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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

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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

Keywords: biomedical HIV prevention approaches, Men who have sex with men, rectal douche, dissolvable implant, removable implant, injection

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Abstract:

**Objectives** HIV scholars and practitioners have worked to expand strategies for prevention among marginalized 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 & 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 was collected as part of screening for Connecting Latinos en Pareja, a couple-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. A majority (54%) reported some form of child sexual abuse. Of those 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. A majority of participants reported interest in all bio tools assessed, including dissolvable implants (60%), removable implants (64%), rectal douching (79%), and an injection (79%). Although interest in bio tools was broadly unassociated with demographics and sexual risk behaviors, 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 tools, future studies should explore and identify potential strategies for adherence and retention.

**Key words:** biomedical HIV prevention approaches, rectal douche, dissolvable implant, removable implant, injection, men who have sex with men

**Strengths & Limitations:**
- 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 generalizability of findings.
This study collected data on different forms of childhood sexual abuse and determined its link to HIV prevention bio tool preferences.

INTRODUCTION

In recent years, considerable advances have been made in decreasing overall HIV infection and transmission rates in the United States. However, the HIV epidemic continues to disproportionately impact racial and ethnic minorities and sexual and gender minority communities. Data has revealed an urgent national emergency as “The Invisible US Hispanic/Latino HIV Crisis.”

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 6,800 new cases/year in 2010 to 7,900/year in 2019.

Seven in ten new HIV diagnoses occur among gay and bisexual men, even though they comprise about 2% of the US population. Among gay and bisexual men, racial and ethnic minorities continue to be disproportionately impacted by the epidemic.

If current trends continue, 1 in 4 Latino gay and bisexual men and 1 in 2 Black gay and bisexual men will be diagnosed with HIV during their lifetimes. Moreover, HIV surveillance data provides minimal information detailing which social determinants of health may impact risk behaviors, healthcare use and access. Social determinants of health that should be examined include socioeconomic status, social support, and exposure to violence. 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, treatment as prevention (TasP) for people living with HIV, 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, recommended by the World Health Organization and the Centers for Disease Control for persons at substantial risk for HIV infection. Some of the recent progress in curbing HIV infection and transmission has been attributed to increases in PrEP use within and beyond the U.S. However, challenges remain among those who would benefit from PrEP, and use remains somewhat low, particularly among Black and Latino MSM.
A number of explanations have been proposed for low PrEP uptake amongst 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 programs 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 U.S.-born individuals and documented immigrants may avoid pursuing care for fear of discrimination. Concerns about stigma could be addressed by culturally relevant sex education programs 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 [25: pg.11].

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 behavior (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
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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 pre-clinical stage that are looking at combining medications that prevent against other STIs, including the Hepatitis B virus [31].

The benefits of implants include fewer interactions with the healthcare system, easy removal and lower dose/day with no oral medication required [31]. Similar medical technologies are being researched in biodegradable implants that can breakdown 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 medication requires 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 1 and Phase 2 clinical trials. Both phases found comparable efficacy to standard PrEP [36-37].

The aims of this paper are to 1) explore demographic characteristics and sexual risk behaviors among a racially diverse sample of MSM; 2) investigate interest and correlates of interest in four different biomedical HIV prevention methods among racially diverse MSM, and 3) consider promising approaches for HIV prevention among MSM who face an elevated risk of HIV infection and transmission.

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
organizations 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 (38). This study was approved by the Institutional Review Board of Temple University in Philadelphia, PA, USA.

**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 organizations 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 questions gauging interest in biomedical prevention tools. These questions appeared at the end of the survey, and some prospective participants in *Connecting Latinos en Pareja* declined to submit responses to those specific questions and thus, were not included in the sample. Although this resulted in notable loss (out of 533 participants, 381 completed 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 was collected in the study included age, race/ethnicity, health insurance status, country of birth, education, and employment status. We also inquired about history of child sexual abuse prior to age 14, using six individual questions (e.g., “someone tried to touch me in a sexual way, or make me touch them;” “I believe that I was sexually abused”).

Sexual behavior 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 behavior 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. Chi-squared tests were conducted to explore 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 (e.g., only participants in primary relationships were asked about sexual behavior within and outside those relationships), missing cases only resulted in minor data loss (between 0.3% and 7%). All analyses were done in Stata, version 13.0.

Patient Involvement

No patients were involved.

RESULTS

Participant Characteristics

Among 381 MSM who provided data for this exploratory analysis, approximately 26% (n=98) of participants 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. A majority (n=206, 54%) reported at least some form of child sexual abuse before age 14. Of those 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

A majority of 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 an injection (n=300, 79%). Approximately one fifth of 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.
Table 1 Sample Characteristics (n=381)

|                          | M (SD) or N (%) |
|--------------------------|----------------|
| Age (n=376)              | 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 Past 90 Days | 85 (22%)     |
| Interested in Rectal Douche for HIV Prevention¹ | 300 (79%) |
| Interested in Dissolvable Implant for HIV Prevention¹ | 229 (60%) |
| Interested in Removable Implant for HIV Prevention¹ | 242 (64%) |
| Interested in Injection for HIV Prevention¹ | 300 (79%)     |

Sexual Behavior, General

|                          |              |
|--------------------------|--------------|
| Anal Sex with Man, Past 90 Days (n=380) | 309 (81%)   |
| Total Anal Sex Partners, Past 90 Days (n=304) | 4.86 (8.10) |

Sexual Risk Behavior, Primary Relationship

|                          |              |
|--------------------------|--------------|
| Any Anal Sex, Past 90 Days (n=217) | 196 (90%)   |
| Unprotected Anal Sex, Past 90 Days (n=195) | 138 (71%) |

Sexual Risk Behavior, 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 US (n=380) 314 (82%)
Bachelor’s Degree or Higher (n=377) 124 (33%)
Employed Fulltime 187 (49%)

Table 2: Interest in Using Biomedical Prevention Tools (n=381)

| Tool          | Definitely Not Interested | Probably Not Interested | Probably Interested | Definitely Interested |
|---------------|---------------------------|-------------------------|---------------------|-----------------------|
| 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%)             |

Bivariate analyses revealed few connections between demographics and interest in various biomedical HIV prevention methods. Participants with bachelor’s degrees were less likely to report interest in rectal douching ($\chi^2 = 10.48$, df=1, p<.01, n=377) and more likely to report interest in removable implants ($\chi^2 = 4.57$, df=1, p<.05, n=377) than peers who did not possess a college degree. Age, race, Latino ethnicity, health insurance, being born in the U.S., and fulltime 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<.05, n=217). Otherwise, there were no associations between interest in biomedical interventions and the sexual behaviors 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 age 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<.05, n=379); someone threatened to hurt or tell lies about me unless I did something sexual ($\chi^2 = 4.15$, df=1, p<.05, n=379); someone tried to make me do sexual things or watch sexual things ($\chi^2 = 6.46$, df=1, p<.05, n=377; someone molested me ($\chi^2 = 199$).
4.43, df=1, p<.05, n=376); someone on the internet tried to get me to talk about sex when I didn’t want to (χ² = 4.31, df=1, p<.05, n=377); and I believe I was sexually abused (χ² = 7.60, df=1, p<.01, n=375). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse (χ² = 5.22, df=1, p<.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 (χ² = 5.05, df=1, p<.05, n=379); someone threatened to hurt or tell lies about me unless I did something sexual (χ² = 4.07, df=1, p<.05, n=379); someone tried to make me do sexual things or watch sexual things (χ² = 8.91, df=1, p<.01, n=377); and I believe I was sexually abused (χ² = 4.90, df=1, p<.05, n=375).

Interest in removable implants was also positively associated with overall reports of child sexual abuse (χ² = 8.15, df=1, p<.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 (χ² = 7.00, df=1, p<.01, n=379); someone tried to make me do sexual things or watch sexual things (χ² = 10.77, df=1, p<.01, n=377); someone molested me (χ² = 3.96, df=1, p<.05, n=376); and I believe I was sexually abused (χ² = 4.93, df=1, p<.05, n=375). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse (χ² = 5.02, df=1, p<.05, n=380). Table 3 below lays out our bivariate analyses.

| Table 3: Bivariate Analyses (n=381) | Rectal Douche | Dissolvable Implant | Removable Implant | Injection |
|-----------------------------------|---------------|---------------------|-------------------|-----------|
| Age (n=376) | M (SD) or N (%) | M (SD) or N (%) | M (SD) or N (%) | M (SD) or N (%) |
| 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) | Rectal Douche | Dissolvable Implant | Removable Implant | Injection |
|-------------------------------------------------|---------------|---------------------|-------------------|-----------|
| 34 (42%) | 152 (51%) | 68 (45%) | 118 (52%) | 59 (43%) |
| 127 (53%) | 34 (43%) | 152 (51%) | | |
### Race (mutually exclusive, n=375)

| Race                               | 23 (29%) | 75 (25%) | 42 (28%) | 56 (25%) | 37 (27%) | 61 (26%) | 17 (22%) | 81 (27%) |
|------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Black Only                         |          |          |          |          |          |          |          |          |
| Asian, Asian American, Pacific Islander Only | 3 (4%)   | 6 (2%)   | 4 (3%)   | 5 (2%)   | 6 (4%)   | 3 (1%)   | 4 (5%)   | 5 (2%)   |
| Native American, American Indian, Alaska Native Only | 0 (0%) | 6 (2%) | 1 (1%) | 5 (2%) | 1 (%) | 5 (2%) | 0 (0%) | 6 (2%) |
| White Only                         | 24 (30%) | 82 (29%) | 46 (31%) | 60 (27%) | 42 (31%) | 64 (27%) | 24 (30%) | 82 (28%) |
| Other and/or Multiracial           | 30 (38%) | 126 (43%) | 57 (38%) | 99 (44%) | 51 (37%) | 105 (44%) | 34 (43%) | 122 (41%) |
| PrEP Use in Past 90 Days           | 24 (30%) | 61 (20%) | 33 (22%) | 52 (23%) | 29 (21%) | 56 (23%) | 12 (15%) | 73 (24%) |

### Sexual Behavior, General

| Anal Sex with Man, Past 90 Days (n=380) | 68 (84%) | 241 (81%) | 121 (80%) | 188 (83%) | 113 (82%) | 196 (81%) | 60 (75%) | 249 (83%) |
|---------------------------------------|----------|-----------|-----------|-----------|-----------|-----------|----------|-----------|
| Total Anal Sex Partners, Past 90 Days (n=304) | 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 Behavior, Primary Relationship

| Any Anal Sex, Past 90 Days (n=217) | 36 (92%) | 160 (90%) | 78 (89%) | 118 (92%) | 73 (94%) | 123 (89%) | 38 (83%) | 158 (92%) |
|----------------------------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
|                                | n=195 |                                | n=217 |                                | n=201 |                                |
|--------------------------------|-------|--------------------------------|-------|--------------------------------|-------|--------------------------------|
| Unprotected Anal Sex, Past     | 26 (72%) | 112 (70%) | 54 (69%) | 84 (72%) | 55 (73%) | 83 (68%) | 28 (74%) | 110 (70%) |
| 90 Days                        |       |       |       |       |       |       |       |       |
|                                |       |       |       |       |       |       |       |       |
| **Sexual Risk Behavior,       |       |       |       |       |       |       |       |       |
| Outside Primary Relationship   |       |       |       |       |       |       |       |       |
| Any Anal Sex, Past 90 Days     | 20 (51%) | 106 (59%) | 54 (61%) | 72 (56%) | 47 (60%) | 79 (57%) | 28 (61%) | 98 (57%) |
| (n=217)                        |       |       |       |       |       |       |       |       |
| Unprotected Anal Sex, Past     | 23 (58%) | 94 (58%) | 53 (65%) | 64 (54%) | 42 (58%) | 75 (58%) | 23 (61%) | 94 (58%) |
| 90 Days                        | (n=201)|       |       |       |       |       |       |       |
|                                |       |       |       |       |       |       |       |       |
| **Child Sexual Abuse, Before**|       |       |       |       |       |       |       |       |
| age 14                         |       |       |       |       |       |       |       |       |
| Someone tried to touch me in   | 36 (45%) | 130 (44%) | 55 (37%) | 111 (49%) | 50 (36%) | 116 (48%) | 25 (31%) | 141 (47%) |
| a sexual way, or make me       | (n=379)|       |       |       |       |       |       |       |
| touch them                     |       |       |       |       |       |       |       |       |
|                                |       |       |       |       |       |       |       |       |
| Someone threatened to          | 16 (20%) | 53 (18%) | 20 (13%) | 49 (22%) | 18 (13%) | 51 (21%) | 12 (15%) | 57 (19%) |
| hurt me or tell lies about me  |       |       |       |       |       |       |       |       |
| unless I did something sexual  |       |       |       |       |       |       |       |       |
| with them                      |       |       |       |       |       |       |       |       |
| (n=379)                        |       |       |       |       |       |       |       |       |
|                                |       |       |       |       |       |       |       |       |
| Someone tried to make me do   | 25 (31%) | 107 (36%) | 41 (27%) | 91 (40%) | 35 (25%) | 97 (41%) | 15 (19%) | 117 (39%) |
| sexual things or watch         |       |       |       |       |       |       |       |       |
| sexual things                  |       |       |       |       |       |       |       |       |
| (n=377)                        |       |       |       |       |       |       |       |       |
|                                | 22 (28%) | 92 (31%) | 36 (24%) | 78 (34%)* | 35 (26%) | 79 (33%) | 17 (21%) | 97 (33%)* |
|--------------------------------|----------|----------|----------|-----------|----------|----------|----------|----------|
| Someone molested me (n=376)    | 14 (18%) | 55 (19%) | 20 (13%) | 49 (22%)* | 20 (14%) | 49 (21%) | 12 (15%) | 57 (19%) |
| Someone on the internet tried  | 13 (16%) | 56 (19%) | 22 (15%) | 47 (21%)  | 21 (15%) | 48 (20%) | 11 (14%) | 58 (19%) |
| to get me to talk about sex    |          |          |          |           |          |          |          |          |
| when I did not want to (n=377) |          |          |          |           |          |          |          |          |
| I believe that I was sexually  | 22 (28%) | 87 (29%) | 32 (21%) | 77 (34%)* | 31 (22%) | 78 (33%)* | 15 (19%) | 94 (32%) |
| abused (n=375)                 |          |          |          |           |          |          |          |          |
| Answered yes to at least one  | 44 (54%) | 162 (54%)| 71 (47%) | 135 (59%) | 62 (44%) | 144 (60%)* | 35 (43%) | 171 (57%)|
| CSA question (n=380)           |          |          |          |           |          |          |          |          |

**Protective Factors**

|                                | 74 (91%) | 251 (84%) | 134 (89%) | 191 (83%) | 120 (87%) | 205 (85%) | 70 (86%) | 255 (86%) |
|--------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Health Insurance (n=380)       |          |          |          |          |          |          |          |          |

|                                | 70 (86%) | 244 (82%) | 128 (84%) | 186 (82%) | 118 (86%) | 196 (81%) | 67 (84%) | 247 (82%) |
|--------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Born in US (n=380)             |          |          |          |          |          |          |          |          |

|                                | 38 (48%) | 86 (29%)* | 44 (29%) | 80 (35%)  | 36 (26%) | 88 (36%)* | 24 (30%) | 100 (34%) |
|--------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Bachelor's Degree or Higher (n=377) |          |          |          |           |          |          |          |          |

|                                | 47 (58%) | 140 (47%) | 76 (50%) | 111 (49%) | 71 (51%) | 116 (48%) | 37 (46%) | 150 (50%) |
|--------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Employed Fulltime              |          |          |          |           |          |          |          |          |

*p < .05, **p < .01, ***p < .001 in
DISCUSSION

In order to reduce demographic imbalances in HIV transmission, it is essential to develop and promote innovative biobehavioral 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 behaviors. 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. This data reinforces the need to continue prioritizing 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 a high desirability amongst 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 FDA, 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. A majority of participants (54%) reported at least some form of child sexual abuse before age 14. Other studies have documented the high prevalence estimates of sexual risk behaviors and childhood sexual abuse [39, 40]. 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 in-person 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 U.S. have a high acceptability for long-acting injectable PrEP as well as for rectal douching. LAI PrEP was found to be more highly acceptable
amongst men than females in both the U.S. and countries outside of the U.S. but only compared against standard PrEP, leaving out other biomedical prevention tools [41]. Our findings delve deeper and show that amongst MSM, LAI PrEP as a biomedical tool for HIV prevention tool is preferred over both removable and dissolvable implants. A study investigating the acceptability of rectal douching amongst a sample of Peruvian men found that rectal douching was likely to be used when condoms were not used [42]. This study’s findings compare the acceptability of rectal douching to three other biomedical prevention tools and find 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 [43-44].

Although it is impossible to infer causal mechanisms from the cross-sectional exploratory data, it is worth 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 [45]. Qualitative studies have shown that providers’ bias against the LGBTQ+ community and their views on sex have prevented prescription to patients [45]. Providers have been shown to know little about PrEP and the criteria that should be used to identify patients that would benefit from the medication [45].

POC MSM have expressed wanting stigma free PrEP access and that should extend to the interventions covered in this study [46]. It is possible that these biases will act as barriers to uptake for 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 POC MSM are not discriminated against when seeking out these interventions. Antibias and informational training has been found to increase knowledge of PrEP amongst providers along with an increased prescription rate [47].

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 indicates 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 to this study is that it was limited to a subsection of the Northeast Corridor of the U.S and utilized 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 generalizable. 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 relate 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 behaviors 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 a 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 men who have sex with men 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.

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### Sample Characteristics (n=381)

| Sample Characteristic                                      | M (SD) or N (%) |
|------------------------------------------------------------|-----------------|
| **Age (n=376)**                                            | 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 Past 90 Days                                   | 85 (22%)        |
| Interested in Rectal Douche for HIV Prevention¹            | 300 (79%)       |
| Interested in Dissolvable Implant for HIV Prevention¹      | 229 (60%)       |
| Interested in Removable Implant for HIV Prevention¹        | 242 (64%)       |
| Interested in Injection for HIV Prevention¹                | 300 (79%)       |
| **Sexual Behavior, General**                               |                 |
| Anal Sex with Man, Past 90 Days (n=380)                    | 309 (81%)       |
| Total Anal Sex Partners, Past 90 Days (n=304)               | 4.86 (8.10)     |
| **Sexual Risk Behavior, Primary Relationship**             |                 |
| Any Anal Sex, Past 90 Days (n=217)                         | 196 (90%)       |
| Unprotected Anal Sex, Past 90 Days (n=195)                  | 138 (71%)       |
| **Sexual Risk Behavior, 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 | 166 (44%)       |
| them (n=379)                                               |                 |
| Someone threatened to hurt me or tell lies about me unless | 69 (18%)        |
| I did something sexual with them (n=379)                   |                 |
| Someone tried to make me do sexual things or watch sexual   | 132 (35%)       |
| things (n=377)                                             |                 |
| Someone molested me (n=376)                                | 114 (30%)       |
| Someone on the internet tried to get me to talk about sex  | 69 (18%)        |
| when I did not want to (n=377)                             |                 |
| Someone on the internet tried to get me to do sexual things| 69 (18%)        |
| when I did not want to (n=379)                             |                 |
| 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 US (n=380)                                         | 314 (82%)       |
| Bachelor's Degree or Higher (n=377) | 124 (33%) |
|-----------------------------------|----------|
| Employed Fulltime                 | 187 (49%)|

¹Operationalized as indicating "definite" or "probable" interest in using this prevention method.
### Interest in Using Biomedical Prevention Tools (n=381)

| Prevention Tool          | Definitely Not Interested | Probably Not Interested |
|--------------------------|---------------------------|-------------------------|
| Rectal Douche            | 33 (9%)                   | 48 (13%)                |
| Dissolvable Implant      | 69 (18%)                  | 83 (22%)                |
| Removable Implant        | 55 (14%)                  | 84 (22%)                |
| Injection                | 30 (8%)                   | 51 (13%)                |
| Probably Interested | Definitely Interested |
|---------------------|----------------------|
| 117 (31%)           | 183 (48%)            |
| 111 (29%)           | 118 (31%)            |
| 111 (29%)           | 131 (34%)            |
| 110 (29%)           | 190 (50%)            |
### Bivariate Analyses (n=381)

|                      | Rectal Douche |
|----------------------|--------------|
|                      | Not Interested | Interested |
|                      | M (SD) or N (%) | M (SD) or N (%) |
| Age (n=376)          |              |              |
|                      | 30.69 (9.37) | 30.88 (11.28) |
| Identify as Latino/Hispanic/Afro-Latino (n=379) |          |              |
|                      | 34 (42%) | 152 (51%) |
| Race (mutually exclusive, n=375) |              |              |
| Black Only           | 23 (29%) | 75 (25%) |
| Asian, Asian American, Pacific Islander Only | 3 (4%) | 6 (2%) |
| Native American, American Indian, Alaska Native Only | 0 (0%) | 6 (2%) |
| White Only           | 24 (30%) | 82 (29%) |
| Other and/or Multiracial | 30 (38%) | 126 (43%) |
| PreP Use in Past 90 Days |              |              |
|                      | 24 (30%) | 61 (20%) |
| Sexual Behavior, General |              |              |
| Anal Sex with Man, Past 90 Days (n=380) |          |              |
|                      | 68 (84%) | 241 (81%) |
| Total Anal Sex Partners, Past 90 Days (n=304) |          |              |
|                      | 4.79 (6.23) | 4.88 (8.56) |
| Sexual Risk Behavior, Primary Relationship |              |              |
| Any Anal Sex, Past 90 Days (n=217) |          |              |
|                      | 36 (92%) | 160 (90%) |
| Unprotected Anal Sex, Past 90 Days (n=195) |          |              |
|                      | 26 (72%) | 112 (70%) |
| Sexual Risk Behavior, Outside Primary Relationship |              |              |
| Any Anal Sex, Past 90 Days (n=217) |          |              |
|                      | 20 (51%) | 106 (59%) |
| Unprotected Anal Sex, Past 90 Days (n=201) |          |              |
|                      | 23 (58%) | 94 (58%) |
| Child Sexual Abuse, Before age 14 |              |              |
| Someone tried to touch me in a sexual way, or make me touch them (n=379) |          |              |
|                      | 36 (45%) | 130 (44%) |
| Someone threatened to hurt me or tell lies about me unless I did something sexual with them (n=379) |          |              |
|                      | 16 (20%) | 53 (18%) |
| Someone tried to make me do sexual things or watch sexual things (n=377) |          |              |
|                      | 25 (31%) | 107 (36%) |
| Someone molested me (n=376) |          |              |
|                      | 22 (28%) | 92 (31%) |
| Someone on the internet tried to get me to talk about sex when I did not want to (n=377) |          |              |
|                      | 14 (18%) | 55 (19%) |
| Someone on the internet tried to get me to do sexual things when I did not want to (n=379) |          |              |
|                      | 13 (16%) | 56 (19%) |
| I believe that I was sexually abused (n=375) |          |              |
|                      | 22 (28%) | 87 (29%) |
| Answered yes to at least one CSA question (n=380) |          |              |
|                      | 44 (54%) | 162 (54%) |
| Protective Factors |              |              |
| Health Insurance (n=380) |          |              |
|                      | 74 (91%) | 251 (84%) |
| Born in US (n=380) |          |              |
|                      | 70 (86%) | 244 (82%) |
| Bachelor's Degree or Higher (n=377) |          |              |
|                      | 38 (48%) | 86 (29%)** |
| Employed Fulltime |          |              |
|                      | 47 (58%) | 140 (47%) |

*p<.05, **p<.01, ***p<.001 in chi squared analysis
| Dissolvable Implant | Removable Implant |
|--------------------|------------------|
|                    | 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 (%) |
|--------------------|------------------|-----------------|----------------|-----------------|
| 31.00 (11.21)      | 30.73 (10.69)    | 30.96 (10.92)   | 30.77 (10.89)  |
| 68 (45%)           | 118 (52%)        | 59 (43%)        | 127 (53%)      |
| 42 (28%)           | 56 (25%)         | 37 (27%)        | 61 (26%)       |
| 4 (3%)             | 5 (2%)           | 6 (4%)          | 3 (1%)         |
| 1 (1%)             | 5 (2%)           | 1 (%)           | 5 (2%)         |
| 46 (31%)           | 60 (27%)         | 42 (31%)        | 64 (27%)       |
| 57 (38%)           | 99 (44%)         | 51 (37%)        | 105 (44%)      |
| 33 (22%)           | 52 (23%)         | 29 (21%)        | 56 (23%)       |
| 121 (80%)          | 188 (83%)        | 113 (82%)       | 196 (81%)      |
| 4.25 (4.99)        | 5.24 (9.55)      | 4.17 (4.82)     | 5.24 (9.44)    |
| 78 (89%)           | 118 (92%)        | 73 (94%)        | 123 (89%)      |
| 54 (69%)           | 84 (72%)         | 55 (73%)        | 83 (68%)       |
| 54 (61%)           | 72 (56%)         | 47 (60%)        | 79 (57%)       |
| 53 (65%)           | 64 (54%)         | 42 (58%)        | 75 (58%)       |
| 55 (37%)           | 111 (49%)*       | 50 (36%)        | 116 (48%)*     |
| 20 (13%)           | 49 (22%)*        | 18 (13%)        | 51 (21%)       |
| 41 (27%)           | 91 (40%)*        | 35 (25%)        | 97 (41%)**     |
| 36 (24%)           | 78 (34%)*        | 35 (26%)        | 79 (33%)       |
| 20 (13%)           | 49 (22%)*        | 20 (14%)        | 49 (21%)       |
| 22 (15%)           | 47 (21%)         | 21 (15%)        | 48 (20%)       |
| 32 (21%)           | 77 (34%)**       | 31 (22%)        | 78 (33%)*      |
| 71 (47%)           | 135 (59%)        | 62 (44%)        | 144 (60%)**    |
| 134 (89%)          | 191 (83%)        | 120 (87%)       | 205 (85%)      |
| 128 (84%)          | 186 (82%)        | 118 (86%)       | 196 (81%)      |
| 44 (29%)           | 80 (35%)         | 36 (26%)        | 88 (36%)*      |
| 76 (50%)           | 111 (49%)        | 71 (51%)        | 116 (48%)      |
| Injection | Not Interested | Interested |
|-----------|---------------|------------|
| M (SD) or N (%) | M (SD) or N (%) |
| 30.30 (10.90) | 30.99 (10.90) |
| 34 (43%) | 152 (51%) |
| 17 (22%) | 81 (27%) |
| 4 (5%) | 5 (2%) |
| 0 (0%) | 6 (2%) |
| 24 (30%) | 82 (28%) |
| 34 (43%) | 122 (41%) |
| 12 (15%) | 73 (24%) |
| 60 (75%) | 249 (83%) |
| 4.05 (5.24) | 5.05 (8.63) |
| 38 (83%) | 158 (92%)* |
| 28 (74%) | 110 (70%) |
| 28 (61%) | 98 (57%) |
| 23 (61%) | 94 (58%) |
| 25 (31%) | 141 (47%)** |
| 12 (15%) | 57 (19%) |
| 15 (19%) | 117 (39%)** |
| 17 (21%) | 97 (33%)* |
| 12 (15%) | 57 (19%) |
| 11 (14%) | 58 (19%) |
| 15 (19%) | 94 (32%) |
| 35 (43%) | 171 (57%) |
| 70 (86%) | 255 (86%) |
| 67 (84%) | 247 (82%) |
| 24 (30%) | 100 (34%) |
| 37 (46%) | 150 (50%) |
### STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

| Item No | Recommendation | Page No |
|---------|----------------|---------|
| **Title and abstract** | (a) Indicate the study’s design with a commonly used term in the title or the abstract | 1 |
| | (b) Provide in the abstract an informative and balanced summary of what was done and what was found | 1 |
| **Introduction** | | 2-4 |
| Background/rationale | Explain the scientific background and rationale for the investigation being reported | |
| Objectives | State specific objectives, including any prespecified hypotheses | 4 |
| **Methods** | | 4-6 |
| Study design | Present key elements of study design early in the paper | 4-6 |
| Setting | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 4 |
| Participants | (a) Give the eligibility criteria, and the sources and methods of selection of participants | 4-5 |
| Variables | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 5 |
| Data sources/measurement | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 5-6 |
| Bias | Describe any efforts to address potential sources of bias | 6 |
| Study size | Explain how the study size was arrived at | 6 |
| Quantitative variables | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 5-6 |
| Statistical methods | (a) Describe all statistical methods, including those used to control for confounding | 6 |
| | (b) Describe any methods used to examine subgroups and interactions | 6 |
| | (c) Explain how missing data were addressed | 6 |
| | (d) If applicable, describe analytical methods taking account of sampling strategy | 6 |
| | (e) Describe any sensitivity analyses | 6 |
| **Results** | | |
| Participants | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 6 |
| | (b) Give reasons for non-participation at each stage | 6 |
| | (c) Consider use of a flow diagram | N/A |
| Descriptive data | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 6 |
| | (b) Indicate number of participants with missing data for each variable of interest | 6 |
| Outcome data | Report numbers of outcome events or summary measures | 6-7 |
| Main results | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 6-7 |
(b) Report category boundaries when continuous variables were categorized.

(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.

| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | 6-7 |
|----------------|----|---------------------------------------------------------------------------------------------|-----|

| Discussion |
|------------|
| Key results | 18 | Summarise key results with reference to study objectives | 7-8 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 10 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 8-9 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 9 |

| Other information |
|-------------------|
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 11 |

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.
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

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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

Keywords: biomedical HIV prevention approaches, Men who have sex with men, rectal douche, dissolvable implant, removable implant, injection

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Abstract:

Objectives HIV scholars and practitioners have worked to expand strategies for prevention among marginalized 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 & 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 was 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. A majority (54%) reported some form of child sexual abuse. Of those 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. A majority of participants reported interest in all bio tools assessed, including dissolvable implants (60%), removable implants (64%), rectal douching (79%), and an injection (79%). Although interest in bio tools was broadly unassociated with demographics and sexual risk behaviors, 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 tools, future studies should explore potential strategies for adherence.

Key words: biomedical HIV prevention approaches, rectal douche, dissolvable implant, removable implant, injection, men who have sex with men

Strengths & Limitations:
- 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 generalizability of findings.
This study collected data on different forms of childhood sexual abuse and determined its link to HIV prevention bio tool preferences.

INTRODUCTION

In recent years, considerable advances have been made in decreasing overall HIV infection and transmission rates in the United States. However, the HIV epidemic continues to disproportionately impact racial and ethnic minorities and sexual and gender minority communities. Data has revealed an urgent national emergency as “The Invisible US Hispanic/Latino HIV Crisis.” 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 6,800 new cases/year in 2010 to 7,900/year in 2019. Seven in ten new HIV diagnoses occur among gay and bisexual men, even though they comprise about 2% of the US population. Among gay and bisexual men, racial and ethnic minorities continue to be disproportionately impacted by the epidemic.

If current trends continue, 1 in 4 Latino gay and bisexual men and 1 in 2 Black gay and bisexual men will be diagnosed with HIV during their lifetimes. Moreover, HIV surveillance data provides minimal information detailing which social determinants of health may impact risk behaviors, healthcare use and access. Social determinants of health that should be examined include socioeconomic status, social support, and exposure to violence. 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, treatment as prevention (TasP) for people living with HIV, 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, recommended by the World Health Organization and the Centers for Disease Control for persons at substantial risk for HIV infection. Some of the recent progress in curbing HIV infection and transmission has been attributed to increases in PrEP use within and beyond the U.S. However, challenges remain among those who would benefit from PrEP, and use remains somewhat low, particularly among Black and Latino MSM.
A number of explanations have been proposed for low PrEP uptake amongst 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 programs 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 U.S.-born individuals and documented immigrants may avoid pursuing care for fear of discrimination. Concerns about stigma could be addressed by culturally relevant sex education programs 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 [25: pg.11].

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 behavior (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 pre-clinical stage that are looking at combining medications that prevent against other STIs, including the Hepatitis B virus [31].

The benefits of implants include fewer interactions with the healthcare system, easy removal and lower dose/day with no oral medication required [31]. Similar medical technologies are being researched in biodegradable implants that can breakdown 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 medication requires 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 1 and Phase 2 clinical trials. Both phases found comparable efficacy to 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 the transmission of HIV in the aforementioned populations compared to a daily oral emtricitabine/tenofovir disoproxil fumarate (TDF/FTC) tablet [38-39].

This paper aims to address the following question: amongst 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 these 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 demographic characteristics and sexual risk behaviors 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 organizations 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]. This study was approved by the Institutional Review Board of Temple University in Philadelphia, PA, USA.

**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 organizations 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 questions gaging interest in biomedical prevention tools. These questions appeared at the end of the survey, and some prospective participants in Connecting Latinos en Pareja declined to submit responses to those specific questions and thus, were not included in the sample. Although this resulted in notable loss (out of 533 participants, 381 completed 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 was collected in the study included age, race/ethnicity, health insurance status, country of birth, education, and employment status. We also inquired about history of child sexual abuse prior to age 14, using six individual questions (e.g., “someone tried to touch me in a sexual way, or make me touch them;” “I believe that I was sexually abused”).

Sexual behavior 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 behavior 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. Chi-squared tests were conducted to explore 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 (e.g., only participants in primary relationships were asked about sexual behavior within and outside those relationships), missing cases only resulted in minor data loss (between 0.3% and 7%). All analyses were done in Stata, version 13.0.

**Patient and Public Involvement**

No patients were involved. We established a local Community Advisory Board (CAB) who met quarterly throughout the study to promote community engagement and utilization of research findings.

**RESULTS**

**Participant Characteristics**

Among 381 MSM who provided data for this exploratory analysis, approximately 26% (n=98) of participants 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. A majority (n=206, 54%) reported at least some form of child sexual abuse before age 14. Of those 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

A majority of 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 an injection (n=300, 79%). Approximately one fifth of 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.

| Table 1 Sample Characteristics (n=381) | M (SD) or N (%) |
|--------------------------------------|-----------------|
| Age (n=376)                          | 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 Past 90 Days             | 85 (22%)        |
| Interested in Rectal Douche for HIV Prevention¹ | 300 (79%) |
| Interested in Dissolvable Implant for HIV Prevention¹ | 229 (60%) |
| Interested in Removable Implant for HIV Prevention¹ | 242 (64%) |
| Interested in Injection for HIV Prevention¹ | 300 (79%) |

Sexual Behavior, General

| Anal Sex with Man, Past 90 Days (n=380) | 309 (81%)     |
| Total Anal Sex Partners, Past 90 Days (n=304) | 4.86 (8.10) |

Sexual Risk Behavior, Primary Relationship

| Any Anal Sex, Past 90 Days (n=217) | 196 (90%)     |
| Unprotected Anal Sex, Past 90 Days (n=195) | 138 (71%) |

Sexual Risk Behavior, 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

| Question                                                                 | Yes (n=379) | No (n=379) |
|--------------------------------------------------------------------------|-------------|------------|
| Someone tried to touch me in a sexual way, or make me touch them          | 166 (44%)   |            |
| Someone threatened to hurt me or tell lies about me unless I did something sexual with them | 69 (18%)    |            |
| Someone tried to make me do sexual things or watch sexual things          | 132 (35%)   |            |
| Someone molested me                                                       | 114 (30%)   |            |
| Someone on the internet tried to get me to talk about sex when I did not want to | 69 (18%)    |            |
| Someone on the internet tried to get me to do sexual things when I did not want to | 69 (18%)    |            |
| I believe that I was sexually abused                                     | 109 (29%)   |            |

Answered yes to at least one CSA question (n=380) 206 (54%)

Protective Factors

| Factor                              | Yes (n=380) |
|-------------------------------------|-------------|
| Health Insurance                    | 325 (86%)   |
| Born in US                          | 314 (82%)   |
| Bachelor’s Degree or Higher          | 124 (33%)   |
| Employed Fulltime                   | 187 (49%)   |

'Operationalized as indicating "definite" or "probable" interest in using this prevention method.

Table 2: Interest in Using Biomedical Prevention Tools (n=381)

| Prevention Tool      | Definitely Not Interested | Probably Not Interested | Probably Interested | Definitely Interested |
|----------------------|---------------------------|-------------------------|---------------------|-----------------------|
| 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%)             |

Bivariate analyses revealed few connections between demographics and interest in various biomedical HIV prevention methods. Participants with bachelor’s degrees were less likely to report interest in rectal douching (n=377, $\chi^2 = 10.48$, df=1, p<.01, n=377) and more likely to report interest in removable implants ($\chi^2 = 4.57$, df=1, p<.05, n=377) than peers who did not possess a college degree. Age, race, Latino ethnicity, health insurance, being born in the U.S., and fulltime 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<.05, n=217). Otherwise, there were no associations between interest in biomedical interventions and the
sexual behaviors 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 age 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, $p<.05$, n=379); someone threatened to hurt or tell lies about me unless I did something sexual ($\chi^2 = 4.15$, df=1, $p<.05$, n=379); someone tried to make me do sexual things or watch sexual things ($\chi^2 = 6.46$, df=1, $p<.05$, n=377; someone molested me ($\chi^2 = 4.43$, df=1, $p<.05$, n=376); someone on the internet tried to get me to talk about sex when I didn’t want to ($\chi^2 = 4.31$, df=1, $p<.05$, n=377); and I believe I was sexually abused ($\chi^2 = 7.60$, df=1, $p<.01$, n=375). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse ($\chi^2 = 5.22$, df=1, $p<.05$, 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, $p<.05$, n=379); someone threatened to hurt or tell lies about me unless I did something sexual ($\chi^2 = 4.07$, df=1, $p<.05$, n=379); someone tried to make me do sexual things or watch sexual things ($\chi^2 = 8.91$, df=1, $p<.01$, n=377; and I believe I was sexually abused ($\chi^2 = 4.90$, df=1, $p<.05$, n=375).

Interest in removable implants was also positively associated with overall reports of child sexual abuse ($\chi^2 = 8.15$, df=1, $p<.01$, 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, $p<.01$, n=379); someone tried to make me do sexual things or watch sexual things ($\chi^2 = 10.77$, df=1, $p<.01$, n=377; someone molested me ($\chi^2 = 3.96$, df=1, $p<.05$, n=376); and I believe I was sexually abused ($\chi^2 = 4.93$, df=1, $p<.05$, n=375). Interest in dissolvable implants was also positively associated with overall reports of child sexual abuse ($\chi^2 = 5.02$, df=1, $p<.05$, n=380). Table 3 below lays out our bivariate analyses.

| Table 3: Bivariate Analyses (n=381) | Rectal Douche | Dissolvable Implant | Removable Implant | Injection |
|-----------------------------------|---------------|---------------------|-------------------|-----------|
| Not Interested | M (SD) or N (%) | Not Interested | M (SD) or N (%) | Not Interested | M (SD) or N (%) | Not Interested | M (SD) or N (%) |
| Interested | M (SD) or N (%) | Intersted | M (SD) or N (%) | Intersted | M (SD) or N (%) | Intersted | M (SD) or N (%) |
|                        |           |           |           |           |           |           |           |           |           |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| **Age (n=376)**        | 30.69     | 30.88     | 31.00     | 30.73     | 30.96     | 30.77     | 30.30     | 30.99     |           |
|                        | (9.37)    | (11.28)   | (11.21)   | (10.69)   | (10.92)   | (10.89)   | (10.90)   | (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)** | 23 (23%)  | 75 (77%)  | 42 (42%)  | 56 (58%)  | 37 (37%)  | 61 (63%)  | 17 (17%)  | 81 (83%)  |           |
| Black Only             |           |           |           |           |           |           |           |           |           |
| 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 Past 90 Days** | 24 (28%)  | 61 (72%)  | 33 (38%)  | 52 (62%)  | 29 (34%)  | 56 (66%)  | 12 (14%)  | 73 (86%)  |           |
| Sexual Behavior, General |           |           |           |           |           |           |           |           |           |
| Anal Sex with 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) | 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 Behavior, Primary Relationship | Any Anal Sex, Past 90 Days (n=217) | Unprotected Anal Sex, Past 90 Days (n=195) | Sexual Risk Behavior, Outside Primary Relationship | Any Anal Sex, Past 90 Days (n=217) | Unprotected Anal Sex, Past 90 Days (n=201) | Child Sexual Abuse, Before age 14 |
|------------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------------|-----------------------------------|------------------------------------------|----------------------------------|
|                                          | 36 (18%)                          | 26 (18%)                                 |                                               | 20 (15%)                          | 23 (19%)                                 | 36 (21%)                         |
|                                          | 160 (82%)                         | 112 (82%)                                |                                               | 106 (85%)                         | 94 (81%)                                 | 130 (79%)                        |
|                                          | 78 (39%)                          | 54 (39%)                                 |                                               | 54 (42%)                          | 53 (45%)                                 | 55 (33%)                         |
|                                          | 118 (61%)                         | 84 (61%)                                 |                                               | 72 (58%)                          | 64 (55%)                                 | 111 (67%)*                       |
|                                          | 73 (37%)                          | 55 (39%)                                 |                                               | 47 (37%)                          | 42 (35%)                                 | 50 (30%)                         |
|                                          | 123 (63%)                         | 83 (61%)                                 |                                               | 79 (63%)                          | 75 (65%)                                 | 116 (70%)*                       |
|                                          | 38 (19%)                          | 28 (20%)                                 |                                               | 28 (22%)                          | 23 (19%)                                 | 25 (15%)                         |
|                                          | 158 (81%)*                        | 110 (80%)                                |                                               | 98 (78%)                          | 94 (81%)                                 | 141 (85%)*                       |

*Someone tried to touch me in a sexual way, or make me touch them (n=379)

|                                          | 36 (21%)                          | 16 (23%)                                 |                                               | 106 (85%)                         | 53 (77%)                                 | 13 (17%)                         |
|                                          | 130 (79%)                         | 20 (28%)                                 |                                               | 55 (33%)                          | 49 (71%)*                                | 51 (74%)                         |
|                                          | 111 (67%)*                        | 49 (71%)*                                |                                               | 50 (30%)                          | 18 (26%)                                 | 12 (17%)                         |
|                                          | 116 (70%)*                        | 49 (71%)*                                |                                               | 51 (74%)                          | 57 (83%)                                 | 141 (85%)*                       |

*Someone threatened to hurt me or tell lies about me unless I did something sexual with them (n=379)
|                                                                 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Someone tried to make me do sexual things or watch sexual things  | 25| 107| 41| 91| 35| 97| 15| 117|   |   |   |   |   |   |
| (n=377)                                                          | (18%) | (82%) | (31%) | (69%)* | (26%) | (74%)* | (11%) | (89%)* |
| Someone molested me                                              | 22| 92| 36| 78| 35| 79| 17| 97|   |   |   |   |   |   |
| (n=376)                                                          | (19%) | (81%) | (31%) | (69%)* | (30%) | (70%) | (14%) | (86%)* |
| Someone on the internet tried to get me to talk about sex when   | 14| 55| 20| 49| 20| 49| 12| 57|   |   |   |   |   |   |
| I did not want to                                                | (20%) | (80%) | (28%) | (72%)* | (28%) | (72%) | (17%) | (83%) |
| (n=377)                                                          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Someone on the internet tried to get me to make me do sexual     | 13| 56| 22| 47| 21| 48| 11| 58|   |   |   |   |   |   |
| things when I did not want to                                    | (18%) | (82%) | (31%) | (69%) | (30%) | (70%) | (15%) | (85%) |
| (n=379)                                                          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| I believe that I was sexually abused                             | 22| 87| 32| 77| 31| 78| 15| 94|   |   |   |   |   |   |
| (n=375)                                                          | (20%) | (80%) | (29%) | (71%)* | (28%) | (72%)* | (13%) | (87%) |
| Answered yes to at least one CSA question                       | 44| 162| 71| 135| 62| 144| 35| 171|   |   |   |   |   |   |
| (n=380)                                                          | (21%) | (79%) | (34%) | (66%) | (30%) | (70%)* | (16%) | (84%) |
| **Protective Factors**                                           |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Health Insurance                                                | 74| 251| 134| 191| 120| 205| 70| 255|   |   |   |   |   |   |
| (n=380)                                                          | (22%) | (78%) | (41%) | (59%) | (36%) | (64%) | (21%) | (79%) |
| Born in US                                                       | 70| 244| 128| 186| 118| 196| 67| 247|   |   |   |   |   |   |
| (n=380)                                                          | (22%) | (77%) | (40%) | (60%) | (37%) | (63%) | (21%) | (79%) |
**DISCUSSION**

In order to reduce demographic imbalances in HIV transmission, it is essential to develop and promote innovative biobehavioral 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 behaviors. 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. This data reinforces the need to continue prioritizing 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 a high desirability amongst 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 FDA, 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. A majority of participants (54%) reported at least some form of child sexual abuse before age 14. Other studies have documented the high prevalence estimates of sexual risk behaviors 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 in-person 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 U.S. have a high acceptability for long-acting injectable PrEP as well as for rectal douching. LAI PrEP was found to be more highly acceptable amongst men than females in both the U.S. and countries outside of the U.S. but only compared against standard PrEP, leaving out other biomedical prevention tools [43]. Our findings delve deeper and show that amongst MSM, LAI PrEP as a biomedical tool for HIV prevention tool is preferred over both removable and dissolvable implants. A study investigating the acceptability of rectal douching amongst a sample of Peruvian men found that rectal douching was likely to be used when condoms were not used [44]. This study’s findings compare the acceptability of rectal douching to three other biomedical prevention tools and find 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 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 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 that would benefit from the medication [47].

POC MSM 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 for 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 POC MSM are not discriminated against when
seeking out these interventions. Antibias and informational training has been found to increase knowledge of PrEP amongst 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 indicates 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 to this study is that it was limited to a subsection of the Northeast Corridor of the U.S and utilized 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 generalizable. 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 relate 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 behaviors 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 a 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 men who have sex with men 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.

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## STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

| Item No | Recommendation | Page No |
|---------|----------------|---------|
| **Title and abstract** | (a) Indicate the study’s design with a commonly used term in the title or the abstract | 3 |
| | (b) Provide in the abstract an informative and balanced summary of what was done and what was found | 3 |
| **Introduction** | | |
| Background/rationale | 2 Explain the scientific background and rationale for the investigation being reported | 4-6 |
| Objectives | 3 State specific objectives, including any prespecified hypotheses | 6 |
| **Methods** | | |
| Study design | 4 Present key elements of study design early in the paper | 6-8 |
| Setting | 5 Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 6-8 |
| Participants | 6 (a) Give the eligibility criteria, and the sources and methods of selection of participants | 6-8 |
| Variables | 7 Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 8-15 |
| Data sources/measurement | 8* For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 8-15 |
| Bias | 9 Describe any efforts to address potential sources of bias | 6-7 |
| Study size | 10 Explain how the study size was arrived at | 6-7 |
| Quantitative variables | 11 Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 7-8 |
| Statistical methods | 12 (a) Describe all statistical methods, including those used to control for confounding | 8 |
| | (b) Describe any methods used to examine subgroups and interactions | 8 |
| | (c) Explain how missing data were addressed | 8 |
| | (d) If applicable, describe analytical methods taking account of sampling strategy | 8 |
| | (e) Describe any sensitivity analyses | 8 |
| **Results** | | |
| Participants | 13* (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 7 & 8 |
| | (b) Give reasons for non-participation at each stage | 7 & 8 |
| | (c) Consider use of a flow diagram | N/A |
| Descriptive data | 14* (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 8 |
| | (b) Indicate number of participants with missing data for each variable of interest | 8 |
| Outcome data | 15* Report numbers of outcome events or summary measures | |
### Main results

16. **Main results**

- (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included.

- (b) Report category boundaries when continuous variables were categorized.

- (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.

### Other analyses

17. **Other analyses**

- Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses.

### Discussion

18. **Key results**

- Summarise key results with reference to study objectives.

19. **Limitations**

- Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.

20. **Interpretation**

- Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.

21. **Generalisability**

- Discuss the generalisability (external validity) of the study results.

### Other information

22. **Funding**

- Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.

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*Give information separately for exposed and unexposed groups.

### Note:
An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.