72)
Number of HIV-Positive Partners <2 vs >=2 *	3.33(1.04,10.69)	0.75(0.45,1.25)
Disabled/Unemployed *	2.53(1.27,5.05)	1.29(0.76,2.21)

* Indicates p<0.05 for difference by comparison.