HIV burden and correlates of infection among transfeminine persons and cisgender men who have sex with men in Nairobi: an observational study

Adrian D Smith DPhil[1§], Joshua Kimani MBChB[2,3], Rhoda Kabuti MSc[2], Peter Weatherburn MSc[4], Elizabeth Fearon PhD[5], Adam Bourne PhD[6]

1. Nuffield Department of Population Health, University of Oxford, Oxford, UK
2. Partners for Health and Development, Nairobi, Kenya
3. Department of Community Health Sciences, University of Manitoba, Winnipeg, Canada
4. Sigma Research, Department of Public Health, Environments and Society, London School of Hygiene & Tropical Medicine, London, UK
5. Department of Global Health & Development, London School of Hygiene & Tropical Medicine, London, UK
6. Australian Research Centre in Sex, Health & Society, La Trobe University, Melbourne, Australia

§ Corresponding author:

Nuffield Department of Population Health
Old Road Campus
Oxford OX3 7LF UK

ADS: adrian.smith@dph.ox.ac.uk
JK: jkimani@crstkenya.org
RK: rhodakabuti@gmail.com
PW: peter.weatherburn@lshtm.ac.uk
EF: elizabeth.fearon@lshtm.ac.uk
AB: a.bourne@latrobe.edu.au

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Summary

Background

Globally transgender persons are disproportionately affected by HIV and other sexually transmitted infections (STIs), and culturally competent prevention and treatment services are often unavailable or inaccessible. Despite recent improvements in national HIV responses for many key populations in East Africa, evidence of transgender sexual health needs to inform effective responses is sparse. We aimed to assess gender identity among men and transgender persons who have sex with men in Nairobi and explore associations with sexual health related outcomes, risk behaviour and uptake of HIV interventions

Methods

We recruited adult men and transgender persons who reported sex with men through respondent driven sampling during 2017 in Nairobi. We assessed gender identity, sociodemographics, sexual behaviour and HIV prevention and care uptake by self-completed survey. Participants tested for HIV, syphilis, rectal and urethral gonorrhoea and chlamydia. We compared prevalence of sexual health outcomes, risk behaviour and service uptake among transfeminine and cisgender participants using multivariable robust Poisson regression models with gender identity as the independent variable.

Findings

Among 618 recruits, 522 (86.1%) identified as cisgender, 70 (11.5%) transfeminine and 3 (0.7%) transmasculine. Compared to cisgender participants, transfeminine persons were more likely to be HIV positive (41.4% (28/70) v 24.6% (151/521) p=0.00087) and report rectal symptoms consistent with a current STI (16.3% (88/67) v 7.0% (38/518) p=0.014). Transfeminine persons reported higher recent male partner counts and were more likely to report recent condomless anal intercourse (62.1% (43/70) v 38.6% (208/522) p=0.00085), receptive anal intercourse (76.5% (54/70) v 45.5% (252/522) p<0.0001), transactional sex with men (57.5% (42/69) v 41.7% (240/518) p=0.023) and experience of sexual assault during the last year (23.1% (16/69) v 11.3% (65/520) p=0.019). Utilisation of pre- and post-exposure prophylaxis was low.

Interpretation

Transfeminine persons who have sex with men have a higher burden of HIV and associated risk behaviours compared to cisgender MSM in the same context, yet uptake of prevention and care services is poor. Policies should acknowledge the specific needs of transfeminine persons as distinct from men who have sex with men, and support providers to address these.

Funding

Funded by Evidence for HIV Prevention in Southern Africa (EHPSA), UK Aid

Introduction

The term 'transgender' is often used to describe those whose internal sense of their gender (their gender identity) is different from the sex they were assigned at birth[1]. UNAIDS identify transgender people, in particular transgender women, as a priority population in the global response to the HIV epidemic. Yet, as of 2014, only 39% of countries reported national AIDS strategies that specifically addressed transgender persons[2]. Where evidence is available, transgender women are often disproportionately affected by HIV and other STIs but reviews highlight the paucity of HIV surveillance for this population generally[3]. Proximal origins of elevated HIV risk among transfeminine persons include high rates of receptive anal intercourse, multiple sexual partnerships and engagement in transactional sex[4]. Vulnerability is compounded by high rates of depression and substance use, and degrees of social exclusion and economic marginalisation that impede access to prevention and treatment options[3,5]. Comparable research with transgender men is limited to a few small studies predominantly in the US[6].

Despite a recent increase in research focussed on transgender populations, policy-informative research on the sexual health burden and needs of transgender individuals remains particularly scant in sub-Saharan Africa[3,7,8]. However, studies of gay, bisexual and other men who have sex with men (GBMSM) increasingly elicit gender identity measures from participants or are inclusive of transfeminine participants. A synthesis of studies between 2011-2015 in Western and Southern Africa consisting participants assigned male sex at birth and reporting recent sexual activity with men found that 26% currently identified as female or transgender[9], they were almost twice as likely to be living with HIV and more often reported condomless receptive anal intercourse than cisgender GBMSM (cis-MSM). Recent cohort studies with similar eligibility in South Africa[10], Nigeria[11] and Kenya[12] also report significantly higher HIV incidence among transfeminine participants but have yet to clarify correlates of risk specific to this group.

Kenya has a declining generalised HIV epidemic and an aggressive HIV prevention and control strategy that aims to be inclusive of key populations most affected by HIV[13]. Yet Kenya's most recent HIV Prevention and Treatment Strategic Plan does not include responses for transgender or other gender diverse people[7,13]. National evidence is limited to two small studies including transgender participants: baseline prevalence was 25% among 32 participants in the Kisumu arm of HTPN075[14] whilst annual incidence of 21% was recorded among fourteen participants in a self-testing study in Malindi[12]. The first National Transgender Discrimination Survey also reported high levels of gender-related mental health diagnoses and suicidality, economic hardship, refusal of medical care and widespread gender-related discrimination in pubic, educational, workplace and health care settings[15]. In the absence of specific services for gender diverse persons, transgender and other gender diverse people seek care from key population services, specifically those catering for cis-MSM[15].

We sought to examine self-assessed gender identity among a population-based study of men and transgender persons who have sex with men in Nairobi, and where possible to document sexual health related outcomes, associated risk behaviour and prevention knowledge and uptake among transgender people and cis-MSM.

Methods

Study design and participants Between May-December 2017, respondent driven sampling (RDS) was employed to recruit 618 participants to a cross-sectional study in Nairobi. Seed participants were identified by three community organisations who provide targeted health care services to GBMSM communities in Nairobi. Following formative qualitative research, ten seeds were selected to optimise

diversity in personal characteristics (age, marital status, gender identity, socioeconomic status and location of residence within Nairobi County).

After completion of study procedures, each participant received two coupons and instruction in recruiting from their social network. Inclusion criteria for recruits were: possession of a valid study coupon; age 18 or over; male gender assignment at birth or identification currently; residence within 50km of Nairobi, and consensual anal or oral sexual activity with a man in the previous twelve months. Coupons detailed the location and contact details for the study site but disclosed no information about the purpose of the study or target population. To ensure legitimacy and avoid duplication, coupons were uniquely numbered, used non-standard grade watermarked paper and date stamped. The two-week period of coupon validity was temporarily extended to allow coupon holders to avoid election-related demonstrations near the study site in October 2017. Participants were reimbursed 300 Kenya shillings (~USD $3) for each recruit they referred to the study who subsequently participated.

The study was approved by the Kenya Medical Research Institute Scientific and Ethics Review Unit (KERMI/SERU/CGMR-C/CSC 044/3334), the University of Oxford, Oxford Tropical Research Ethics Committee (OxTREC 47-16) and London School of Hygiene & Tropical Medicine Human Research Ethics Committee (REF: 14144). All participants provided separate written informed consent to the questionnaire, sample collection and sample storage, and were able to withdraw from any portion of the study.

Procedures Valid coupon recipients who satisfied eligibility criteria underwent informed consent procedures. Prior participation was established using a commercially available digital fingerprint scanner. Clinic visitors who were ineligible for the study were provided details of other testing and care services. Links between participant details and study identifiers were held securely off-site. Clinical and laboratory reports were stored in secure premises and online surveys did not record identifying characteristics.

Personal behaviours were collected via a tablet-administered, self-completed questionnaire in English or Kiswahili on SurveyGizmo™. Participants had access to an interviewer for clarification of questions or assisted completion. The questionnaire collected demographic characteristics; measures of sexual behaviour; alcohol and other substance use; knowledge of HIV transmission risks; awareness and use of HIV/STI prevention methods; recent anogenital STI symptoms; experiences of sexuality-related stigma, discrimination or violence; HIV testing history; measures of engagement with HIV care continuum; and pre-validated measures of alcohol use and dependence (AUDIT). Individual network degree was elicited from a sequence of questions yielding the number of Nairobi resident adult GBMSM they had met in person in the last fortnight. Participants were compensated 500 Kenya shillings (~USD $5), according with Kenyan research remuneration guidelines.

Gender identity was assessed using what at the time was considered best practice via a two-step approach[16], comprising assessment of sex assignment at birth (male, female or prefer not to say) and current gender identity (male, female, transgender or none of these). In line with expert recommendations[5], we coded participants as ‘cisgender’ where birth assignment and currently identification was male, ‘transmasculine’ where birth assignment was female but currently identification was male or transgender, and ‘transfeminine’ where birth assignment was male sex but currently identification was female or transgender. Participants who did not currently identify as male, female or transgender could chose to specify that none of these terms applied.

Participants were offered HIV counselling and rapid testing following Kenya National Guidelines using two commercial rapid HIV testing kits (Determine Alere HIV 1/2 and First Response HIV 1–2.0). Blood

specimens were tested for syphilis (TPHA/RPR) and qualitative or quantitative HIV-1 PCR conditional on rapid test results (GeneXpert® HIV-1 Qual or VL). Urine and either self- or clinical collected rectal swabs were tested for *Neisseria gonorrhoeae* (NG) and *Chlamydia trachomatis* (CT) using PCR (GeneXpert® CT/NG).

HIV positive participants not receiving care were referred to government services for initiation of antiretroviral therapy. HIV negative participants were informed of government and community clinics offering pre-exposure prophylaxis (PrEP) eligibility assessment and referred directly if requested. Free treatment for STIs and active syphilis infections was provided according to national guidelines. Condoms, lubricants, sexual health information and details of local sexual services were freely available in the study clinic.

Statistical analysis RDS diagnostics including visualisation of recruitment chains, convergence and seed dependence, and statistical assessment of recruitment homophily were analysed using the *rds* library for R version 3.4.0[17]. Prevalence of cisgender, transfeminine and transmasculine identities, as well as those who used none of these identity labels, were reported as crude and weighted estimates in accordance with good practice. In univariate and multivariable analyses, point estimates and prevalence ratios were sample weighted by the inverse of the individual network degree measure (RDS-II method) [18]. Seeds were excluded from RDS-II analyses.

Associations between gender identity and STI outcomes, sexual behaviour, sexual health knowledge and intervention access were only explored for transfeminine and cis-MSM participants, given the small sample size of other gender identities. Differences in sociodemographic characteristics of transfeminine and cis-MSM were compared using Pearson's X^2 with second-order correction[19]. We used Poisson regression models with robust variance estimation (non-clustered sandwich estimator[20]) to estimate prevalence ratios of sexual health outcomes, behaviours and prevention and care uptake by gender identity as the independent variable. Multivariable models were confounder-adjusted for age and sociodemographic covariates in bivariate association with gender identity at $p<0.200$ (Wald test). Models assessing sexual behaviour associations were also adjusted for awareness of HIV status. Models of PrEP and post-exposure prophylaxis (PEP) knowledge and use were limited to participants who were HIV negative or status unaware, whilst associations with care engagement were restricted to participants living with HIV irrespective of awareness of status. Model specification and results were compared using unweighted and RDS-II weighted approaches and no marked differences were noted. Missing covariates were coded as dummy variables in models. Analyses were performed in Stata version 16.

Role of the funding source The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

761 individuals presented to the study site with the intention of participation. 124 were ineligible due to fake or missing coupons (31), repeat attendance (2), intoxication (6), ineligible by other inclusion criteria (85)). Of the 637 individuals with confirmed eligibility, 29 declined participation during consent procedures (refused biometrics (2), insufficient reimbursement (5), process too long (22)). Of 608 recruits and 10 seeds completing informed consent, one participant declined blood testing and six declined rectal swabs. Four seeds accounted for 516 (84.9%) recruits. Depth of recruitment ranged from 1 to 19 waves per seed (median 7) (Appendix page 1).

612 participants completed both two-step questions on sex assignment at birth and current gender identification (table 1). Six participants indicated that they preferred not to answer these questions, and were excluded. 85.3% (RDS-II 86.1%; 95%CI 82.6-88.9) identified as cisgender male. Seventy participants (11.4%; RDS-II 11.4%, 95%CI 8.8-14.7) identified as transfeminine, with approximately equal proportions currently identify as female and transgender. Only three participants identified as transmasculine. A total of 17 participants (2.8%; RDS-II 2.2%; 95%CI 1.2-3.8), the majority of whom had been assigned male sex at birth, did not self-identify as male, female or transgender.

Sampling proportions of gender categories did not converge by the end of recruitment (Appendix page 2). Diagnostic plots indicated a degree of seed dependence and suggested that the sampling proportion of transfeminine participants may have further increased if recruitment had continued. We found no evidence for recruitment homophily by gender identity (1.003 χ^2 p=0.376).

The median age of both transfeminine and cisgender participants was 24 years with no significant differences in age-distribution (table 2). The vast majority of both transfeminine and cis-MSM participants identified as gay or homosexual, and there were no significant differences in sexuality by gender identity. HIV prevalence was significantly higher among transfeminine participants (41.4%) compared to cis-MSM (24.6%, table 3). Transfeminine participants were more likely than cis-MSM to report symptoms suggestive of a rectal STI at the time of participation (16.3%) or at some point during the previous year (34.3%), and more likely to report rectal symptoms than urethral symptoms at both points. Overall prevalence of NG and CT by anatomical site did not differ significantly different by gender identity, although prevalence of rectal NG was high among transfeminine participants. The proportion of confirmed infections that were asymptomatic did not differ by site (rectal: 83.9% (73.4-90.8%) urethral: 83.0% (68.6-91.6)), however symptoms were more often indicative of confirmed rectal infection when reported by transfeminine than cis-MSM participants (36.7% versus 12.5%, p=0.045) while the reverse was true of urethral symptoms (3.3% versus 18.3%, p=0.069).

Transfeminine participants reported higher numbers of male partners within the last three months and were more likely to report having sold sex to men in the last year (Table 4). There were no significant differences in the reported number of transactional and non-transactional female contacts in the last year. Transfeminine participants were much more likely to report receptive anal intercourse during the last three months than cis-MSM, and twice as likely to report condomless receptive anal intercourse during that period. Conversely, transfeminine participants were significantly less likely to report insertive anal intercourse with male partners, but were no less likely to report condomless insertive anal intercourse than cis-MSM. Almost one in four transfeminine participants reported being the victim of non-consensual sex in the previous year. No associations were apparent between gender identity and alcohol or substance use.

Table 5 reports measures of knowledge, access and uptake of sexual health resources, and HIV care and prevention services available in Kenya. Transfeminine participants were less likely than cis-MSM to have ever taken an HIV test and more likely to cite difficulties accessing lubricants. Among participants living with HIV, the HIV care cascade for both transfeminine and cisgender participants were significantly short of UNAIDS 90-90-90 targets (transfeminine: 72-85-71; cis-MSM: 78-86-80). Differences between transfeminine and cisgender participants were not statistically significant in this restricted sample, but were suggestive of lower status awareness and virological suppression in care among transfeminine participants. Among HIV negative and undiagnosed HIV positive participants, less than half of transfeminine participants demonstrated accurate understanding of pre- and post-exposure prophylaxis, and very few reported ever using either form of biomedical prevention (PrEP 3.7%; PEP 4.8%).

Discussion

This population-based study highlights the startlingly high burden of HIV and STIs among this hitherto unrecognised population within the national HIV/AIDS response in Kenya. Our findings suggest that transfeminine persons who have sex with men in Nairobi have over 80% higher prevalence of HIV than cisgender GBMSM who themselves bear a high burden of infection. Our estimates concur with those from similar populations in different African contexts over the last decade among which the pooled odds of HIV was 1.8 times that of cis-MSM in the same context[9]. The high prevalence of symptomatic rectal STIs among transfeminine persons, principally rectal gonorrhoea, is consistent with findings elsewhere and may both reflect high levels of sexual exposure through receptive anal intercourse as well as lack of access to prompt diagnosis or care[8]. The high prevalence of asymptomatic STIs is consistent with findings elsewhere in the region [11] and calls into question the adequacy of existing national syndromic management guidance for key populations[21].

In keeping with similar studies of transfeminine persons in other contexts[5,8,9], we found higher levels of sexual risk behaviours that may in part explain the higher observed burden of HIV and rectal STIs in this population. Transfeminine persons were more likely to report condomless receptive anal intercourse, transactional sex with male partners and higher male partner counts compared to cis-MSM. These findings are of particular concern juxtaposed with the extremely low usage of pre-exposure and post-exposure prophylaxis in both populations, despite public provision in Kenya[22], and widespread self-reports of problems accessing lubricants and condoms for transfeminine persons specifically.

Occupational, housing and income instability, experience of stigma and discrimination and poor mental health also contribute to socio-ecological vulnerability to HIV acquisition among transgender populations in other settings[4,23,24]. Recent evidence suggests these wider issues affect the lives of transgender Kenyans too[15], and our observation that 1 in 4 transfeminine people in Nairobi have been recent victims of non-consensual sex alludes to the need for urgent action to reduce the social vulnerability of this group.

The behavioural exclusion criteria and network sampling methods employed likely accounts for the low representation of transmasculine persons in this study, but signals the need for further research into the full spectrum of gender diversity in Kenya and the implications for sexual health responses [25]. A sizeable minority of study participants did not identify with any of the gender options presented by our two-step survey questions suggesting this common approach fails to capture the complexity of gender in this context. There is increasing recognition in other regions that such approaches may be too simplistic in not allowing individuals to affirm other specific gender identities (e.g. gender non-binary, gender fluid, gender queer)[16] and hence fail to capture distinct identities with specific sociodemographic and health needs[26]. Our observation that self-identified sexuality was not markedly different between transfeminine and cisgender participants might reflect the need for transgender persons to 'pass' as cis-MSM to access services[15]. However previous work documents the complex intersectional nature of gender role, gender expression, anal intercourse role preference and relational power dynamics among Kenyan GBMSM that challenges simplistic and common categorisation of gender or sexuality[27]. There is a pressing need for culturally acceptable and meaningful gender identity measures to be validated and adopted to enable providers and programmes to tailor services to meet the needs of gender diverse users.

Limitations of the study include the cross-sectional design (precluding examination of causal direction of correlates) and the reliance on self-reported measures of behaviours and service uptake (subject

to memory error and social desirability bias). Furthermore, eligibility was limited to persons reporting sexual activity with men and we applied an RDS degree measure based on GBMSM network size. This reflects the primary focus of this and other such studies in the region upon GBMSM for whom advocacy, public health policy and research is well established. However gender diverse populations also comprise individuals who are not sexually active with men or do not share the same social networks[28], and who therefore would not be represented in this study. Thus while our findings signal worrying patterns of sexual ill health, HIV acquisition risk and difficulties accessing resources and services among transfeminine persons who have sex with men that demand action in their own right, we caution against generalizing these findings to all transfeminine persons. Conversely, sampling within close sexual networks shared by participants may have resulted in some non-independence of observed sexually transmitted infections and may partially explain similarities seen in bacterial STI prevalence between groups. These design limitations perhaps explain why our sample failed to converge on measures of gender identity, despite satisfactory sample size and recruitment wave depth for other study measures. This underscores the need for research that is specific to gender diverse populations in Africa as distinct from GBMSM populations[29].

Notwithstanding these limitations, our findings have clear implications for sexual health surveillance and responses in Kenya. Our study highlights the importance of routinely distinguishing between gender identity and sexual identity in surveillance, research and service interactions with key populations, where they may otherwise be conflated[29]. Failure to distinguish gender diverse persons who engage with research or services designed for GBMSM not only obscures the specific needs of gender diverse service users, it also threatens to compromise our understanding of cisgender men's burden and needs.

It is crucial that Kenyan HIV/AIDS policy-makers now acknowledge and respond to the sexual health needs of transfeminine populations as distinct from GBMSM in accordance with UNAIDS/WHO guidance[30]. In 2015 WHO recommended essential health sector HIV interventions for transgender persons, including comprehensive condom and lubrication programming, provision of pre-exposure prophylaxis, and access to STI and community-based HIV testing, to be delivered by health-care providers sensitive to and knowledgeable of specific health needs of transgender people[1]. Our findings suggest these aspirations are yet to be realised for transfeminine persons in Nairobi.

Developing an acceptable HIV prevention and care response for transgender persons will also require better understanding of wider priorities and needs of gender diverse Kenyans beyond sexual health. Holistic transgender-specific service models have been developed in other settings[31], and limited evidence suggests that sexual health services delivered in conjunction with gender affirming services such as gender counselling and hormone therapy may improve acceptability, uptake and retention in HIV services[32]. Specialist services may be an unrealistic prospect outside major cities, and given half of the transfeminine persons in our study identified as women rather than transgender suggests that no single service model is likely to be universally accepted or accessible. Rather we suggest that sensitisation and gender-inclusion training across a range of service types is required, including mainstream health services and those catering to sexual minorities, as well as law enforcement agencies or other social care providers, especially in support of post-rape care[1,33]

In summary, gender diverse persons exist in Kenya and have sexual health needs that remain largely unrecognised and unmet. Transfeminine persons who have sex with men in Nairobi have a higher burden of HIV and report greater sexual HIV acquisition risks than cis-MSM in the same context, yet uptake of available sexual health interventions is poor. National HIV/AIDS strategies should recognise this key population in the Kenyan HIV response and articulate effective and acceptable approaches to

surveillance, prevention and care. Sexual health services and programmes, particularly those targeting key populations, should routinely assess gender identity to better identify the needs of individual service users and to understand the health disparities between them. Future research must aim to understand and address obstacles to the uptake of existing sexual health programs and services for this population, and should seek to describe wider health, social and gender-affirming needs. Action to increase the cultural competence of community organisations, health and social care providers and other public authorities already serving gender diverse Kenyans should be prioritised.

Acknowledgements

We would like to acknowledge and thank the commitment of study participants, and are grateful to our community partner organisations: the Gay and Lesbian Coalition of Kenya (GALCK); Ishtar MSM and Health Options for Young Men with AIDS (HOYMAS) for their support of study procedures and in dissemination of findings. We thank our administrative, counselling, clinical and laboratory staff at the TRANSFORM clinic and Partners for Health and Development for Africa (PHDA) for their hard work and dedication. This paper was published with permission from the Director of KEMRI.

This study was funded by Evidence for HIV Prevention in Southern Africa (EHPSA), a UK aid programme managed by Mott MacDonald (award reference MM/EHPSA/WHC/0116029).

Conflicts of Interest

No author has conflicts of interest to declare.

Author contributions

ADS contributed to designing the study and data collection instruments, carried out quantitative analyses and wrote the first draft of the manuscript; AB contributed to conceiving and designing the study and data collection instruments and drafting of the manuscript; JK and RK contributed to designing the study and data collection instruments, implementation of study procedures, and commented on the manuscript. PW and EF contributed to conceiving and designing the study and data collection instruments and commented on the manuscript. All authors approved the final draft.

Data sharing

Data from this study has not been deposited publicly because of the potential risk of deductive disclosure that may arise from individual data needed for valid analysis of the data, and the potential individual and social harms that may arise from such disclosure in a context of criminalisation and stigmatisation. However all authors aim to make the data underlying the findings of the study available for legitimate research purposes, and requests will be considered by the London School of Hygiene and Tropical Medicine Research Operations Office Data Management lead (alex.hollander@lshtm.ac.uk). The request must specify the purpose of research, the list of required variables, and if personally identifiers or sensitive data are sought, specify measures to maintain information security and governance that will be applied in storage, handling and reporting the data.

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Table 1: Current gender identity and gender assignment at birth, TRANSFORM participants 2017

		Sex assignment at birth		
		Male	**Female**	**Total**
Current gender identity	**Male**	522 85.3% **86.1 (82.6-88.9)**	3 0.5% **0.4 (0.1-1.2)**	525 85.8% **86.4 (83.0-89.2)**
	Female	33 5.4% **5.5 (3.7-8.0)**	-	33 5.4 **5.5 (3.7-8.0)**
	Transgender	37 6.1% **6.0 (4.2-8.5)**	-	37 6.1% **6.0 (4.2-8.5)**
	None of these terms	16 2.6% **1.9 (1.0-3.4)**	1 0.2% **0.3 (0.0-2.0)**	17 2.8% **2.2 (1.2-3.8)**
	Total	608 99.4% **99.4 (98.1 – 99.8)**	4 0.7% **0.6 (0.2-1.9)**	612
Cell content: number of participants, unweighted proportion and (in bold) RDS-II weighted proportion and 95% confidence interval Table excludes 6 persons who preferred not to answer				

Table 2: Sociodemographic characteristics of transfeminine persons and cisgender GBMSM in Nairobi, 2017

		Transfeminine		Cisgender GBMSM		p‡
		N=70		N=522		
	N	n	% (95% CI)†	n	% (95% CI)†	
Age (years)						
18-23	214	22	32.3 (21.0-46.2)	192	38.6 (33.8-43.6)	
23-29	242	33	49.2 (36.0-62.4)	209	38.5 (33.8-43.5)	0.324
30+	136	15	22.9 (19.0-27.4)	121	22.6 (19.0-27.4)	
Employment (current)						
Salaried	171	21	26.2 (16.3-39.5)	150	28.4 (24.1-33.2)	
Self employed	153	14	24.1 (14.2-37.9)	139	28.3 (23.9-33.1)	0.861
Unemployed	237	32	46.8 (33.7-60.3)	205	40.6 (35.7-45.6)	
Other	21	2	2.8 (0.5-15.2)	19	2.8 (1.6-4.8)	
Education (highest level of attendance)						
Primary	108	13	21.0 (11.9-34.5)	95	18.1 (14.6-22.2)	
Secondary	312	37	55.1 (41.5-68.0)	275	54.3 (49.2-59.2)	0.792
Higher	165	19	23.9 (14.5-36.8)	146	27.7 (23.4-32.4)	
Income (1000s KES last month)						
<5	214	28	46.7 (33.0-60.9)	186	39.6 (34.6-44.8)	
5 < 10	162	18	28.0 (16.9-42.7)	144	27.9 (23.5-32.7)	0.162
10 < 20	123	15	23.9 (13.9-37.8)	108	22.0 (18.0-26.6)	
20+	53	2	1.4 (0.3-6.1)	51	10.6 (7.7-14.2)	
Country of birth						
Kenya	465	50	75.3 (61.7-85.2)	415	79.5 (75.1-83.3)	
Other Africa	107	18	24.7 (14.8-38.3)	89	18.8 (15.1-23.2)	0.400
Outside Africa	11	0	- -	11	1.7 (0.8-3.4)	
Self-identified sexual identity						
Gay/Homosexual	429	56	78.9 (65.1-76.6)	373	72.3 (67.6-76.6)	
Bisexual	139	11	18.5 (10.0-31.8)	128	24.6 (20.5-29.2)	0.649
Other	15	1	2.6 (0.4-16.4)	14	3.1 (1.7-5.6)	

†: RDS-II weighted & seeds excluded ‡: Pearson χ^2 with second-order survey design correction

Table 3: Sexually transmitted infections and engagement with HIV care among transfeminine persons and cisgender GBMSM in Nairobi, 2017

	Transfeminine N = 70		Cisgender GBMSM n = 522		Crude		Adjusted	
	n/N	% (95% CI)†	n/N	% (95% CI)†	PR (95% CI) ††	Wald p value	aPR (95% CI) ‡	Wald p value
HIV [Determine®, First Response® & Xpert® HIV-Qual]								
Positive	28/70	41.4 (29.0-55.1)	151/521	24.6 (20.7-29.0)	**1.68 (1.17-2.42)**	**0.0050**	**1.83 (1.28-2.62)**	**0.00087**
Syphilis [TPHA/ RPR>3]								
Positive	1/70	0.8 (0.1-5.8)	4/519	1.2 (0.4-3.2)	0.71 (0.08-6.47)	0.763	0.65 (0.06- 6.61)	0.719
Neisseria Gonorrhoea [Xpert® CTNG]								
Rectal	15/70	20.7 (11.8-33.7)	57/516	11.8 (8.8-15.5)	1.76 (0.97-3.20)	0.063	1.58 (0.84-2.97)	0.157
Urine	3/70	3.1 (1.0-9.8)	23/519	4.6 (2.9-7.2)	0.68 (0.19-2.37)	0.540	0.66 (0.18-2.43)	0.537
Chlamydia Trachomatis [Xpert® CTNG]								
Rectal	8/70	7.2 (3.0-16.4)	44/516	8.2 (5.9-11.4)	0.88 (0.35-2.20)	0.778	0.71 (0.32-1.56)	0.392
Urine	5/70	5.4 (1.3-19.9)	33/519	10.9 (6.1-18.9)	0.57 (0.20-1.63)	0.296	0.57 (0.20-1.62)	0.291
Symptoms suggestive of an STI (current)								
Rectal[a]	8/67	16.3 (8.0-30.3)	38/518	7.0 (4.8-10.0)	**2.34 (1.09-5.00)**	**0.029**	**2.57 (1.21-5.48)**	**0.014**
Urethral[b]	3/66	2.3 (0.6-8.3)	36/511	6.2 (4.2-9.0)	0.38 (0.10-1.47)	0.160	0.43 (0.11-1.69)	0.227
Symptoms suggestive of an STI (last 12 months)								
Rectal[a]	23/67	34.3 (22.6-48.3)	99/519	18.1 (14.6-22.3)	**1.89 (1.22-2.92)**	**0.0041**	**1.96 (1.26-3.03)**	**0.0026**
Urethral[b]	13/66	16.9 (9.0-29.6)	98/512	16.7 (13.4-20.7)	1.01 (0.53-1.92)	0.978	1.04 (0.55-1.96)	0.893

PR: prevalence ratio aPR: adjusted prevalence ratio

†: Seeds excluded & RDS-II weighted

††: Poisson regression with robust variance, seeds excluded & RDS-II weighting

‡: Poisson regression with robust variance, seeds excluded, RDS-II weighting and adjusted for age, income and country of birth

[a]: Participants were asked 'Have you had any discharge from your anus or severe pain during anal sex?'

[b]: Participants were asked 'Have you had any discharge from your penis or pain when you pass urine?':

Table 4: Sexual and substance use behaviour among transfeminine persons and cisgender GBMSM in Nairobi, 2017

	Transfeminine N = 70		Cisgender GBMSM N=522		Crude		Adjusted‡	
	n/N	% (95% CI)†	n/N	% (95% CI)†	PR (95% CI) ††	Wald p value	aPR (95% CI) ‡	Wald p value
Sexual behaviour – male partners								
Male sexual partners (last 3 months)								
None	7/70	9.2 (3.8-20.5)	64/522	12.9 (9.9-16.8)	**0.71 (0.29-1.72)**		**0.81 (0.34-1.94)**	
1-3	41/70	63.6 (50.1-75.2)	346/522	73.8 (69.3-77.8)	**0.86 (0.70-1.06)**	**0.020**	**0.68 (0.69-1.06)**	**0.042**
4 or more	22/70	27.3 (17.3-40.3)	112/522	13.3 (10.6-16.7)	**2.05 (1.26-3.32)**		**1.93 (1.19-3.14)**	
Transactional sex with male partners (last 12 months)								
Once or more	42/69	57.5 (43.7-70.2)	240/518	41.7 (36.9-46.7)	**1.38 (1.06-1.79)**	**0.017**	**1.36(1.04-1.76)**	**0.023**
Sexual behaviour with male partners (last 3 months)								
Receptive AI	54/70	76.5 (63.2-86.0)	252/522	45.5 (40.6 – 50.5)	**1.68 (1.40-2.02)**	**<0.0001**	**1.55 (1.28-1.87)**	**<0.0001**
Insertive AI	31/70	42.8 (30.3-56.3)	333/522	63.8 (58.9 – 68.5)	**0.67 (0.49-0.92)**	**0.014**	**0.68 (0.49-0.93)**	**0.017**
Condomless anal intercourse (AI) with male partners (last 3 months)								
Any AI	43/70	62.1 (48.4-74.0)	208/522	38.6 (33.8 – 43.5)	**1.61 (1.26-2.06)**	**0.00014**	**1.57 (1.22-2.01)**	**0.00085**
Receptive AI	34/70	48.1 (35.0-61.5)	133/522	24.4 (20.4 – 28.9)	**1.97 (1.42-2.75)**	**<0.0001**	**1.88 (1.34-2.65)**	**0.00041**
Insertive AI	18/70	26.7 (16.5-40.2)	146/522	26.5 (22.4 – 31.1)	1.01 (0.62-1.62)	0.982	0.99 (0.61-1.61)	0.975
Sexual behaviour – female partners								
Female sexual partners (last 3 months)								
One or more	11/70	19.6 (10.8-32.9)	144/522	27.5 (23.3-32.2)	0.64 (0.36-1.15)	0.133	0.69 (0.39-1.22)	0.202
Transactional sex with female partners (last 12 months)								
Once or more	4/70	7.7 (2.6-20.7)	52/519	9.4 (6.9-12.8)	0.82 (0.28-2.45)	0.724	0.72 (0.25-2.08)	0.543
Condomless intercourse with female partners (last 3 months)								
Any intercourse	8/70	15.8 (7.9-29.3)	85/522	16.6 (13.3 – 20.7)	0.95 (0.47-1.92)	0.889	1.09 (0.54-2.17)	0.814
Vaginal intercourse	7/70	13.3 (6.2-26.3)	79/522	15.4 (12.2-19.4)	0.86 (0.40-1.85)	0.706	1.01 (0.47-2.16)	0.987
Anal intercourse	2/70	5.0 (1.3-17.8)	14/522	2.8 (1.5-5.1)	1.77 (0.41-7.73)	0.447	1.96 (0.52-7.38)	0.318
Sexual violence								
Forced to have sex against will (last 12 months)								
Once or more	16/69	23.1 (13.7-36.3)	65/520	11.3 (8.5-14.9)	**2.04 (1.16-3.58)**	**0.013**	**1.99 (1.12-3.53)**	**0.019**
Substance Use Behaviour								
Alcohol use								
Never	26/70	37.1 (25.2-50.9)	222/522	45.5 (40.5-50.5)	0.82 (0.56-1.18)		0.78 (0.55-1.13)	
Monthly	33/70	47.9 (24.9-61.3)	228/522	42.2 (37.5-47.4)	1.13 (0.83-1.53)	0.243	1.15 (0.85-1.55)	0.132
Weekly	11/70	14.9 (7.7-27.0)	72/522	12.2 (9.3-15.8)	1.23 (0.62-2.44)		1.35 (0.68-2.67)	
Substance use (last 3 months)[a]								
Once or more	11/70	13.4 (6.9-24.5)	37/522	7.3 (5.0-10.5)	1.84 (0.88-3.86)	0.105	1.77 (0.79-3.93)	0.164

PR: prevalence ratio aPR: adjusted prevalence ratio

†: Seeds excluded & RDS-II weighted

††: Poisson regression with robust variance, seeds excluded & RDS-II weighting

‡: Poisson regression with robust variance, seeds excluded, RDS-II weighting and adjusted for age, income, awareness of HIV status and country of birth

[a] Ecstacy, amphetimines, mephamphetamine, mephedrone, heroin, GHB, rohypnol, cocacine, crack cocaine, benzene, amyl nitrite

Table 5: Access to HIV testing, prevention and care products and services

	Transfeminine N = 70		Cisgender GBMSM N=522		Crude		Adjusted‡	
	n/N	% (95% CI)†	n/N	% (95% CI)†	PR (95% CI)††	Wald p value	aPR (95% CI) ‡	Wald p value
Access to testing, condoms and lube [all participants]								
Ever tested for HIV	62/70	85.0 (72.0-92.6)	490/522	93.6 (90.6-95.6)	0.91 (0.80-1.03)	0.119	0.90 (0.80-1.02)	0.089
Problems accessing condoms	36/64	55.3 (41.1-68.6)	208/510	41.9 (36.9-46.9)	1.32 (1.00-1.75)	0.053	1.30 (0.98-1.74)	0.072
Problem accessing lubricants	43/66	67.7 (53.8-79.0)	266/509	52.1 (47.1-57.2)	1.30 (1.05–1.61)	0.017	1.31 (1.06-1.61)	0.012
HIV care [HIV positive participants]								
Aware of status	22/28	71.9 (48.4-87.4)	122/151	78.1 (68.9-85.1)	0.92 (0.68- 1.24)	0.586	0.99 (0.74-1.32)	0.923
Currently on ART	18/28	60.8 (39.2-78.8)	106/151	67.0 (57.2-75.5)	0.91 (0.63- 1.31)	0.603	1.00 (0.70-1.45)	0.966
Virological suppression	13/28	42.9 (24.2-63.9)	84/151	53.8 (44.1-63.2)	0.80 (0.48-1.34)	0.394	0.94 (0.58-1.53)	0.797
Biomedical HIV prevention knowledge and uptake [HIV negative & undiagnosed HIV positive participants]								
Pre-exposure prophylaxis								
Correct knowledge[a]	17/44	46.0 (30.0-62.9)	197/386	46.6 (40.9-52.4)	0.99 (0.67-1.46)	0.949	0.99 (0.67-1.45)	0.945
Previously or currently use	2/44	3.9 (1.0-14.5)	37/394	7.0 (4.7-10.4)	0.55 (0.13-2.30)	0.414	0.58 (0.14-2.40)	0.452
Post-exposure prophylaxis								
Correct knowledge[b]	16/44	41.0 (25.5-58.6)	196/389	48.6 (42.9-54.3)	0.84 (0.55-1.30)	0.446	0.85 (0.56-1.31)	0.462
Previously or currently use	3/45	5.0 (1.0-20.6)	30/388	6.5 (4.1-10.0)	0.78 (0.16-3.72)	0.751	0.81 (0.17-3.77)	0.786

PR: prevalence ratio aPR: adjusted prevalence ratio

†: Seeds excluded & RDS-II weighted

††: Poisson regression with robust variance, seeds excluded & RDS-II weighting

‡: Poisson regression with robust variance, seeds excluded, RDS-II weighting and adjusted for age, income and country of birth

[a]: participants were asked if they knew the following information: "PrEP involves someone who does not have HIV taking a pill on an ongoing basis to prevent them from getting HIV. Most people who use PrEP take a pill everyday. PrEP needs to be taken before sex for it to be effective."

[b]: participants were asked if they knew the following information: "PEP is a one-month course of pills that may stop someone from becoming infected with HIV if they are exposed to the virus (such as by having sex without condoms. PEP needs to be started as soon as possible after an HIV risk."

Evidence before this study

Globally, transfeminine persons bear a significantly higher burden of HIV and other sexually transmitted diseases. Systematic reviews highlight the lack of research attending to gender diversity in sub Saharan African countries with generalised HIV epidemics. We searched PubMed (search terms: trans*, HIV and Africa; date range 2000-2019) and found nine population-based studies reporting HIV risk among transfeminine persons limited to Southern and Western Africa among which pooled odds of HIV was 1.6 times greater than cisgender men who have sex with men. We found no reports of HIV risk among transmasculine persons in the region.

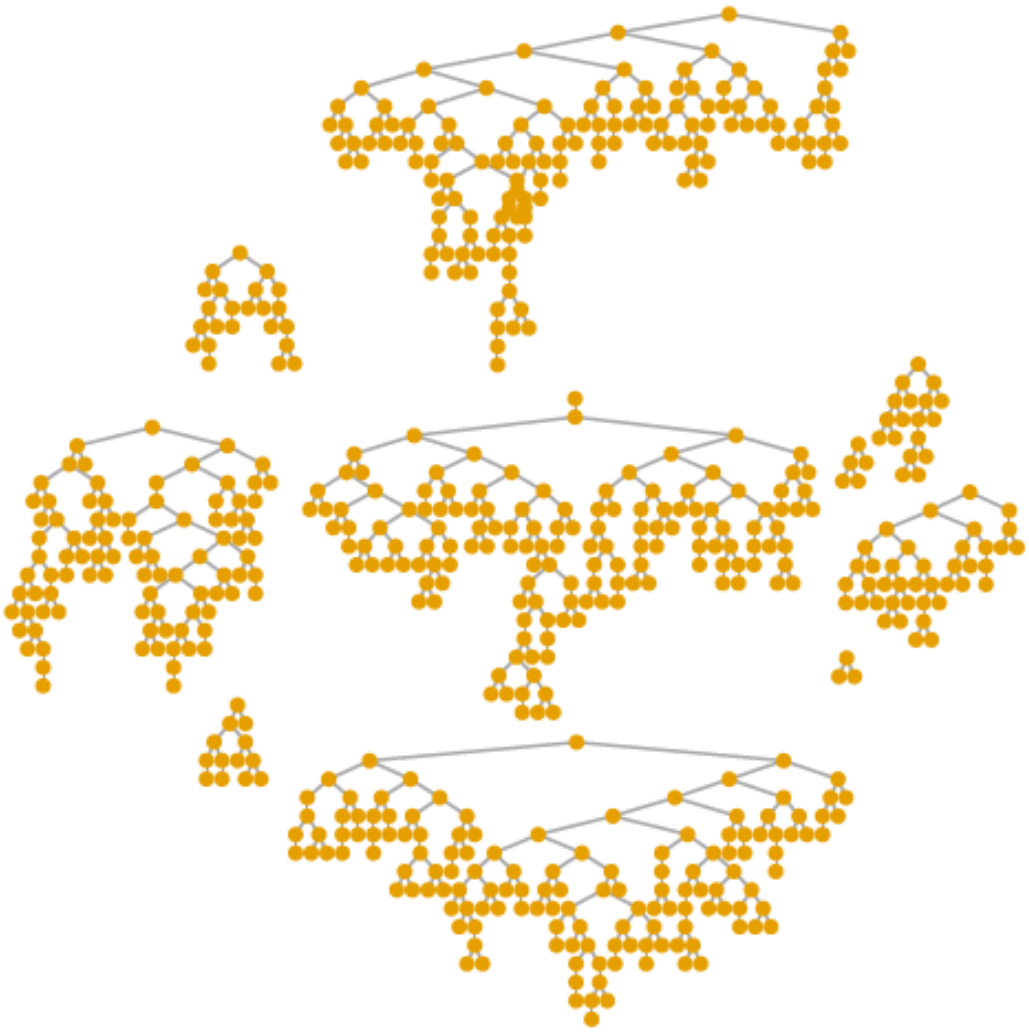
Added value of this study

We report HIV and STI prevalence and related sexual risk behaviours among transfeminine persons who have sex with men in Nairobi, the first such data from East Africa. In this setting, HIV prevalence was 41% among transfeminine persons and considerably higher than among cisgender men who have sex with men. Higher reports of concurrent rectal STIs, recent condomless anal intercourse and transactional sex behaviours highlight unmet needs for accessible sexual health promotion and services, whilst the high frequency of sexual violence experience suggests wider vulnerabilities of transfeminine individuals in Kenya. Our study also documents the existence of wider gender diversity among social networks predominated by African men who have sex with men. Strengths of our approach include a representative sampling strategy and gender inclusive eligibility criteria.

Implications of all the available evidence

Transfeminine individuals are an emerging key population in African generalised HIV epidemic settings whose sexual health needs are not specifically recognised or addressed in existing national key population policies and services. Existing key population service providers can routinely assess gender identity measures among clients, and address cultural competency of staff and clinics to improve acceptability to transgender clients. Holistic, integrated services capable of addressing sexual and mental health, harm reduction and gender affirmative needs are standard of care in many high-resource settings, and sustainable service models should be adapted.

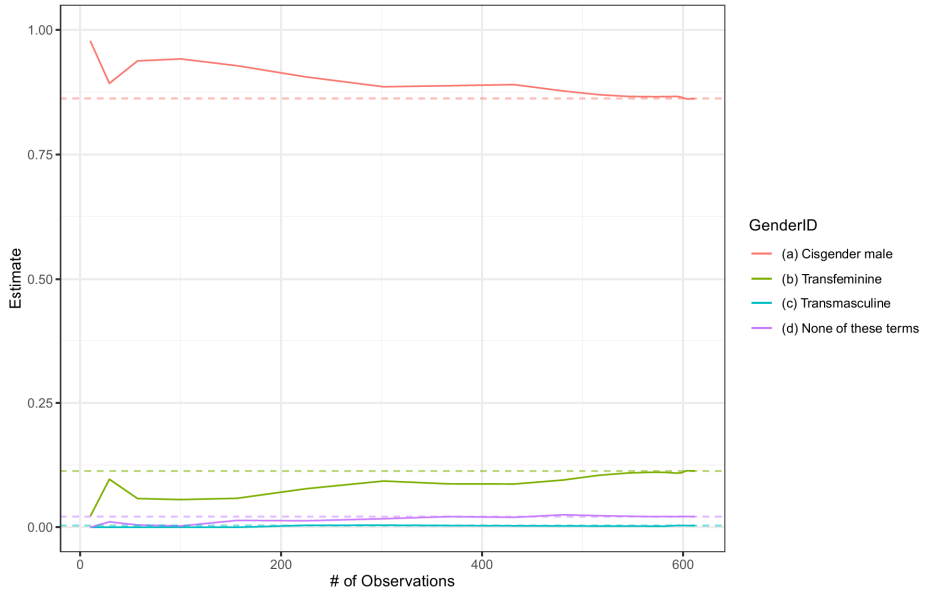
Supplementary Figure 1: Recruitment network (Reingold Tilford algorithm), TRANSFORM 2017



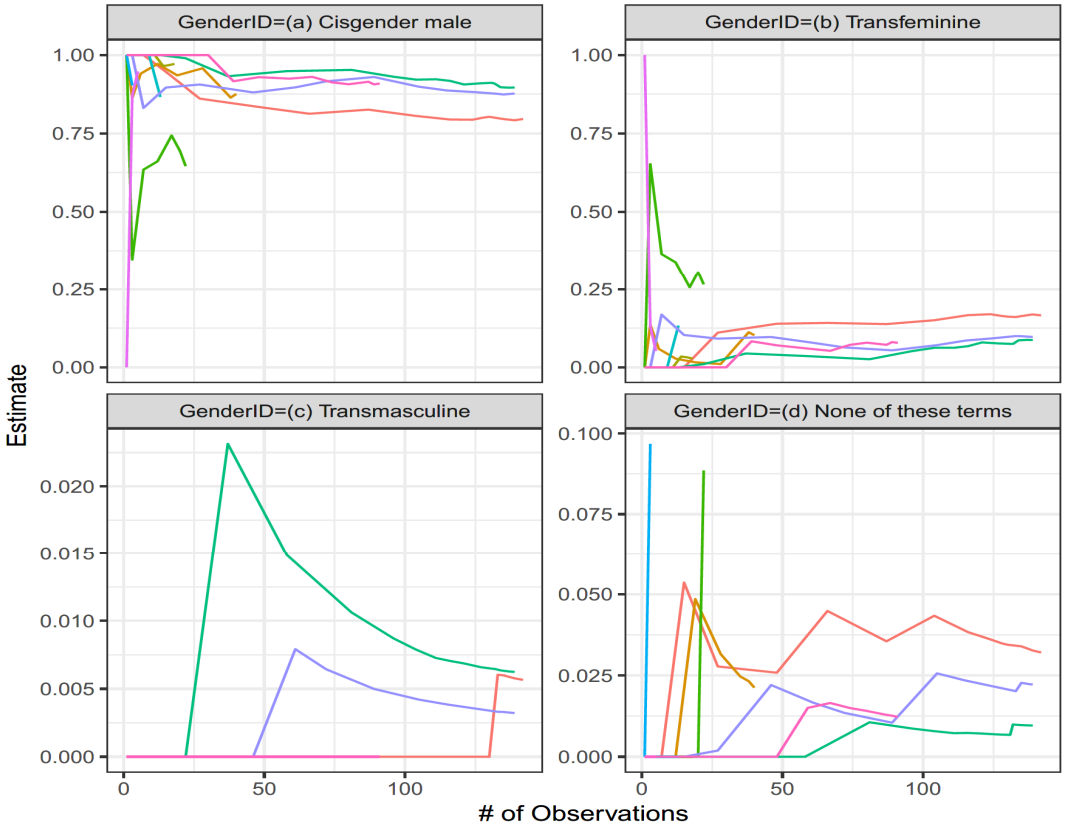
Recruitment chains start at the top of each distinct network (10 seeds) and flow downward by recruitment wave.

Supplementary Figure 2: Convergence and bottleneck plots by gender identity, TRANSFORM 2017

a. Convergence plot



b. Bottleneck plots



The convergence plot (a) shows the cumulative RDS-II weighted estimate the proportion of different gender identities, by sample size attained ('Observations'). Bottleneck plots (b) show the cumulative RDS-II weighted estimate for each recruitment chain (ancestors of each seed) by sample size attained. These are shown separately for each gender identity category and the different colours represent recruitment chains originating from different seed participants.