




BMJ Open More than just oral PrEP: exploring interest in rectal douche, dissolvable implant, removable implant and injection HIV prevention approaches among racially diverse men who have sex with men in the Northeast Corridor

Omar Martinez,¹ Ethan Levine,² Miguel Munoz-Laboy,³ Alex Carballo-Diéguez,⁴ José Arturo Bauermeister,⁵ Alexi Chacon ,⁶ Jeffrey Jacobson,⁷ Robert Bettiker,⁷ Madeline Sutton,⁸ Abby E Rudolph,⁹ Elwin Wu,¹⁰ Scott D Rhodes ,¹¹ Amanda E Tanner ,¹² Lilli Mann,¹¹ Omar Valentin,¹³ Ariel Ilarraza,¹ Mariana Pardes,¹ Robin Davison,¹ Maria Isabel Fernandez¹⁴

To cite: Martinez O, Levine E, Munoz-Laboy M, *et al.* More than just oral PrEP: exploring interest in rectal douche, dissolvable implant, removable implant and injection HIV prevention approaches among racially diverse men who have sex with men in the Northeast Corridor. *BMJ Open* 2022;**12**:e063474. doi:10.1136/bmjopen-2022-063474

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-063474>).

Received 01 April 2022
Accepted 29 June 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Alexi Chacon;
alexici213@gmail.com and
Mr Omar Martinez;
omar.martinez@ucf.edu

ABSTRACT

Objectives HIV scholars and practitioners have worked to expand strategies for prevention among marginalised populations who are disproportionately impacted by the epidemic, such as racial minority men who have sex with men (MSM). Given this urgency, the objective of this study was to assess interest in biomedical prevention strategies.

Methods This exploratory and cross-sectional study investigated interest in four biomedical prevention tools—rectal douche, dissolvable implant, removable implant and injection—among a racially diverse sample of MSM from the Northeast Corridor region between Philadelphia and Trenton. Data were collected as part of screening for *Connecting Latinos en Pareja*, a couples-based HIV prevention intervention for Latino MSM and their partners.

Results A total of 381 individuals participated in the screener and provided information about their interest in bio tools. Approximately 26% of participants identified as black, 28% as white and 42% as ‘other’ or multiracial; 49% identified as Latino. Majority (54%) reported some form of child sexual abuse. Of the participants who reported being in a primary relationship (n=217), two-thirds reported unprotected anal sex within that relationship over the past 90 days (n=138, 64%) and approximately half (n=117, 54%) reported unprotected anal sex outside of the relationship in this period. Majority of participants reported interest in all bio tools assessed, including dissolvable implants (60%), removable implants (64%), rectal douching (79%) and injection (79%). Although interest in bio tools was broadly unassociated with demographics and sexual risk behaviours, analyses revealed significant associations between reports of child sexual abuse and interest in implant and injection methods.

Conclusions The authors recommend investing in these prevention methods, particularly rectal douching and injection, as a means of preventing HIV among racial minority MSM. Given the interest in biomedical prevention

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Data for this study came from a preliminary screening for a larger study on HIV prevention and thus analysis is limited to the variables and demographics that were collected in the screening.
- ⇒ The sample is limited to individuals in the Northeast Corridor, which may impact generalisability of findings.
- ⇒ This study collected data on different forms of childhood sexual abuse and determined its link to HIV prevention bio tool preferences.

tools, future studies should explore potential strategies for adherence.

INTRODUCTION

In recent years, considerable advances have been made in decreasing overall HIV infection and transmission rates in the USA. However, the HIV epidemic continues to disproportionately impact racial and ethnic minorities and sexual and gender minority communities. Data have revealed an urgent national emergency as ‘The Invisible US Hispanic/Latino HIV Crisis’.¹ While the number of new cases decreased in 2019 for gay and bisexual black and white men, HIV infection rates in gay and bisexual Latinx men increased from 6800 new cases per year in 2010 to 7900 per year in 2019.² Seven in ten new HIV diagnoses occur among gay and bisexual men, even though they comprise about 2% of the US population.³ Among gay



and bisexual men, racial and ethnic minorities continue to be disproportionately impacted by the epidemic.

If current trends continue, one in four Latino gay and bisexual men and one in two black gay and bisexual men will be diagnosed with HIV during their lifetime.⁴ Moreover, HIV surveillance data provide minimal information detailing which social determinants of health may impact risk behaviours and healthcare use and access.^{5–8} Social determinants of health that should be examined include socioeconomic status, social support and exposure to violence.^{5–8} It is thus difficult, if not impossible, to determine the extent to which populations whose HIV risk is exacerbated by these and other interacting syndemic factors benefit from overall declines in diagnoses.

Biomedical prevention approaches, including pre-exposure prophylaxis (PrEP) for HIV-negative individuals,^{8–10} treatment as prevention (TasP) for people living with HIV,^{11–14} and condoms for both HIV-negative and people living with HIV, have emerged as effective biomedical prevention tools to address the global HIV epidemic among men who have sex with men (MSM). PrEP, for example, is an effective HIV prevention tool,¹⁵ recommended by the WHO¹⁶ and the Centers for Disease Control and Prevention¹⁷ for persons at substantial risk of HIV infection. Some of the recent progress in curbing HIV infection and transmission has been attributed to increase in PrEP use within and beyond the USA. However, challenges remain among those who would benefit from PrEP, and use remains somewhat low, particularly among black and Latino MSM.^{18 19}

A number of explanations have been proposed for low PrEP uptake among racial minority MSM, including (mis)perception of HIV infection risk, concerns about medication side effects, low health literacy, concerns about stigma, access to affordable healthcare, and access to care providers who are both knowledgeable and culturally sensitive.^{18 19}

Immigration-related barriers are particularly pronounced among Latino MSM. Temporary immigrants and undocumented individuals lack access to healthcare coverage under the Affordable Care Act, as well as a range of social service programmes that might otherwise facilitate access or mitigate barriers to PrEP use.¹⁹ Biomedical interventions that require less interactions with a healthcare system could be essential in improving adherence. Given recent increases in anti-immigrant rhetoric, even USA-born individuals and documented immigrants may avoid pursuing care for fear of discrimination. Concerns about stigma could be addressed by culturally relevant sex education programmes that are tailored to the experiences of black and Latino MSM.²⁰

Several challenges exist with prescription-based prevention products like PrEP and TasP, including adherence and access to medication.^{21 22} Prevention tools such as condoms pose their own challenges. Not only must condoms be present at each sexual encounter, but some at-risk individuals also consider condom use disruptive or detrimental to sexual pleasure.^{23 24} This concern has

been documented in research on racial minority MSM, including one study of Latino gay couples in which a participant described community members as ‘tired of using condoms’ and in urgent need of alternative prevention methods (p11).²⁵

However, the following four biomedical intervention tools have the potential to address the previously outlined concerns: rectal douches, dissolvable implants, removable implants and injections.²⁵ Not all of these biomedical tools are on the market and each intervention has varying levels of effectiveness in preventing HIV transmission. If and when these methods become available in the market, they could shift HIV prevention from the realm of interpersonal sexual encounters to the realm of individual healthcare. Such a shift may help individuals feel more in control of their bodies and decision-making.

For example, rectal douches present a feasible opportunity to also apply a topical rectal microbicide. Research has shown that MSM who douche also have an increased likelihood of applying a rectal microbicide gel.²⁶ Many individuals who engage in anal intercourse use cleansing douches regularly before and even afterwards.^{27–29} Preventive rectal douching might thus align relatively easily with those individuals’ existing sexual practices, rather than place additional demands in the form of daily medication or changes to sexual communication and behaviour (as may be required for condom use, which must be negotiated with each anal sex partner before or during each sexual encounter). There is a desire for ‘invisible’ biomedical interventions that do not interfere with intercourse and help protect against stigma because of their invisibility from family members, partners, household members and community members.³⁰

Removable implants are still in the early stages of clinical development but are a promising method towards ensuring that individuals receive both consistent and on-time drug release.^{31 32} Subcutaneous implants could potentially deliver the appropriate dosage of antiretroviral drugs for 12 months or longer with a single implant.³¹ There are implants in the preclinical stage that are looking at combining medications that prevent other STIs, including hepatitis B virus.³¹

The benefits of implants include fewer interactions with the healthcare system, easy removal and lower dose per day with no oral medication required.³¹ Similar medical technologies are being researched in biodegradable implants that can break down over time and be expelled from the body without a healthcare interaction.^{33 34} Both removable and dissolvable implants require either single or periodic medical appointments, which may be more manageable for some individuals than daily medications and can help add to the medication’s ‘invisibility’.

Injectable antiretroviral medications require less uptake than rectal douching but more healthcare interactions than dissolvable and removable implants. There is high acceptability among users despite the required 8-week interval injections.³⁵ Long-acting PrEP in an injectable form has been tested in phase I and phase II clinical

trials. Both phases found comparable efficacy with standard PrEP.^{36 37} Phase IIb/III investigated the efficacy and safety of long-acting injectable PrEP (cabotegravir) in the following populations: HIV-negative MSM, transgender women and cisgender women at risk of sexually acquiring HIV. The most recent two phases of this clinical trial found that injectable PrEP is more effective at preventing transmission of HIV in the aforementioned populations compared with a daily oral emtricitabine/tenofovir disoproxil fumarate tablet.^{38 39}

This paper aims to address the following question: among racially diverse MSM, what factors are correlated with interest in four biomedical HIV prevention methods, including dissolvable implants, removable implants, rectal douching and injection? We used the findings to explore promising approaches for HIV prevention among MSM who face an elevated risk of HIV infection and transmission. Additionally, this paper looks at the demographic characteristics and sexual risk behaviours among a racially diverse sample of MSM.

METHODS

Setting and recruitment

This exploratory cross-sectional study investigated interest in four biomedical prevention tools—rectal douches, dissolvable implants, removable implants and injections—among a racially diverse sample of MSM from the Northeast Corridor region between Philadelphia and Trenton. Data were collected as part of screening for *Connecting Latinos en Pareja*, a couples-based HIV prevention intervention for Latino MSM and their partners. Research staff invited participants to complete a preliminary screening through online social networking apps and social media platforms including Grindr, Facebook, Instagram and the online profiles of AIDS service organisations in the region. Research assistants posted study flyers on our social media profiles as another recruitment strategy. These flyers included broad and general information about the study, including self-identifying as MSM and details about participant incentives. Research methods have been published elsewhere.⁴⁰

Procedures

Participants took an average of 20 min to complete the anonymous online screening survey. The screening survey was programmed in REDCap, a secure questionnaire development, data entry and analysis platform. Participants were recruited through community-based organisations and online social venues, including Facebook, Grindr, Twitter and Instagram. The first screen of the online survey briefly described the screening process and asked potential participants to provide consent for screening.

For this analysis, inclusion in the sample required that participants complete the questions gauging interest in biomedical prevention tools. These questions appeared at the end of the survey. Some prospective participants

in *Connecting Latinos en Pareja* declined to submit responses to these specific questions and thus were not included in the sample. Although this resulted in notable loss (out of 533 participants, 381 completed the bio tool questions), subsequent analyses did not find substantial demographic differences between the overall sample and those participants retained for this analysis.

Measures

Sociodemographic data that were collected in the study included age, race/ethnicity, health insurance status, country of birth, education and employment status. We also enquired about history of child sexual abuse prior to the age of 14, using six individual questions (eg, ‘someone tried to touch me in a sexual way, or make me touch them’, ‘I believe that I was sexually abused’).

Sexual behaviour over the past 90 days was assessed in terms of overall reports of anal sex with men (yes/no), total anal sex partners, any anal sex within primary relationships (yes/no), unprotected anal sex within primary relationships (yes/no), any anal sex outside primary sexual relationships (yes/no) and any unprotected anal sex outside primary relationships (yes/no).

Participants were asked about PrEP use in the past 90 days. Finally, participants were asked how interested they would be in the use of rectal douche, dissolvable implant, removable implant and injection for HIV prevention (definitely not interested, probably not interested, probably interested, definitely interested) if they become available.

Statistical analysis

Sample demographic characteristics, sexual behaviour in the past 90 days, PrEP use in the past 90 days, reports of child sexual abuse and interest in bio tools were calculated using percentages or means as appropriate. χ^2 tests were conducted to explore the associations between interest in various bio tools and other variables. For bivariate analyses, we used dichotomous versions of interest in each prevention method (probably or definitely not interested vs probably or definitely interested). When reporting univariate and bivariate statistics, we only report on raw data rather than imputing or making other substitutions to compensate for missing cases. Once skip patterns are taken into account (eg, only participants in primary relationships were asked about sexual behaviour within and outside those relationships), missing cases only resulted in minor data loss (between 0.3% and 7%). All analyses were done in Stata V.13.0.

Patient and public involvement

No patients were involved. We established a local community advisory board who met quarterly throughout the study to promote community engagement and utilisation of research findings.

RESULTS

Participant characteristics

Among 381 MSM who provided data for this exploratory analysis, approximately 26% (n=98) identified as black, 28% as white (n=106) and 41% as 'other' or multiracial (n=156) using mutually exclusive categories for race. In a separate question on ethnicity, nearly half (n=186, 49%) identified as Latino. A third of the sample (n=124, 33%) reported having attained at least a bachelor's degree. Majority (n=206, 54%) reported at least some form of child sexual abuse before the age of 14. Of the participants who reported being in a primary relationship (n=217), two-thirds reported unprotected anal sex within that relationship over the past 90 days (n=138, 64%) and just over half (n=117, 54%) reported unprotected anal sex outside of the relationship in the past 90 days.

Interest in biomedical prevention tools

Majority of the participants reported probable or definite interest in all biomedical prevention tools assessed, including dissolvable implants (n=229, 60%), removable implants (n=242, 64%), rectal douching (n=300, 79%) and injection (n=300, 79%). Approximately one-fifth of the participants reported at least some PrEP use in the past 90 days (n=85, 22%). Sample characteristics appear in [table 1](#), with more detailed information regarding interest in biomedical prevention tools in [table 2](#).

Bivariate analyses revealed few connections between demographics and interest in various biomedical HIV prevention methods. Participants with bachelor's degree were less likely to report interest in rectal douching (n=377, $\chi^2=10.48$, df=1, p<0.01, n=377) and more likely to report interest in removable implants ($\chi^2=4.57$, df=1, p<0.05, n=377) than peers who did not possess a college degree. Age, race, Latino ethnicity, health insurance, being born in the USA and full-time employment were unassociated with interest in various prevention tools.

We documented a positive association between overall reports of anal sex within primary relationships in the past 90 days and interest in injections ($\chi^2=3.97$, df=1, p<0.05, n=217). Otherwise, there were no associations between interest in biomedical interventions and the sexual behaviours addressed here. PrEP use in the past 90 days was not associated with interest in other methods.

There were associations between reports of child sexual abuse before the age of 14 and for all prevention methods except for rectal douching. Interest in dissolvable implants was positively associated with the following statements: someone tried to touch me in a sexual way, or make me touch them ($\chi^2=5.13$, df=1, p<0.05, n=379); someone threatened to hurt or tell lies about me unless I did something sexual ($\chi^2=4.15$, df=1, p<0.05, n=379); someone tried to make me do sexual things or watch sexual things ($\chi^2=6.46$, df=1, p<0.05, n=377); someone molested me ($\chi^2=4.43$, df=1, p<0.05, n=376); someone on the internet tried to get me to talk about sex when I did not want to ($\chi^2=4.31$, df=1, p<0.05, n=377); and I believe I was sexually abused ($\chi^2=7.60$, df=1, p<0.01,

Table 1 Sample characteristics (N=381)

	M (SD) or n (%)
Age (n=376), M (SD)	30.84 (10.89)
Identify as Latino/Hispanic/Afro-Latino (n=379)	186 (49)
Race (mutually exclusive, n=375)	
Black only	98 (26)
Asian, Asian American, Pacific Islander only	9 (2)
Native American, American Indian, Alaska Native only	6 (2)
White only	106 (28)
Other and/or multiracial	156 (42)
Biomedical prevention tools	
PrEP use in the past 90 days	85 (22)
Interested in rectal douche for HIV prevention*	300 (79)
Interested in dissolvable implant for HIV prevention*	229 (60)
Interested in removable implant for HIV prevention*	242 (64)
Interested in injection for HIV prevention*	300 (79)
Sexual behaviour, general	
Anal sex with a man, past 90 days (n=380)	309 (81)
Total anal sex partners, past 90 days (n=304), M (SD)	4.86 (8.10)
Sexual risk behaviour, primary relationship	
Any anal sex, past 90 days (n=217)	196 (90)
Unprotected anal sex, past 90 days (n=195)	138 (71)
Sexual risk behaviour, outside primary relationship	
Any anal sex, past 90 days (n=217)	126 (58)
Unprotected anal sex, past 90 days (n=201)	117 (58)
Child sexual abuse, before age 14	
Someone tried to touch me in a sexual way, or make me touch them (n=379)	166 (44)
Someone threatened to hurt me or tell lies about me unless I did something sexual with them (n=379)	69 (18)
Someone tried to make me do sexual things or watch sexual things (n=377)	132 (35)
Someone molested me (n=376)	114 (30)
Someone on the internet tried to get me to talk about sex when I did not want to (n=377)	69 (18)
Someone on the internet tried to get me to do sexual things when I did not want to (n=379)	69 (18)
I believe that I was sexually abused (n=375)	109 (29)
Answered yes to at least one CSA question (n=380)	206 (54)
Protective factors	
Health insurance (n=380)	325 (86)
Born in the USA (n=380)	314 (82)
Bachelor's degree or higher (n=377)	124 (33)
Employed full time	187 (49)

*Operationalised as indicating 'definite' or 'probable' interest in using this prevention method.
CSA, Childhood Sexual Abuse; PrEP, pre-exposure prophylaxis.

Table 2 Interest in using biomedical prevention tools (N=381)

	Definitely not interested n (%)	Probably not interested n (%)	Probably interested n (%)	Definitely interested n (%)
Rectal douche	33 (9)	48 (13)	117 (31)	183 (48)
Dissolvable implant	69 (18)	83 (22)	111 (29)	118 (31)
Removable implant	55 (14)	84 (22)	111 (29)	131 (34)
Injection	30 (8)	51 (13)	110 (29)	190 (50)

n=375). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse ($\chi^2=5.22$, $df=1$, $p<0.05$, $n=380$).

Interest in removable implants was positively associated with the following statements: someone tried to touch me in a sexual way, or make me touch them ($\chi^2=5.05$, $df=1$, $p<0.05$, $n=379$); someone threatened to hurt or tell lies about me unless I did something sexual ($\chi^2=4.07$, $df=1$, $p<0.05$, $n=379$); someone tried to make me do sexual things or watch sexual things ($\chi^2=8.91$, $df=1$, $p<0.01$, $n=377$); and I believe I was sexually abused ($\chi^2=4.90$, $df=1$, $p<0.05$, $n=375$).

Interest in removable implants was also positively associated with overall reports of child sexual abuse ($\chi^2=8.15$, $df=1$, $p<0.01$, $n=380$). Interest in injections was positively associated with the following statements: someone tried to touch me in a sexual way, or make me touch them ($\chi^2=7.00$, $df=1$, $p<0.01$, $n=379$); someone tried to make me do sexual things or watch sexual things ($\chi^2=10.77$, $df=1$, $p<0.01$, $n=377$); someone molested me ($\chi^2=3.96$, $df=1$, $p<0.05$, $n=376$); and I believe I was sexually abused ($\chi^2=4.93$, $df=1$, $p<0.05$, $n=375$). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse ($\chi^2=5.02$, $df=1$, $p<0.05$, $n=380$). [Table 3](#) lays out our bivariate analyses.

DISCUSSION

In order to reduce demographic imbalances in HIV transmission, it is essential to develop and promote innovative biobehavioural approaches to HIV prevention among those who are highly impacted and vulnerable. The study findings have important implications for HIV prevention programming, including investment in and potential uptake of various biomedical tools.

Within this exploratory analysis, sexual minority MSM reported high prevalence estimates of sexual risk behaviours. More than half of the sample reported unprotected anal sex with primary partners, and more than half of those with primary partners reported unprotected anal sex outside of those relationships within the past 90 days. These data reinforce the need to continue prioritising

HIV prevention among racially diverse MSM. Investment in the different biomedical tools that were investigated in this study will serve that goal.

Our findings show high desirability among MSM to use the four biomedical prevention approaches assessed here. Rectal douching and injection emerged as the most desirable among study participants. If these biomedical prevention approaches are proven efficacious and approved by the Food and Drug Administration, it is important that promotional efforts for these biomedical approaches be implemented in racially diverse MSM communities. Strategies for promotional efforts can include peer navigation, social media campaigns and community collaborative approaches. All promotion efforts should make sure to address the unique barriers to HIV prevention and care that Latinx MSM experience, including discrimination, stigma and anti-immigration rhetoric.

The most important findings in this study were the associations between reports of child sexual abuse in and interest in different prevention methods. Majority of the participants (54%) reported at least some form of child sexual abuse before the age of 14. Other studies have documented the high prevalence estimates of sexual risk behaviours and childhood sexual abuse.^{41 42} Prevalence estimates of child sexual abuse in this sample rank among the highest up to date in the literature. We found that participants who reported any child sexual abuse, as well as some who reported particular forms of inperson and online abusive experiences, were more likely to express interest in dissolvable implants, removable implants and injections. There was no association between child sexual abuse and interest in rectal douching as an HIV prevention strategy.

Our research adds to a body of work investigating the acceptability of HIV prevention biomedical tools in different countries and populations. Previous studies have found that different populations in countries outside of the USA have high acceptability for long-acting injectable PrEP as well as for rectal douching. long-acting injectable (LAI) PrEP was found to be more highly acceptable among men than women in both the USA and countries outside of the USA, but only compared against standard PrEP, leaving out other biomedical prevention tools.⁴³ Our findings delve deeper and show that, among MSM, LAI PrEP as a biomedical tool for HIV prevention is preferred over both removable and dissolvable implants. A study investigating the acceptability of rectal douching among a sample of Peruvian men found that rectal douching was likely to be used when condoms were not used.⁴⁴ This study's findings compared the acceptability of rectal douching with three other biomedical prevention tools and found that, within our sample, acceptability of rectal douching (79%) is equal to acceptability of LAI injection (79%). Overall, our research corroborates prior studies which indicate that there is an increased acceptability for biomedical interventions that prevent HIV transmission apart from standard oral PrEP.^{45 46}

Although it is impossible to infer causal mechanisms from the cross-sectional exploratory data, it is worth

Table 3 Bivariate analyses (N=381)

	Rectal douche		Dissolvable implant		Removable implant		Injection	
	Not interested	Interested	Not interested	Interested	Not interested	Interested	Not interested	Interested
	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)
Age (n=376), M (SD)	30.69 (9.37)	30.88 (11.28)	31.00 (11.21)	30.73 (10.69)	30.96 (10.92)	30.77 (10.89)	30.30 (10.90)	30.99 (10.90)
Identify as Latino/Hispanic/Afro-Latino (n=379)	34 (18)	152 (82)	68 (36)	118 (64)	59 (31)	127 (69)	34 (18)	152 (82)
Race (mutually exclusive, n=375)								
Black only	23 (23)	75 (77)	42 (42)	56 (58)	37 (37)	61 (63)	17 (17)	81 (83)
Asian, Asian American, Pacific Islander only	3 (33)	6 (67)	4 (44)	5 (56)	6 (66)	3 (34)	4 (44)	5 (56)
Native American, American Indian, Alaska Native only	0 (0)	6 (100)	1 (16)	5 (84)	1 (16)	5 (84)	0 (0)	6 (100)
White only	24 (22)	82 (78)	46 (43)	60 (57)	42 (39)	64 (61)	24 (22)	82 (78)
Other and/or multiracial	30 (19)	126 (81)	57 (36)	99 (64)	51 (32)	105 (68)	34 (21)	122 (79)
PrEP use in the past 90 days	24 (28)	61 (72)	33 (38)	52 (62)	29 (34)	56 (66)	12 (14)	73 (86)
Sexual behaviour, general								
Anal sex with a man, past 90 days (n=380)	68 (22)	241 (78)	121 (39)	188 (61)	113 (36)	196 (64)	60 (19)	249 (81)
Total anal sex partners, past 90 days (n=304), M (SD)	4.79 (6.23)	4.88 (8.56)	4.25 (4.99)	5.24 (9.55)	4.17 (4.82)	5.24 (9.44)	4.05 (5.24)	5.05 (8.63)
Sexual risk behaviour, primary relationship								
Any anal sex, past 90 days (n=217)	36 (18)	160 (82)	78 (39)	118 (61)	73 (37)	123 (63)	38 (19)	158 (81)*
Unprotected anal sex, past 90 days (n=195)	26 (18)	112 (82)	54 (39)	84 (61)	55 (39)	83 (61)	28 (20)	110 (80)
Sexual risk behaviour, outside primary relationship								
Any anal sex, past 90 days (n=217)	20 (15)	106 (85)	54 (42)	72 (58)	47 (37)	79 (63)	28 (22)	98 (78)
Unprotected anal sex, past 90 days (n=201)	23 (19)	94 (81)	53 (45)	64 (55)	42 (35)	75 (65)	23 (19)	94 (81)
Child sexual abuse, before age 14								
Someone tried to touch me in a sexual way, or make me touch them (n=379)	36 (21)	130 (79)	55 (33)	111 (67)*	50 (30)	116 (70)*	25 (15)	141 (85)**
Someone threatened to hurt me or tell lies about me unless I did something sexual with them (n=379)	16 (23)	53 (77)	20 (28)	49 (71)*	18 (26)	51 (74)	12 (17)	57 (83)
Someone tried to make me do sexual things or watch sexual things (n=377)	25 (18)	107 (82)	41 (31)	91 (69)*	35 (26)	97 (74)**	15 (11)	117 (89)**
Someone molested me (n=376)	22 (19)	92 (81)	36 (31)	78 (69)*	35 (30)	79 (70)	17 (14)	97 (86)*
Someone on the internet tried to get me to talk about sex when I did not want to (n=377)	14 (20)	55 (80)	20 (28)	49 (72)*	20 (28)	49 (72)	12 (17)	57 (83)
Someone on the internet tried to get me to do sexual things when I did not want to (n=379)	13 (18)	56 (82)	22 (31)	47 (69)	21 (30)	48 (70)	11 (15)	58 (85)
I believe that I was sexually abused (n=375)	22 (20)	87 (80)	32 (29)	77 (71)**	31 (28)	78 (72)*	15 (13)	94 (87)
Answered yes to at least one CSA question (n=380)	44 (21)	162 (79)	71 (34)	135 (66)	62 (30)	144 (70)**	35 (16)	171 (84)
Protective factors								
Health insurance (n=380)	74 (22)	251 (78)	134 (41)	191 (59)	120 (36)	205 (64)	70 (21)	255 (79)
Born in the USA (n=380)	70 (22)	244 (77)	128 (40)	186 (60)	118 (37)	196 (63)	67 (21)	247 (79)
Bachelor's degree or higher (n=377)	38 (30)	86 (70)**	44 (35)	80 (65)	36 (29)	88 (71)*	24 (19)	100 (81)
Employed full time	47 (25)	140 (75)	76 (40)	111 (60)	71 (37)	116 (63)	37 (19)	150 (81)

*P<0.05, **P<0.01, in χ^2 analysis.
PrEP, pre-exposure prophylaxis.

noting that implants and injections occur separate from individual sexual encounters. Whereas individuals may face pressure around safer sex practices when engaging directly with prospective partners, including pressure

to engage in or forego rectal douching or condom use, these pressures are far less likely to come into play during medical appointments. Providing resources that separate HIV prevention strategies from sexual encounters may

empower MSM, including those who have experienced child sexual abuse, to make independent decisions about their bodies and boundaries.

The increased interest in biomedical interventions that require medical appointments points to a larger need for providers to undergo antibias training to ensure the equitable distribution of PrEP in healthcare settings. Provider bias may allow stigma to prevent the prescription of PrEP to individuals who need it most.⁴⁷ Qualitative studies have shown that providers' bias against the lesbian, gay, bisexual, transgender, queer, and/or questioning (LGBTQ+) community and their views on sex have prevented prescription to patients.⁴⁷ Providers have been shown to know little about PrEP and the criteria that should be used to identify patients who would benefit from the medication.⁴⁷

MSM of color have expressed wanting stigma-free PrEP access and that should extend to the interventions covered in this study.⁴⁸ It is possible that these biases will act as barriers to uptake of the biomedical prevention tools investigated in this study. Given the interest in all four biomedical interventions that has been displayed in our findings, plans to scale up access should also be paired with antibias training to ensure that MSM of color are not discriminated against when seeking out these interventions. Antibias and informational training has been found to increase knowledge of PrEP among providers along with an increased prescription rate.⁴⁹

This study found no associations between interest in various biomedical prevention tools and age, race or Hispanic/Latino ancestry. Socioeconomic indicators, for the most part, were also not associated with interest in those tools. Although null findings are rarely regarded as noteworthy in scientific literature, we believe that these particular findings are valuable for HIV prevention. The data indicate that a general strategy of promoting various prevention methods, rather than a range of approaches tailored to different demographic groups, may be appropriate when working with racially diverse MSM.

Limitations

This study has several limitations. An important limitation is that the study was limited to a subsection of the Northeast Corridor of the USA and used convenience sampling. However, given the large sample size of MSM who responded to our survey and the similarity in the proportion of ethnic/racial minorities among our respondents to that of the latest US Census, there is an increased likelihood that our findings may be generalisable. Asking about potential interest in various prevention strategies is also not equivalent to documenting uptake and adherence to those strategies were they to become available.

Data for this analysis came from a preliminary screening for a larger study on HIV prevention, Connecting Latinos en Pareja, causing limitations in the variables that could be included during data collection. Questions regarding childhood sexual abuse were included in order to further expand the research team's previous research with the

intention of exploring intimate partner violence in the formal study itself. Additionally, relevant variables to the immigrant community, including history of incarceration and visa status, are anticipated to be incorporated in future surveys within the research team's future formal studies. Consequently, the full range of variables/predictors that would be included for a comprehensive analysis were not part of the preliminary screening. However, future papers from this research team will be able to fill in the analysis gaps that are present in the study. Additionally, we hope to conduct future surveys that are able to investigate how interest in different biomedical tools relates to an individual's interest in and adherence to standard oral PrEP.

More research is needed to understand intended and actual usage of biomedical prevention tools globally among individuals whose sexual behaviours may expose them to HIV. Additionally, although this study documented several significant associations between child sexual abuse and interest in implant and injection prevention methods, these data do not reveal the causes or logics behind such associations. Qualitative and mixed methods investigations are warranted to further investigate connections among exposure to violence in youth and adulthood, approaches to navigating sexual consent and boundaries, and HIV/STI prevention strategies among MSM.

CONCLUSIONS

Biomedical prevention tools—both existing and new potential products that could become available in the market—have the potential to profoundly impact the global HIV epidemic. Although challenges will certainly arise, including securing adherence and access, this is true for all prevention methods, including those which have had a demonstrable impact on HIV infection rates, such as PrEP and condoms. Our study shows high desirability of four biomedical prevention tools not currently available in the market—rectal douche, dissolvable implant, removable implant and injection—among a sample of MSM who could potentially benefit from these given their sexual risk profiles. This desirability transcends demographic categories, including race, age and socioeconomic status. Methods that move HIV prevention from interpersonal sexual encounters to individual medical appointments may be particularly valuable for those who have experienced sexual abuse. Transitioning HIV prevention to individual medical appointments means increasing access to biomedical interventions that go beyond oral PrEP and can include those investigated in our study, such as implants and injections.

Author affiliations

¹College of Medicine, University of Central Florida, Orlando, Florida, USA

²School of Social and Behavioral Sciences, Stockton University, Galloway, New Jersey, USA

³School of Social Welfare, Stony Brook University, Stony Brook, New York, USA

⁴HIV Center, Columbia University Medical Center, New York, New York, USA

⁵Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, Pennsylvania, USA

⁶Editorial Department, Token Theatre Friends, New York City, New York, USA

⁷School of Medicine, Temple University, Philadelphia, Pennsylvania, USA

⁸School of Medicine, Morehouse School of Medicine, Atlanta, Georgia, USA

⁹College of Public Health, Temple University, Philadelphia, Pennsylvania, USA

¹⁰School of Social Work, Columbia University, New York, New York, USA

¹¹Department of Social Science and Health Policy, Wake Forest University, Winston-Salem, North Carolina, USA

¹²School of Health and Human Sciences, University of North Carolina at Greensboro, Greensboro, North Carolina, USA

¹³Miller School Of Medicine, University of Miami, Coral Gables, Florida, USA

¹⁴College of Osteopathic Medicine, Nova Southeastern University, Sunny Isles Beach, Florida, USA

Twitter Alexi Chacon @alexix213 and Amanda E Tanner @ae_tanner

Acknowledgements We would like to thank all the study participants for their time and effort. We thank our research assistants for their exceptional work interviewing the research participants. We gratefully acknowledge the contribution of all community collaborative members, AIDS service organisations, clinics and health centres in the Northeast Corridor that supported the recruitment of study participants.

Contributors Design and data collection: OM, OV, AI and MP. Analysis and interpretation: OM and EL. Drafting the manuscript: AC-D, JAB, JJ, RB, MS, AER, EW, SDR, AET, LM, OV, AI, MP, RD, AC and MIF. OM is the author acting as guarantor.

Funding This work was supported by the Centers for Disease Control and Prevention under a grant from the Minority HIV and AIDS Research Initiative (MARI 1U01PS005124; PI: OM).

Disclaimer The views expressed in this presentation are those of the authors and not necessarily those of the Centers for Disease Control and Prevention.

Competing interests None declared.

Patient and public involvement Patients were not involved in the design, or conduct, or reporting, or dissemination plans of this research. This study engaged community members through a community advisory board.

Patient consent for publication Not required.

Ethics approval This study involves human participants and was approved by the Temple University Institutional Review Board (IRB #24120).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement De-identified data available upon request. Due to confidentiality and sensitivity issues, the data will be shared upon request and through a controlled access repository.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Alexi Chacon <http://orcid.org/0000-0002-2348-6707>

Scott D Rhodes <http://orcid.org/0000-0002-9797-8114>

Amanda E Tanner <http://orcid.org/0000-0003-4488-7160>

REFERENCES

- Centers for Disease Control and Prevention. HIV surveillance report 2017, 2018. Available: <http://www.cdc.gov/hiv/library/reports/surveillance/>
- Satcher Johnson A, Song R, Hall HI. Estimated HIV incidence, prevalence, and undiagnosed infections in US states and Washington, DC, 2010-2014. *J Acquir Immune Defic Syndr* 2017;76:116-22.
- Hess KL, Hu X, Lansky A, et al. Lifetime risk of a diagnosis of HIV infection in the United States. *Ann Epidemiol* 2017;27:238-43.
- Stephenson R, Finneran C. Receipt and perpetration of intimate partner violence and condomless anal intercourse among gay and bisexual men in Atlanta. *AIDS Behav* 2017;21:2253-60.
- Muñoz-Laboy M, Martinez O, Levine EC, et al. Syndemic conditions reinforcing disparities in HIV and other STIs in an urban sample of behaviorally bisexual Latino men. *J Immigr Minor Health* 2018;20:497-501.
- Martinez O, Arreola S, Wu E, et al. Syndemic factors associated with adult sexual HIV risk behaviors in a sample of Latino men who have sex with men in New York City. *Drug Alcohol Depend* 2016;166:258-62.
- Bauermeister JA, Eaton L, Andrzejewski J, et al. Where you live matters: structural correlates of HIV risk behavior among young men who have sex with men in Metro Detroit. *AIDS Behav* 2015;19:2358-69.
- Hosek SG, Siberry G, Bell M, et al. The acceptability and feasibility of an HIV preexposure prophylaxis (PrEP) trial with young men who have sex with men. *J Acquir Immune Defic Syndr* 2013;62:447-56.
- Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med* 2010;363:2587-99.
- Baeten JM, Donnell D, Ndase P, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *N Engl J Med* 2012;367:399-410.
- Jiwatram-Negrón T, El-Bassel N. Systematic review of couple-based HIV intervention and prevention studies: advantages, gaps, and future directions. *AIDS Behav* 2014;18:1864-87.
- Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* 2011;365:493-505.
- Rodger AJ, Cambiano V, Bruun T, et al. Sexual activity without condoms and risk of HIV transmission in Serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. *JAMA* 2016;316:171-81.
- Risk of HIV transmission through condomless sex in MSM couples with suppressive ART: the PARTNER2 study extended results in gay men. *AIDS & Hepatitis Digest* 2018;5:3-5.
- Bauermeister JA, Meanley S, Pingel E, et al. PrEP awareness and perceived barriers among single young men who have sex with men. *Curr HIV Res* 2013;11:520-7.
- World Health Organization. *Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV*. Geneva: World Health Organization, 2015.
- Centers for Disease Control and Prevention. *Preexposure prophylaxis for the prevention of HIV infection in the United States - 2014: a clinical practice guideline*. US Public Health Service, 2014.
- Serota DP, Rosenberg ES, Lockard AM, et al. Beyond the biomedical: preexposure prophylaxis failures in a cohort of young black men who have sex with men in Atlanta, Georgia. *Clin Infect Dis* 2018;67:965-70.
- Page KR, Martinez O, Nieves-Lugo K, et al. Promoting pre-exposure prophylaxis to prevent HIV infections among sexual and gender minority Hispanics/Latinxs. *AIDS Educ Prev* 2017;29:389-400.
- Taggart T, Liang Y, Pina P, et al. Awareness of and willingness to use PrEP among black and Latinx adolescents residing in higher prevalence areas in the United States. *PLoS One* 2020;15:e0234821.
- Arnold EA, Rebchook GM, Kegeles SM. 'Triply cursed': racism, homophobia and HIV-related stigma are barriers to regular HIV testing, treatment adherence and disclosure among young black gay men. *Cult Health Sex* 2014;16:710-22.
- Pérez-Figueroa RE, Kapadia F, Barton SC, et al. Acceptability of PrEP uptake among racially/ethnically diverse young men who have sex with men: the p18 study. *AIDS Educ Prev* 2015;27:112-25.
- St Lawrence JS, Chapdelaine AP, Devieux JG, et al. Measuring perceived barriers to condom use: psychometric evaluation of the condom barriers scale. *Assessment* 1999;6:391-404.
- Crosby R, Shrier LA, Charnigo R, et al. Negative perceptions about condom use in a clinic population: comparisons by gender, race and age. *Int J STD AIDS* 2013;24:100-5.
- Biello KB, Mimiaga MJ, Santostefano CM, et al. MSM at highest risk for HIV acquisition express greatest interest and preference for injectable antiretroviral PrEP compared to daily, oral medication. *AIDS Behav* 2018;22:1158-64.
- Hambrick HR, Park SH, Goedel WC, et al. Rectal douching among men who have sex with men in Paris: implications for HIV/STI risk behaviors and rectal microbicide development. *AIDS Behav* 2018;22:379-87.
- Carballo-Diéguez A, Bauermeister JA, Ventuneac A, et al. The use of rectal douches among HIV-uninfected and infected men who have unprotected receptive anal intercourse: implications for rectal microbicides. *AIDS Behav* 2008;12:860-6.
- Carballo-Diéguez A, Bauermeister J, Ventuneac A, et al. Why rectal douches may be acceptable rectal-microbicide delivery vehicles for men who have sex with men. *Sex Transm Dis* 2010;37:228-33.

- 29 Carballo-Diéguez A, Lentz C, Giguere R, *et al.* Rectal douching associated with receptive anal intercourse: a literature review. *AIDS Behav* 2018;22:1288–94.
- 30 Montgomery ET, Atujuna M, Krogstad E, *et al.* The invisible product: preferences for sustained-release, long-acting pre-exposure prophylaxis to HIV among South African youth. *J Acquir Immune Defic Syndr* 2019;80:542–50.
- 31 Weld ED, Flexner C. Long-acting implants to treat and prevent HIV infection. *Curr Opin HIV AIDS* 2020;15:33–41.
- 32 Cobb DA, Smith NA, Edagwa BJ, *et al.* Long-acting approaches for delivery of antiretroviral drugs for prevention and treatment of HIV: a review of recent research. *Expert Opin Drug Deliv* 2020;17:1227–38.
- 33 Li L, Johnson LM, Krovi SA, *et al.* Performance and stability of tenofovir Alafenamide formulations within subcutaneous biodegradable implants for HIV pre-exposure prophylaxis (PreP). *Pharmaceutics* 2020;12:1057.
- 34 Schlesinger E, Johengen D, Luecke E, *et al.* A tunable, biodegradable, thin-film polymer device as a long-acting implant delivering tenofovir alafenamide fumarate for HIV pre-exposure prophylaxis. *Pharm Res* 2016;33:1649–56.
- 35 Beymer MR, Holloway IW, Pulsipher C, *et al.* Current and future PrEP medications and modalities: on-demand, injectables, and topicals. *Curr HIV/AIDS Rep* 2019;16:349–58.
- 36 McGowan I, Dezzutti CS, Siegel A, *et al.* Long-acting rilpivirine as potential pre-exposure prophylaxis for HIV-1 prevention (the MWRI-01 study): an open-label, phase 1, compartmental, pharmacokinetic and pharmacodynamic assessment. *Lancet HIV* 2016;3:e569–78.
- 37 Walensky RP, Jacobsen MM, Bekker L-G, *et al.* Potential clinical and economic value of long-acting preexposure prophylaxis for South African women at high-risk for HIV infection. *J Infect Dis* 2016;213:1523–31.
- 38 Eshleman SH, Fogel JM, Piwowar-Manning E, *et al.* Characterization of human immunodeficiency virus (HIV) infections in women who received injectable cabotegravir or tenofovir disoproxil fumarate/emtricitabine for HIV prevention: HPTN 084. *J Infect Dis* 2022;225:1741–9.
- 39 Landovitz RJ, Donnell D, Clement ME, *et al.* Cabotegravir for HIV prevention in cisgender men and transgender women. *N Engl J Med* 2021;385:595–608.
- 40 Martinez O, Isabel Fernandez M, Wu E, *et al.* A couple-based HIV prevention intervention for Latino men who have sex with men: study protocol for a randomized controlled trial. *Trials* 2018;19.
- 41 Brennan-Ing M, Porter KE, Seidel L, *et al.* Substance use and sexual risk differences among older bisexual and gay men with HIV. *Behav Med* 2014;40:108–15.
- 42 Muñoz-Laboy M, Martinez O, Levine EC, *et al.* Syndemic conditions reinforcing disparities in HIV and other STIs in an urban sample of behaviorally bisexual Latino men. *J Immigr Minor Health* 2018;20:497–501.
- 43 Tolley EE, Zangeneh SZ, Chau G, *et al.* Acceptability of long-acting injectable cabotegravir (CAB LA) in HIV-uninfected individuals: HPTN 077. *AIDS Behav* 2020;24:2520–31.
- 44 Kinsler JJ, Galea JT, Lama JR, *et al.* Rectal douching among Peruvian men who have sex with men, and acceptability of a douche-formulated rectal microbicide to prevent HIV infection. *Sex Transm Infect* 2013;89:62.
- 45 Ogunbajo A, Tsai AC, Kanki PJ, *et al.* Acceptability of and preferences for long-acting injectable HIV PreP and other PreP modalities among sexual minority men in Nigeria, Africa. *AIDS Behav* 2022;26:2363–75.
- 46 Galea JT, Kinsler JJ, Imrie J, *et al.* Rectal douching and implications for rectal microbicides among populations vulnerable to HIV in South America: a qualitative study. *Sex Transm Infect* 2014;90:33–5.
- 47 Pleuhs B, Quinn KG, Walsh JL, *et al.* Health care provider barriers to HIV pre-exposure prophylaxis in the United States: a systematic review. *AIDS Patient Care STDS* 2020;34:111–23.
- 48 Lau JYC, Wong N-S, Lee KCK, *et al.* What makes an optimal delivery for PrEP against HIV: a qualitative study in MSM. *Int J STD AIDS* 2022;33:322–9.
- 49 Sales JM, Cwiak C, Haddad LB, *et al.* Brief report: impact of PreP training for family planning providers on HIV prevention counseling and patient interest in PreP in Atlanta, Georgia. *J Acquir Immune Defic Syndr* 2019;81:414–8.