Published in final edited form as:
Sex Transm Dis. 2022 February 01; 49(2): 93–98. doi:10.1097/OLQ.0000000000001544.

Beyond Disease Intervention: Exploring an Expanded Role for Partner Services in the MATRix-NC Demonstration Project

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Abstract

BACKGROUND: Disease intervention specialists (DIS) provide partner services (PS) for sexually transmitted infections (STI). We assessed an expansion of DIS services for clients with HIV and/or syphilis, and contacts within their social and sexual networks.

METHODS: Black and Latinx cisgender men and transgender women who have sex with men diagnosed with HIV and/or syphilis in four urban North Carolina (NC) counties were referred to designated DIS, who were trained to recruit clients as “seeds” for chain-referral sampling of sociosexual network “peers.” All received HIV/STI testing and care; referrals for pre-exposure prophylaxis (PrEP) and social, behavioral, and non-STI medical services were offered. Participants completed baseline, 1 month, and 3 month computerized surveys.

RESULTS: Of 213 cases referred to DIS from May 2018 to February 2020, 42 seeds (25 with syphilis, 17 with HIV) and 50 peers participated. Median age was 27 years; 93% were Black and 86% were cisgender men. Most peers came from seeds’ social networks: 66% were friends, 20% were relatives, and 38% were cisgender women. Incomes were low, 41% were uninsured, and 10% experienced recent homelessness. More seeds than peers had baseline PrEP awareness; attitudes were favorable but utilization was poor. Thirty-seven participants were referred for PrEP 50 times;

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17 (46%) accessed PrEP by month 3. Thirty-nine participants received 129 non-PrEP referrals, most commonly for housing assistance, primary care, Medicaid navigation, and food insecurity.

CONCLUSIONS: Chain-referral sampling from PS clients allowed DIS to access persons with significant medical and social service needs, demonstrating that DIS can support marginalized communities beyond STI intervention.

BRIEF SUMMARY

This CDC-funded project demonstrated that disease intervention specialists could help connect marginalized communities to systems and services supporting their well-being, if the partner services concept is expanded beyond disease intervention.

Keywords

partner services; HIV; syphilis; disease intervention specialist; linkage to care; North Carolina; public health research

INTRODUCTION

Partner services (PS) are a key element of strategies to manage the spread of sexually transmitted infections (STIs) in the United States (US). Originally deployed in the 1930s as part of syphilis control efforts, today's disease intervention specialists (DIS) play a central role in interrupting the transmission of not just *Treponema pallidum* but HIV and other STIs.[1] Indeed, the role of DIS is unique: direct outreach to persons with communicable diseases in order to protect individual and public health.

While the reach of PS is wide, its scope has historically been fairly narrow. Traditional services prioritize sexual partner notification and evaluation to identify unrecognized STIs. In North Carolina (NC), for example, PS are offered to clients with HIV, early syphilis, or pregnant mothers with syphilis of any stage. Most efforts to "modernize" DIS activities since the early 2000s have focused on trying to catch up (and keep up) with changes in how people communicate and how they identify new sex partners.[2] Yet the perception that DIS are simply contact tracers has been limiting. DIS are better characterized as adaptable public health professionals with specialized skill sets in interviewing, counseling, and health systems navigation, operating in close proximity to the social and sexual networks of persons at greatest risk for STIs. The demography of HIV and syphilis in the US is skewed toward the socially marginalized and economically disadvantaged, with communities of color disproportionately impacted.

Expanding the scope of DIS to leverage their unique vantage point in the community may assist in the delivery of other public health services. There is a growing interest across health departments nationwide to integrate more HIV prevention options into PS activities, including a more active role in linking HIV-uninfected persons to pre-exposure prophylaxis (PrEP).[2] This is a logical extension of existing DIS activities, but generally it does not address structural barriers that prevent many at-risk people from being able to reliably and stably access PrEP or preventive healthcare.

In 2017, the NC Division of Public Health received funding from the Centers for Disease Control and Prevention (CDC) for a project entitled, “Combined HIV and STD Prevention and Care for Vulnerable Men who Have Sex with Men and Transgender Women (TGW) via Network Methods (MATRix).”[3] MATRix-NC was designed to assess whether specially-trained DIS could access and engage the social and sexual networks of persons at risk for syphilis and HIV and link them to a variety of social, behavioral, sexual wellness, and primary care services. We hypothesized that helping clients address necessities like housing, food security, or mental health could facilitate engagement in sexual health services, including PrEP.[4] Here, we describe results from baseline, one-month, and three-month surveys exploring risk behaviors, health-seeking behaviors, and utilization of HIV and STI services among PS clients served through MATRix-NC and provide context for our findings.

METHODS

Project Design

MATRix-NC was a longitudinal demonstration project built upon the established infrastructure of the state’s DIS program, which follows a traditional model of PS for HIV[5] and syphilis. Four urbanized counties with high incidence of syphilis[6] and HIV[7] (Durham, Forsyth, Guilford, and Wake) were selected as sites. Three DIS were trained on MATRix-NC procedures and methods for referral and linkage to services and were assigned to these counties. New laboratory-confirmed cases of syphilis and/or HIV among minority MSM and TGW were preferentially assigned by regional DIS field offices to MATRix DIS for PS. MATRix DIS provided traditional PS by conducting routine interviews and provision of STI services for these clients. Within the same face-to-face encounter at a health department venue, MATRix DIS then offered participation to Black or Latinx MSM or TGW who: were over 18 years old; had a recent diagnosis of HIV and/or primary, secondary, or early latent syphilis; reported ever having oral or anal sex with a man; and lived, worked or sought medical care in the selected counties. Potential participants who were unable to provide informed consent, complete interviews in English or Spanish, or unwilling to recruit sociosexual network contacts for the project (as described below) were ineligible to participate.

After MATRix DIS obtained informed consent, participants completed a 30-minute, computer-assisted self-interview (CASI) exploring sexual and health-seeking behaviors, utilization of STI/HIV services, and awareness of and attitudes toward PrEP. CASIs were administered at a health department on computerized tablets at baseline, one-month, and three-months after enrollment. CASIs were adapted from the CDC Network Epidemiology of Syphilis Transmission Core Questionnaire (Version 0.5) and designed to complement data collected for the NC Electronic Disease Surveillance System.[8]

These participants were identified as “seeds” for chain-referral recruitment[9] and reconstruction of social and sexual networks in separate analyses. Following CASI completion, MATRix DIS met with the participant to explain the process of recruiting “peers,” defined as sexual/social contacts whom the seed thought could benefit from HIV/STI testing and prevention services. Seeds were given five, non-replicable recruitment coupons printed with instructions for contacting MATRix DIS, who offered free STI/HIV testing and project participation. Peers were eligible to participate if they were ≥18 years old and lived within one hour of the health department in a project county. To avoid any limitations on the chain referral process, peers were not restricted to MSM or TGW of color. Ineligibility criteria for peers were similar to seeds.

Upon enrollment, peers completed a baseline CASI and were given three coupons and instructions for recruiting additional peers. Sampling continued until three “waves” of contacts were reached from each seed. Peers within any wave with new diagnoses of HIV and/or syphilis were considered seeds, evaluated for services, received treatment, and/or referred for care. Success of a referral was defined as participant self-reported ability to access the service since the last assessment.

CASIs were programmed using Research Electronic Data Capture (REDCap) version 10.6.4, hosted on secure servers at the University of North Carolina at Chapel Hill (UNC). All participants received an honorarium for enrollment and for each peer they recruited.

After project completion, MATRix DIS were surveyed about time, feasibility and comfort with providing referrals, to provide additional context for our principal findings.

Analyses

CASI data were summarized using descriptive statistics. We assessed the magnitude of differences between seeds and peers on the basis of demographics, sexual and health-seeking behaviors, health service utilization, or PrEP awareness using Pearson’s χ^2 and Fisher’s exact tests for categorical variables and Wilcoxon rank sum and Kruskal-Wallis tests for comparisons with ordinal or continuous outcomes. Statistical significance was set at $\alpha = 0.05$, and all analyses were performed using Stata version 16.1 (StataCorp, College Station, TX).

Protection of Research Participants

All procedures were approved by Institutional Review Boards of the University of North Carolina at Chapel Hill and Wake Forest University Health Sciences.

RESULTS

Between 1 May 2018 and 29 February 2020, 213 unique Black or Latinx MSM or TGW were referred to MATRix DIS for syphilis and/or HIV-related PS in a project county. From these potential participants, 39 persons enrolled as seeds; 24 had new diagnoses of syphilis and 15 had an HIV diagnosis. From referrals by seeds, 53 peers initially enrolled as participants, 3 of whom were subsequently diagnosed with syphilis (n=1) or HIV (n=2) through project-facilitated testing. Peers with new diagnoses were reclassified as seeds, resulting in 42 seeds and 50 peers for analysis. Of these original 92, 65 completed the month 1 assessment (71%; 31 seeds, 34 peers) and 52 completed the month 3 assessment (57%; 23 seeds, 29 peers).

At enrollment, the median age of seeds and peers was 27 years (interquartile range [IQR], 22–32), consistent with local epidemiological trends[67]. Seeds were about 5 years younger than the peers they recruited (p=0.02); 93% identified as Black, and 86% were cisgender men (Table 1). Significantly more peers were assigned female sex at birth (38% vs 7%, p<0.001), and twice as many peers indicated Hispanic or Latinx ethnicity (22% vs 10%). In all, 5 transgender women and two genderqueer persons were enrolled; all but one were seeds. Seeds identified as gay (64%) or bisexual (21%) but 46% of peers identified as "straight," a significant difference (p=0.005) driven largely by a greater proportion of heterosexual, cisgender women among peers. Indeed, peers were derived primarily from seeds' social (not sexual) networks. Most peers were either friends/acquaintances (66%) or a family members (20%) of a seed; only 12% were current sex partners of a seed.

The majority (85%) of participants reported prior-year incomes below 200% of the 2019 federal poverty level for a household of one.[10] Ten percent had experienced homelessness in the 6 months prior to project enrollment, and 9% reported having sex in exchange for money, drugs, or shelter in the prior 3 months (n=8). Four in ten participants lacked health insurance entirely; 24 of the remaining 54 (44%) were covered by public insurance (primarily Medicaid, n=20). Three-quarters of participants had seen a healthcare provider within the last year (n=70). There were no significant differences in any of these indicators between seeds and peers.

At enrollment, a greater proportion of seeds than peers had ever been tested for syphilis (90% vs 68%, p=0.009) and HIV (98% vs 86%, non-significant), which was expected given that seeds were identified through HIV/STI testing (Table 2). Thirty participants (24 seeds and 6 peers) had HIV; among these, 83% had seen an HIV care provider within the prior 12 months (i.e., engaged in care).

No participant had used HIV post-exposure prophylaxis in the previous 12 months. More seeds than peers were aware of PrEP at baseline (90% vs 68%, p=0.009), but only 6 participants (4 seeds and 2 peers) had taken it in the prior year and just 2 (both seeds) currently took PrEP. Attitudes of seeds and peers toward PrEP use were comparable, highly favorable, and without any meaningful changes across the 3 assessments (Supplemental Table). Thirty-seven participants (40% of all enrollees) were referred for PrEP a total of 50 times during the project period. Seventeen of these 37 (46%) were able to access PrEP services by their month 3 follow-up, but only 4 reported initiating PrEP (11% of those referred). The most commonly reported barriers to accessing PrEP following referral were forgetting about the appointment (n=3), scheduling conflicts (n=5), and other challenges outside of logistical or financial factors (n=12).

In all, MATRix DIS made 179 service referrals for 57 participants (62%; 28 seeds and 29 peers); for 18 of those 57, their only referral was for PrEP (32%). Among the 39 recipients of non-PrEP referrals, the median number of services requested was 2 (IQR, 1–4; maximum 8). Table 3 shows the distribution and disposition of referrals made during the project; the crude, participant-reported success rates for accessing PrEP and non-PrEP service(s) were 34% and 32%, respectively. Assistance in connecting to a primary care provider was the most common non-PrEP referral (18 participants), followed by Medicaid application or renewal help (17 participants). Housing and food assistance were the most common non-medical services requested (20 and 17 participants, respectively). The success rate for referrals was greatest for HIV care (80% were able to access) and non-HIV primary care (50%); the least successful referrals were for dental care (11%).

Following completion of participant activities, all three MATRix DIS were queried about time spent and comfort with the intervention through an anonymous survey. Two out of three MATRix DIS felt that time spent with seeds was less or comparable to time spent with other persons diagnosed with syphilis or HIV to whom they reached out, while all three indicated that the number of in-person or phone exchanges were greater with seeds. All MATRix DIS felt seeds and peers were more willing to engage with PS activities compared with other clients who received routine PS and were not enrolled in the project. The three MATRix DIS felt prepared to refer participants to services, and none felt making referrals impeded their typical PS responsibilities.

DISCUSSION

The goal of the CDC's Project MATRix initiative was to explore innovative approaches to improving HIV/STI prevention and care for sexual minorities of color.[3] In MATRix-NC, we empowered DIS to facilitate referral for a variety of medical and non-medical services in the context of routine PS, with an objective of lowering barriers to access faced by Black and Latinx MSM and TGW.[11, 12] Through chain-referral sampling initiated with clients of partner services,[4] we successfully reached the social networks of PS clients – a population with significant medical and social service needs. MATRix-NC demonstrated that DIS could play an important role in connecting marginalized communities to systems and services that improve their health and well-being, if the scope of PS is expanded beyond disease intervention.

Although only 39 of the 213 PS clients (18%) offered participation opted to enroll, we were able to enroll at least one peer per seed through chain referral sampling and retained 57% through month 3. Our design did not permit us to collect robust demographic data on those who were ineligible or declined, or reasons for not enrolling. MATRix DIS perceived project participants as being more engaged than routine PS clients, however, so it seems reasonable to assume that individuals with a greater interest in what the project had to offer self-selected to participate. The proportion of our participants who were experiencing extremes of socioeconomic disadvantage was notable, as indicated by income level, recent homelessness, engaging in transactional sex, and requesting assistance with housing or food insecurity. Very few participants had an income above the statewide 2019 median ($34,864),[13] despite 42% having education beyond high school. We noted that 70% of participants had seen a medical provider in the prior year, but also that a large number requested referrals for HIV and non-HIV primary care or Medicaid application assistance. Working poor people in the US tend to access healthcare only on an emergent or as-needed basis,[14] and our findings suggest this may be amplified for sexual minorities of color in NC. For MSM and TGW of color, DIS with the ability to refer to social services might play two equally important roles: helping individuals protect their health, and countering negative perceptions about the state's interest in the well-being of stigmatized groups (through health promotion rather than solely disease intervention).[15]

Sixty percent of participants were referred for at least one medical or non-medical service during follow-up, and approximately one-third of referrals made resulted in a participant accessing a requested service. These findings demonstrate that, when offered referral to medical or social services with perceived benefit, TGW and MSM of color were willing to accept a referral from DIS. Considering the social and economic marginalization of these key populations, this is an important, noteworthy finding that warrants further exploration. Navigating entry into medical or social services is daunting for many Americans from structurally vulnerable groups,[16, 17] which generally includes the participants in this demonstration project and many PS clients in NC.[6, 7] In bringing referral resources directly to individuals, we helped to address participants' "not knowing where to begin" in the process of entering healthcare – arguably the most important early barrier to engagement. The longitudinal nature of the project, with up to three contacts per participant, allowed MATRix DIS to follow-up and troubleshoot prior referrals and make new referrals in response to changing needs over time. It is possible that some participants felt obligated to accept a referral, perceiving possible power differences between themselves and a quasi-governmental official, which is an important potential limitation. However, the use of CASI (reducing desirability bias in survey responses) and the substantial rate of self-reported access of requested services suggest that this effect was not a major contributor.

Of course, ability to access a service is not the same as utilization, as evidenced by the proportion of referred participants who reported being able to access PrEP (18%) versus those who initiated it (2%). Based on the number of individuals who required (or requested) a second or third referral for the same service, it is clear that repeated contact may be required to make sure that TGW and MSM of color are successfully, durably engaged. The current model for DIS-client interactions does not easily lend itself to longitudinal follow-up, and MATRix DIS reported that time invested with each MATRix participant was greater than that spent with other PS clients. These hurdles must be addressed before this approach can be scaled up. One solution might be for DIS to assess client needs at the time of an initial outreach visit, and then perform a warm handoff to a colleague with specific expertise in social work or community resource navigation. For example, PrEP-eligible clients who express ambivalence about its benefit could be handed off to health educators trained in motivational interviewing, with a goal of helping the client advance from pre-contemplation toward readiness to initiate. Placing such an intervention earlier in the PrEP care continuum could substantially improve downstream outcomes.

On the basis of studies showing tight overlap of the social and sexual networks of MSM,[18, 19] we anticipated the majority of peers referred to the project would be MSM. We therefore noted the high proportion of cisgender women among peers (21%) with interest. US implementation of PrEP has largely ignored[20] the approximately 18% of infections estimated to occur among cisgender women each year nationwide, three-quarters of whom are Black or Hispanic/Latina.[21] Awareness of individual HIV risk, familiarity with PrEP, and mistrust of health systems are all significant and potent barriers to uptake among women of color.[22, 23] However a key, longstanding question has been how to reach cisgender women for education and assessment of PrEP interest and eligibility.[20] Studies have explored the use of family planning[24] and obstetrical[25] clinics and venues catering to cisgender women[26] as potential PrEP access points. In our demonstration project, DIS were an unexpected potential resource for cisgender women to learn about PrEP. Because these women were linked to DIS-delivered PrEP information through friends, acquaintances, and family members who were at baseline savvy about PrEP, it likely increased the potential for ongoing discussions with "informed consumers" who were personally close to them. Having a trusted confidante vouch for the safety or benefit of a new intervention may promote further or deeper consideration of PrEP, themselves.[27]

At baseline, 77% of participants with HIV reported actively receiving medical care for their infection, which was slightly greater than the statewide HIV care retention estimate of 74% in 2019.[28] Although a significantly higher proportion of seeds reported being engaged in HIV care compared to peers (83% and 50%, respectively), the small number of peers with HIV (n=6) somewhat limits meaningful comparison. In contrast, a significantly lower proportion of peers reported ever receiving a syphilis test (68% vs 90% among seeds). This could reflect differential access to syphilis testing in the social networks of persons recently diagnosed with HIV or syphilis, but given the greater proportion of cisgender women among peers and compulsory antenatal screening for syphilis in NC,[29] some peers likely had been tested without realizing it.

In order to maximize the potential impact of this project, we used statewide epidemiological surveillance data to focus on four counties with high HIV and syphilis incidence among MSM and TGW of color. Convenience did factor into our selections since each location had prior experience with implementation research, local resources to accommodate various referral types, and a willingness to experiment with novel public health interventions. Indeed, our PS modifications would not have been possible without the backing of the state's HIV/STI Field Services Unit to broaden the scope of DIS activities; this willingness was based on trust from long-standing academic and public health partnerships at the state level. We trained DIS to offer referrals for a slate of services to participants in this demonstration project, essentially embedding MATRix within existing workflows. This eliminated handoffs of participants from public health to research, and helped to shift DIS-client interactions from a single encounter to a more longitudinal relationship. Other existing public health models in which DIS are integrated within community based organizations providing social services may be already well-positioned to facilitate long-term follow-up.

The magnitude of social and structural barriers faced by sexual minorities of color is truly daunting, preventing many from addressing a variety of basic needs. Disenfranchisement from institutions that support health and well-being have myriad downstream effects on Black and Hispanic/Latinx MSM and TGW. MATRix-NC demonstrated that leveraging existing public health infrastructure can help lower those barriers and increase the ability of TGW and MSM of color (and their associated networks) to access medical and non-medical services. In light of growing movements for social and racial justice in the US and the complicated legacy of the Tuskegee Study,[30] the literal and figurative position of DIS in the community could help rebuild trust in healthcare institutions. Now the challenge we face is how to develop and sustain similar programs to effect positive, lasting impacts for these key, chronically underserved populations. Looking ahead, we encourage local public health authorities to partner with their social and human services colleagues to offer PS clients with options for support that go beyond sexual health. Indeed, addressing social wellness is perhaps the most important public health intervention of all.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGMENTS & FUNDING

The authors thank Katie McCallister, Jamillae Stockett, Kimberly Knight, Rodrigo Rodriguez-Celedon and the DIS staff of the North Carolina Communicable Disease Branch for their assistance with this project. This work was supported by the Centers for Disease Control and Prevention (CDC; CK14-140105PPHF18). The content is solely the responsibility of the authors and does not necessarily represent the views of the CDC. Additional support was provided by the North Carolina Translational and Clinical Sciences Institute, with funding from the Clinical and Translational Science Award Program at the National Institutes of Health (UL1TR002489).

CONFLICTS OF INTEREST

CBH supervised local research activities for a clinical trial of pre-exposure prophylaxis sponsored by Gilead Sciences. ACS received a Frontlines of Communities of the United States (FOCUS) grant from Gilead Sciences and royalties from UpToDate.

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Table 1:

Baseline Sociodemographic Characteristics of 92 Participants in MATRIX-NC Project, 1 May 2018 – 29 February 2020

	Overall n=92	Seeds n=42	Peers n=50	*P*
Age, Median (IQR)	27 (22–32)	24 (21–29)	29 (23–34)	**0.02**
Race				0.07
White	3 (3)	0 (0)	3 (6)	
Black	76 (83)	39 (93)	37 (74)	
Multiple	3 (3)	0 (0)	3 (6)	
Hispanic/Latinx	10 (11)	3 (7)	7 (14)	
Ethnicity				0.11
Hispanic/Latinx	15 (16)	4 (10)	11 (22)	
Not Hispanic/Latinx	77 (84)	38 (90)	39 (78)	
Gender				**<0.001**
Male (cisgender)	66 (72)	36 (86)	30 (60)	
Female (cisgender)	19 (21)	0 (0)	19 (38)	
Transgender female or transwoman	5 (5)	4 (10)	1 (2)	
Genderqueer	2 (2)	2 (5)	0 (0)	
Sexual orientation				**0.005**
Gay (lesbian or gay)	48 (52)	27 (64)	21 (42)	
Straight	29 (32)	6 (14)	23 (46)	
Bisexual	15 (16)	9 (21)	6 (12)	
Relation to recruiter				
Family member	10 (11)	0 (0)	10 (20)	**0.002**
Current sex partner	6 (7)	0 (0)	6 (12)	**0.02**
Friend/acquaintance	36 (39)	3 (7)	33 (66)	**<0.001**
Stranger	2 (2)	0 (0)	2 (4)	0.19
Highest education level attained				0.7
Never attended school	2 (2)	1 (2)	1 (2)	
Completed at least some high school	20 (22)	8 (19)	12 (24)	
Completed high school or GED diploma	31 (34)	12 (29)	19 (38)	
Some college, associate’s degree, or technical degree	26 (28)	14 (33)	12 (24)	
Bachelor’s degree	11 (12)	6 (14)	5 (10)	
Any post graduate studies	2 (2)	1 (2)	1 (2)	
Household pre-tax income in prior year				0.61
Less than $10,000	53 (58)	24 (57)	29 (58)	
$10,000 to $24,999	25 (27)	14 (34)	11 (22)	
$25,000 to $49,999	13 (15)	4 (10)	9 (18)	
$75,000 or more	1 (1)	0 (0)	1 (2)	
Health insurance				0.39
Insurance through an employer	25 (27)	15 (36)	10 (20)	

	Overall **n=92**	**Seeds** **n=42**	**Peers** **n=50**	***P***
Insurance purchased from ACA Marketplace	5 (5)	2 (5)	3 (6)	
Medicaid	20 (22)	6 (14)	14 (28)	
Medicare	4 (4)	2 (5)	2 (4)	
No insurance	38 (41)	17 (40)	21 (42)	
Homeless in the past 6 months				0.94
Yes	9 (10)	4 (10)	5 (10)	
No	83 (90)	38 (90)	45 (90)	
Sex in exchange for money, drugs, or shelter in past 3 months				**0.01**
Yes	8 (9)	7 (17)	1 (2)	
No	72 (78)	29 (69)	43 (86)	
Time since last visited a healthcare provider				0.096
Within the last year	70 (76)	37 (88)	33 (66)	
Within last 1–5 years	19 (21)	4 (9)	15 (30)	
Never	3 (3)	1 (2)	2 (4)	

P-values meeting statistical significance are indicated in bold.

Data are presented as number (%) unless otherwise indicated.

Abbreviations: IQR, interquartile range. GED, General Educational Development. ACA, Affordable Care Act.

Table 2:

Baseline HIV and STI Testing Histories of 92 Participants in MATRIX-NC Project, 1 May 2018 – 29 February 2020

	Overall **n=92**	**Seeds** **n=42**	**Peers** **n=50**	***P***
Ever tested for syphilis				0.009
Yes	72 (78)	38 (90)	34 (68)	
No	20 (22)	4 (10)	16 (32)	
Most recent syphilis test result				<0.001
Positive/reactive	25 (35)	23 (60)	2 (6)	
Negative/non-reactive	45 (63)	15 (40)	30 (88)	
Have not obtained my result	2 (3)	0 (0)	2 (6)	
Ever tested for HIV				0.13
Yes	84 (91)	41 (98)	43 (86)	
No	6 (7)	1 (2)	5 (10)	
I don’t know	2 (2)	0 (0)	2 (4)	
Most recent HIV test result				<0.001
Positive/reactive	30 (36)	24 (59)	6 (14)	
Negative/non-reactive	49 (58)	15 (37)	34 (79)	
Haven’t obtained results	3 (4)	0 (0)	3 (7)	
Indeterminate	2 (2)	2 (5)	0 (0)	
Engaged in HIV care				0.08
Yes	23 (77)	20 (83)	3 (50)	
No	7 (23)	4 (17)	3 (50)	

Data are presented as number (%) unless otherwise indicated.

Table 3:

Quantity and Outcomes of Referrals Made for 92 Participants in MATRIX-NC Project, 1 May 2018 – 29 February 2020

Service	**Participants Referred n (%)**	**Number of Referrals Made**	**Participant-Reported Success**	**Success Rate by Number of Participants Referred (%)**	**Success Rate by Number of Referrals Made (%)**
Pre-exposure prophylaxis (PrEP)	37 (40)	50	17	46	34
Housing assistance	20 (22)	22	5	25	23
Housing Opportunities for Persons with AIDS (HOPWA)	*10 (11)*	*11*	*3*	*30*	*27*
Non-HOPWA	*10 (11)*	*11*	*2*	*20*	*18*
Primary care provider	18 (20)	20	10	56	50
Medicaid	17 (18)	20	6	35	30
Food	17 (18)	21	4	24	19
Mental health	15 (16)	18	3	20	17
Ryan White HIV/AIDS Program care provider	9 (10)	10	8	89	80
Substance use	8 (9)	9	4	50	44
Dental	7 (8)	9	1	14	11
Any referral	*56 (61)*	*179*	*58*	*104*	*32*
Any non-PrEP referral	*39 (42)*	*129*	*41*	*105*	*32*

Data are presented as number unless otherwise indicated.