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Comparison of a novel expanded social network recruitment intervention with risk network recruitment to HIV testing: locating undiagnosed cases in South Africa

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Objective: To ascertain whether a novel expanded social network recruitment to HIV testing (E-SNRHT) intervention recruits men and individuals with previously undiagnosed HIV at higher rates than risk network recruitment.

Design: Initial ''seed'' participants were prospectively randomly assigned to the E-SNRHT intervention or to risk network recruitment. Their network members were included in the study arm of their recruiter.

Setting: Three Department of Health clinics and two drug treatment centers (DTCs) in the Msunduzi municipality of KwaZulu-Natal, South Africa.

Participants: Clinics and DTCs referred 110 newly HIV-diagnosed adult ''seeds'' to the study from June 2022 to February 2023. E-SNRHT seeds were asked to recruit network members as described below; risk network recruitment arm seeds were asked to recruit recent sex and/or injection partners. Presenting a recruitment coupon (from clinic/DTC staff or another participant) was required for eligibility.

Intervention: E-SNRHT seeds were shown educational material about HIV transmission risks and then asked to recruit anyone they know (e.g., friends, family) whom they thought could benefit from HIV testing.

Main outcome measure(s): Rates of recruiting men to HIV testing and locating individuals with previously undiagnosed HIV.

Results: E-SNRHT recruited significantly higher proportions of men to HIV testing (70.3 vs. 40.4%; $\chi^2 = 16.33$; $P < 0.0005$) and located significantly more previously undiagnosed cases of HIV per seed than risk network recruitment (rate ratio = 9.40; $P < 0.0001$). E-SNRHT also recruited significantly higher proportions of women with previously undiagnosed HIV (29.0 vs. 10.7%; $\chi^2 = 3.87$; $P = 0.049$).

Conclusion: E-SNRHT is an important strategy to expand the reach of HIV testing among men and undiagnosed cases of HIV in KwaZulu-Natal.

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AIDS 2024, **38**:1861–1865

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Received: 7 September 2023; revised: 24 June 2024; accepted: 28 June 2024.

DOI:10.1097/QAD.0000000000003976

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Keywords: addressing stigma as a barrier to HIV services, increasing HIV testing among men, locating undiagnosed cases of HIV, social network recruitment to HIV testing, South Africa

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Introduction

An estimated 8–15% of people living with HIV in South Africa are undiagnosed [1–3], with a large gender disparity (up to 21.8% among men) [1]. South African men test at clinics at much lower rates than women [4–7] and are more likely to be diagnosed at a late stage of disease progression [8,9].

HIV-related stigma is a well-documented barrier to HIV testing in South Africa [10–13], and may especially increase testing reluctance among men. South African men have reported feeling viewed as perpetrators of transmission and blamed for HIV by their communities and partners [14,15]. Desire to avoid gender-based stigma may cause or exacerbate reluctance to test in clinics (where they may be seen by others) [15], and to seek treatment in clinics following home-based or self-testing (evidenced by extremely low care-linkage rates among South African men after positive self-test results [16,17]).

Risk network recruitment to HIV testing (in which people newly diagnosed with HIV [PNDH] are asked to recruit their direct risk partners, who are then asked to recruit their own partners, in an effort to recruit/test entire networks [18,19]) has demonstrated efficiency at locating undiagnosed cases among various risk groups and geographic settings [19–22], but has limitations that make it less optimal for recruiting men and locating undiagnosed cases within South Africa's generalized heterosexual epidemic. First, discussing HIV testing with direct partners can trigger suspicion or blame [23–25], which may cause individuals with higher anticipated stigma (e.g., men) to be reluctant to participate in this type of recruitment [26,27]. Second, risk network recruitment asks individuals to recruit *recent* partners, excluding individuals who have not recently engaged in HIV risk behaviors [19]. Third, it excludes individuals who do not have long-term relationships with their partners (e.g., transactional sex partners) and may be unable to contact them for recruitment.

The present study

We developed a novel expanded social network recruitment to HIV testing (E-SNRHT) intervention to address these limitations of risk network recruitment. E-SNRHT asks PNDH to recruit anyone they know (e.g., friends, family, peers) whom they think might benefit from HIV testing. E-SNRHT allows participants to avoid blame and stigmatization associated with discussing HIV with risk partners; allows for a much greater possibility of recruiting people with longer-term-undiagnosed HIV who may not have recently engaged in any HIV risk activities; and allows for recruitment (by friends/family/peers) of people who do not know their risk partners well enough to be recruited by them. (Our previous small pilot of E-SNRHT demonstrated its acceptability and potential for recruiting men [28].)

We recruited PNDH from primary care clinics and drug treatment centers in KwaZulu-Natal, South Africa, and randomly assigned them to recruit people they know to HIV testing either via the E-SNRHT intervention or risk network recruitment. We compared the ability of these two strategies to recruit men to HIV testing and to locate additional (i.e., previously undiagnosed) PNDH and refer them to care.

Materials and methods

Sample and procedures

This study was conducted in the Msunduzi municipality of KwaZulu-Natal province. Detailed descriptions of this region and of all study procedures are provided in the Online Supplement. To recruit "seeds" (i.e., initial participants), we asked staff at three Department of Health clinics and two drug treatment centers to refer to us any adult whom they newly diagnosed with HIV between July 2022 and March 2023, using referral coupons containing study contact information.

Seeds were randomly assigned to the E-SNRHT intervention arm or risk network recruitment arm. All members of each seed's network were automatically assigned to the seed's study arm. In the E-SNRHT intervention arm, we briefly reminded participants of HIV transmission risks, and then asked them to recruit anyone they knew whom they thought might be at risk of having HIV but being unaware. We asked them to enumerate people they might recruit, and gave them one recruitment coupon for each person enumerated, and five extra coupons for people they might have forgotten. In the risk network recruitment arm, we asked participants to recruit all of their direct sex and/or injection partners from the last six months. One recruitment coupon was given for each partner reported; no extra coupons were given. All participants recruited by seeds (Step 1) were asked to help us recruit their own additional network members (Step 2). Step 2 network members were not asked to recruit anyone.

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Prospective participants were eligible if they presented a recruitment coupon (from clinic staff if seeds or from another participant if network members), were at least 18 years old, were able to be interviewed in isiZulu or English, and were able to give informed consent. All network members received HIV testing and counselling, and all HIV-positive participants were referred to care. Participants received ZAR60 compensation for completing interviews and ZAR20 for each network member recruited to learn more about the study (regardless of enrollment). Stigma was monitored to ensure participant safety; and a reduction in stigma between baseline and follow-up was found and reported elsewhere [29]. All procedures were approved by IRBs at University of Illinois Chicago and Human Sciences Research Council.

Measures

PNDH were defined as participants who tested positive for HIV, had no recorded previous positive result at clinics (if seeds), and self-reported that they had never received a positive test result. All participants self-reported being cisgender men or women.

Analysis

Descriptive statistics were computed for numbers and rates per seed of network members, men, and PNDH in each arm. Chi-square tests were conducted to compare proportions of men recruited and PNDH located among network members between study arms. Logistic regression was used to test for differences between arms in likelihood of recruiting men and PNDH. Gender subgroup analyses of PNDH recruitment rates were conducted. Descriptive statistics of characteristics of E-SNRHT-recruited PNDH were computed.

Results

We enrolled 470 participants, including 110 seeds and 360 network members (313 in E-SNRHT networks and 47 in risk networks). Descriptive statistics for the demographic characteristics of seeds and of network members are presented by study arm in Supplement Table A, http://links.lww.com/QAD/D287. There were no significant differences between study arms on these characteristics.

Table 1 presents descriptive statistics and Chi-square tests comparing proportions of men and PNDH recruited in each study arm, overall and by gender. The proportion of network members who were men was significantly higher in the E-SNRHT arm (70.3%; $N = 220$) than in the network recruitment arm (40.4%; $N = 19$; $\chi^2 = 16.33$; $P < 0.0005$).

The number of PNDH network members recruited per seed was significantly higher (rate ratio = 9.40; $P < 0.0001$) among E-SNRHT networks (1 PNDH recruited per 1.1 seeds) than risk networks (1 PNDH recruited per 10 seeds). There were no significant differences by study arm in the proportion of network members that were PNDH (15.0% among E-SNRHT and 12.8% among risk networks) overall. However, proportions of PNDH for both strategies were substantially higher than PNDH yields from local clinic testing (4.5%); and gender subgroup analysis found that E-SNRHT recruited significantly higher proportions of PNDH among women (29.0%; $N = 27$) than risk network recruitment (10.7%; $N = 3$; $\chi^2 = 3.87$; $P = 0.049$).

Logistic regression (Table 2) found that men were significantly more likely to be recruited by E-SNRHT than by risk network recruitment (OR = 3.49; $P < 0.0005$). Study arm was not significantly related to recruitment of PNDH overall. Among women, PNDH were marginally significantly more likely to be recruited by E-SNRHT than by risk network recruitment (OR = 3.41; $P = 0.060$).

Among the 47 E-SNRHT-recruited PNDH, 11% had never tested for HIV before; 32% had not tested in 5 years; 15% reported having no risk partners in the last 6 months; and 9% reported engaging in transactional sex in the last 6 months. Among the six PNDH recruited via risk networks, all had tested for HIV before, three had not tested in 5 years, two reported having no sex or injection partners in the last 6 months (which could reflect imperfect instruction-following for recruiting recent risk

Table 1. Descriptive statistics and Chi-square tests for men and people newly diagnosed with HIV recruited by study arm.

Study arm	*N* network members (*N* seeds)	Men recruited in networks	PNDH	PNDH located per seed	Women NDH	Men NDH
E-SNRHT intervention	313 (50 seeds)	220 (70.3%)	47 (15.0%)	0.94	27 (29.0%)	20 (9.1%)
Risk network recruitment	47 (60 seeds)	19 (40.4%)	6 (12.8%)	0.10	3 (10.7%)	3 (15.8%)
Statistical comparison of arms		$\chi^2 = 16.33^{**}$	$\chi^2 = 0.17$	rate ratio = 9.40^{**} 95% CI (4.02, 26.91)	$\chi^2 = 3.87^{*}$	$\chi^2 = 0.90$
Local clinic testing (standard care)		36.0% average	4.5% average		6.0%	5.4%

$^{**}P < 0.0005$.
$^{*}P < 0.05$.

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Table 2. Logistic regression results.

	Models predicting men recruited			Models predicting PNDH recruited		
	B (S.E.)	O.R.	C.I.	B (S.E.)	O.R.	C.I.
Study arm (full sample)	1.25 (0.32)	3.49**	1.86, 6.55	0.19 (0.47)	1.21	0.49, 3.00
Study arm (only women)	–	–	–	1.23 (0.65)	3.41†	0.95, 12.24
Study arm (only men)	–	————	————	-0.63 (0.67)	0.53	0.14, 1.99

**$P < 0.0005$.
†$P < 0.10$.

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partners, or could reflect differences in estimation of the timing of engaging with risk partners), and none reported having transactional sex.

Discussion

E-SNRHT recruited networks to HIV testing that were comprised of 70% men, compared to 40% men among risk networks. This may suggest that men are more comfortable recruiting and being recruited by friends, family members, or peers than by direct risk partners. While this interpretation is consistent with literature on men's stigma experiences and perceptions of being blamed for HIV [14,15], future research should empirically examine whether/why men prefer discussing HIV among their expanded networks.

E-SNRHT networks were composed of significantly higher proportions of women-NDH than were risk networks, and regardless of gender, E-SNRHT recruited PNDH at significantly higher rates per seed than risk network recruitment, with each E-SNRHT seed recruiting 0.94 PNDH to testing and care referral, on average. This suggests that E-SNRHT is an efficient mechanism by which to locate PNDH and link them to care.

Consistent with data from our previous pilot study, in which 93% of E-SNRHT-recruited participants reported that they were unlikely to have gotten tested in the near future without the intervention [30], we found that substantial proportions of E-SNRHT-recruited PNDH (a) had not tested for HIV in the last five years or had never tested, suggesting that E-SNRHT recruited "hard-to-reach" groups; and/or (b) had not engaged in any HIV risk activity in more than six months, suggesting that E-SNRHT may have recruited individuals with longer-term undiagnosed HIV.

Limitations

This study was limited by its sample size, comparing only 47 risk network members to 313 E-SNRHT network members. While our analyses were robust to this cell size imbalance, future studies should recruit larger samples of seeds to increase statistical power to detect smaller effects (e.g., differences in PNDH recruitment rates among men). This study also may have low external validity. The study clinics serve a socioculturally homogeneous population, so our findings may not be generalizable to other groups or settings. Future research should evaluate E-SNRHT among more diverse samples of clinics and among different sociocultural groups and geographic settings. Finally, we did not measure implementation differences at the clinic or individual levels. Future research should examine conditions under which E-SNRHT is most successful at recruiting men and PNDH in order to identify best practices to expand its implementation.

Conclusion

We found that E-SNRHT recruited significantly more men to HIV testing and located significantly more PNDH per seed than risk network recruitment, and recruited networks with significantly higher proportions of women NDH. It also successfully recruited "hard to reach" or reluctant to test individuals (i.e., who had never tested or had not tested in 5 years), and individuals who might have longer-term undiagnosed HIV (since they had not engaged in HIV risk activity in more than 6 months) to HIV testing. These findings suggest that E-SNRHT is an important strategy to expand the reach of HIV testing, diagnosis, and care linkage and contribute to progress towards 95-95-95 goals in KwaZulu-Natal, South Africa.

Acknowledgements

Research reported in this manuscript was supported by a University of Illinois Chicago School of Public Health Seed Funding Award (SPH1909, "An Expanded Social Network Approach to Locating People who Use Drugs and Recently Infected and/or Undiagnosed Positive Cases for HIV Testing in South Africa," a.k.a. the TRIPLE-SA Project). The authors would like to express our gratitude to our study team and staff at the Human Sciences Research Council. We acknowledge assistance from all of the participants in this project and hope that it

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has improved their lives and health as well as those of people in their networks and communities.

Conflicts of interest

There are no conflicts of interest.

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