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A Role for Depression in Sexual Risk Reduction for Women? A Meta-Analysis of HIV Prevention Trials with Depression Outcomes

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Abstract

Rates of HIV/AIDS and depression in women are significant public health concerns. The current meta-analysis tested the hypothesis that depression levels moderate change in sexual risk behavior in women participating in HIV prevention interventions. Features of the interventions were also explored as possible factors in decreasing levels of depression and sexual risk behavior. Included were HIV primary prevention interventions that measured sexual risk behavior and depression at baseline and follow-up and reported separate results for women. Ten studies (fourteen intervention groups) met the inclusion criteria. The majority of participants (N = 4,195 women) were African American; mean age was 28-years old. Both depression and sexual risk behavior decreased significantly in treatment and control groups from baseline to follow-up. Sexual risk decreased more to the extent that interventions sampled (a) participants with higher baseline levels of depression, (b) older women, (c) Hispanics/Latinas, and (d) members of risk groups (e.g., drug users, homeless). Interventions that included (e) condom provision, (f) information about condoms, and (g) HIV counseling and testing were also more successful in decreasing sexual risk. Finally (h), interventions were more likely to reduce sexual risk behavior when they decreased depression to a large extent relative to baseline levels. Interventions were more likely to decrease depression when they (a) had samples of only women; (b) targeted risk groups; and (c) provided self-management and coping skills. Reducing depression appears to play a role in decreasing sexual risk behavior, suggesting that interventions should actively address depression.

Keywords

HIV primary prevention interventions; behavioral interventions; sexual risk behavior; depression; depression severity; mental health; women; meta-analysis

AIDS is among the leading causes of death in the United States (Heron, 2011) and the number one killer worldwide of women aged 15–44 (World Health Organization, 2009). In the United States, as of 2008, the CDC (2011b) estimated nearly 1,200,000 people living with HIV/AIDS, with approximately 48,100 new cases diagnosed in 2009, 23% of whom

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were women (Prejean et al., 2011). Women comprise over one-third of all people living with HIV/AIDS (CDC, 2011b) and African American and Hispanic/Latina women are disproportionately affected by HIV/AIDS, with rates about 15 and 5 times higher than white women, respectively (CDC, 2011a). Depression is also a major public health concern for women as significantly higher rates of depression are seen in women compared to men (Pratt & Brody, 2008). Risk factors for depression include financial problems, low socioeconomic status, unemployment, and lower levels of education, with ethnic/racial minority women being more likely to possess these risk factors (American Psychological Association, 2010; Lorant et al., 2003; Mossakowski, 2009). Furthermore, women who experience depression/psychological distress are more likely to report unprotected sex, a higher number of sexual partners, having a sexually transmitted infection, alcohol and drug use, sex under the influence of alcohol or drugs, and unstable housing, among other HIV risk factors (Beadnell et al., 2003; Seth et al., 2009; Williams & Latkin, 2005). Therefore, depression and its risk factors also place women at increased risk for contracting HIV.

From a theoretical perspective, it is logical to expect that depression plays a role in HIV prevention intervention outcomes for women. According to the theory of gender and power (Connell, 1987), there are three structures that illustrate gender interactions between men and women: (a) the sexual division of labor, (b) the sexual division of power, and (c) cathexis, or social norms and emotional attachment, all of which function at the societal and institutional levels. Wingood and DiClemente (2000) adapted the theory of gender and power to apply to HIV risk factors for women. In the sexual division of labor, for example, paying women less than men for similar work perpetuates a cycle whereby women are financially dependent upon men. The sexual division of power reflects women's disempowerment through the media portrayal of women as sexual objects. Cathexis dictates what sexual behavior is appropriate for women and portrays motherhood as a valued role. These three phenomena lead to less ability to negotiate safe sex practices, condom use, education, power in relationships, and access to healthcare and increased homelessness in women (Wingood & DiClemente, 2000). These outcomes not only put women at risk for HIV but also for depression.

The sexual division of labor, sexual division of power, and cathexis highlight the lack of resources that some women experience in comparison to men. The network-individual-resource model (Johnson et al., 2010a) elucidates how the individual functions within one or more networks to fulfill his or her needs. The individual's networks continually or intermittently interact with him or her to affect levels of resources that both the individual and network possess: (a) mental resources, including efficacy, control, intentions, skills, and attitudes and (b) tangible resources, including money, condoms, and physical health. The goal of the individual is to use the network to fulfill the deficit in resources. Therefore, network, resource, and power factors converge to put women at risk for HIV and depression. In the case of HIV, for example, if a woman has insufficient money, she may use her network to obtain this resource through commercial sex work. Deficits in mental (e.g., coping skills) and tangible (e.g., housing) resources can lead to depression, as discussed above.

Individuals who are depressed (DiFranceisco et al., 1998; Kim et al., 2006) and those most at risk for HIV (e.g., those who engage in high levels of sexual risk behavior; Noguchi et al., 2007) are less likely to complete interventions. If depressed women are not being retained in interventions, then they cannot reap the benefits of reducing sexual risk behavior (e.g., increased condom use, decreased rates of unprotected sex, decreased number of partners; Crepaz et al., 2009; Mize et al., 2002). Past meta-analyses of prevention interventions with women have shown significant decreases in sexual risk behavior (e.g., Crepaz et al., 2009; Mize et al., 2002). While these meta-analyses have taken into account some psychosocial

variables (e.g., empowerment, self-efficacy), to date they have not examined how psychological functioning (e.g., depressive symptoms) plays a role in the efficacy of these interventions. Meta-analyses examining other populations (e.g., men who have sex with men, Herbst et al., 2005; adolescents, Mullen et al., 2002) also have not specifically addressed depression within the context of HIV prevention interventions.

Drawing on these theoretical perspectives, empirical studies, and past meta-analyses, the main foci of this meta-analysis were to examine (a) how sexual risk behavior and depression levels change in women as a result of completing an HIV prevention intervention, (b) whether baseline severity of depression moderates the change in sexual risk behavior from baseline to follow-up, and (c) whether components of HIV interventions are related to decreased depression and sexual risk.

Method

The current meta-analysis adheres to PRISMA guidelines (Moher et al., 2009).

Literature Search

Relevant studies were located through several search strategies. First, electronic databases were searched through September 1, 2010 using a Boolean search (PsycINFO, PubMED, Academic Search Premier, CINAHL, Psychology & Behavioral Sciences Collection, Women's Studies International, ProQuest Dissertations and Theses, Scopus). Keyword searches included: HIV prevention AND depression AND women; HIV prevention AND depressive AND women; HIV- women AND depress* AND HIV intervention; depression OR depressive AND HIV prevention AND women; depression OR depressive AND HIV prevention AND women AND condom. A full-text search was conducted using the University of Connecticut's Synthesis of HIV/AIDS Research Project's (SHARP) Sexual Risk Reduction database which consists of digitized reports of HIV interventions and related research. Sexual risk behavior intervention articles housed by the CDC's Prevention Research Synthesis group were full-text searched as well. The keyword depression was truncated as depress* in order to increase sensitivity in the full-text searchs. Reference lists of articles were also searched to identify other relevant published or unpublished studies. Additionally, five journals (*Journal of Acquired Immune Deficiency Syndromes*, *AIDS & Behavior*, *AIDS Care*, *AIDS Education & Prevention* and *American Journal of Public Health*) were searched online (January 2009–November 2010). Finally, a request for reports was also sent to several electronic listservs (Society of Behavioral Medicine; American Public Health Association; American Psychological Association, Division 12; European Association of Social Psychology; European Health Psychology Society), but no additional qualifying studies were obtained.

In order to be included in the sample, a study must (a) report on a face-to-face HIV/AIDS prevention intervention, (b) have a control condition, and (c) report separate analyses for women for depression and sexual risk behavior at baseline and at least one post-intervention assessment. Studies could be from any country or reported in any language, although only English reports were found. Studies were excluded if (a) the intervention included only men, people living with HIV/AIDS, or transgendered individuals, (b) the study was qualitative in nature, or (c) we could not obtain enough statistical information to calculate effect sizes. From the selection criteria and literature search, 10 studies (14 different intervention groups) were included in the analyses.

Coding

Each article, treatment group, and control group were coded. *Article characteristics* included such dimensions as (a) sex of first author; (b) year of data collection; (c) location of study, and (d) whether a theoretical framework guided the intervention design. *Participant characteristics* included (a) age; (b) race/ethnicity; (c) sample type (community, drug users, etc.); and (d) proportion of females in the sample. *Design characteristics* included (a) type of design (e.g., randomized controlled trial); (b) type of control group (e.g., HIV/AIDS education only); and (c) depression measure (e.g., Center for Epidemiological Studies Depression Scale [CES-D]). *Intervention characteristics* included (a) type of HIV/AIDS education, (b) type of motivational skills, (c) type of behavioral skills, (d) if condom information was provided, (e) if counseling and testing was provided, (f) if condoms were provided, (g) the number and length of sessions (length estimated when necessary), and (h) study quality (measure adapted from Jadad et al., 1996). Specific examples of intervention characteristics appear in Table 1. Thirteen reports met the inclusion criteria of the current meta-analysis. One report was excluded because it lacked statistical information necessary to calculate effect sizes (Tripiboon, 2001) and this information could not be obtained from the author; two other reports were excluded because their samples were non-independent from other studies included in the final sample (Nyamathi & Stein, 1997; Sales et al., 2010). Ten reports with a total of 14 intervention groups and a sample size of N = 4,195 were included in the final sample (Figure 1).

Effect Size Calculation and Analysis

Effect sizes (ESs) were calculated from information provided in the article or from information received directly from the authors. For both sexual risk and depressive symptoms (termed *depression* throughout the current paper), ESs were calculated as the mean difference between pretest and posttest divided by the standard deviation of the pretest (Becker, 1988) for each group separately, correcting for sample size bias (Hedges, 1981). Multiple ESs were calculated if the study reported more than one intervention or multiple time measures, averaging ESs when there was more than one follow-up before or after eight months. Only data for women are included in the analyses. Sexual risk behavior was defined as unprotected intercourse, condom use, or number of partners. The sign of ESs was set so that negative values signify a decrease of either depression or sexual risk behavior, even when the absolute pattern might have been an increase of the behavior (e.g., an increase in condom use). Due to the small sample size of included studies, we examined sexual risk reduction broadly (i.e., averaged over types of risk behavior) rather than one specific sexual risk behavior (e.g., increased condom use).

The ESs were examined using fixed- and random-effects models (Lipsey & Wilson, 2001; Wilson, 2002); because there were no differences in results between these models only random-effects model estimations are reported, which can be more robustly generalized. The homogeneity statistic, Q, and the I^2 index and its corresponding 95% confidence intervals (Huedo-Medina, et al., 2006) were calculated to determine whether each set of mean standardized mean differences (ES_+s) plausibly shared a common parametric mean ES. Possible asymmetries in the distribution of the ESs, which may indicate reporting bias, were analyzed using Begg's strategy (Begg & Mazundar, 1994) and Egger's test (Egger et al., 1997).

To examine depression as a moderator, it was necessary to transform the scales into a common metric because a variety of measures appeared in the literature with a range of possible scores (e.g., 0–60 for the CES-D, 0–63 for the Beck Depression Inventory; Beck et al., 1979). Scales were placed on a uniform 0–100 scale based on the percent of maximum possible (POMP) score formula detailed below (Cohen et al., 1999):

$$M_{\text{POMP}} = \left(\frac{M - \text{minimum possible score}}{\text{maximum possible score} - \text{minimum possible score}} \right) \times 100.$$

Once all measures of depression were on the same metric, the scores on each scale could now plausibly be compared and depression could be examined as a potential moderator of the sexual risk ESs. To test the moderation effect of the baseline levels of depression and coded content on our targeted outcomes, sexual risk behavior and depression ESs were entered as the dependent variable into weighted least-squares regressions incorporating random-effects assumptions (Lipsey & Wilson, 2001). Confidence bands in figures and confidence intervals in tables for moderation patterns were created using the moving constant technique (Johnson & Huedo-Medina, in press).

Results

Description of Studies

Of the 10 included articles, 9 (90%) were conducted in the United States and 1 (10%) in South Africa. Seven (70%) used a theoretical framework to guide the intervention. The most common type of sample was a community sample ($k = 6$; 60%). The average age across samples was 28.04 years (range = 15.98–36.10; $k = 9$); 5 studies included 100% African Americans and 4 other studies had at least 30% African Americans, 4 studies included at least 8% Hispanic/Latina participants, 2 included at least 23% white participants, and 1 was an African sample. The mean number of intended session was 5.93 (range = 1–17) for treatment groups and 1.9 (range = 0–10) for control groups. On average, treatment group participants received 12.76 hours (range = 0.30–50.42) of contact and control group participants received 3.38 hours (range = 0–16). The median number of post-intervention follow-ups was 2.25 (range = 1–4). The first post-intervention assessment occurred, on average, at 16.50 weeks (SD = 9.01, range = 0–28 weeks) after the intervention and the last follow-up occurred, on average, at 52.55 weeks (SD = 8.62; range = 48–96 weeks). The most commonly used depression measure was the CES-D (70%; Radloff, 1977). Mean baseline levels of depression in participants were variable (range = 2.82–58.27). Sexual risk was assessed as unprotected sex in 5 studies (50%), condom use in 4 studies (40%), and by multiple sexual partners in 1 study (10%). Tables 1 and 2 provide qualitative summaries of intervention features.

All 14 treatment groups received an educational component; 11 (79%; percentage rounded to nearest whole number) received general HIV education (e.g., definition of HIV, symptoms) and all groups received HIV prevention education (e.g., condoms prevent transmission). Ten (71 %) treatment groups were given information about condoms (e.g., condoms are effective in decreasing HIV risk), half ($k = 7$) were given condoms and received a condom use demonstration from the facilitator, and 6 (43%) of the groups were given an opportunity to practice how to properly use a condom. Other skills that the treatment groups were taught included coping/self-management ($k = 10$, 71%), communication ($k = 6$, 43%), safe sex negotiation ($k = 2$, 14 %), role playing, ($k = 3$, 21%) and proper needle cleaning ($k = 2$; 14%). Eleven of the treatment groups (79%) received motivational components: Seven (50%) included motivation for prevention of HIV/AIDS (e.g., risk awareness), 6 (43%) included motivation to boost esteem, and 3 (21%) included motivation to bolster group identity (e.g., connect with other women and/or people of the same race/ethnicity). Five (50%) of the control groups received HIV prevention education and the same 5 (50%) were given general HIV education. Three (30%) of the control groups were given information about condoms, 2 (20%) were given condoms, and 5 (50%) received

no content related to HIV risk. Control groups received no motivational or behavioral skill components.

Quantitative Analyses

Initial analyses revealed no significant differences between treatment and control groups on sexual risk or depression levels at either interval (first vs. last follow-up; see Table 3). Nonetheless, we found that control groups that received "active" HIV-related intervention components (e.g., HIV/AIDS education, condoms) saw larger decreases in sexual risk reduction compared to "true" control groups (i.e., no or irrelevant content, see Table 4). The lack of difference between groups, coupled with the fact that half of control groups included relevant preventive content, justified further analyses focused on temporal change for sexual risk and depression outcomes, treating results from both treatment and control groups as one group (see Table 3). Finally, there were no asymmetries in the distributions of the ESs, suggesting the absence of publication bias (Begg's test [$z = -0.15$, $p = 0.88$; $z = -1.22$, $p = 0.22$]; Egger's test [$t = 0.97$, $p = 0.34$; $t = 0.29$, $p = 0.77$] for sexual risk behavior and depression, respectively).

Change in sexual risk behavior and depression from baseline to follow-up— Figure 2 provides a forest plot of the distribution of sexual risk behavior ESs for both groups at the last follow-up. Overall, there was a small significant decrease in sexual risk behavior from baseline to first and last follow-up for the treatment, control, and combined groups (see Table 3). The significant I^2 value implies that the ES results vary more from study to study than expected by sampling error alone and that more complex models (i.e., moderation models) are necessary. A forest plot of the distribution of depression ESs for both groups at the last follow-up appears in Figure 3. Overall, there was a small significant decrease in depression from baseline to first and last follow-up for the treatment, control, and combined groups (see Table 3), but effects were again marked by heterogeneity, as evidenced by a large I^2 and significant Q statistic.

Baseline depression as a moderator of change in sexual risk behavior— Samples with higher baseline mean levels of depression exhibited more risk behavior change at the last assessment ($r = -.46$, $p < .05$), but when the amount of change in depression was standardized, this pattern was non-significant. Depression levels at baseline, follow-up length, and amount of change did not significantly relate to attrition ($|rs| < .22$).

Moderators of change in sexual risk behavior and depression—As Table 4 details, interventions were more successful in decreasing sexual risk behavior to the extent that they sampled (a) participants with higher baseline levels of depression (Figure 4), (b) older women, (c) larger percentages of Hispanics/Latinas, and (d) risk groups (e.g., drug users, homeless). Interventions also were more successful when they provided (e) condoms, (f) information about condoms, (g) HIV counseling and testing, and (h) active treatment components to the control group; finally, (i) interventions were more likely to reduce sexual risk behavior when they decreased depression to a large extent relative to baseline levels (Figure 5). As Table 5 details, interventions were more likely to decrease depression when they (a) had samples of only women (vs. also sampling men); (b) targeted risk groups (i.e., drug users, homeless); and (c) provided self-management and coping skills.

Discussion

To our knowledge, this meta-analytic review is the first to document that primary HIV prevention interventions can successfully address not only HIV risk but also depression levels in at-risk women. Overall, women participating in behavioral interventions targeting

sexual risk reduction against HIV infection exhibited significant decreases in both depressive symptoms and sexual risk behavior at follow-up regardless of follow-up length and intervention condition. Overall, interventions that ameliorated depression the most also had the largest sexual risk reduction; indeed, the confidence bands in Figure 5 reveal that on average, interventions had non-significant risk reduction unless they also reduced depression levels at least somewhat. Importantly, decreases in sexual risk behavior from baseline to follow-up paralleled decreases in levels of depression from baseline over the same period.

In the current sample of trials that also included depression outcomes, patterns of sexual risk reduction (Table 4) generally mirrored results from past meta-analyses that did not require included studies to measure depression. Speaking to the generalizability of our results, many of our findings are akin to past domestic (e.g., Crepaz et al., 2009; Mize et al., 2002) and international (e.g., Huedo-Medina et al., 2010) meta-analyses showing that prevention interventions are successful in decreasing sexual risk behavior when they target women. Our results also support past findings that greater risk reduction appears in samples of young adults compared to adolescents (Johnson et al., 2010b, Noar, 2008), samples with larger percentages of Hispanics/Latinos (Albarracín et al., 2008), samples provided with condoms (Johnson et al., 2003), and a broad sample of interventions with sexual frequency outcomes (Smoak et al., 2006). More generally, providing condoms and condom information, as well as HIV counseling and testing, appears to afford participants the mental and tangible resources necessary to reduce sexual risk behavior (Johnson et al., 2010a). It may be beneficial, however, to evaluate outcomes for interventions that measure depression as compared to those that do not measure depression. Our results suggest that depressive symptoms may be acting as an often unmeasured—or unreported—mechanism of change in sexual risk behavior.

It is important to note that decreasing levels of depression was not a stated goal of these interventions, with only two exceptions (Harris et al., 1998; Jewkes et al., 2008). Because depression was a secondary outcome in nearly all of the included studies, it is remarkable to see a significant decrease in depression in both groups. Given that drug trials commonly document robust placebo effects even for samples and patients with very severe depression (Fournier et al., 2010; Kirsch et al., 2008), it is conceivable that HIV interventions act as a sort of placebo agent, thereby reducing depression levels in participants. More plausibly, interventions may act as a form of social support for participants, which have been found to decrease risk of depression in women (Kendler et al., 2005). Social support may also explain why interventions with only female participants were more effective in decreasing levels of depression compared to interventions that also included male participants. In addition, when participants were taught coping and self-management skills (Table 5), there was a larger decrease in depression. Arming participants with skills that are necessary to manage factors that may contribute to depression (e.g., stress) seems to aid in managing depression and may be the reason why our review found no association between depression and the rates of completing trials. This finding is extremely pertinent as reductions in depression and sexual risk behavior seem to go hand-in-hand.

The qualitative analysis of the literature highlights the lack of uniformity in intervention design (e.g., type of intervention components). Overall, control groups received a high number of the intervention components which could account for the lack of differences between control and treatment groups. Control groups received a high level of care with 5 (50%) receiving HIV/AIDS education and 4 (40%) receiving HIV counseling and testing (Table 1). Because control arms resembled treatment arms, we combined the groups in order to detect the main components that were affecting study results. Our findings parallel results of some other health promotion meta-analyses that have shown that the content of the

control arm affects comparisons between treatment and control (e.g., de Bruin et al., 2010; Johnson et al., 2003).

Several limitations apply to the current meta-analysis. First, despite an extensive search (Figure 1), the small number of studies available (k = 10, 24 groups) limits power and the ability to find conclusive results, test certain moderators (e.g., intervention components), and generalize to other countries and cultures. Second, all of the qualifying studies were published in peerreviewed journals and no unpublished studies were obtained (e.g., dissertations), even though they could have qualified if found. Third, this study highlights the need to capture "fugitive" literature through more extensive access to full-text searching options. Most available databases (e.g., PubMED, PsycINFO) only permit keyword searches of the title and abstract and cannot identify those reports in which a particular variable (e.g., depression) was not a main focus. To that end, we cannot be certain that all relevant studies were included in this meta-analysis. Fourth, the current results do not speak to the temporal ordering of change: It is possible that reducing sexual risk is empowering and therefore ameliorates depression rather than the reverse, although one longitudinal study suggests that higher rates of depressive symptoms leads to riskier sexual behavior (Williams & Latkin, 2005). Finally, the current results cannot address whether the link between depression and sexual risk behavior change observed is due to regression to the mean, floor effects, or unmeasured third variables.

The current meta-analysis highlights the importance of examining depression within the context of HIV prevention interventions, especially since AIDS is a leading cause of death in the United States (Heron, 2011) and worldwide (World Health Organization, 2009), women are more likely to be diagnosed with depression than men (Pratt & Brody, 2008), and HIV and depression share common risk factors. The theory of gender and power (Connell, 1987; Wingood & DiClemente, 2000) and the network-individual-resource model (Johnson et al., 2010a) highlight the theoretical threats that place women at risk for HIV (e.g., lack of resources, power, and healthy networks/social support) and these theories can be applied to depression as well. Interventions conducted with people living with HIV/AIDS are also effective in decreasing depression (Sherr et al., 2011), indicating that depression may have implications for both primary and secondary HIV prevention. Because a significant decrease in depression was found without interventions explicitly addressing depression, it is conceivable that an even larger decrease in depression and sexual risk behavior could be obtained if depression is directly addressed. Although we cannot determine causality, future trials could address the sequential timing of the depression-sexual risk behavior link. Future research should also explore whether the patterns obtained in this review match those for other samples such as men and transgendered individuals who participate in HIV prevention intervention trials. Finally, future research should elucidate the causal relationship between depression and sexual risk behavior.

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* indicates reference was included in the meta-analysis.

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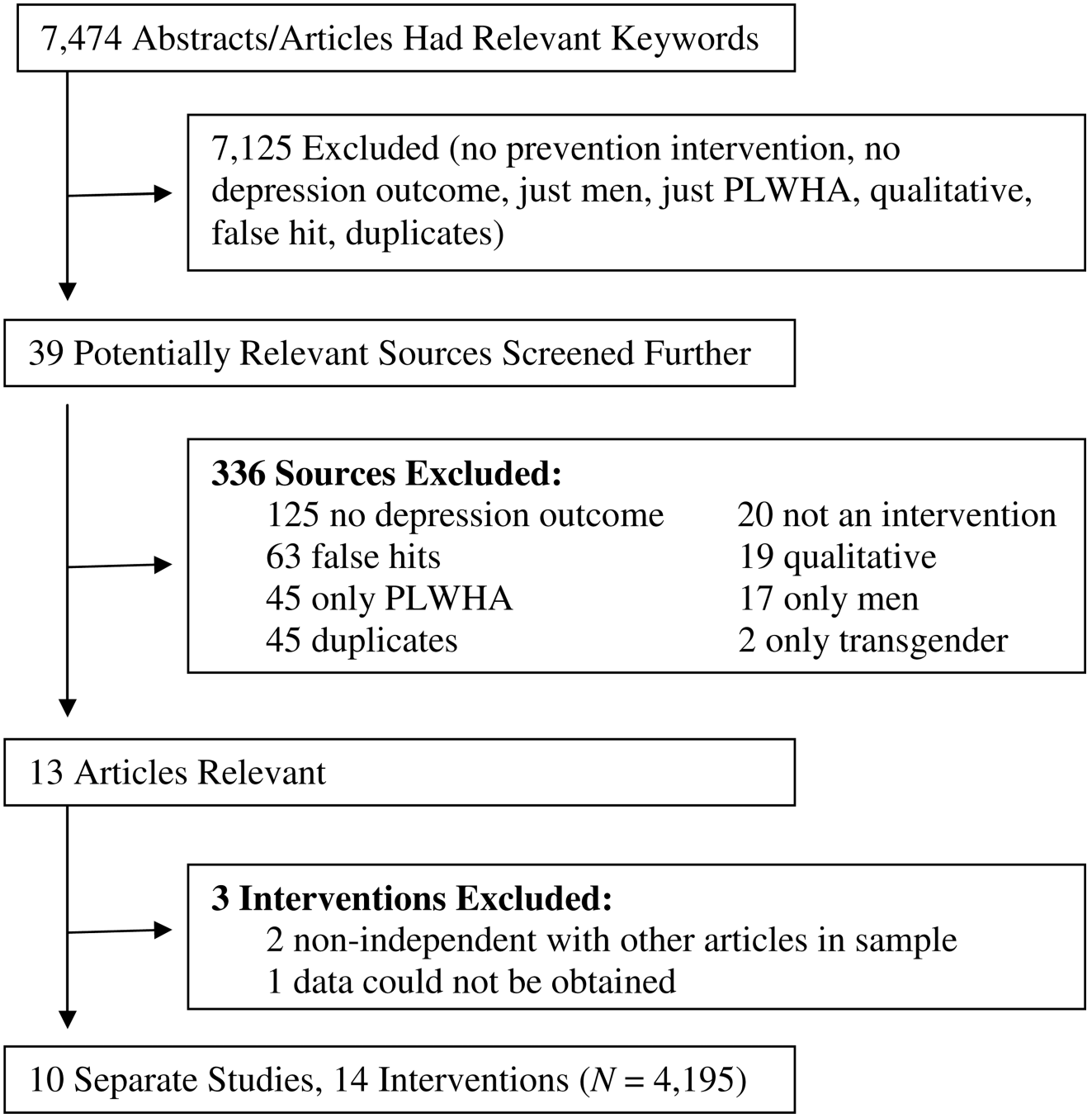

Figure 1.
Flow chart of selected studies. *Note.* False hits were characterized if the words depression, depressive, or depressed were mentioned only in the reference section or in the introduction of the article (e.g., stating that there is a relationship between depression and HIV risk behaviors). PLWHA = people living with HIV/AIDS.

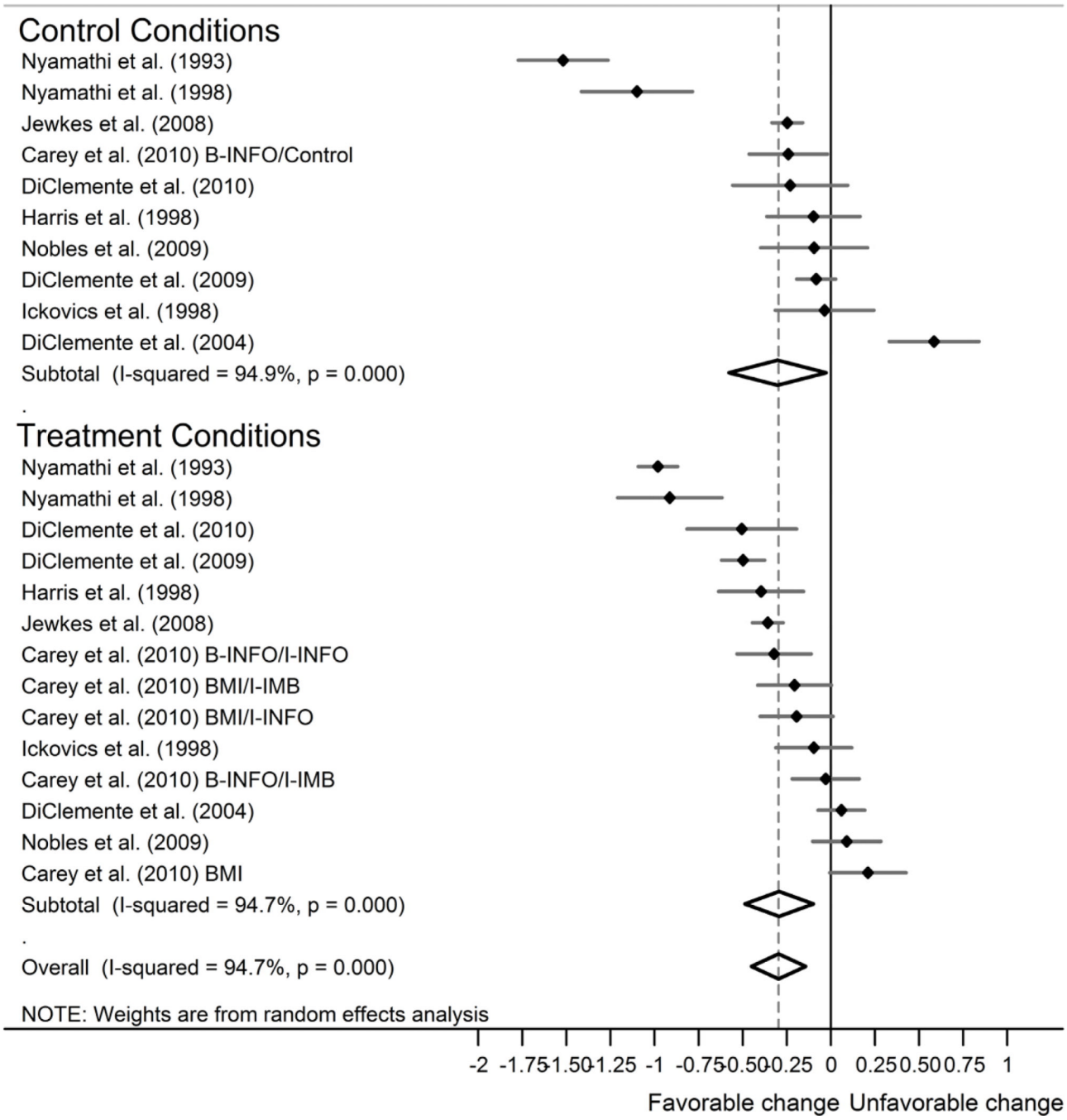

Figure 2.

Forest plot of effect sizes gauging sexual risk from baseline to the last available follow-up, grouped by condition and ordered by magnitude. Negative (positive) effect sizes correspond to a decrease (increase) in sexual risk. Confidence intervals (lines) for each effect size are significant when they do not include zero. Weighted mean effect sizes (diamonds) show a significant decrease in sexual risk behavior for each combination of conditions.

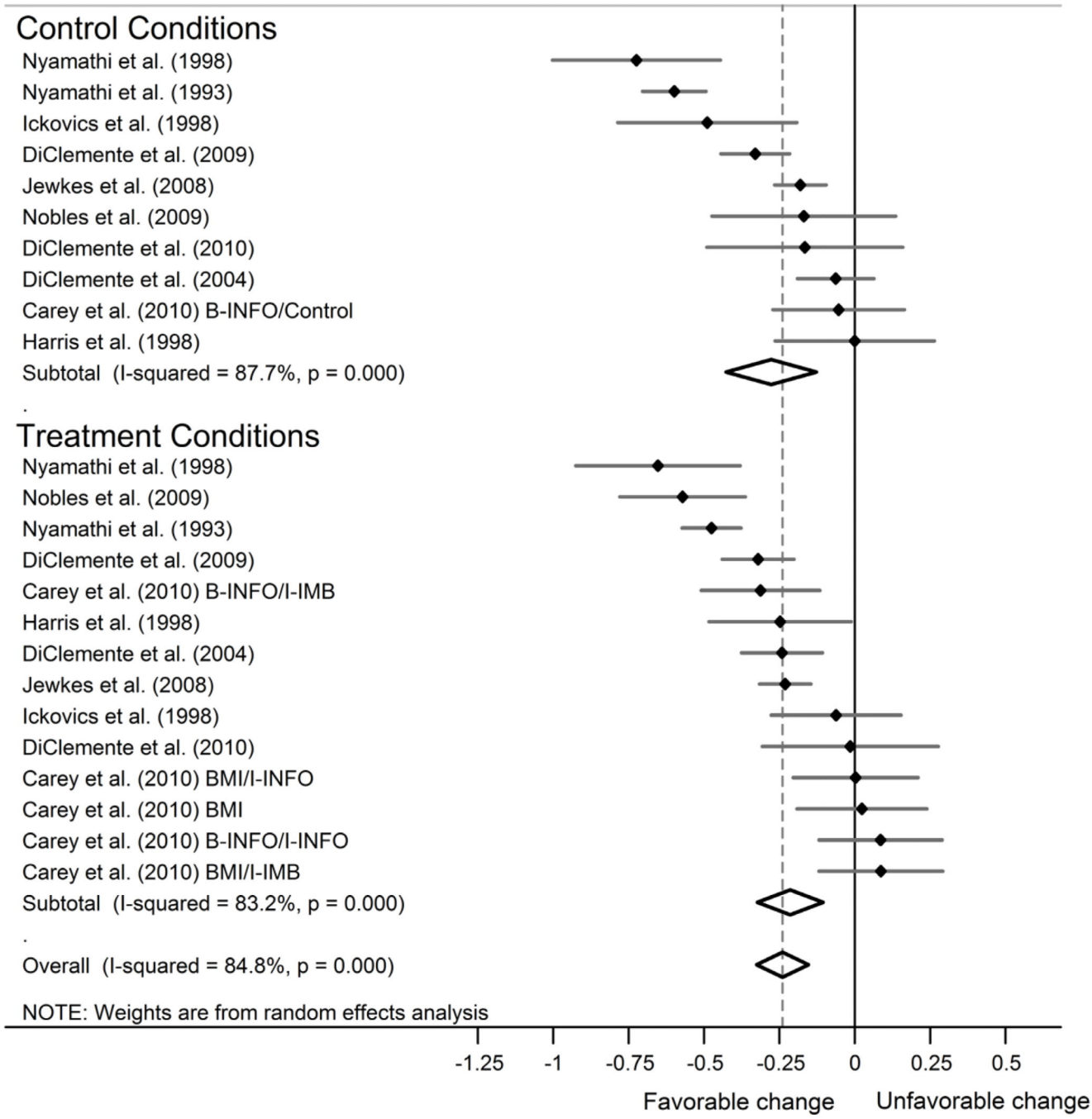

Figure 3.

Forest plot of effect sizes gauging depression from baseline to the last available follow-up, grouped by condition and ordered by magnitude. Negative (positive) effect sizes correspond to a decrease (increase) in depression. Confidence intervals (lines) for each effect size are significant when they do not include zero. Weighted mean effect sizes (diamonds) show a significant decrease in depression for each combination of conditions.

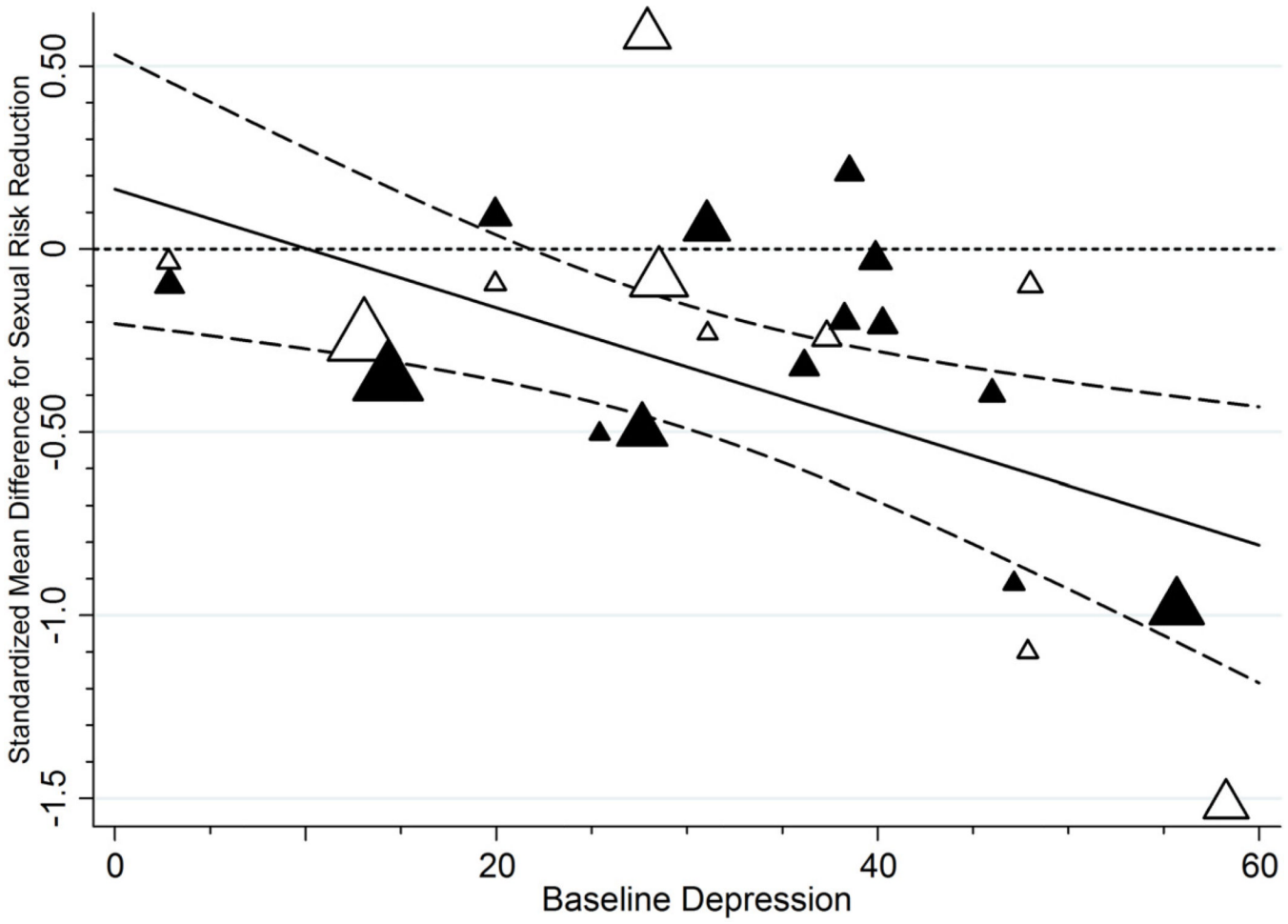

Figure 4.
Sexual risk reduction as a function of baseline depression. Sexual risk behavior declined following the intevention at the last available follow-up to the extent that samples had higher levels of baseline depression (treatment [control] group effects appear as black [white] triangles; the size of each plotted value reflects its weight in the analysis). The solid regression line indicates trends across initial levels of depression; dashed lines provide 95% confidence bands for these trends.

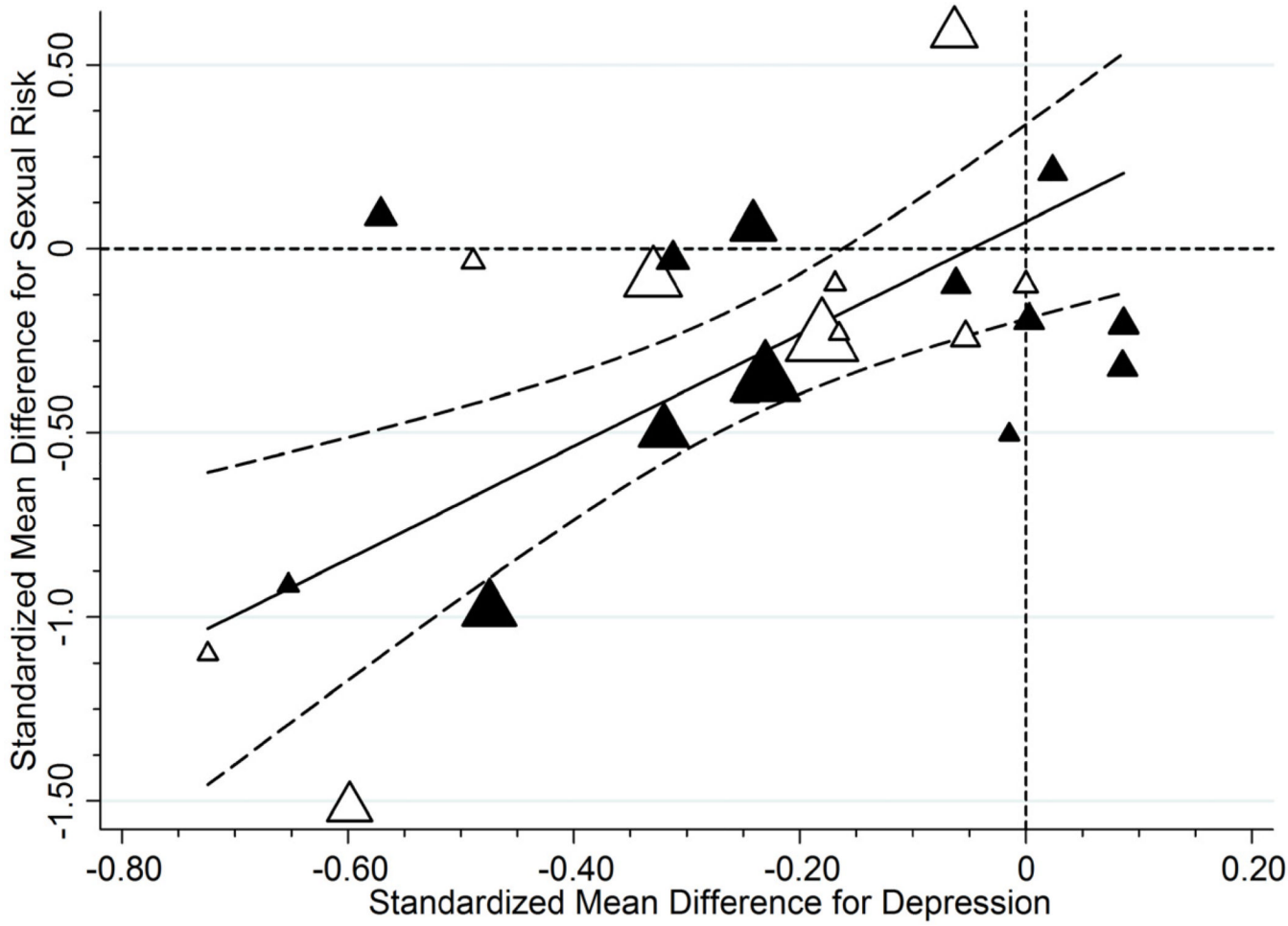

Figure 5.

Depression as a moderator of reductions in sexual risk behavior. Sexual risk behavior reductions at last available follow-up as a function of reductions of depression from baseline (treatment [control] group effects appear as black [white] triangles; the size of each plotted value reflects its weight in the analysis). The solid regression line indicates trends across levels of standardized change in depression levels; dashed lines provide 95% confidence bands for these trends.

Table 1

Coded intervention features by study.

Intervention Feature	Carey et al. (2010)	DiClemente et al. (2004)	DiClemente et al. (2009)	DiClemente et al. (2010)	Harris et al. (1998)
Sample	N = 555 (nc = 83; $n_{B\text{-}INFO/I\text{-}INFO}$ = 94, $n_{B\text{-}INFO/I\text{-}IMB}$ = 107, n_{BMI} = 85, $n_{BMI/I\text{-}INFO}$ = 93, $n_{BMI/I\text{-}IMB}$ = 93); 64%AA, 23%W, 13%O, 9%:H; M age = 28.2	N = 460 (nc = 241; nt = 219); 100%B, M age = 15.98	N = 605 (nc = 316; nt = 289); 100%B; M age = 17.80	N = 86 (nc = 39; nt = 47); 100%B; M age = 17.85	N = 130 (nc = 57; nt = 73); 100%B; M age = 36.10
Year of Data Collection	2004	1996	2002	1999	1991
Location	Rochester, NY	USA	Atlanta, GA	Atlanta, GA	Eastern U.S. city
Design	RCT	RCT	RCT	RCT	Random assignment
Type of Control Group	HIV/AIDS education only	Irrelevant content: nutrition & exercise	Other: Enhanced usual care comparison condition	Irrelevant content: good nutrition during pregnancy	No contact
Framework Used	Information-Motivation Behavioral Skills Model; Transtheoretical Model	Social Cognitive Theory; Theory of Gender & Power	Social Cognitive Theory; Theory of Gender & Power	Social Cognitive Theory; Theory of Gender & Power	Leininger's Culturally Congruent Care
Recruitment Site	Public walk-in STD clinic	Community health agencies	Community health clinics	Prenatal clinic at public hospital	Methadone maintenance clinic
Attrition Rate Baseline to FUP	19.33%	11.90%	8.65%	19.50%	36%
Depression Measure	CES-D (9-item)	CES-D (brief 8-item version)	CES-D	CES-D (short version)	Rosenberg (1979) Depressive Affect Scale
Intervention Facilitators	Professional, paraprofessional; female	Peer, paraprofessional; female; ethnicity matched	Paraprofessional; female; ethnicity matched	Professional; both sexes represented; ethnicity matched	Professional
Study Quality (out of 21)	15	17	18	14	16

Intervention Feature	Ickovics et al. (1998)	Jewkes et al. (2008)	Nobles et al. (2009)	Nyamathi et al. (1993)	Nyamathi et al. (1998)
Sample	N = 136 (nc = 51; nt = 85); 54%W, 31%B, 11%H, 3%O; M age = 31.40	N = 1086 (nc = 547; ne = 539); 100%AA; Age R = 15–26	N = 149 (nc = 44; ne = 105); 100%B; M age = 30.26	N = 858 (nc = 410; ne = 448); 81%AA, 19%H; M age = 32.8	N = 130 (nc = 65; ne = 65); 91%AA, 8%H, 1%O; M age = 34.8
Year of Data Collection	Not reported	2003	Not reported	Not reported	1991
Location	Connecticut	South Africa, Eastern Cape Province	USA	Los Angeles, CA	Los Angeles, CA
Design	Matched	RCT	Quasi-experimental	Random assignment	Quasi-experimental
Type of Control Group	No contact	Brief form of treatment (Stepping Stones)	No contact	HIV/AIDS education only	HIV/AIDS education only
Framework Used	None reported	None reported	Culturecology, African-Centered Behavioral Change	Comprehensive Health Seeking & Coping Paradigm	None reported

Intervention Feature	Carey et al. (2010)	DiClemente et al. (2004)	DiClemente et al. (2009)	DiClemente et al. (2010)	Harris et al. (1998)
Recruitment Site	Community-based health clinics	School	Agencies providing services to African American Women	Women in homeless shelters or drug recovery programs	Women in homeless shelters or drug recovery programs
Attrition Rate Baseline to FUP	25.40%	24.45%	Not reported	6.33%	29.88%
Depression Measure	Hopkins Symptom Checklist (15 items)	CES-D	BDI	CES-D	CES-D
Intervention Facilitators	Paraprofessional	Paraprofessional; female	Professional, paraprofessional; female	Professional, paraprofessional; female	Professional, paraprofessional; ethnicity matched
Study Quality (out of 21)	12	12	6	14	11

Note. N = number of participants, nc = number of participants in control condition, nt = number of participants in treatment condition; B-INFO/I-INFO = brief informational session followed by an intensive informational session; B-INFO/I-IMB = brief informational session followed by intensive information, motivation and behavioral skills training; BMI = brief motivational training; BMI/I-INFO = brief motivational training followed by an intensive informational session; BMI/I-IMB = brief motivational training followed by intensive information, motivation, and behavioral skills training; AA = African American, W = White, H = Hispanic/Latina, O = Other, STD = sexually transmitted disease, RCT = randomized controlled trial, CES-D = Center for Epidemiological Studies-Depression Scale, BDI = Beck Depression Inventory, FUP = Follow-up.

Table 2

Coded intervention components by study.

Intervention Component	Carey et al. (2010) B-INFO/I-INFO	Carey et al. (2010) B-INFO/I-IMB	Carey et al. (2010) BMI	Carey et al. (2010) BMI/I-INFO	Carey et al. (2010) BMI/I-IMB
Educational Components (C)	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention
Educational Components (T)	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention
Motivational Components (T)	None	For HIV prevention	For HIV prevention	For HIV prevention	For HIV prevention
Condom Components (C)	Condom provision	Condom provision	Condom provision	Condom provision	Condom provision
Condom Components (T)	Condom provision	Condom information, demonstration and skills, condom provision	Condom information and provision	Condom information and provision	Condom information, demonstration and skills, condom provision
HIV C & T (C)	Yes	Yes	Yes	Yes	Yes
HIV C & T (T)	Yes	Yes	Yes	Yes	Yes
Other Skills (T)	None	Communication, other (problem solving, identifying triggers, role playing)	None	None	Communication, other (problem solving, identifying triggers, role playing)
Risky Sexual Behavior Measure	Number of unprotected sexual episodes	Number of unprotected sexual episodes	Number of unprotected sexual episodes	Number of unprotected sexual episodes	Number of unprotected sexual episodes
Total Contact Time (HIV-Related content; C)	20 (15)	20 (15)	20 (15)	20 (15)	20 (15)
Total Contact Time (HIV-Related Contact Time; T)	260 (255)	260 (255)	20 (20)	260 (260)	260 (260)

Intervention Component	DiClemente et al. (2004)	DiClemente et al. (2009)	DiClemente et al. (2010)	Harris et al. (1998)	Ickovics et al. (1998)
Educational Components (C)	None	General HIV education, HIV prevention	None	None	None
Educational Components (T)	HIV prevention	HIV prevention, other (peer norms of condom use, negatives of douching)	HIV prevention, other (adverse consequences of STDs/HIV to unborn child & themselves)	General HIV education, HIV prevention, other (sex & sexuality as related to AIDS)	General HIV education, HIV prevention
Motivational Components (T)	For HIV prevention, bolster group identity	For HIV prevention, build self-esteem	Build self-esteem	For HIV prevention, build self-esteem, bolster group identity, other (e.g., empowerment)	None
Condom Components (C)	None	None	None	None	None
Condom Components (T)	Condom information, demonstration, and skills	Condom information, demonstration, and skills	Condom information and demonstration, and skills	None	None

Intervention Component	Carey et al. (2010) B-INFO/I-INFO	Carey et al. (2010) B-INFO/I-IMB	Carey et al. (2010) BMI	Carey et al. (2010) BMI/I-INFO	Carey et al. (2010) BMI/I-IMB
HIV C & T (C)	No	No	No	No	No
HIV C & T (T)	No	No	No	No	Yes
Other Skills (T)	Communication, safe sex negotiation, other (role play, cognitive rehearsal)	Communication, other (facilitate male partner testing, role playing)	Communication, safe sex negotiation	None	None
Risky Sexual Behavior Measure	Unprotected sex (past 6 months)	Consistent condom use (past 60 days)	Consistent condom use (past 30 days)	Safer sex (condom use)	Level of sexual Risk (unprotected sex)
Total Contact Time (HIV-Related Contact Time; C)[a]	960 (0)	60 (60)	120 (0)	0 (0)	0 (0)
Total Contact Time (HIV-Related Contact Time; T)[a]	960 (600)	540 (540)	480 (480)	1440 (864)	40 (40)

Intervention Component	Jewkes et al. (2008)	Nobles et al. (2009)	Nyamathi et al. (1993)	Nyamathi et al. (1998)
Educational Components (C)	General HIV education, HIV prevention	None	General HIV education, HIV prevention	General HIV education, HIV prevention
Educational Components (T)	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention	General HIV education, HIV prevention
Motivational Components (T)	None	Build self-esteem, bolster group identity	Build self-esteem, other (self-control)	Build self-esteem
Condom Components (C)	Condom information	None	Condom information and provision	Condom information and provision
Condom Components (T)	Condom information	None	Condom information, demonstration and practice on correctly using a condom, condom provision	Condom information, demonstration and practice on correctly using a condom, condom provision
HIV C&T (C)	Yes	No	Yes	Yes
HIV C & T (T)	Yes	No	Yes	Yes
Other Skills (T)	Communication, other (role play)	Other (meditation, journaling)	Needle/syringe disinfection, other (coping responses, enhancing self-esteem and feelings of control)	Needle/syringe disinfection, other (how to cope/reduce stress, enhancing self-esteem & feelings of control
Risky Sexual Behavior Measure	Correct condom use (at last sex)	Risky sexual behavior (unprotected sex)	Multiple sexual partners	Unprotected sex
Total Contact Time (HIV-Related Contact Time; C)[a]	205 (205)	0 (0)	130 (130)	535 (535)
Total Contact Time (HIV-Related Contact Time; T)[a]	3,025 (1,523)	1,920 (960)	190 (150)	1,060 (500)

Note. C = control group, T = treatment group, B-INFO/I-INFO = brief informational session followed by an intensive informational session; B-INFO/I-IMB = brief informational session followed by intensive information, motivation and behavioral skills training; BMI = brief motivational training; BMI/I-INFO = brief motivational training followed by an intensive informational session; BMI/I-IMB = brief motivational training followed by intensive information, motivation, and behavioral skills training, C & T = counseling and testing.

[a]Contact time estimated where necessary.

Table 3

Weighted Mean Effect Sizes of Depression and Sexual Risk Behavior.

			Depression		Sexual Risk Behavior	
Condition	***k***	***M* weeks**	**ES_+ (95% *CI*)**	**I^2 (95% *CI*)[a]**	**ES_+ (95% *CI*)**	**I^2 (95% *CI*)[a]**
Treatment	13					
First FUP		17	−0.22 (−0.33, −0.10)	80.72 (68.59, 88.16)	−0.33 (−0.56, −0.11)	93.69 (91.02, 95.57)
Last FUP		50	−0.21 (−0.33, −0.09)	83.21 (73.14, 89.50)	−0.29 (−0.39, −0.31)	94.65 (92.51, 96.18)
Control	10					
First FUP		16	−0.27 (−0.41, −0.13)	88.32 (80.59, 92.97)	−0.30 (−0.57, −0.028)	98.07 (97.42, 98.56)
Last FUP		51	−0.28 (−0.42, −0.13)	87.70 (79.41, 92.65)	−0.30 (−0.58, −0.025)	98.15 (97.53, 98.61)
Combined	24					
First FUP		21	−0.24 (−0.33, −0.15)	84.11 (77.45, 88.80)	−0.32 (−0.49, −0.16)	96.62 (95.79, 97.29)
Last FUP		39	−0.24 (−0.33, −0.15)	84.79 (78.52, 89.24)	−0.30 (−0.48, −0.12)	96.88 (96.13, 97.48)

Note. A negative effect size indicates a decrease in depression or sexual risk behavior. *M* = mean, *k* = number of comparisons, ES_+ = Weighted standardized mean difference effect size under random-effects assumptions. *CI* = Confidence interval. FUP = follow-up.

[a]Significance implies rejection of the hypothesis of homogeneity

Table 4

Sexual Risk Behavior as a Function of Control and Intervention Features at Last Follow-Up Assessment.

Features of studies[a]	ES_{+i}[b]	95% *CI* for ES_+	β[c]
Sample Characteristics			
Baseline depression ($k = 24$)			−0.54**
Low (2.82)	0.19	−0.15, 0.53	
High (58.27)	−0.72	−1.03, −0.41	
M age ($k = 27$)			−0.56**
16 years	0.034	−0.31, 0.38	
36 years	−0.55	−0.84, −0.26	
Percent Hispanic/Latina ($k = 24$)			−0.36**
None	−0.087	−0.29, 0.12	
19%	−0.81	−1.17, −0.45	
Type of population			0.58***
Risk group ($k = 8$)	−0.70	−0.94, −0.46	
General population ($k = 16$)	−0.094	−0.27, 0.076	
Intervention Components			
Control content			−0.54**
Wait-list or irrelevant ($k = 5$)	−0.26	−0.36, −0.16	
Relevant ($k = 5$)	−0.44	−0.50, −0.39	
Condom provision			−0.52**
Absent ($k = 14$)	−0.13	−0.34, 0.078	
Present ($k = 10$)	−0.53	−0.78, −0.28	
Condom information			−0.47*
Absent ($k = 11$)	−0.079	−0.32, 0.16	
Present ($k = 13$)	−0.48	−0.70, −0.26	
Counseling and testing			−0.45*
Absent ($k = 11$)	−0.10	−0.35, 0.14	
Present ($k = 13$)	−0.46	−0.68, −0.23	
Intervention Impact on Depression			
Effect size (d) for change in depression ($k = 24$)			0.63***
Large ($d = -0.72$)	−0.82	−1.17, −0.48	
None ($d = 0.087$)	0.053	−0.20, 0.31	

Note. Abbreviations: *CI*, confidence interval; ES_+ = Weighted standardized mean difference effect size.

[a] When the feature is continuous, extremes of the observed feature are estimated.

[b] Values under random-effects assumptions; negative *ES*s imply lower sexual risk behavior at the final available measures; estimates appear for observed extremes of continuous features

[c] Standardized regression coefficient.

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 5

Change in Depression as a Function of Control and Intervention Features at the Last Follow-Up Assessment.

Features of studies	ES_{+i}[a]	95% *CI* for ES_{+}	β[b]
Sample Characteristics			
Percentage of women sample			0.52**
52.5%	−0.082	−0.21, 0.051	
All women	−0.33	−0.42, −0.22	
Type of population			0.34*
Risk group (k = 8)	−0.38	−0.52, −0.24	
General population (k = 16)	−0.16	−0.26, −0.063	
Intervention Components			
Coping/self-management skills			−0.45**
Absent (k = 8)	−0.081	−0.22, 0.063	
Present (k = 16)	−0.31	−0.40, −0.21	

Note. Abbreviations: *CI*, confidence interval; ES_{+} = Weighted standardized mean difference effect size.

[a] Values under random effects assumptions; negative *ES*s imply lower levels of depression at the last evaluation.

[b] Standardized regression coefficient.

* $p < .05$,

** $p < .01$,

*** $p < .001$.