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Are couple-based interventions more effective than interventions delivered to individuals in promoting HIV protective behaviors? A meta-analysis

Nicole Crepaz, **Malu V. Tungol-Ashmon**, **H. Waverly Vosburgh**, **Brittney N. Baack**, and **Mary M. Mullins**

Division of HIV/AIDS Prevention, The U.S. Centers for Disease Control and Prevention, Atlanta, Georgia, USA. Requests for reprints should be sent to Nicole Crepaz, PhD, Division of HIV/AIDS Prevention, The U.S. Centers for Disease Control and Prevention, 1600 Clifton Road, Mailstop E-47, Atlanta, GA30329, USA

Abstract

Despite several advantages to bringing couples together to learn how to protect themselves and new-born children from the risk of HIV infection, most interventions are designed for individuals or groups, not for dyads. This meta-analysis provides a direct test of whether couple-based interventions are more effective in promoting HIV protective behaviors than interventions delivered to individuals. We conducted systematic searches of five electronic databases and 60 journals. Eligible studies were controlled trials or prospective cohort designs; evaluated a couple-based intervention compared to an individual-level intervention; assessed at least one HIV prevention outcome (e.g., protective sex, drug use, HIV testing, medication adherence, and sexually transmitted infections [STI]); and were published between 1988 and 2014. Fifteen interventions, including 21,882 participants from China, Kenya, Rwanda, Tanzania, Trinidad, Zambia, and the USA, were evaluated. The results of random-effects models showed statistically significant intervention effects for protective sex (OR = 1.60, 95% CI = 1.21, 2.11), HIV testing (OR = 1.79, 95% CI = 1.31, 2.45), and Nevirapine uptake (OR = 1.51, 95% CI = 1.02, 2.24). The evidence demonstrates the usefulness of couple-based interventions in protecting individuals, partners, and new-born children from the risk of HIV transmission and infection.

Keywords

HIV prevention; Couple-based; Systematic review; Meta-analysis; Intervention

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention.

Human Participant Protection. No human subjects were involved in this study.

Contributors. N Crepaz originated the study and was responsible for writing the brief. MV Tungol-Ashmon, HW Vosburgh, BN Baack, and MM Mullins did data coding, conducted analyses, and provided technical and material support, article review and editing.

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INTRODUCTION

Sexual transmission of HIV continues to be the driving force of the epidemic in many parts of the world (UNAIDS, 2013). While a large proportion of HIV transmission takes place between two sexually intimate people, prevention efforts for heterosexuals, men who have sex with men (MSM), and people who use drugs have primarily focused on individuals or groups and typically have not included both members of a dyad (Jiwatram-Negron & El-Bassel, 2014; Meader et al., 2013; Purcell et al., 2014). There are several advantages to bringing couples together to learn how to protect themselves from HIV and other sexually transmitted infections (STIs) (El-Bassel & Wechsberg, 2012; Jiwatram-Negron & El-Bassel, 2014). It gives the couple the opportunity to learn and practice communication and negotiation skills together, facilitate disclosure of HIV serostatus and previous and current sexual risk and drug use behaviors in a safe environment, and foster a joint responsibility for preventing HIV and STI.

Additionally, couple-based voluntary HIV counseling and testing provides a shared knowledge base that, together with confirmation of serostatus, allows a couple to plan and make essential life decisions jointly about HIV treatment and reproductive health care (Jiwatram-Negron & El-Bassel, 2014). Acquiring partner's support also facilitates adherence to HIV treatment (Langebeek et al., 2014; Sandelowski, Voils, Chang, & Lee, 2009). In the case of intimate couples becoming parents, involving fathers and incorporating their support in couple-based prevention of mother to child transmission may increase HIV testing among pregnant women and the uptake and adherence to Nevirapine among those who are tested positive for HIV (Kiarie, Kreiss, Richardson, & John-Stewart, 2003). Couple-based interventions have the potential for protecting not only individuals and partners, but also new-born children from the risk of HIV transmission and infection.

While a few published systematic reviews have evaluated couple-based interventions (Burton, Darbes, &Operario, 2010; Kennedy, Medley, Sweat, & O'Reilly, 2010; LaCroix, Pellowski, Lennon, & Johnson, 2013), none has directly tested whether couple-based interventions are more effective than interventions delivered to individuals in a relationship (referred to as individual-level interventions in this paper). In this systematic review and meta-analysis, we examine the effects of couple-based interventions that have been evaluated against individual-level interventions through experimental or cohort studies and provide estimates of the magnitude of couple-based intervention effects on HIV protective behaviors.

METHODS

Two content expert librarians conducted systematic, automated, and manual searches to locate relevant HIV intervention evaluation studies with behavioral or biologic outcomes. The automated searches consisted of five databases (and platforms): MEDLINE (OVID), EMBASE (OVID), PsycINFO (OVID), and CINAHL (EBSCOhost) and Sociological Abstracts (ProQuest). Two separate comprehensive searches were conducted: one for locating citations related to HIV/STI risk reduction and the other for locating citations related to HIV treatment and medication adherence. The full search strategy, including terms

and key words, used for searching MEDLINE and other databases for each of the two comprehensive searches are available from the corresponding author. The manual search consisted of searching 60 journals to identify potentially relevant citations not yet indexed in electronic databases at the time when the comprehensive searches were conducted.

Studies were eligible if they were controlled trials or prospective cohort designs, evaluated a couple-based, HIV-prevention intervention with an individual-level comparison group, assessed at least one HIV prevention outcome (e.g., sex or drug use behavior, STI, HIV testing, HIV treatment uptake, and medication adherence), reported data sufficient for calculating effect sizes, and were published between January 1988 and December 2014.

Before abstracting data, we searched for linked citations that are supplementary publications offering additional information on the same study. Pairs of trained coders independently coded each eligible study (with linked citations) using standardized coding forms for study characteristics, participant characteristics, interventions, and outcomes. There was 95% agreement between coders across variables. Coding discrepancies were reconciled by coding pairs. We contacted the primary study investigator to obtain additional information as needed and the response rate was 85%.

Odds Ratios (OR) and corresponding variances were calculated to estimate effect sizes (Lipsey & Wilson, 2001). The magnitude of heterogeneity of the effect sizes was tested using the Q statistic and I^2 statistic (Higgins, Thompson, Deeks, & Altman, 2003). The Windsorizing method was applied to adjust any extreme effect size that was three standard errors from the mean of all effect sizes (Lipsey & Wilson, 2001). Weighted effect sizes were combined using a random-effects model (Hedges & Vevea, 1998). Sensitivity tests were conducted by removing one study at a time to determine if any study affected the aggregated point estimate. An OR > 1 indicates a greater odds of protective behavior in the couple-based intervention relative to the individual-level comparison.

RESULTS

Figure 1 shows the flow of study selection. After screening titles, abstracts and full reports, 15 couple-based interventions, including 21,882 participants, met the inclusion criteria (Figure 1). As seen in Table 1, study locations included China, Kenya, Rwanda, Tanzania, Trinidad, Zambia, and the United States. All studies except two exclusively focused on heterosexual couples. Two studies were specifically designed for HIV-serodiscordant couples. Eight studies were randomized controlled trials.

As reported in Table 2, outcomes examined include protective sex behavior (defined as consistent condom use or no sex without condoms), STIs, HIV testing, Nevirapine uptake among pregnant women, and HIV medication adherence. No studies evaluated drug use behaviors. The results of random-effect models showed statistically significant intervention effects for protective sex (OR = 1.60, 95% CI = 1.21, 2.11, p = 0.0012, nine effect sizes), HIV testing (OR = 1.79, 95% CI = 1.31, 2.45, p = .0000, three effect sizes), and Nevirapine uptake (OR = 1.51, 95% CI = 1.02, 2.24, p =0.0397, six effect sizes). There was insufficient evidence for STI and HIV medication adherence due to a small number of studies (only two

studies examining STI and one study on HIV medication adherence). Modest heterogeneity (i.e., I^2 around 50%) was observed. One study included in the HIV testing outcome was windsorized (Semrau et al., 2005) and there was no evidence that any other individual effect size exerted influence on the aggregated effect sizes.

DISCUSSION

Our systematic review and meta-analysis provides direct evidence that couple-based interventions are more effective in promoting protective sex, HIV testing and Nevirapine uptake when directly compared to interventions delivered to individuals. The evidence demonstrates the usefulness of couple-based interventions in protecting individuals, partners, and newborn children from the risk of HIV transmission and infection.

Our findings are particularly important in the era of treatment as prevention. Couples HIV counseling and testing allows both members of a couple to learn their HIV status and make informed choices surrounding antiretroviral prophylaxis during pregnancy (for heterosexual couples) and antiretroviral therapy (ART). ART reduces HIV-1 infection within discordant couples (Baggaley, White, Hollingsworth, & Boily, 2013; Cohen et al., 2011); however, the non-zero transmission risk from partners receiving ART points to the need of appropriate counseling and risk-reduction strategies for discordant couples (Baggaley et al., 2013). Couple-based interventions can provide a supportive environment that enables a couple to disclose more safely to each other about personal and potentially difficult information (e.g., outside partners, STIs), to make a joint decision and responsibility for safer sex practice, and to capitalize partner's support for prevention and care. Given the promise of couple-based interventions (Jiwatram-Negron & El-Bassel, 2014; Purcell et al., 2014), it is exciting that several treatment-as-prevention and preexposure prophylaxis (PrEP) trials have incorporated the couple-based component as part of biomedical interventions (Cohen et al., 2011; Baeten et al., 2012).

Several limitations warrant comment. The evidence presented is primarily driven by behavior changes among heterosexual couples. Only one study (Sullivan et al., 2014) that compared the couple-based intervention with an intervention delivered to individuals was specifically designed for MSM couples. Additionally, none of the included studies targeted drug users or evaluated drug use behaviors and only one study evaluated medication adherence outcomes. The findings should be reassessed when additional data become available. The U.S.-based studies primarily focused on sexual risk reduction, while most of the international studies focused on couple HIV testing or prevention of mother-to-child transmission. Replicating and adapting effective couple-based interventions in the countries where the interventions were not previously tested will be an important quest.

Based on the current couple-based research literature, several important operational questions merit future examinations: (1) Which intervention modalities work best and under what circumstances? and (2) What are the best strategies to combine couple-based interventions with other behavioral, structural and biomedical interventions in a scalable and cost-effective way? Although additional operational research is needed, couple-based

interventions can be utilized to enhance prevention effects and reduce HIV transmission and infection in the era of treatment as prevention.

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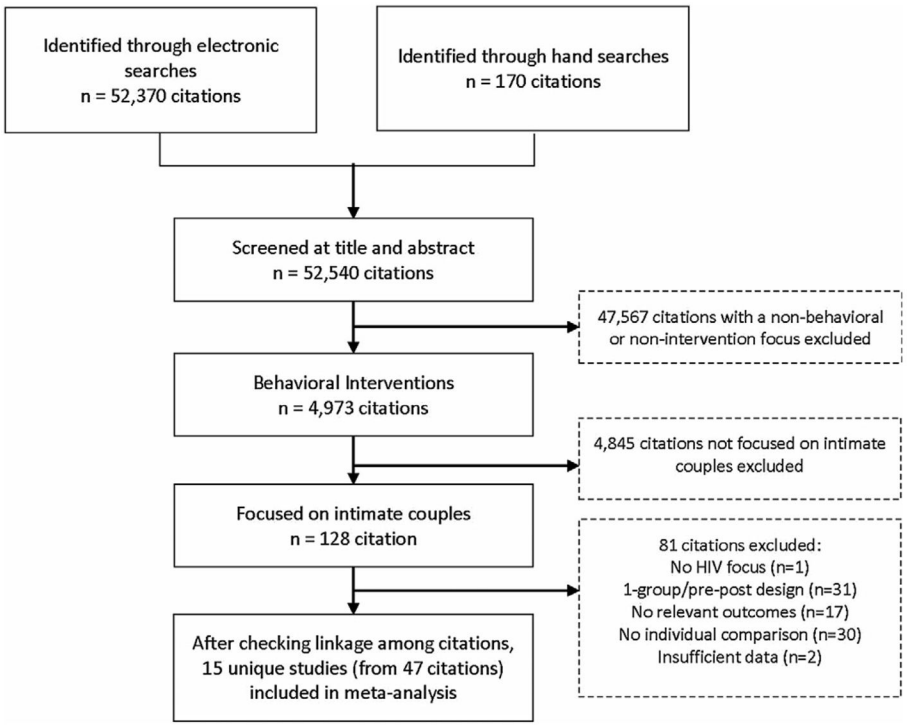

Figure 1.
Study Selection

Table 1

Description of 15 studies that evaluated the effects of couple-based interventions

First Author, Publication Year	Location	Participants	Recruited from	Age	Relationship Status	Study Design
Allen et al., 1992	Kigali, Rwanda	1442 heterosexual women	Prenatal and pediatric outpatient clinics	Mean=29 years	Mean=8 years	Prospective cohort
Becker et al., 2010	Dar es Salaam, Tanzania	1,521 heterosexual women	Antenatal clinics	Mean=25 years	Married for at least 2 years	Randomized controlled trial
Conkling et al, 2010	Kigali, Rwanda	1,940 heterosexual women	Antenatal clinics	Mean=26 years	Mean=5 years	Prospective cohort
Conkling et al, 2010	Lusaka, Zambia	1,685 heterosexual women	Antenatal clinics	Mean=24 years	Mean=6 years	Prospective cohort
El-Bassel et al., 2003	Bronx, New York City, USA	217 heterosexual couples	Hospital-based outpatient clinics	Mean=38 years	Together for at least 6 months	Randomized controlled trial
El-Bassel et al., 2010	Atlanta, Georgia; Los Angeles, California; New York, New York; Philadelphia, Pennsylvania, USA	535 HIV-serodiscordant heterosexual couples	HIV care clinics, other health clinics, AIDS service organizations, community-based organizations, targeted street outreach, word of mouth, and various media outlets	Mean=43 years	Together for at least 6 months	Randomized controlled trial
El-Bassel et al., 2011	New York, USA	282 HIV-negative, drug-using, heterosexual couples	Street outreach, homeless-shelters, soup kitchens, syringe-exchange programs	Mean=37 years	Together for at least 6 months	Randomized controlled trial
Farquhar et al., 2004	Nairobi, Kenya	314 HIV-positive heterosexual women	Antenatal clinic	Mean=24 years	Mean=3.7 years	Prospective cohort
Jones et al., 2013	Miami, Florida, USA	216 heterosexual couples	Community health centers, community agencies and non-governmental organizations and churches	Mean=45 years	Together for at least 6 months	Randomized controlled trial
Khoshnood et al., 2006	Urumqi City, Xinjiang Province, China	300 heterosexual couples	Antenatal clinics	Mean for women=28 years; 72% men aged 26–30	Length of time not reported; 100% married	Prospective cohort
Msuya et al, 2008	Moshi, Tanzania	2654 heterosexual women	Primary healthcare clinics	Mean=25 years	Not reported	Prospective cohort
Remien et al., 2005	New York, New York, USA	215 HIV-serodiscordant couples (74% heterosexual, 26% same-sex couples)	HIV/AIDS treatment clinics	Mean=42 years	Together for at least 6 months	Randomized controlled trial
Semrau et al., 2005	Lusaka, Zambia	9409 heterosexual women	Antenatal clinic	Mean=22 years	Length of time not reported; 100% married	Prospective cohort

First Author, Publication Year	Location	Participants	Recruited from	Age	Relationship Status	Study Design
Sullivan et al.., 2014	Atlanta, Georgia, USA	11 HIV-serodiscordant men who have sex (MSM) couples	Community-based organizations, retail locations, and web ads	Median=18 to 29 years	Mean=14 months	Randomized controlled trial
Voluntary HIV-1 Counseling & Testing Efficacy Study Group, 2000	Nairobi, Kenya; Dar es Salaam, Tanzania; Port of Spain, Trinidad	586 heterosexual couples	Communities	Mean for men=29 years; Mean for women = 28 years	Length of time not reported; 64% couple married	Randomized controlled trial

Table 2

Effect of couple-based interventions on protective sex, STIs, HIV testing, Nevirapine uptake, and medication adherence

Outcomes Author (year), Study Location	OR	low 95%	upper 95%	Z	p value	Q statistic, p value	I^2
Protective Sex							
Allen (1992), Rwanda	2.31	1.77	3.00	6.23	0.0000		
Becker (2010), Tanzania	6.00	0.77	46.58	1.71	0.0866		
El-Bassel (2003), USA	1.37	0.61	3.07	0.77	0.4398		
El-Bassel (2010), USA	1.75	1.21	2.52	3.00	0.0027		
El-Bassel (2011), USA	0.76	0.44	1.30	−1.01	0.3131		
Farquhar (2004), Kenya	6.50	0.77	54.93	1.72	0.0856		
Jones (2013), USA	1.14	0.63	2.04	0.43	0.6692		
Sullivan (2014), USA	1.00	0.14	7.10	0.00	1.0000		
VCT HIV-1 Eff Stdy Grp (2000), Kenya, Tanzania, Trinidad	1.75	1.40	2.20	4.86	0.0000		
Random Effect Model	**1.60**	**1.21**	**2.11**	**3.28**	**0.0012**	19.01, p=.015	57.93
Reduction of Sexually transmitted infections (STIs)							
El-Bassel (2010), USA	1.02	0.64	1.62	0.09	0.9316		
El-Bassel (2011), USA	3.47	1.01	11.89	1.98	0.0475		
Random Effect Model	1.64	0.51	5.27	0.83	0.4075	3.33, p=.068	65.14
HIV Testing							
Becker (2010), Tanzania	1.59	1.09	2.32	2.43	0.0153		
Khoshnood (2006), China	1.42	0.90	2.24	1.50	0.1328		
Semrau (2005)[a], Zambia	2.37	1.68	3.33	4.93	0.0000		
Random Effect Model	**1.79**	**1.31**	**2.45**	**3.64**	**0.0000**	3.90, p=.142	48.76
Nevirapine uptake among HIV-positive pregnant women							
Becker (2010), Tanzania	3.87	1.00	14.98	1.96	0.0500		
Conkling (2010), Rwanda	0.94	0.55	1.61	−0.23	0.8178		
Conkling (2010), Zambia	1.62	0.55	4.76	0.87	0.3842		
Farquhar (2004), Kenya	2.36	1.02	5.43	2.02	0.0439		
Msuya (2008), Tanzania	3.44	0.99	11.97	1.94	0.0521		
Semrua (2005), Zambia	1.17	0.91	1.51	1.22	0.2218		
Random Effect Model	**1.51**	**1.02**	**2.24**	**2.06**	**0.0397**	8.92, p=.112	43.98

Outcomes Author (year), Study Location	OR	low 95%	upper 95%	Z	p value	Q statistic, p value	I^2
HIV medication adherence							
Remien (2005), USA	1.23	0.73	2.08	0.776	0.438		

[a]Windsorized to the value of three standard errors from the means of all the effect sizes for HIV testing. The original effect size was OR=6.16, 95% CI=4.38, 8.68.