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Secondary Prevention of HIV in the United States: Past, Current, and Future Perspectives

Jeffrey D. Fisher, PhD[*], **Laramie R. Smith, BA**[*], and **Erin M. Lenz, BA**[*]
[*]Center for Health, Intervention, and Prevention (CHIP), University of Connecticut, Storrs, CT

Abstract

Objective—To provide a synopsis of past, current, and potential next-generation approaches to prevention for positives (PfP) interventions in the United States.

Findings/Summary—For a variety of reasons, PfP interventions, with the goals of limiting HIV transmission from people living with HIV/AIDS (PLWHA) to others, and protecting the health of PLWHA, did not appear with any frequency in the United States until about 2000. Even today, the number and breadth of evidence-based PfP interventions is very limited. Nevertheless, meta-analytic evidence demonstrates that such interventions can be effective, perhaps even more so than interventions targeting HIV-uninfected individuals.

We review early and more recent PfP interventions and suggest that next-generation PfP interventions must involve behavioral and biologic components and target any element that affects HIV risk behavior and/or infectivity. Next generation PfP should include increased HIV testing to identify additional PLWHA, components to initiate and maintain HIV care, to initiate antiretroviral therapy (ART) and promote adherence, and to reduce sexual and injection drug use risk behavior, as well as ancillary treatments and referrals to services. Comprehensive next-generation PfP, including all of these elements *and* effective linkages among them, is depicted in Figure 1.

Keywords

Positive prevention; secondary prevention of HIV; prevention for positives interventions; HIV prevention; people living with HIV (PLWHA); behavioral-biologic interventions

INTRODUCTION

Prevention for positives (PfP) interventions are supportive prevention efforts administered to people living with HIV/AIDS (PLWHA) and tailored to their needs. They involve behavioral and biologic strategies (see components B–G, Figure 1) that can benefit the public health by limiting HIV transmission to others, and at the same time, can protect the health of PLWHA by lowering their likelihood of acquiring other pathogens.[1–4] The rationale for PfP interventions as a critical element of HIV prevention involves the fact that

Correspondence and requests for reprints to: Jeffrey D. Fisher, PhD, Director, Center for Health, Intervention, and Prevention (CHIP), and Board of Trustees Distinguished Professor of Psychology, University of Connecticut, 2006 Hillside Rd., Unit 1248, Storrs, CT 06269-1248, USA (Jeffrey.Fisher@uconn.edu), 860/208-4393, 860/486-4940 (fax)..
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all “new” HIV infections must begin with an HIV positive individual, and the finding that some PLWHA who are aware of their antibody status continue to practice risky behavior.[5–9] For these reasons, from an HIV prevention perspective, it can be highly efficient to intervene with PLWHA,[3,10] and highly effective.[1,11,12] Strengthening this argument is that, since large numbers of PLWHA are on ART, HIV prevalence in the United States will continue to rise,[3,13] along with the number of individuals capable of transmitting HIV, and even drug resistant HIV, through risky behavior.[1,3]

About 1.1 million Americans are living with HIV,[13,14] 75% to 80% of whom are aware of their antibody status.[13,15,16] About one third of these PLWHA continue to engage in risk behaviors that can transmit HIV to others.[5–9] Reasons vary widely and include dynamics such as lack of critical information, motivation, and behavioral skills needed to practice safer behaviors, alcohol and drug use, mental health issues, extreme poverty, and intimate partner violence, among others. These have been reviewed elsewhere.[1,17–20]

Despite a critical need, PfP interventions were rare until 2 decades into the US epidemic.[21] The delay in funding and addressing the prevention needs of PLWHA likely occurred because US policy was late in prioritizing this issue. For reasons synthesized in a recent article,[21] policies and programmatic approaches highlighting the importance of PfP emerged only circa 2000.[22–24]

A review paper in 2000 described PfP as a “new issue.”[25,26] In fact, to date, the vast majority of HIV prevention interventions in the United States have *not* focused on the HIV prevention needs of PLWHA. Literally hundreds of HIV prevention intervention studies and many meta-analytic reviews of this work have been published, and almost all of the populations targeted in this work were selected for characteristics *other than* serostatus. 11،21،27 As reported in W. Fisher,[21] of fully 898 HIV prevention interventions between 1988 and 2006 identified in a research synthesis project database of the United States Centers for Disease Control (CDC), only 6.6% were directed at PLWHA, most occurring after 2000. The overall dearth of evidence-based PfP interventions is also manifest in the very small number of such interventions identified by the CDC as “best” or “promising evidence” and targeted for widespread dissemination.[21] This is the case despite strong arguments that PfP interventions, which focus, in part, on serostatus and its effect on HIV risk and preventive behavior, are a critical component of an effective, comprehensive approach to HIV prevention.1،3،10،[21,23,28,29]

EARLY PFP INTERVENTIONS

The first 2 meta-analytic reviews of PfP interventions were conducted on trials published before early 2005 and involved outcomes on sexual risk behavior,11،[12] sexually transmitted infections (STI),[11] and drug use risk behavior.11 Eighteen distinct interventions, meeting strict criteria, were included in these meta-analyses. All but 2 interventions were conducted exclusively within the United States and 14 exclusively targeted PLWHA. Across both meta-analyses, PfP interventions effectively reduced sexual risk, particularly instances of unprotected vaginal or anal intercourse, and did so more effectively than earlier interventions with seronegative populations. Crepaz et al11 also found that PfP interventions targeting biologic end points were effective in reducing STI incidence. However, significant reductions were not observed in number of sex partners12 and in needle-sharing outcomes. [11] Nevertheless, Crepaz et al[11] concluded that the overall magnitude of sexual risk reduction observed across all interventions and end points reviewed implied that PfP would likely be cost-effective in terms of larger-scale health benefits. Meta-analyses also identified specific PfP intervention elements with respect to *intervention design* (eg, theoretically based;

individual vs group level), *content*, *delivery* (eg, by a health care provider or professional counselor), and *population characteristics*, related to more effective outcomes.[11,12]

Our own program of PfP research, the Options Project, was funded by NIMH in 1999 to develop, implement, and rigorously evaluate a PfP intervention delivered by HIV-care providers with PLWHA in a clinical care setting. It was based on the Information–Motivation–Behavioral Skills (IMB) model of HIV risk and prevention.[30–32] In terms of the model, HIV risk behavior in PLWHA, and others, is often associated with weaknesses in individuals' levels of HIV prevention IMB. Individual-level PfP interventions, which address these elements, should lead to sustained increases in HIV prevention. Options involved having providers assess the IMB dynamics of patients' HIV risk behavior and intervene to remediate any weaknesses. US studies revealed that these brief interventions, embedded in regular patient care, led to significant and sustained changes in patient risk behavior.[10,28]

MORE RECENT PFP INTERVENTIONS

Since the two 2006 meta-analyses, additional PfP intervention trials have been published. Two *descriptive* reviews published in 2009 identified 7 new intervention outcome studies and 14 characterizations of interventions under development or investigation. Across both reviews, PfP interventions continued to be effective across a variety of intervention design and delivery processes.[1,33]

Table 1 summarizes all US PfP interventions with *behavioral or biologic* outcomes conducted, evaluated, and published between January 1, 2005 (the approximate cutoff for the two 2006 meta-analyses), and July 13, 2010. We utilized all search terms[1] provided in all previous reviews.[1,11,12,33] Eighteen PfP interventions reporting behavioral or biologic outcomes[10,34–50] are depicted in Table 1. Twenty-seven additional studies were identified reporting intermediate, *prebehavioral* outcomes (eg, information, self-efficacy)[51–53] or characterizing intervention development and implementation processes.[29,54–76] All were identified through searches in PubMed, Psych Info, Cumulative Index to Nursing and Allied Health (CINAHL), and the previous reviews.

Across the 18 studies with behavioral or biologic outcomes, PfP interventions continue to be effective, with all but 3 reducing targeted sexual and/or drug-related risk behaviors; Table 1 provides specifics of relevant studies. Most of the interventions contained elements consistent with those identified earlier as contributing to effective outcomes.[11,12] For example, most were developed using one[10,37,46–48,50] or more[34,38,40–42,45,49] health-behavior theories and were delivered in either an HIV clinic[10,35,36,38,39,42,43,45,48,49] or another HIV service venue,[40,44] and by professional counselors/therapists[40,41,43,44,48,50] or HIV care providers/other medical staff.[1,35,39,49] A relatively small number of interventions targeted multiple HIV risk–related behaviors (eg, increasing disclosure, reducing heavy drinking or drug use, or enhancing coping skills[36,37,40–45,48,50]) *and* targeted biologic transmission risk factors (eg, increased adherence to ART, reduced viral load[37,40,42–45]). Compared to previous reviews,[1,11,33] we note an increase in the number of PfP interventions tailored to risk dynamics unique to specific subpopulations of PLWHA (eg, decreasing sexual risk in substance-using seropositive MSM).[34,40,41,45–47,50,76] Future meta-analysis should evaluate the effectiveness of emerging efforts to use multicomponent and more tailored intervention approaches to reduce overall transmission risk.

[1]Search terms were combined as follows, Group 1 (OR between each term): HIV positive, prevention with positives, prevention for positives, positive prevention, HIV prevention with positives, HIV/AIDS prevention with positives, secondary HIV prevention. Group 2 (OR between each term): prevention, HIV prevention, HIV counseling, transmission, risk behavior, risk reduction, harm reduction. Combine Group 1 AND Group 2 AND intervention.

NEXT-GENERATION PREVENTION FOR POSITIVES

We believe that a synergistic package of PfP interventions at the intersection of behavior and biology will have optimal impact on limiting HIV transmission and maintaining PLWHA health.[1–4,77] In Figure 1, we identify vital components and linkages of a comprehensive behavioral–biomedical conceptualization of next-generation PfP interventions (with an alphanumeric system denoting the various components and paths as well as "movement" within the model—for example, to component C from component B via path i).

All components and linkages need to be co-present and integrated in such an approach. To date, these elements remain separate, unintegrated components of HIV prevention and of treatment science for PLWHA. Finally, we emphasize that the model must be evaluated and supported over the disease course of PLWHA (component A), understanding that what is needed to optimize the effect of each component and path may vary by disease stages[78] and subpopulations (eg, PLWHA who are MSM vs IDU; young vs older PLWHA; incarcerated vs unincarcerated PLWHA; PLWHA with different comorbid conditions38,39,43,48,57,77,79–81).

Critical Components of Next-Generation Prevention for Positives

Increased HIV testing (component B) is a critical element in next-generation PfP. This will identify PLWHA who were previously unaware of their serostatus. When individuals learn they are HIV infected, substantial, self-initiated, postdiagnosis reductions in risk behavior often follow.82,83 Testing may also help reduce the number of PLWHA unaware of their status during periods of increased infectiousness (ie, acute, symptomatic, and late stages), which can affect transmission.4,78 Achieving postdiagnosis linkages to HIV care (component C, path i) to reduce biologic risk of transmission (eg, through identification and treatment of STIs and access to ART medications) as well as ensuring linkages to ancillary services (component G, path x) to address behavioral risk–related contextual factors, are essential.

Initiating and maintaining HIV care (component C) aims to facilitate routine primary care visits and continued monitoring of patients' overall health.84 Routine appointments have been related to lower levels of behavioral79,85,86 and biologic risk (eg, treatment of existing STIs, increased viral suppression, decreased resistance),87–89 whereas prolonged absences from care relate to poorer health outcomes.90,91 Routine care provides ongoing opportunities to reduce biologic transmission through ART initiation (component D, path ii), sustained ART monitoring, and adherence support (component E, path iii). Behavioral risk reduction ideally integrates PfP support (component F, path iv) and referral to ancillary services (component G, path v), addressing contextual risk factors such as social isolation or depression.[4,86,92,93]

Initiation of ART (component D) rapidly curbs viral replication and reduces the amount of viral load present in plasma or genital tracts, reducing biologic risk of transmission and facilitating overall health.[94-97] The relationship between risk behaviors and being on ART or achieving viral suppression is complex, with any increases in risk behavior likely a result of treatment-related beliefs98 and underlying contextual risk factors,[2,18,92] not actual receipt of ART or suppressed viral load *per se*.98 As biologic risk reduction requires sustaining health and high levels of adherence, support in both continuing routine HIV care (component C, path ii) and initial[99] and ongoing access to ART adherence support (component E, path vi) are needed.94,96,100

ART adherence behavioral interventions (component E) sustain viral suppression through enhancing adherence behaviors. Optimal adherence decreases biologic risk by controlling both viral replication and potential to develop treatment resistance.[94,96,101] Meta-analyses report that adherence interventions significantly improve adherence behavior[96,101] and support viral suppression.[101] Co-occurrence of both nonadherence and HIV risk behaviors are often identified, likely resulting from common underlying barriers (eg, substance use, social isolation, psychological distress/depression).[2,18,92] Integration with ongoing PfP behavioral support (component F, path vii) and referral to ancillary services (component G, path viii) to address root contextual risks[4,18,92] can strengthen adherence.

Prevention for positives behavioral interventions (component F) support safer sex and drug use behaviors, and overall health of PLWHA. Meta-analyses of PfP interventions discussed earlier demonstrate their efficacy in reducing behavioral[11,12] and potentially biologic risk (ie, STIs[11]). In the context of existing ART, future PfP interventions need to address ART-related beliefs[98] and integrate ART adherence support (E, path vii). Referrals to or incorporation of ancillary services to address root contextual risks (G, path ix) are also critical.[1,3,48,80,102]

Ancillary treatments and referrals to services (component G) address contextual factors and vulnerabilities that may undermine necessary health behaviors (eg, ability to maintain care, medication adherence, or risk reduction) through referrals to treatment and support services (see a sample list of services in box for component G in Figure 1). These referrals may emanate from HIV testing (component B, path x), HIV care (component C, path v), adherence interventions (component E, path viii), and PfP behavioral interventions (component F, path ix), among other sources. Simultaneously, PLWHA receiving ancillary treatments or services and who are in need of testing, medical care, and behavioral support for existing adherence and risk reduction issues should be identified and connected to other components, as appropriate. For example, HIV testing for high risk individuals (component B, path x), re-engaging PLWHA not in HIV care or who never initiated care postdiagnosis (component C, path v), and providing access to existing adherence (component E, path viii) and risk reduction (component F, path ix) behavioral interventions is critical.

Due to space limitations, our discussion of a comprehensive behavioral–biomedical approach to PfP addresses model components and their links in a somewhat arbitrary, linear fashion. We recognize that the need for any component and relevant linkages could occur along paths not discussed. The next generation of PfP interventions must attend to reducing both behavioral and biologic risk factors across the components in Figure 1 *and* ensure the linkages among them. Fortunately, some emerging PfP interventions are beginning to incorporate elements of behavioral *and* biologic risk reduction, but they are not comprehensive and the links are not always fleshed out.[37,43,45] Future PfP intervention development needs to ensure the linkages among these components are maintained, enhanced, and evaluated.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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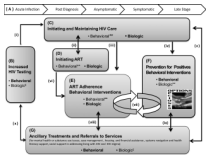

Figure 1.
A comprehensive approach to next-generation prevention for positives. (Degree of evidence supporting behavioral and/or biologic transmission risk: Bold face denotes that there is substantial evidence, ** emerging evidence, or ‡ limited to no support.)

Table 1

US Prevention for Positives Interventions Published in English, Reporting Behavioral or Biologic Transmission Risk Outcomes between January 1, 2005, and June 13, 2010

STUDY **Setting(s)** **Target Population** **Project Name (Date)**	**INTERVENTION DESIGN** **Level of Intervention** **Intervention Delivery** **Intensity–Duration**	**INTERVENTION DESCRIPTION** **Intervention Goal** **Theory** **Intervention Group (G) and Comparison Group (CG) Brief Descriptions**	**OUTCOMES** **Direction and Significance of outcomes in IG vs CG (Behavioral, Biomedical, and Psychosocial Variables)**
Coleman et al (2009)[34] *Setting:* Classroom-like setting *Population*†: PLWHA (age ≥ 50); African American MSM; CLN, COMM *Project*: No name (2006–2007)	RCT (2 arm), feasibility pilot test *Level*: Group *Delivery*: By group facilitators, Cog–Behavioral techniques *Intensity–Duration*: 4 sessions (120 min ea); 1 mo duration; last FU 3 mo	*Goal*: Increase proportion of consistent condom use for each anal sex act *Theory*: SCT, TRA, TPB *IG* (*n* = 30): Taught condom negotiation skills with role-play and contextual risk negotiation, provided health-focused information *CG* (*n* = 30): Time-and-attention–matched, health-focused control arm	*Sex outcomes* ↑Consistent condom use total sample: Observed in both arms, slight trend in IG arm ↑Consistent condom use if inconsistent at BL: Trend ↓ Proportion of MSM with multiple partners: Trend
Fisher et al (2006)[10] *Setting*: 2 HIV clinics *Population*: PLWHA, CLN *Project*: Options/Opciones (2000–2003)	Quasi-experimental (2 arms) *Level:* Individual *Delivery:* By HIV providers during routine care visits; MI approach *Intensity–Duration:* ~ 6 sessions (5–10 min ea); 18 mo duration; last FU 18 mo	*Goal*: Reduce UVA/O through brief, ongoing risk reduction counseling *Theory*: IMB *IG* (*n* = 252)‡: Patient-centered conversations around sex or drug use behaviors; assess readiness to address risk behaviors, provide risk reduction strategy options, develop tailored risk reduction goal *CG* (*n* = 245)‡: Standard of care, risk counseling at providers' discretion	*Sex outcomes* ↓ UVA/O all partners: SIG ↓ UVA/O HIV-/? partners: Trend ↓ No. of HIV- /? partners: Trend *Drug outcomes* Low response rate, not analyzed
Gardner et al (2008)[35] *Setting*: 7 HIV clinics *Population*†: PLWHA, CLN *Project*: Positive Steps (2005–2006)	Pre–post (1 arm); demonstration project *Level:* Individual *Delivery*: By HIV providers during routine care visits *Intensity–Duration*: ~ 3 sessions (~ 3 min ea); 12 mo duration; last FU 12 mo	*Goal:* Evaluate reduced risk of transmission in multiclinic study *Theory*: N/A *IG* (*n* = 767)‡: Screen for risk, deliver risk reduction messages, and create risk reduction plan with providers; provide supplemental brochures and posters *CG*: N/A; longitudinal cohort, with only participants who had data at all time points included in analysis	*Sex outcomes* ↓ UVA all partners: SIG ↓ UVA HIV-/? partners: SIG ↓ UVA HIV+ partners: SIG *Drug outcomes* Low response rate, not analyzed *STI outcomes* Low BL prevalence, not analyzed
Gilbert et al (2008)[36] *Setting*: 5 HIV clinics *Population*†: PLWHA, CLN *Project*: Positive Choice (2003–2006)	RCT (2 arms) *Level:* Individual *Delivery*: By computers during routine care visits; MI approach *Intensity–Duration*: 2 sessions (~ 24 min ea); 3 mo duration; last FU 6 mo	*Goal:* Reduce illicit drug use, risky alcohol consumption, and UVA *Theory*: N/A *IG* (*n* = 243): Computer-based risk assessment preceding a tailored "Video Doctor" risk reduction counseling session; printout of behavioral assignment and referrals for substance use and harm-reduction services *CG* (*n* = 233): Computer-based risk assessment, followed by standard of care, risk counseling at providers' discretion	*Sex outcomes* ↓ UVA: SIG ↑ Condom use all partners: Trend observed in both arms, no difference between arms ↓ No. casual partners: SIG# *Drug outcomes* ↓ Drug use: SIG ↓ Mean days of ongoing drug use: Trend ↓ Alcohol risk: Observed in both arms, no difference between arms
The Healthy Living Project (2007)[37] *Setting*: 4 sites (HIV clinic, research, and community service sites) *Population*†: PLWHA, CLN, COMM *Project:* The Healthy Living Project (2000–2004)	RCT (2 arms) *Level*: Individual *Delivery*: By facilitators; Cog–Behavioral techniques *Intensity–Duration*: 15 sessions (90 min. ea); 5 mo duration; last FU 25 mo	*Goal:* Reduce number of sex-related risk acts with HIV-/? partners, execute effective coping responses, enhance adherence with PLWHA ≤ 85% adherent at BL *Theory*: Social Action Theory *IG* (*n* = 467)‡: 3 modules focused on stress, coping, and adjustment; reducing transmission risk behaviors; enhancing health promotion via adherence to medical care and ART *CG* (*n* = 469)‡: Wait-list control comparison group	*Sex outcomes* ↓ Mean no. sex risk acts with HIV-/? partners: SIG# ↓ No. sex risk acts with HIV-/? partners from BL: Observed in both arms, no difference between arms *Adherence outcomes* ↑ Adherence in nonadherers at BL: SIG# *Psychosocial outcomes* Changes in psychosocial adjustment: NS

STUDY Setting(s) Target Population Project Name (Date)	INTERVENTION DESIGN Level of Intervention Intervention Delivery Intensity–Duration	INTERVENTION DESCRIPTION Intervention Goal Theory Intervention Group (G) and Comparison Group (CG) Brief Descriptions	OUTCOMES Direction and Significance of outcomes in IG vs CG (Behavioral, Biomedical, and Psychosocial Variables)
			Changes in psychosocial adjustment among PLWHA with depressive symptoms at BL: NS
Illa et al (2010)[38] *Setting*:1 HIV clinic *Population*†: PLWHA (age ≥ 45); CLN *Project*: Project ROADMAP (2004–2006)	RCT (2 arms) *Level*: Group *Delivery*: Based on Project INSPIRE[45] *Intensity–Duration*: 4 sessions (1–2.5 hr ea); intervention duration NR; last FU 6 mo	*Goal:* Target sexual risk reduction in older PLWHA *Theory*: IMB, Self-Efficacy Theory *IG* (*n* = 149)‡: Tailored psychoeducational group sessions to address HIV, its effects on sexual behaviors, and harm reduction approaches; safer-sex negotiation skills and strategies for older PLWHA *CG* (*n* = 92): Received educational brochure, followed by standard of care	*Sex outcomes* ↓ UVA all partners: SIG ↓ UVA HIV-/? partners: SIG ↓ UVA HIV+ partners: NS *Psychosocial outcomes* ↑ HIV knowledge: Observed in both arms, no difference between arms ↑ Sexual self-efficacy: NS
Lightfoot et al (2010)[39] *Setting*: 6 HIV clinics *Population*: PLWHA, CLN *Project*: No name (2001–2004)	Quasi-experimental (3 arms) *Level*: Individual *Delivery*: By computer or HIV provider/staff during routine care visits; FRAMES *Intensity–Duration*: ≤ 11 sessions (10 min ea computer, 5–15 min ea providers); 30 mo duration; last FU 30 mo	*Goal*: Provide brief risk reduction intervention to enhance motivation and encourage PLWHA to act in accordance with their values *Theory:* N/A *IGs* 2 intervention conditions: Computer-delivered arm (IG-1, *n* = 325)‡; provider-delivered arm (IG-2, *n* = 209)‡; assess/provide feedback on behavior and personal values; enhance self-efficacy and behavior change *CG* (*n* = 229)‡: Standard of care provided in control comparison clinics	*Sex outcomes* ↓ No. of HIV-/? partners: SIG (IG-1 compared to IG-2 and CG arms) ↓ UVA HIV-/? partners: SIG (IG-1 compared to CG arm)
Margolin et al (2007)[40] *Setting:* 1 methadone clinic *Population:* PLWHA, methadone-maintained drug users, COMM *Project:* 3-S+ Therapy (dates NR)	Quasi-experimental, pre–post (2 arm) *Level:* Individual *Delivery:* Therapist-led; Cog–Behavioral and Buddhist psychologies *Intensity–Duration:* 12 sessions (session time NR); 3 mo duration; last FU 3 mo	*Goal:* Increase motivation for abstinence, HIV prevention, and medication adherence; decrease impulsivity in HIV-positive drug-using population *Theory:* Cognitive Self Schema Theory, Buddhist principles *IG* (*n* = 21)‡: Weekly therapy focused on replacing addict self-schema with a spiritual self-schema; and on increasing awareness of addiction and its impact on adherence, risk, and HIV care behaviors *CG* (*n* = 17)‡: Standard-of-care methadone-maintenance therapy; nonrandomized; participants elected to complete preassessments and postassessments only	*HIV risk outcomes (low response rate)* ↓HIV transmission risk behaviors: NS *Drug outcomes* ↓ Intoxicant use: Trend ↑ Motivation for drug abstinence: SIG *Psychosocial outcomes* ↓Impulsivity: SIG ↑ Mean influence of spirituality on motivation for health-promoting behaviors: SIG
Mausbach et al (2007)[41] *Setting*: NR *Population*†: PLWHA, MSM who use methamphetamines, CLN, COMM *Project:* EDGE (1999–2004)	RCT (2 arms) *Level*: Individual *Delivery*: Therapist-led; MI approach *Intensity–Duration*: 8 sessions (90 min ea); 3 mo duration; last FU 12 mo	*Goal:* Increase safer sexual behaviors in presence of methamphetamine use *Theory:* SCT, TRA *IG* (*n* = 170)‡: Targeted skills training and problem solving to enhance knowledge and self-efficacy with condom use/negotiation; serostatus disclosure to partners in context of ongoing substance use *CG* (*n* = 171)‡: Time–attention control diet and exercise sessions	*Sex outcomes* ↓ Total UVA over time: NS ↑ Proportion protected sex acts: SIG ↑ No. protected sex acts over time: SIG *Psychosocial outcomes* ↑ Self-efficacy condom use: SIG ↑ Self-efficacy condom negotiation: observed in both arms, no difference between arms
Mitchell et al (2007)[42] *Setting:* 1 HIV clinic *Population:* PLWHA, marginally housed, substance-using, CLN *Project:* DAART+ (2003–2006)	Pre–post (1 arm), feasibility pilot *Level:* Individual *Delivery:* By case managers; strengths-based approach *Intensity–Duration:* Daily mDOT sessions tapered to	*Goal:* Support adoption and maintenance of medication adherence and HIV risk reduction behaviors *Theory:* TTM Stages of Change, IMB *IG* (*n* = 30)‡: Integrated discussions on adherence barriers and current sex and	*Sex and drug outcomes (low response rate)* ↓ Sexual and substance-using risk behaviors: NS *Viral load outcomes* Viral load data for participants with final

STUDY Setting(s) Target Population Project Name (Date)	INTERVENTION DESIGN Level of Intervention Intervention Delivery Intensity–Duration	INTERVENTION DESCRIPTION Intervention Goal Theory Intervention Group (G) and Comparison Group (CG) Brief Descriptions	OUTCOMES Direction and Significance of outcomes in IG vs CG (Behavioral, Biomedical, and Psychosocial Variables)
	biweekly, then monthly; 12 mo duration; last FU 3–6 mo	substance-use behaviors in the context of mDOT *CG*: N/A; longitudinal cohort, with no comparison group available	assessment (n = 18), 83% achieved viral suppression
Naar-King et al (2009)[43] *Setting:* 5 HIV clinics *Population*†: PLWHA (aged 16–24), multiple risk factors, CLN *Project:* Healthy Choices (2005–2007)	RCT (2 arm) *Level:* Individual *Delivery:* Therapist-led; MI approach *Intensity–Duration:* 4 sessions (60 min ea); 2.5 mo duration; last FU 9 mo	*Goal:* Enhance viral response in young PLWHA with multiple transmission–related risk behaviors *Theory:* N/A *IG* (n = 94): MI sessions to address two risk factors (eg, nonadherence; sex or drug risk) and access to enhanced support services for sexual risk, drug use, mental health, and medication adherence *CG* (n = 92)‡: Standard of care, access to enhanced support services	*Viral load outcomes* ↓ Viral load: SIG#
Petry et al (2010)[44] *Setting:* HIV drop-in center *Population:* PLWHA, cocaine or opioid dependent diagnosis, COMM *Project:* No name (2003–2007)	RCT (2 arm) *Level:* Group *Delivery:* Therapist-delivered *Intensity–Duration:* 24 sessions (60 min ea); 6 mo duration; last FU 12 mo	*Goal:* Assess efficacy of contingency-based rewards on supporting and sustaining both health and substance use reduction behaviors *Theory:* N/A *IG* (n = 89): Support group with contingency-based rewards provided for substance use abstinence and completion of health enhancement components; integrated support and substance use reduction messages *CG* (n = 81): 12 Step–based group support, abstinence messages	*Sex outcomes* ↓ Sexual risk scores: SIG# *Drug outcomes* ↓ Drug risk scores: NS ↑ No. consecutive drug-free urine tests: SIG ↑ Proportion drug-free urine tests: NS *Viral load outcomes* ↓Viral load: SIG#
Purcell et al (2007)[45] *Setting:* 4 community health centers *Population*†: PLWHA, IDU, COMM *Project:* INSPIRE (2001–2005)	RCT (2 arm) *Level:* Individual, group *Delivery:* By paraprofessionals *Intensity–Duration:* 10 sessions (session time NR); 1.25 mo duration; last FU 12 mo	*Goal:* Reduce sexual and injection risk behaviors, increase utilization of HIV care and adherence to ART *Theory:* SLT, Social Identity Theory, IMB *IG* (n = 486): Focus on motivation/skills for increasing use of HIV care, for adherence, and for reducing sex and drug risk behaviors through developing new social role as a peer–mentor *CG* (n = 480): Discuss videos focusing on information for HIV-infected IDU	*Sex and injection-drug outcomes* ↓ Sex and injection risk: Observed in both arms, no difference between arms *Health care utilization outcomes* ↑ Care utilization: NS *Adherence outcomes* ↑ Adherence: NS
Rosser et al (2010)[46] *Setting:* 6 community sites *Population*†: PLWHA, MSM, CLN, COMM *Project:* Positive Connections (2005–2008)	RCT (3 arms) *Level:* Group *Delivery:* By HIV+ MSM-identified or MSM-identified health professional facilitators (matched to intervention arm) *Intensity–Duration:* 1 session (14–16 hr); 1 weekend long; last FU 18 mo	*Goal:* Reduce frequency of serodiscordant UAI *Theory:* Sexual Health Model *IGs* across 2 arms: Health seminars identified and address sexual health and HIV risk concerns from an HIV+ MSM (IG-1, n = 248)‡ or general, serostatus-neutral, MSM (IG-2, n = 237)‡ perspective *CG* (n = 190)‡: Viewed and evaluated MSM HIV prevention–focused DVDs	*Sex outcomes* ↓ Frequency of serodiscordant UAI: observed in all 3 arms, no difference between arms *Psychosocial outcomes* ↑ Intentions to avoid high-risk behaviors: SIG# (IG-1 and IG-2 arms)
Serovich et al (2009)[47] *Setting:* NR *Population:* PLWHA, MSM, COMM *Project:* No name (dates NR)	Randomized control, crossover design (3 arms); pilot study *Level:* Individual *Delivery:* By facilitator, or computer and facilitator *Intensity–Duration:* 4 sessions (session time NR); 1 mo duration; last FU 3 mo	*Goal:* Reduce UAI and enhance disclosure to casual partners in MSM *Theory:* Consequences Theory of Disclosure *IGs* 2 intervention conditions: One with facilitator risk assessment and facilitator delivery (IG-1, n=40)§, the other with computer risk assessment and facilitator delivery (IG-2, n=37)§; both assessed cost and benefits of disclosure and disclosure triggers and strategies *CG* (n = 21)§: Wait-list control condition	*Sex outcomes (small sample size, low response rate CG)* ↓ Mean frequency of UAI all partners: NS; increased odds of UAI observed in both IG-1 and IG-2 compared to CG arm, despite a reduction in UAI over time in IG-1 arm *Disclosure outcomes* ↑ Favorable disclosure attitudes: SIG (IG-1 arm) ↑ Favorable disclosure behaviors: Trend (IG-1 arm)

STUDY **Setting(s)** **Target Population** **Project Name (Date)**	**INTERVENTION DESIGN** **Level of Intervention** **Intervention Delivery** **Intensity–Duration**	**INTERVENTION DESCRIPTION** **Intervention Goal** **Theory** **Intervention Group (G) and Comparison Group (CG) Brief Descriptions**	**OUTCOMES** **Direction and Significance of outcomes in IG vs CG (Behavioral, Biomedical, and Psychosocial Variables)**
			↑ Favorable intentions to disclose: NS
Sikkema et al (2008)[48] *Setting:* 1 community health center *Population:* PLWHA, childhood sexual abuse–related trauma, CLN, COMM *Project:* LIFT (2002–2004)	RCT (2 arms) *Level:* Group *Delivery:* By cotherapists; Cog–Behavioral and coping strategies *Intensity–Duration:* 15 sessions (90 min ea); 3.75 mo duration; last FU 12 mo	*Goal:* Improve coping and reduce sexual risk behavior in PLWHA with childhood sexual abuse history *Theory:* Cognitive Theory of Stress and Coping *IG* (n = 124)[‡]: Taught adaptive coping and problem-solving strategies to identify individual triggers and select goals; skills building for dealing with sexual abuse–related trauma and risk reduction *CG* (n = 123)[‡]: Time-matched HIV support group comparison condition	*Sex outcomes* ↓ UAV all partners: SIG ↓ UAV HIV-/? partners: SIG
Teti et al (2010)[49] *Setting:* 1 HIV clinic *Population:* PLWHA, women, CLN *Project:* Protect and Respect (2004–NR)	RCT (2 arms) *Level:* Individual, group *Delivery:* 3 components (by HIV providers during routine care visits, health educators, HIV+ peers) *Intensity–Duration:* Provider sessions (3–5 min ea), health education group 5 sessions (1.5 hrs/wk), optional peer support group (1 hr/wk); 1.25 mo duration; last FU 18 mo	*Goal:* Support HIV+ women in decreasing UVA and other sexual risks; increase serostatus disclosure to partners *Theory:* TTM Stages of Change, Modified AIDS Risk Reduction Model, Theory of Gender and Power *IG* (n = 92)[‡]: Brief risk reduction conversation with HIV providers; health educator–led group sessions for sexual risk reduction education and skills building; weekly HIV+ peer-led support group to discuss skills *CG* (n = 92)[‡]: Standard of care; brief provider risk-reduction messages	*Sex outcomes* ↑ Condom use during vaginal/anal intercourse: Trend *Disclosure outcomes* ↑ Proportion of partners disclosed serostatus to: SIG[#] ↑ Total no. partners disclosed serostatus to: NS
Velasquez et al (2009)[50] *Setting:* NR *Population*[†]: PLWHA, MSM with diagnosed alcohol use disorder, COMM *Project:* Positive Choices (1999–2003)	RCT (2 arms) *Level:* Individual, group *Delivery:* By therapist and HIV+ MSM group facilitators; MI approach *Intensity–Duration:* 8 sessions (session time NR); 2 mo duration; last FU 12 mo	*Goal:* Reduce both alcohol use and unprotected sexual behaviors *Theory:* TTM Stages of Change and Processes of Change *IG* (n = 118)[‡]: Individual therapy sessions enhanced motivation and skills to change alcohol, sexual behavior; peer support group sessions focused on HIV risk reduction and safer sexual behaviors *CG* (n = 135)[‡]: Resource referral control condition	*Sex and drinking outcomes* ↓ No. days with both UAI and heavy drinking: SIG[#] *Drinking outcomes* ↓ No. drinks in past 30 days: SIG[#] ↓ No. heavy drinking days in past 30 days: SIG[#]

* **STUDY**: PLWHA denotes adults living with HIV aged 18 or older, unless otherwise noted; CLN, HIV medical clinic–based sample; COMM, community-based sample; IDU, injection drug users; NR, information not reported in manuscript. **INTERVENTION DESIGN:** ea, each; mo, months; min, minutes; FU, follow-up; Cog–Behavioral, cognitive-behavioral intervention delivery techniques; MI, motivational interviewing intervention delivery techniques; FRAMES, Feedback–Responsibility–Advise–Menu of Options–Empathy–Self-Efficacy; mDOT, Modified Directly Observed Therapy. **INTERVENTION DESCRIPTION:** IG, intervention group; CG, comparison group; BL, baseline assessment; SCT, Social Cognitive Theory; TRA, Theory of Reasoned Action; TPB, Theory of Planned Behavior; IMB, Information–Motivation–Behavioral Skills Model; TTM, Transtheoretical Model; SLT, Social Learning Theory. **OUTCOMES:** Trend, a nonsignificant trend was observed in the IG; UAI/UVA/UVAO, unprotected anal, vaginal–anal, vaginal–anal–oral intercourse; HIV-/?, HIV negative or status unknown; SIG, changes in outcomes between the IG and CG were significant ($p \leq 0.05$); NS, changes in outcome between IG and CG were nonsignificant ($p \leq 0.05$).

[†]Participants were screened for recent history of risk behaviors and/or sexual activity.

[‡]Attrition rates > 20% as reported or calculated based on sample size reported at BL and last FU.

[§]Sufficient information to calculate attrition was not provided.

[#]Significant difference between IG and CG shows some decay over time.