

Acceptability and efficacy of partner notification for curable sexually transmitted infections in sub-Saharan Africa: A systematic review

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Abstract

Comprehensive case management of sexually transmitted infections (STIs) includes partner notification. We reviewed the recent literature evaluating the acceptability and efficacy of partner notification strategies (i.e. direct patient referral, provider referral, or expedited partner treatment) for curable STIs in sub-Saharan Africa. We conducted a systematic search following PRISMA guidelines: published January 2008 to June 2017 in the English language, study in sub-Saharan Africa, and discussion of any curable STI with an outcome on partner notification. We searched six electronic databases, conference abstracts, online clinical trial registries, and article bibliographies. The results showed that out of the 74 identified articles, 55 did not meet inclusion criteria. Of the 11 studies evaluating direct patient referral, the proportion of index cases ($n = 4163$) who successfully notified sex partner(s) was 53% (range 23–95%). Among those who notified ($n = 1727$), 25% (range 0–77%) had partner(s) that sought evaluation (95% CI 0.51–0.54; 95% CI 0.23–0.27). Both provider referral and expedited partner treatment had higher proportions of partner(s) who sought treatment ($n = 208$, 69% and $n = 44$, 84%, respectively). Direct patient referral is the most commonly used and evaluated partner notification strategy for STIs in sub-Saharan Africa with mixed success. We recommend future research to investigate other strategies such as expedited partner treatment.

Keywords

Africa, bacterial disease, Chlamydia (*Chlamydia trachomatis*), Gonorrhoea (*Neisseria gonorrhoeae*), protozoal disease, trichomoniasis (*Trichomonas vaginalis*)

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Background

Partner notification is an integral component of comprehensive management of sexually transmitted infections (STIs). Effective partner notification and treatment for curable STIs can prevent re-infection of the index patient, break the cycle of transmission, and reduce infection burden.¹

Three main strategies have been commonly used for notification of STIs to sex partner(s): direct patient referral, provider referral (or conditional referral), and expedited partner treatment.² Direct patient referral involves the index patient notifying the partner(s), usually with a notification slip from the clinic and encouragement to seek evaluation.² In provider

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referral, the health care provider contacts the partner immediately or contacts the partner(s) only if the index patient has not done so within a specified time frame (conditional referral).² In expedited partner treatment, the provider provides presumptive treatment to the partner(s) by giving the index patient medication to deliver to the partner(s).²

No single strategy has yet been identified as the most effective for increasing notification or treatment, reducing reinfection of the index patient, or lowering STI transmission at the population level.²⁻⁴ Alam et al.³ identified 39 articles in a systemic review of partner notification in developing countries (28 from Africa, six from Asia, and five from Latin American or Caribbean countries). Willingness to notify sex partner(s) was generally high across all settings. However, the median proportion of partner(s) actually notified or referred through direct patient referral was 54% (range, 0–94%) among 15 studies.³ Mathews and Coetzee⁴ conducted an analysis of 17 publications (published up to August 2008 and not limited by geography, intervention type, or STI) to evaluate interventions aimed at increasing patient referral in people with STIs. Moderate quality evidence from one randomized control trial in a US public health clinic supported the use of provider referral (0.72 partners per index patient) compared with patient referral (0.20 partners per index patient) in encouraging partners to undergo treatment among index patients with nongonococcal urethritis (95% CI 0.40–0.64). Moderate quality evidence supported supplementing the patient referral method with expedited partner treatment to increase the proportion of partners treated than patient referral alone (two randomized control trials: RR 1.25; 95% CI 1.15–1.37).⁴ Ferreira et al.² conducted a systematic review (from 1966 to 2011) of 26 randomized control trials (14 in the United States, four in the UK, and one each in Australia, Malawi, South Africa, Uganda, Zambia, and Zimbabwe) that compared at least two partner notification strategies. Expedited partner treatment, compared to patient referral, increased the number of partners treated per index patient (three trials) with *Chlamydia trachomatis*, *Neisseria gonorrhoeae* (MD 0.43, 95% CI 0.28–0.58), trichomoniasis (MD 0.51, 95% CI 0.35–0.67), and people with any STI syndrome (MD 0.5, 95% CI 0.34–0.67). Despite research evidence that other partner notification strategies may be efficacious in treating partners in developing countries, direct patient referral has been widely preferred and utilized in low-resource settings due to fewer associated costs.¹

Regional context and culture dynamics may play a key role in identifying an optimal strategy to facilitate partner notification and treatment. Sub-Saharan Africa carries 19% of the total global prevalence of four

curable STIs (Chlamydia, gonorrhea, trichomoniasis, and syphilis).⁵ We conducted a systematic review of literature published from 2008 to 2017 on partner notification of curable STIs in sub-Saharan Africa in order to: (1) evaluate the acceptability of partner notification strategies (defined as the proportion of index cases willing to notify partner(s) or reporting successful notification of partner(s)); (2) evaluate the efficacy of partner notification strategies (defined as the proportion of index cases who reported partner testing or treatment); (3) identify barriers and facilitators of partner notification strategies.

Methods

Search strategy

We used the PRISMA guidelines to conduct a systematic review of six electronic databases, abstracts of two international conferences and three clinical trial registries from June to July 2017 (Figure 1).⁶ The databases searched include: PubMed, Web of Science, Embase, Cochrane, Google Scholar, and ProQuest. Available abstracts on international conference websites were searched: the Center for Disease Control (CDC) STD Prevention Conference (2008, 2010, 2014, 2016) (<https://www.cdc.gov/stdconference/default.htm>) and the International Union against Sexually Transmitted Infections conferences (2009, 2010, 2012, 2013, 2014, 2015) (<http://www.iusti.org/>). The WHO International

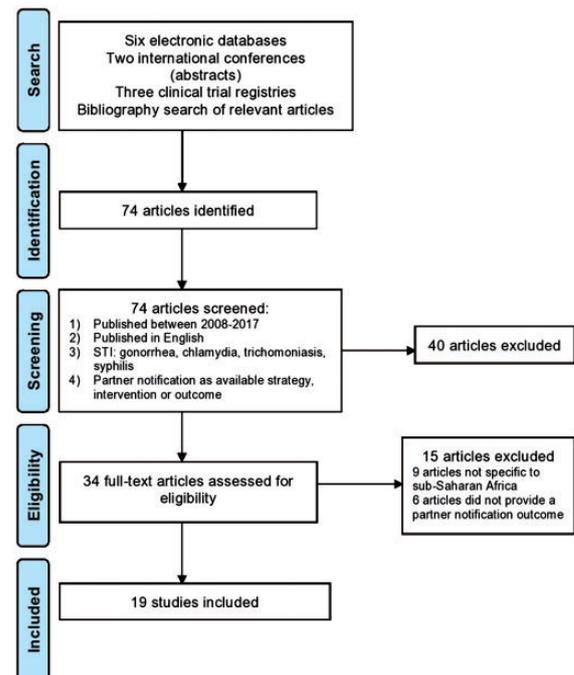


Figure 1. PRISMA diagram for review of partner notification sexually transmitted infections in sub-Saharan Africa 2008–2017.

Clinical Trials Registry Platform (<http://www.who.int/ictrp/en/>), the NIH's Clinical Trial registry (<https://clinicaltrials.gov/>), and the Pan African Clinical Trials Registry (<http://www.pactr.org/>) were also searched. Reference lists of potentially relevant articles and the "related" section in PubMed were examined to identify additional studies. The search query was limited to the following inclusion criteria: articles published in the English language between 2008 and 2017, study setting in sub-Saharan Africa and discussion of partner notification as a primary or secondary outcome in the research setting of treating a curable sexually transmitted infection: *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis*, and *Treponema pallidum*. Search terms included the key words ("partner notification" or "contact tracing" or "partner treatment" or "partner testing" or "partner referral") AND ("sexually transmitted infections" or "chlamydia" or "gonorrhoea" or "trichomonas" or "syphilis") OR "Africa". The first (ST), third (SBW), and fourth (HJK) authors performed the searches independently. The first author eliminated duplicated results.

Screening

Abstracts identified through the search query using the inclusion criteria were screened by the first author. Full-text articles were considered eligible if they reported an outcome of acceptability, efficacy, barriers, or facilitators. We defined "acceptability" as the proportion of index cases who reported willingness to notify partner(s) or reported successful notification of partner(s). We defined "efficacy" as the proportion of index cases who reported partner evaluation or treatment.

Data abstraction

The first, third, and fourth authors used a standardized form to abstract author name, year, study design, geographical location, study setting, study population, primary research question, sample size, partner notification method evaluated (direct patient referral, provider referral, expedited partner treatment, or unspecified), and major findings. Two authors independently performed each data abstraction; a third author consolidated both entries into one form. Qualitative findings on barriers and facilitators were grouped into themes with consensus among the authors.

Results

We identified 74 articles from the search query and included 19 eligible studies (Table 1). Forty abstracts did not meet inclusion criteria in the primary screening

process. Fifteen full-text articles were excluded because they were not specific to sub-Saharan Africa or to one of the research questions. Six studies were from South Africa, one from Botswana, two from Kenya, two from Uganda, and one from Ethiopia, Tanzania, Madagascar, Namibia, Ghana, Guinea, Nigeria, and Rwanda each. Ten studies were cross-sectional, four were cohort studies, three were randomized control trials, and two were qualitative studies (focus groups and/or in-depth interviews). Four studies were published as conference abstracts. Twelve studies evaluated direct patient referral, two evaluated expedited partner treatment, one evaluated provider referral, two did not specify, and two others investigated direct referral in addition to expedited partner treatment and provider referral, respectively.

Acceptability

Willingness to notify partners. Five studies (total sample size = 2234) evaluating willingness of the index case to notify partner(s) using the direct referral method reported a wide range of acceptability (Table 2).⁷⁻¹¹ In a community clinic in South Africa, 48% ($n = 372$) of 776 patients with an STI reported intention to notify partner(s).⁸ University students in Nigeria ($n = 274$), pregnant women in Botswana ($n = 300$), and HIV-infected pregnant women in Uganda ($n = 29$) had high proportions of patient willing to notify their partner(s): 82%, 98%, and 57%, respectively.^{7,9,10} A randomized controlled trial at the Alexandra Health Centre and University Clinic in South Africa comparing four groups: study participants who received a standardized health message, counseling, both interventions, or neither (control) measured willingness to notify partners by whether or not study participants requested one or more partner notification slip(s).¹¹ They found that study participants who received a combination of both interventions ($n = 417$) were more than 15 times more likely to request additional partner notification slip(s) than the control group ($n = 433$).¹¹

Two prospective cohort studies evaluating expedited partner treatment found high willingness among pregnant women: 95% of pregnant women in Botswana ($n = 300$) and 89% of pregnant women who tested positive for an STI in Kenya ($n = 66$) (Table 4).^{10,12}

Successfully notified partners. Variable results were found among five studies measuring the proportion of index patients that reported successfully notifying their partners using direct patient referral (Table 2).^{10,13-16} Among the total sample size ($n = 4163$), 53% (range 23-95%) notified sex partner(s) (95% CI 0.51-0.54).

Table 1. List of study articles included in the review of partner notification (PN) for sexually transmitted infections (STIs) in sub-Saharan Africa 2008–2017.

Author; year	Location	Study design	Population/Setting	Primary research question	PN strategy evaluated	Method of outcome measure	PN major findings
Agyarko-Poku et al. 2013	Ghana	Cross-sectional	2746 male and female patients at a STI clinic	To investigate the relationship between partner notification and marital status	Direct referral	Partner notified (clinical records)	Partners of 61% of index cases were notified Lower partner reporting among married couples in stable relationships (19%)
Chen et al. 2008	Guinea	Cross-sectional	889 male and female refugees from Sierra Leone and Liberia	To assess sexual health needs, knowledge, and practices	Direct referral	Partner notified (index case report)	Among 104 men and 134 women who reported STI symptoms in past 12 months, men (~79%) were more likely to have notified their partners than women (~65%)
Chiduo et al. 2012	Tanzania	Cross-sectional	205 pregnant females at an antenatal clinic	To determine STI prevalence	Direct referral	Partner present to clinic for evaluation	No partners reported to the study clinic for treatment
Ham et al. 2016	South Africa	Cross-sectional	611 providers at public and private clinics	To evaluate health providers' knowledge, attitudes, and practices around STI services	N/A	Provider perspective	92% of providers said that partner treatment is important
lipinge and Pretorius, 2012	Namibia	Cross-sectional	50 private general practitioners	To investigate the quality of STI treatment and control by the private sector	N/A	Provider perspective	Doctors reported low rates of prompting partner notification: <30% among males with discharge <40% among males with genital ulcer <35% among females with pelvic inflammatory disease 90% of clinics did not have partner notification forms
Onyedibe et al. 2014	Nigeria	Cross-sectional	274 male and female university students	To assess risk behaviors of STI acquisition	Direct referral	Willingness to notify (index case report)	Among 225 students asked if they will notify a partner if they had an STI, 82% answered "Yes", and 18% answered "No"
Kalichman et al. 2017	South Africa	Cross-sectional	776 male and female patients seeking STI services at a community clinic	To identify social and relationship barriers to partner notification	Direct referral	Willingness to notify (index case report)	46% of men and 48% did intend to notify (n= 776) More likely to intend to notify: <ul style="list-style-type: none"> men and women who completed formal education

(continued)

Table 1. Continued

Author, year	Location	Study design	Population/Setting	Primary research question	PN strategy evaluated	Method of outcome measure	PN major findings
Khan et al. 2010	Madagascar	Randomized controlled trial	565 male and female patients diagnosed with early syphilis	To evaluate the case-finding effectiveness of a clinic-based partner notification effort	Direct referral Provider referral Conditional referral	Partner notified (index case report or provider report) Partner present to clinic for evaluation	<ul style="list-style-type: none"> • women who did not use a condom at last intercourse or exchanged • women who did not exchange sex for money • women who drank less frequently Adverse outcome expectancies were associated with intentions to not notify 53% of index cases were unable to provide partner contact information. Among the contactable, 98% were contacted. Among the index cases with a contacted partner, 75% presented to the clinic for testing Partners less likely to present to clinic
Kohler et al. 2017	South Africa	Cross-sectional	50 public clinics: providers with standardized patient encounters	To evaluate current utilization and adherence to national STI guidelines	Direct referral	Provider perspective Standardized patient visit	<ul style="list-style-type: none"> • if referred by index case who reported 3–9 recent partners (vs. index case who reported one recent partner) • partner presentation was slighter lower among partners contacted by providers than patients 93% of facilities reported partner notification slips were available 70% of standardized patients (actors) received a PN slip or counseling
Manabe et al. 2015	Uganda	Descriptive cohort study	570 pregnant females at HIV-antenatal care clinics	To investigate the feasibility of adding syphilis screening within an integrated antenatal HIV clinic	Direct referral	Willingness to notify (index case report) Partner present to clinic for evaluation	58% of index cases with a positive RPR test agreed to notify partner; 10 out of 17 partners presented to the clinic

(continued)

Table 1. Continued

Author, year	Location	Study design	Population/Setting	Primary research question	PN strategy evaluated	Method of outcome measure	PN major findings
Mayanja et al. 2016	Uganda	Cross-sectional study	241 female sex workers	To assess acceptance of STI treatment, and identify associate factors	Expedited partner treatment	Index case picking from clinic pharmacy	51% of index cases accepted STI treatment for stable sexual partners Higher acceptance associated with: <ul style="list-style-type: none"> • no condom used at last sexual act • shorter duration since last sexual act • earning more than 4USD per sexual act
Offorjébe et al. 2017	Botswana	Prospective cohort study	300 pregnant females seeking antenatal care	To assess willingness to disclose STI results and deliver medications to partners(s)	Direct referral Expedited partner treatment	Willingness to notify or give partner medication (index case report) Partner notified (index case report) Partner sought evaluation (index case report)	98% of women willing to notify partner using direct referral 95% willing to use expedited partner treatment Among 32 women who returned for test of cure, 84% reported notifying partner and 60% reported their partner(s) were treated
Otieno et al. 2014	Kenya	Cohort study	846 male and female patients enrolled in a HIV seroconversion study	To evaluate syndromic management in the diagnosis and management of STIs	Direct referral	Partner present to clinic for evaluation	Among 54 participants who received a syndromic management diagnosis, 1 partner presented to clinic Among 272 participants who received aetiological diagnosis, 1 partner presented to clinic Participants receiving both interventions were more than 15 times likely to request additional partner notification slip(s) and 1.5 times more likely to successfully notify their partner(s) Neither intervention was sufficient on their own to elicit a significant increase in the number of partners presenting for treatment
Stein et al. 2011	South Africa	Randomized controlled trial	1719 male and female students seeking STI services at a university clinic	To assess whether the proportion of patients asking questions after receiving the standardized health message, and/or duration of counseling sessions associated with partners seeking treatment	Direct referral	Willingness to notify (# of notification slips requested) Partner present to health center pharmacy for evaluation	

(continued)

Table 1. Continued

Author, year	Location	Study design	Population/Setting	Primary research question	PN strategy evaluated	Method of outcome measure	PN major findings
Tsadik 2016	Ethiopia	Cross-sectional	1082 male and female patients seeking STI services at public health facilities	To study the practice of partner notification	Direct referral	Partner notified (index case report)	Among 250 index cases, 58% notified partners More likely to notify associated with female gender, and regular partnerships Among notified partners, 65% sought STI treatment Expedited partner treatment was acceptable and feasible: 89% of women were willing to participate and among 51 women with outcome data, 73% reported partners were treated
Unger et al. 2015	Kenya	Prospective cohort	112 pregnant females enrolled in a HIV cohort study	To determine feasibility of expedited partner treatment and determine factors that influence uptake	Expedited partner treatment	Willing to use expedited partner treatment (index case report) Partner uptake of medication (index case report)	
Veldhuijzen et al. 2013	Rwanda	Qualitative: focus groups, in depth interviews	400 females sex workers in a HIV incidence study	To assess the prevalence of genital symptoms, health care seeking behavior for these symptoms and laboratory-confirmed STIs	N/A	Index case perspective	FSW considered treatment-seeking and partner notification important Shame and feeling disrespected by doctors was identified as a barrier to seeking health care
Vezi et al. 2009	South Africa	Qualitative: focus groups	27 male and female patients seeking STI services at a public clinic	To test the usefulness and clarity of STI/HIV educational brochures and STI partner notification referral cards	Direct referral	Index case perspective	PN cards could help STI patients with the process of partner notification
Weaver et al. 2016	South Africa	Randomized controlled trial	10 primary health care clinics: clinicians	To deliver medical education on STIs using one of three training methods: lecture, computer, or paper-based	Direct referral	Provider practice (standardized patient visit)	29% of standardized patients received PN slips pre-training; 24% received PN slips post-training

Table 2. Quantitative outcomes on acceptability and efficacy of direct patient referral from study articles on partner notification (PN) for sexually transmitted infections (STIs) in sub-Saharan Africa 2008–2017.

Author, year	Location	Study design	Population/Setting	Acceptability				Efficacy	
				Willing to notify		Partner notified		Partners treated	
				N = sample size	Index patients	N = sample size	Index cases	N = sample size ^a	Index cases
Agyarko-Poku et al. 2013	Ghana	Cross-sectional	Male and female patients at a STI clinic	–	–	2746	1683 (0.61)	–	–
Chen et al. 2008	Guinea	Cross-sectional	Male and female refugees from Sierra Leone and Liberia	–	–	238	168 (0.71)	–	–
Chiduo et al. 2012	Tanzania	Cross-sectional	Pregnant females at an antenatal clinic	–	–	–	–	185 ^b	0 (0.00)
Onyedibe et al. 2014	Nigeria	Cross-sectional	Male and female university students	274	225 (0.82)	–	–	–	–
Kalichman et al. 2017	South Africa	Cross-sectional	Male and female patients seeking STI services at a community clinic	776	372 (0.48)	–	–	–	–
Khan et al. 2010	Madagascar	Randomized controlled trial	Male and female patients diagnosed with early syphilis	–	–	65 ^c	62 (0.95)	62	48 (0.77)
Manabe et al. 2015	Uganda	Descriptive cohort study	Pregnant females at HIV-antenatal care clinics	29	17 (0.59)	–	–	17	10 (0.59)
Offorjebe et al. 2017	Botswana	Prospective cohort study	Pregnant females seeking antenatal care	300	294 (0.98)	32	27 (0.84)	32	20 (0.63)
Otieno et al. 2014	Kenya	Cohort study	Male and female patients enrolled in a HIV seroconversion study	–	–	–	–	326 ^b	2 (0.01)
Stein et al. 2011	South Africa	Randomized controlled trial ^d	Male and female students seeking STI services at a university clinic	855	190 (0.22)	–	–	855 ^b	193 (0.26)
Tsadik 2016	Ethiopia	Cross-sectional	Male and female patients seeking STI services at public health facilities	–	–	1082	250 (0.23)	250	162 (0.65)

^aSample size measured as number of index cases who successfully reported notifying partners (assume one partner per index case unless otherwise noted).

^bSample size is the total number of index cases; data on those who successfully notified versus those who did not were not available.

^cSample size is the number of contactable partners, as multiple index cases reported more than one contactable partner.

^dData are from one RCT group: includes those who received a standardized health message or a health message with counseling.

Among men and women ($n = 1082$) seeking STI services across 27 public health facilities in Ethiopia, 23% reported notifying their partner.¹⁶ Among patients seeking STI treatment in Ghana ($n = 2746$) and refugees in Guinea with STI symptoms ($n = 238$), 61% and 71%, respectively, reported notifying partner(s).^{13,14} In 32 pregnant women diagnosed with a STI in Botswana, 84% reported notifying their partner(s).¹⁰ In public health clinics in Madagascar that diagnosed index cases with syphilis, 95% of contactable partners

($n = 65$) contacted via direct referral were successfully notified.¹⁵

In that same study, a majority of index cases had partner(s) notified via provider referral: almost 100% of contactable partners ($n = 209$) contacted via provider referral were successfully notified (Table 3).¹⁵

One study reported acceptance of expedited partner treatment: 51% female sex workers (FSW) ($n = 241$) diagnosed with a STI in Uganda chose to pick up medications from the pharmacy for their partner(s) (Table 4).¹⁷

Table 3. Quantitative outcomes on acceptability and efficacy of provider referral from study articles on partner notification (PN) for sexually transmitted infections (STIs) in sub-Saharan Africa 2008–2017.

Author, year	Location	Study design	Population/Setting	Acceptability				Efficacy	
				Willing to notify		Partner notified		Partners treated	
				N = sample size	Index cases	N = sample size ^a	Index cases	N = sample size ^a	Index cases
Khan et al. 2010	Madagascar	Randomized controlled trial	Male and female patients diagnosed with early syphilis	–	–	209	208 (0.99)	208	144 (0.69)

^aSample size is the number of contactable partners, as multiple index cases reported more than one contactable partner.

Table 4. Quantitative outcomes on acceptability and efficacy of expedited partner treatment from study articles on partner notification (PN) for sexually transmitted infections (STIs) in sub-Saharan Africa 2008–2017.

Author, year	Location	Study design	Population/ Setting	Primary research question	Acceptability				Efficacy	
					Willing to notify		Partner notified		Partners treated	
					N = sampl- e size	Index patients	N = sampl- e size	Index patients	N = sampl- e size ^a	Index partners
Mayanja et al. 2016	Uganda	Cross- sectional study	Female sex workers	To assess acceptance of STI treatment, and identify associate factors	–	–	241	122 (0.51)	–	–
Offorjebel et al. 2017	Botswana	Prospective cohort	Pregnant females seeking antenatal care	To assess willingness to dis- close STI results and deliver medications to partners(s)	300	284 (0.95)	–	–	–	–
Unger et al. 2015	Kenya	Prospective cohort	Pregnant females enrolled in a HIV cohort study	To determine feasibility of expedited partner treat- ment and determine fac- tors that influence uptake	66	59 (0.89)	–	–	44	37 (0.84)

^aSample size measured as number of index cases who successfully reported notifying partners (assume one partner per index case).

Efficacy

In seven studies ($n = 1727$), the proportion of index cases who had partner(s) that sought evaluation or treatment after being notified using the direct referral strategy was 25% (range 0–77%) (95% CI 0.23–0.27) (Table 2).^{9–11,15,16,18–20} Successful partner notification was determined by self-report from the index case or retrieved from clinic data, based on partner presenting for evaluation. The proportion of partner(s) presenting to clinic for evaluation among a cohort of HIV-infected and HIV-uninfected pregnant women in Tanzania ($n = 185$) and a cohort of HIV-infected individuals in Kenya ($n = 326$) who used direct patient referral were both below 1%.^{18,19} Among index cases ($n = 855$) randomized to receive a standardized health message or a health message and patient-centered counseling at the Alexandra Health Centre and University Clinic in South Africa, 23% of partner(s) sought treatment at the health center's pharmacy.¹¹ Similar proportions of partner treatment were found in a cohort of HIV-infected pregnant women diagnosed with syphilis

in Uganda (59%, $n = 17$), pregnant women in Botswana (64%, $n = 32$), and individuals seeking STI care in public health facilities in Ethiopia (65%, $n = 250$).^{9,10,16} The highest proportion of partners presenting for evaluation (77%) after being contacted by direct referral was seen among a cohort of index cases diagnosed with syphilis in Madagascar, where 77% partners came to care after being contacted.^{15,20} In that same study where a subset of contactable partners were contacted via provider referral ($n = 208$), 69% of partners presented for evaluation.¹⁵ One study among pregnant women in Kenya evaluated rates of partner treatment utilizing expedited partner treatment: 84% of women ($n = 44$) reported successful partner treatment after delivery of medication (Table 4).¹²

Facilitators

Factors associated with increased acceptability or efficacy of partner notification were identified as “facilitators” in nine studies and grouped into three stratified themes: the individual, the

relationship with sex partner(s), and the health care system.^{8,9,11,13–16,21,22}

Gender, substance use, education, and occupation were found to be associated with differences in partner notification uptake. Female index cases were found to have higher proportion of partner notification compared to male counterparts in three studies.^{8,11,13} Higher levels of education correlated with greater intention to notify and successful notification of partner(s).^{8,16} One study in South Africa found that women who intended to notify their partner(s) were less likely to consume frequent alcohol and less likely to have exchanged sex for money or other materials.⁸

Factors within the relationship may also facilitate uptake of partner notification. In Ethiopia higher rates of partner notification were found in regular partners, compared to casual partners.¹⁶ Similarly, partners of index cases who reported one recent partner versus >1 partner were more likely to present to clinic for evaluation in Madagascar.¹⁵ In Ugandan and South African women, not using a condom in the last sex encounter was associated with higher acceptability of direct patient referral and expedited partner treatment.^{8,9}

At the system level, two studies supported the use of patient-centered counseling to enhance partner notification strategies.^{9,15} In South Africa, index cases that received a standardized message and patient-centered counseling before notifying their partner(s) via direct referral were 15 times more likely to request additional partner notification slips and 1.5 times more likely to successfully notify partners compared to those that received neither intervention.¹¹

Barriers

Thirteen studies reported on barriers to partner notification.^{8,12–18,21,23–36} Factors pertaining to the individual include gender, marital status, and income. In Ethiopia, male patients seeking STI services were less likely to notify their partner(s); however, in Guinea, women were actually half as likely to notify their partners.^{14,16} While Tsadik et al. found that regular partners were more likely to be notified, Agyarko-Poku et al. reported that married couples in stable relationships had lower reporting rates compared to those in other partnerships. Among female sex workers in Uganda, lower acceptance of partner treatment was associated with being widowed or separated, and earning 4 USD or less per sexual act.¹⁷

Commonly reported interpersonal barriers included inability to contact sex partner(s), stigma, risk of intimate partner violence, and fear of adverse reaction. Difficulty reaching partner(s) was cited as barrier among studies in Ethiopia, pregnant women in

Kenya, female sex workers in Rwanda, and in a study in Madagascar where more than 50% of index cases ($n = 534$) had no contactable partner(s).^{12,15,16,21} Pregnant females in Kenya who refused expedited partner treatment cited reasons including fear of partner anger or abuse, accusation of being the STI source, accusation of promiscuity, and fearing stigma.¹² Intimate partner violence was reported in 13% of women with untreated partners in the same study, compared to 0% reported among participants with treated partners ($p = 0.025$).¹² Pregnant females in Tanzania and female sex workers in Rwanda attributed pervasive societal stigma against STIs to low rates of partner notification and partner response.^{18,21}

Four studies (one in Namibia, three in South Africa) evaluated institutional barriers to STI management.^{21,23–36} Only 40% of private clinicians in Namibia reported that they routinely counsel patients on partner notification.²⁴ In South Africa, standardized patients were used in two studies to evaluate provider practice; 29% of standardized patients received a partner notification slip in one study, and 70% in another study.^{25,26} Among public and private health care providers in South Africa ($n = 611$), 8% did not agree with the statement “It is important to tell STI patients to make sure their sex partners are treated”.²³ Availability of partner notification slips was variable: 90% of private practices in Namibia and 1.3% of public clinics in South Africa did not have partner notification slips in the office.^{24,25}

Discussion

We identified 19 studies on partner notification strategies for curable STIs in sub-Saharan Africa that reported on acceptability, efficacy, barriers, and/or facilitators relating to at least one of three commonly used partner notification strategies including: direct referral, provider referral, and expedited partner treatment. Overall, higher proportion of index cases expressed willingness to notify than the proportion of index cases who reported actual notification or partner treatment. The average proportion of partners notified using direct referral in our review focused on sub-Saharan Africa (52%) was similar to the average from a systematic review of partner notification strategies in developing countries from Alam et al.³ (54%). Previous systematic reviews found moderate quality evidence for the use of expedited partner treatment compared to direct referral for enhancing partner treatment.⁴ Our review found similar findings; however, the data on the use of expedited partner treatment are limited to pregnant women and female sex workers. Only five studies reported both an acceptability and an efficacy outcome of direct partner notification; correlation

between acceptability and efficacy was variable and similar to previous findings.³

These findings suggest that successful partner notification is influenced by a variety of other social and cultural factors that may not be generalized to all sub-Saharan Africa. Variability in partner notification strategy uptake may be addressed by implementation of science research that has identified innovative and setting-specific strategies. Future research should focus on populations with common sociodemographic and cultural interests such as pregnant women, youth, or female sex workers to identify partner notification strategies unique to each population's needs. For example, we found in general among pregnant women higher proportions of willingness and uptake in studies evaluating expedited partner treatment compared to studies evaluating direct referral. This may be particularly important in sub-Saharan Africa where maternal syphilis remains a burden to child morbidity and mortality.²⁷

A better understanding of the barriers and facilitators to partner notification may enhance uptake and partner return for treatment. Findings from our review align with previous findings that adding patient-centered counseling increases routine partner notification uptake. Our findings confirm that the fear of adverse reaction, intimate partner violence, and stigma are common barriers across sub-populations and genders. These fears may be addressed by the clinician through incorporating patient centered counseling into the standard of care practiced. What our systematic review has highlighted, not mentioned in previous reviews, is the gap between standard clinical care guidelines and provider practice. Not all providers, whether in public or private practice, are routinely providing partner notification slips. Adherence to clinical care guidelines is an opportunity for intervention and particularly important in sub-Saharan Africa where resources may not always be available to provide additional patient-centered counseling.

Our review had a few limitations. We were unable to perform a meta-analysis due to inconsistent measured outcomes. There were no randomized controlled trials that compared two different partner notification strategies and none that evaluated partner notification strategies for any specific STI, as most sub-Saharan African countries utilize syndromic STI management as standard of care. Most studies evaluated direct referral and often partner notification outcomes were not the principal outcome. Thus, discrepancies between study methodology may have yielded the wide range of outcomes reported in our review. Further, outcome measures were often reported differently such as clinic record versus patient self-report, which may be susceptible to error or bias.

Conclusion

Partner notification and treatment of sex partner(s) remains integral to comprehensive STI management. Direct patient referral is a widely used strategy with high acceptability and variable efficacy. More research is needed to compare direct referral with expedited partner treatment, especially in sub-Saharan Africa where there is high potential to utilize expedited partner treatment for vulnerable populations such as pregnant women. Regardless of partner notification strategy, all providers should offer notification slips and counseling to address stigma and fear of adverse reaction. Sub-Saharan Africa is a diverse region with multiple populations, each with unique needs. No one optimal strategy may be generalized to the whole region. Improvements in STI management practices in sub-Saharan Africa could reduce re-infection incidence, decrease disease burden, and prevent the harmful sequelae of untreated STIs.

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