The Effectiveness of Individual-, Group-, and Community-Level HIV Behavioral Risk-Reduction Interventions for Adult Men Who Have Sex with Men
A Systematic Review

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Abstract: This article presents the results of a systematic review of the effectiveness and economic efficiency of individual-, group-, and community-level behavioral interventions intended to reduce the risk of acquiring sexually transmitted HIV in adult men who have sex with men (MSM). These results form the basis for recommendations by the Task Force on Community Preventive Services on the use of these interventions. Sexual risk behavior and condom use were the outcomes used to assess effectiveness. Intervention effectiveness on biological outcomes could not be assessed because too few studies of adequate quality have been published. The evidence found in our review shows that individual-level, group-level, and community-level HIV behavioral interventions are effective in reducing the odds of unprotected anal intercourse (range 27% to 43% decrease) and increasing the odds of condom use for the group-level approach (by 81%). The Task Force concluded that the findings are applicable to MSM aged 20 years or older, across a range of settings and populations, assuming that interventions are appropriately adapted to the needs and characteristics of the MSM population of interest. Based on findings from economic evaluation studies, the Task Force also concluded that group- and community-level HIV behavioral interventions for adult MSM are not only cost effective but also result in actual cost savings. Additional information about other effects, barriers to implementation, and research gaps is provided in this paper. The recommendations based on these systematic reviews are expected to serve the needs of researchers, planners, and other public health decision makers.
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Introduction

Recent surveillance reports of people newly diagnosed as infected with HIV indicate that men who have sex with men (MSM) are the people most affected by the global epidemic in the United States,[1] Canada,[2] the United Kingdom,[3,4] Australia,[5,6] New Zealand,[7] and countries of Latin America and the Caribbean.[8,9] Of newly diagnosed AIDS cases among U.S. men reported in 2004, an estimated 63% were among men infected through sexual contact with other men.[1] Similarly, nearly half of all newly diagnosed HIV infections among men residing in 19 Western European countries were acquired through homosexual or bisexual contact.[10]

Increasing rates of syphilis diagnoses in the U.S.[11,12] and recent outbreaks of syphilis and gonorrhea in several major European cities[3,13–16] indicate a trend for higher sexual risk-taking behavior of MSM.[9,17–22] These global data emphasize the potential for increased rates of HIV

transmission among MSM,[23] and underscore the need for integrated HIV and sexually transmitted disease (STD) behavioral prevention strategies to avert new infections.[24] As part of a comprehensive strategy across the continuum of HIV prevention and care, behavioral interventions remain an important tool in the global fight against HIV,[25] along with other prevention efforts such as the development of an effective vaccine[26] and identification and treatment of infected individuals.[27,28]

Given the potential variability in effectiveness and cost effectiveness of behavioral interventions to reduce the spread of HIV and other STDs among MSM, it is important to conduct ongoing systematic reviews of the empirical literature to identify effective intervention approaches and to synthesize the evidence for HIV interventions targeting this population. Previous qualitative[29–33] and quantitative[34–38] reviews have shown that HIV behavioral interventions for adult MSM are effective in reducing risky sex behavior and maintaining safer sex practices. This review differs from previous reviews by using the criteria developed by the Task Force on Community Preventive Services[39] to develop recommendations for the use of HIV prevention interventions targeting adult MSM. This review assesses the overall effectiveness of person-to-person HIV behavioral interventions designed to promote change in sex behaviors (e.g., increase condom use, decrease unprotected anal intercourse (AI), and reduce number of sex partners) that reduce the likelihood of HIV acquisition. Thus, we reviewed studies of HIV behavioral interventions only if they involved the provision of relevant information, training, or support through a personal interaction between a deliverer and an MSM. These interactions typically occur within a traditional counseling relationship (individual-level intervention), small groups (group-level intervention), or a defined community (community-level intervention). Such interactions are designed to promote individual behavior change and, in community interventions, widespread change in individual beliefs about social norms in the community. Therefore, this review classifies interventions according to level of delivery, a classification consistent with the research literature.[40–42] In addition, this classification has important implications for HIV prevention planners and providers because levels of delivery may vary by types of organizational capacity needed for implementation and may vary in public health impact.[43]

Person-to-person behavioral interventions vary not only by level of delivery (individual, group, or community),[33,40,41,43,44] but also by type of deliverer (e.g., volunteers or paid professionals), delivery setting (e.g., clinics, bars, telephone), or specific intervention content (e.g., partner negotiation, planning and decision making about risk reduction, how to use a condom). Therefore, a secondary goal of this review is to identify intervention components associated with intervention efficacy.

The *Guide to Community Preventive Services*

The systematic review in this report represents the work of the independent, nonfederal Task Force on Community Preventive Services (Task Force). The Task Force is developing the *Guide to Community Preventive Services* (*Community Guide*)[39] with the support of the U.S. Department of Health and Human Services in collaboration with public and private partners. The Centers for Disease Control and Prevention (CDC) provides staff support to the Task Force for development of the *Community Guide*. The book, *The Guide to Community Preventive Services: What Works to Promote Health?* (Oxford University Press, 2005; also available at www.thecommunityguide.org) presents the background and methods used in developing the *Community Guide*.[39]

Task Force recommendations are based primarily on the effectiveness of each type of intervention in improving important outcomes as determined by the systematic literature review process. In making its recommendations, the Task Force balances information about effectiveness with information about other potential benefits and harms of the intervention itself. The Task Force also considers the applicability of the intervention to various settings and populations in determining the scope of the recommendation. Finally, the Task Force reviews economic analyses of effective interventions, where available. Economic information is provided to assist the reader with decision making, but generally does not affect Task Force recommendations.

Healthy People 2010 Goals and Objectives for Prevention of HIV

The interventions reviewed here may be useful in reaching objectives specified in *Healthy People 2010*,[45] the disease prevention and health promotion agenda for the U.S. (Table 1). The interventions included in this review focus on these objectives in their goal of promoting positive changes in sex behaviors associated with HIV acquisition.

Recommendations from Other Advisory Groups

Both the Presidential Advisory Council on HIV/AIDS in 1996[46] and the CDC's Advisory Committee on HIV and STD Prevention in 2001[47] recommended continued research, development, implementation, and evaluation of evidence-based HIV behavioral interventions to reduce risky sex behavior of MSM. In addition, in 1997 the National Institutes of Health[48] recommended that effective behavioral interventions for MSM be used to aggressively promote safer sex behavior that could avert tens of thousands of new HIV infections and

Table 1. Selected *Healthy People 2010*[45] objectives related to reducing the spread of HIV and STDs

Objective	Population	Baseline	2010 Objective
Reduce AIDS among adolescents and adults (Objective 13-1)	Persons aged ≥13 years	19.5 cases per 100,000 population (1998)	1 case per 100,000 population
Reduce the number of new AIDS cases among adolescent and adult men who have sex with men (13-2)	Males aged ≥13 years	17,847 new cases of AIDS (1998)	13,385 new cases
Reduce the number of cases of HIV infection among adolescents and adults (13-5)	Adolescents and adults	Developmental	
Increase the proportion of sexually active persons who use condoms (13-6b)	Males aged 18 to 49 years	Developmental	
Reduce deaths from HIV infection (13-14)	All	4.9 per 100,000 population (1998[a])	0.7 per 100,000 population

[a]Age adjusted for the year 2000 standard population.
STD, sexually transmitted disease.

potentially save millions of dollars in healthcare costs. From an international perspective, UNAIDS issued a policy position paper in June 2005 for intensifying global HIV prevention by endorsing the promotion of programs targeting the HIV prevention needs of key affected groups and populations, and the removal of barriers to effective, evidence-based HIV prevention among vulnerable or at-risk groups, including MSM.[8]

Methods

The *Community Guide* methods for conducting systematic reviews and linking evidence to effectiveness are described elsewhere[39,49,50] and on the *Community Guide* website (www.thecommunityguide.org/methods). In brief, for each *Community Guide* review topic, a systematic review development team representing diverse disciplines, backgrounds, and work settings conducts a review by (1) developing an approach to identify, organize, group, and select interventions for review; (2) developing an analytic framework depicting interrelationships among interventions, populations, and outcomes; (3) systematically searching for and retrieving evidence; (4) assessing and summarizing the quality and strength of the body of evidence of effectiveness; (5) translating evidence of effectiveness into recommendations; (6) summarizing data about applicability (i.e., the extent to which available effectiveness data might apply to diverse population segments and settings), economic impact, and barriers to implementation; and (7) identifying and summarizing research gaps.

This review was conducted by a systematic review development team comprising staff from the Community Guide Branch and the HIV/AIDS Prevention Research Synthesis (PRS) Project team from the Division of HIV/AIDS Prevention (DHAP) at CDC. Review of drafts and consultation on specific issues were provided by a multidisciplinary team of specialists and consultants representing a variety of perspectives on HIV prevention (HIV Coordination Team; see Acknowledgments).

Conceptual Model

The conceptual model used in these reviews describes a systematic examination of person-to-person HIV behavioral interventions that seek to reduce HIV risk in adult MSM. The relationships among interventions, mediators of behavior change, sex risk behavioral outcomes, incident HIV or STD biological outcomes, and long-term health and quality-of-life outcomes are depicted in the analytic framework (Figure 1). Because this review evaluates interventions according to level of delivery, individual-, group-, and community-level interventions are each listed under the HIV behavioral risk-reduction intervention approach. Regardless of delivery method, all person-to-person HIV behavioral interventions address one or more of the theory-based mediators thought to drive behavior change. The presentation of mediators derived from multiple behavioral science theories rather than a single theoretical paradigm is consistent with the fact that many researchers draw from multiple theoretical approaches when developing HIV behavioral interventions. These include increasing relevant knowledge about HIV and risk reduction, changing key attitudes such as fatalism or unwarranted optimism about the likelihood of a cure, addressing emotional states such as depression that may trigger risky behavior, stimulating the development of new norms and support for safer sex, providing training and rehearsal of specific skills such as condom use, and facilitating increased use of relevant services and supplies, such as condoms.

The primary sexual risk behavior outcomes include unprotected AI, use of condoms during AI, and number of sex partners. Each of these outcomes has been empirically linked to acquisition of HIV[51,52] and other STDs.[53] Two other behaviors included in the model are vaginal intercourse, to capture the possibility of female to male transmission of HIV among those MSM who have female as well as male partners, and oral intercourse, because of the small but non-zero possibility of receptive oral sex as an independent risk factor for HIV transmission.[54] The relevant biological outcomes include incident HIV and STD. The more distal long-term outcomes of AIDS morbidity and mortality and quality of life were seldom measured in the primary studies in this systematic review.

Search for Evidence

In collaboration with reference librarians, using search parameters developed by the PRS Project team,[55] we developed a comprehensive strategy to search for studies evaluating
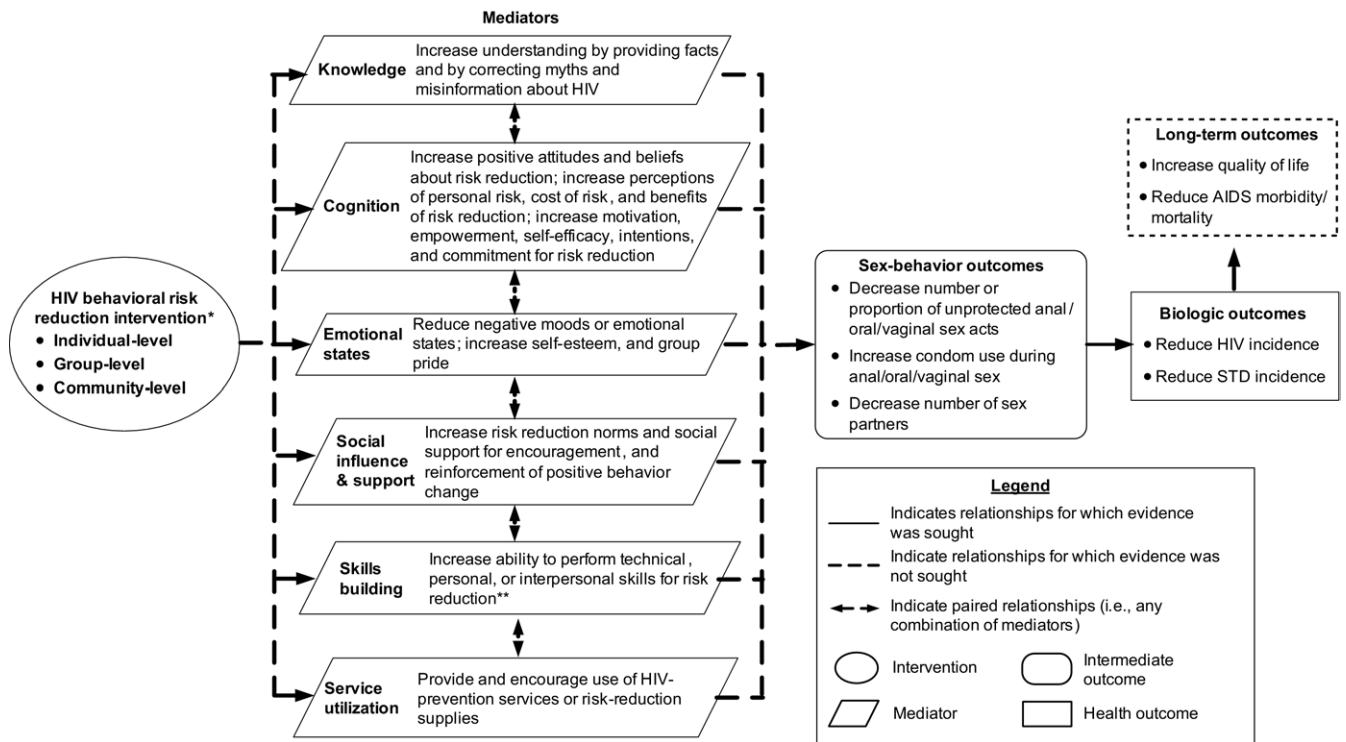
Figure 1. Analytic framework for HIV behavioral risk-reduction interventions among MSM. *Person-to-person HIV risk reduction intervention designed to promote positive change in sex behaviors associated with HIV or STD acquisition in MSM. Mechanisms of change include one or more of the following: knowledge, emotional states, social influence, skills, and use of HIV prevention services or risk-reduction supplies. **Technical skills include proper use of risk-reduction supplies (e.g., condoms). Personal skills include problem solving or self management; interpersonal skills include communication or negotiation. MSM, men who have sex with men.

interventions to reduce behaviors linked to HIV transmission and infection in populations of adult MSM. The literature search was initiated in January 2004 and updated in August 2004 using tailored electronic search strategies for each of the following databases: EMBASE, MEDLINE, PsycINFO, and SocioFile. The specifications of the electronic search involved controlled vocabulary (e.g., MeSH or indexing terms) and keywords in four areas: (1) HIV, AIDS, or sexually transmitted disease; (2) prevention research methods (e.g., intervention, evaluation, education); (3) sex risk behaviors and biological outcomes; and (4) target population (e.g., MSM). Searches were limited to literature published or accepted for publication in English-language journals between 1985 and August 2004.

To reduce gaps in the automated search caused by indexing lags in the electronic databases, the *Community Guide* staff conducted manual searches using the Internet, reference lists of reviewed articles, and referrals from HIV specialists at the CDC and members of the HIV Coordination Team. The PRS Project Team also supplemented the automated search by conducting a hand search of over 35 key journals published from August 2004 through June 2005 using the same domains as the automated search, searching published conference abstracts from national and international HIV/AIDS and STD conferences, searching the online Cochrane Controlled Trials Register and the National Institutes of Health's Computer Retrieval of Information on Scientific Projects (CRISP) database, and contacting principal investigators regarding their current and ongoing research and publications.

Study Selection and Quality Assessment

To be considered for inclusion in the review of effectiveness, studies had to (1) evaluate an HIV/AIDS or STD behavioral intervention that met the definition of a person-to-person risk reduction intervention; (2) target adult MSM (i.e., average age ≥20 years), (3) compare outcomes among groups of people exposed to the intervention with outcomes among groups of people not exposed, less exposed, or delayed in exposure to the intervention; and (4) measure at least one sex behavior or biological outcome included in the analytic framework.[49]

This review was restricted to interventions focusing on MSM aged ≥20 years and not identified as infected with HIV. This restriction assumes that important differences may exist between adolescent and adult MSM in patterns of behaviors, attitudes, and underlying processes for behavior change.[21,43,56–58] Such differences may also exist between HIV-infected and uninfected MSM.[27,59] As such, intervention content for adolescent and HIV-infected MSM are contextually different enough to warrant separate review. Because of these differences, this review focused on the prevention of HIV acquisition among adult MSM, and interventions that specifically targeted adolescent MSM[60,61] or HIV-infected MSM[62,63] were excluded. This review also excluded interventions that were not delivered in a person-to-person format, such as structural interventions (e.g., policy changes), mass media campaigns, and condom distribution programs.

Of the 664 titles and abstracts screened, 53 full reports met the preliminary inclusion criteria. Of these, 22 articles were eliminated from further consideration because they either reported on a study already included in the review or had other disqualifying limitations. This left a total of 31 candidate studies. Each candidate study was read by at least two reviewers from the systematic review development team, using a standard abstraction form to record information from the study (available at www.thecommunityguide.org/methods/abstractionform.pdf).[50] Each candidate study was assessed for suitability of its study design and threats to internal validity, as described previously.[49] Disagreements between reviewers were reconciled by consensus among the review team members. Our classification of study designs is in accord with the standards of the *Community Guide* review process, and sometimes differs from the classification used in the original studies. Studies with greatest design suitability are those in which data on exposed and control populations are collected prospectively; studies with moderate design suitability are those in which data are collected retrospectively, or in which there are multiple pre- or post-measurements, but no concurrent comparison population; and studies with least-suitable designs are those in which there is no comparison population and only a single pre- and post-measurement in the intervention population. Quality of study execution includes six categories of threats to validity (study population and intervention descriptions, sampling, exposure and outcome measurement, data analysis, interpretation of results, and other biases). Studies with zero to one limitation are categorized as having good execution, studies with two to four limitations are categorized as fair execution, and studies with five or more limitations are categorized as limited execution.[49] Studies with greatest or moderate design suitability and good or fair quality of execution were included in the body of evidence. A total of 19 studies qualified for the review.

Evaluating the Body of Evidence

Community Guide rules characterize evidence of effectiveness as strong, sufficient, or insufficient to determine effectiveness on the basis of the number of available studies, the suitability of study designs for evaluating effectiveness, the quality of study execution, the consistency of the results, and effect sizes.[49] Thus, strong or sufficient evidence of effectiveness translates into a recommendation by the Task Force (respectively reflecting whether the degree of confidence in the findings is strong or moderate) and insufficient evidence of effectiveness means that the available studies do not provide sufficient evidence to assess. In addition to assessing suitability of study design, we coded additional study data to describe study characteristics (e.g., study location, start date, and method of outcome assessment), participant characteristics (e.g., age, race or ethnicity, education, HIV serologic status, and baseline sex behavior), evaluation methods (e.g., type of comparison group, length of follow-up, and retention rate), and intervention features (e.g., use of theoretic model, number of sessions, deliverer, delivery methods, and intervention content) using standard abstraction forms developed for the PRS Project.[37]

Summarizing the Body of Evidence on Effectiveness

The sex risk effect measures selected for this review were the mean number of occasions or proportion of MSM engaging in unprotected anal, vaginal, or oral intercourse; the mean number of occasions or proportion of MSM engaging in anal, vaginal, or oral intercourse protected with a condom; and the mean number of sex partners. The biological effect measures were incident HIV and STD.

A summary effect measure, the odds ratio (OR), was calculated to estimate intervention effects for all outcomes of interest. The OR allows for the estimated effect sizes to be expressed in terms of the relative odds of change for each outcome. The OR estimates the relative effect between the intervention group and a comparison group. ORs were calculated for each outcome reported as categorical data (e.g., percentage of unprotected sex or proportion of condom use) using standard formulas for 2×2 tables.[64] For studies that reported means and standard deviations on continuous or interval-level behavioral measures (e.g., mean number of unprotected sex occasions), we first calculated the standardized mean difference (SMD) effect size.[65] The SMD was then converted into the OR effect using standard formulas.[66] For sex risk behaviors (e.g., unprotected anal intercourse [UAI], unprotected oral intercourse [UOI], and number of sex partners), ORs <1.0 favor the intervention group in reducing HIV transmission risk and indicate a protective effect. For protective sex behavior (e.g., condom use), ORs >1.0 favor the intervention group relative to the comparison group and indicate a protective effect.

Standard methods of meta-analysis were applied for combining effect sizes across studies to obtain an overall estimate of effect.[64,65] First, we calculated the natural logarithm of the OR (lnOR) and a corresponding weight (i.e., inverse of the lnOR) for each study reporting dichotomous outcome data using standard procedures.[64] For continuous outcome data, the SMD and corresponding variance were transformed to lnOR using standard formulas.[65] To estimate the overall pooled effect size, each lnOR was multiplied by its weight, the weighted lnOR across studies were summed, and then divided by the sum of the weights.

The final aggregation of effect sizes was based on a random-effects model.[67] The homogeneity of the overall effect size was tested using the Q statistic, an approximate χ^2 distribution with degrees of freedom equal to the number of studies minus 1. A significant Q statistic suggests heterogeneity in effects (i.e., intervention effects come from different underlying populations).[68]

Because studies differed in the number of intervention arms, types of outcomes, analyses conducted, and findings reported, we applied the following rules to guide effect size abstraction for calculating the overall intervention effect:

1. Several studies compare two or more intervention arms to a common comparison or control arm. Often in meta-analysis, only one intervention–comparison contrast per study is included to meet the independence of effect size assumption. When we compared aggregated effects based on multiple intervention comparisons per study to aggregated effects based on only one intervention comparison per study, no differences were found. We report aggre-

gated effects using comparisons of all applicable intervention arms.

2. For studies reporting separate measurements related to the same outcome construct (e.g., insertive UAI, receptive UAI, UAI with nonprimary partners, UAI with serodiscordant partners), we calculated effect size estimates for each outcome. For the analysis of any UAI, we selected the measure providing the highest risk of acquiring HIV to estimate the intervention effect when a study reported multiple measures of UAI. For example, receptive UAI confers the greatest risk for HIV-negative MSM to contract HIV.

3. Length of follow-up (i.e., amount of time from the conclusion of intervention activities to outcome assessment) was considered when deciding which effects to include in the meta-analysis. For studies that reported intervention effects at multiple follow-ups, effect size estimates were calculated at all reported follow-ups. However, the follow-up closest to 3 months was selected for evaluating intervention effects on behavioral change in the overall meta-analysis, a practice recommended for demonstrating sustainable effects of an intervention.[69] To determine intervention sustainability, the studies were also stratified according to length of follow-up (e.g., ≤6 months vs >6 months).

4. A hierarchical approach was used to ascertain effect sizes. If a study reported an adjusted OR and 95% confidence interval (CI), these values were retained for meta-analysis as adjusted models controlled for baseline differences and potential confounding variables. Otherwise, we calculated ORs and 95% CIs for the follow-up outcome data and adjusted for baseline differences in the outcome measure.[65,68]

5. For studies with nested designs that employed community- or group-level assignment, CIs were adjusted to compensate for the underestimate of the variance by using estimates of intraclass correlation.[65]

In using meta-analysis to quantitatively summarize intervention effects, statistical significance (i.e., 95% CI that did not include 1.0) and Q statistics helped to inform decisions about whether results were consistent and in the desired direction. Sensitivity analyses of intervention effects were conducted to determine the robustness of our decision rules, which guided abstraction of effect sizes. Aggregated effect sizes were recalculated using one intervention–comparison arm contrast per study, longest follow-up, and without adjustment for baseline behavior. In addition, we compared the estimated effect size for all studies with the effect size obtained after excluding a study (or set of studies) that might influence the overall intervention effect estimate. None of these sensitivity analyses resulted in appreciably different intervention effect estimates.

Stratified analyses using random-effects models were conducted to assess whether intervention effectiveness differed across subgroups of studies based on characteristics of the samples, intervention features, study design, and length of follow-up assessment. Publication bias was assessed by inspection of a funnel plot of standard error estimates versus effect size estimates from individual samples. There was no evidence of publication bias because the funnel plot (not shown) revealed no asymmetry.

Summaries of effectiveness and conclusions based on those summaries were reviewed separately according to level of intervention delivery: to individuals, to groups of individuals, or to the larger community. Discussion of applicability, other positive or negative effects, implementation barriers, and research gaps for person-to-person HIV behavioral interventions were considered across levels of intervention delivery.

Summarizing Applicability

The body of evidence used to assess effectiveness was also used to assess applicability. The systematic review development team and the Task Force drew conclusions about the applicability of the available literature to various populations and settings after considering the conceptual basis for the interventions and examining data on participant and intervention characteristics, settings, follow-up periods, methods of participant recruitment, participation rates in the various studies, and robustness of results across studies. The goal of this assessment is to inform judgments under which an intervention may be effective, and thus, understand the limits of its application.

Summarizing Other Effects

We routinely sought information on other positive and negative effects of the intervention in the articles included in this review, in other relevant literature, and from the systematic review development team and the HIV coordinating team. Important effects (in the judgment of the team and Task Force) are summarized and presented.

Summarizing Barriers

We systematically examined the qualifying studies in this review for information on barriers and facilitators to intervention implementation. These were evaluated and summarized by the team and Task Force, and discussed in this review. In addition, we reviewed related literature for other barriers that have been encountered when implementing interventions for MSM. Barriers identified from the literature were included if they were considered to be helpful to decision makers when selecting interventions or to practitioners who implement interventions.

Economic Evaluation

Methods for the economic evaluations in the *Community Guide* are described elsewhere.[70,71] Reviews of studies reporting economic evaluations were performed only if the intervention was found to be effective.

Summarizing Research Gaps

Systematic reviews in the *Community Guide* identify existing information on which to base public health decisions about implementing interventions. An important additional benefit of these reviews is the identification of areas in which information is lacking or of poor quality. Where evidence of the effectiveness of an intervention was sufficient or strong, remaining questions about effectiveness, applicability, other effects, economic consequences, and barriers to implementation are presented. In contrast, where the evidence was

insufficient to determine effectiveness, only research questions relating to effectiveness and other effects are presented. Applicability issues are also included as important research gaps if they affected the assessment of effectiveness. In general, research gaps relating to economic evaluations or barriers are not identified in the *Community Guide* unless effectiveness is demonstrated.

Results: Part I—Intervention Effectiveness

In this section, we first summarize effectiveness and conclusions for each of the three types of intervention delivery: to individuals only, to groups of individuals, and to the larger community. We next consider applicability, other effects, economic efficiency, implementation barriers, and research gaps associated with the interventions across the three types of intervention delivery.

Review of Evidence: Individual-Level Interventions

Interventions delivered at the individual level seek to influence HIV risk behavior one individual at a time.[41] Through the "one-on-one" approach, these interventions assist a client in changing his HIV risk behavior by modifying his attitudes, beliefs, motivation, and self-efficacy; providing facts or information about HIV/AIDS or STDs; or influencing moods, emotions, or feelings. Individual-level interventions often encourage clients to make ongoing appraisals of their own behavior, and facilitate their efforts to obtain services in both clinical settings (e.g., where HIV counseling and testing or STD screening are conducted) and community settings (e.g., in drug treatment centers). These interventions typically involve individualized risk-reduction counseling or motivational interviewing delivered by a well-trained counselor, educator, peer, or other professional.

Effectiveness. Our search identified five studies[72–76] evaluating the effectiveness of HIV behavioral interventions delivered to individual adult MSM. Of these studies, one[73] had limited quality of execution and therefore did not qualify for the review. Among the remaining four studies, one had good quality of execution[75] and three had fair quality of execution.[72,74,76] All four studies had greatest suitability of study design. Details of the four qualifying studies[72,74–76] and their respective interventions are provided in Appendix A.

Evidence of effectiveness of six individual-level intervention arms reported in the four qualifying studies[72,74–76] is provided in Table 2. The aggregated effect size of these six interventions on any UAI is statistically significant (OR=0.57, 95% CI=0.37–0.87, *n*=4689). This result suggests an average 43% reduced odds of engaging in any UAI among intervention group members relative to the comparison group. Figure 2 presents a forest plot of

the effect size estimates for the six individual-level intervention arms and the summary effect size estimate in reducing any UAI. Although the effect was heterogeneous (Q_5=11.25, *p*=0.047), sensitivity analyses did not reveal subsets of studies that moderated the significant effect. One study[76] had a much larger sample size than the others in the meta-analysis. When that study was excluded from the meta-analysis, the overall effect estimate did not change (OR=0.48, 95% CI=0.31–0.74, *n*=394). Stratified analyses revealed significant intervention effects at follow-ups ranging from 2 to 6 months (median 6 months, six intervention arms, OR=0.57, 95% CI=0.37–0.87, *n*=4689), and at longer follow-ups ranging from 12 to 18 months (median 12 months, four intervention arms, OR=0.39, 95% CI=0.17–0.89, *n*=4543).

We were unable to assess potential differences in effect sizes by type of UAI (insertive or receptive) or by partner characteristics (nonprimary or serodiscordant partner) because these outcomes were reported in too few studies. The individual-level intervention approach was associated with a significant reduced odds of engaging in receptive UAI in one study,[76] UAI with nonprimary partners in another study,[75] and UAI with serodiscordant partners in both of these studies[75,76] (Table 2). Similarly, meta-analysis of the other behavioral outcomes—condom use with AI, number of sex partners, and unprotected oral sex—could not be performed because each outcome was reported by only a single study.[74] However, the ORs from the single study were in the desired direction for each of these outcomes. In one study,[76] incident HIV at the 6-month post-baseline follow-up was in the desired direction but nonsignificant (*p*=0.07); results reported at subsequent follow-ups ranging from 12 to 48 months post-baseline were inconsistent and nonsignificant.

According to *Community Guide* rules,[49] the studies included in this review provide strong evidence that individual-level person-to-person HIV behavioral interventions for adult MSM are effective in changing risky sex behaviors associated with HIV acquisition, as measured by a 43% reduced odds of engaging in any UAI. Significant reductions in any UAI resulting from the interventions were measured at both short- and long-term follow-ups. Evidence is insufficient to conclude about intervention effects on other sex behaviors and biological outcomes because of small numbers of studies.

Review of Evidence: Group-Level Interventions

Interventions delivered to groups of MSM also seek to influence the HIV risk behaviors of individuals.[41] Like the individual-level intervention approach, group-level interventions are designed to promote positive behavior change among individuals by modifying attitudes or beliefs, and providing facts or information about HIV/

Table 2. Effectiveness of person-to-person HIV behavioral interventions for men who have sex with men (MSM)

Intervention (number of studies)	Description	Meta-analytic findings

Individual level (4)	Interventions that seek to modify individual behavior in a "one-on-one" interaction with a professional or peer counselor	**Any unprotected AI** (k=6, OR=0.57, 95% CI=0.37–0.87)[72,74–76]
		  Receptive unprotected AI (k=1, OR=0.77, 95% CI=0.65–0.92)[76]
		  Unprotected AI with nonprimary partners (k=3, OR=0.41, 95% CI=0.21–0.80)[75]
		  Unprotected AI with serodiscordant partners (k=4, OR=0.52, 95% CI=0.29–0.94)[75,76]
		Condom use with AI (k=1, OR=1.55, 95% CI=0.73–3.29)[74]
		Number of sex partners (k=1, OR=0.97, 95% CI=0.45–2.06)[74]
		Unprotected oral sex (k=1, OR=0.58, 95% CI=0.28–1.24)[74]
		Incident HIV (k=1, OR=0.62, 95% CI=0.36–1.06)[76]

Group level (13)	Interventions that seek to modify individual behavior in a group setting	**Any unprotected AI** (k=15, OR=0.73, 95% CI=0.61–0.88)[72,83,84,86,87,90,91,92,94–96,98,99]
		  Insertive unprotected AI (k=2, OR=0.71, 95% CI=0.27–1.83)[83,95]
		  Receptive unprotected AI (k=2, OR=0.56, 95% CI=0.34–0.92)[83,95]
		  Unprotected AI with nonprimary partners (k=2, OR=0.85, 95% CI=0.50–1.44)[83,96]
		  Unprotected AI with serodiscordant partners (k=1, OR=0.52, 95% CI=0.20–1.34)[86]
		Condom use with AI (k=5, OR=1.81, 95% CI=1.12–2.93)[87,91,92,98]
		Number of sex partners (k=6, OR=0.78, 95% CI=0.59–1.02)[84,87,91,92,95,99]
		Unprotected oral sex (k=3, OR=0.95, 95% CI=0.56–1.60)[87,91,92]
		Incident STD (k=1, OR=1.84, 95% CI=0.85–3.99)[86]

Community level (3)	Interventions that seek to modify individual attitudes, beliefs, and values, as well as community norms	**Any unprotected AI** (k=3, OR=0.65, 95% CI=0.48–0.89)[102,103,105]
		  Insertive unprotected AI (k=1, OR=0.60, 95% CI=0.41–0.87)[102]
		  Receptive unprotected AI (k=1, OR=0.75, 95% CI=0.55–1.01)[102]
		  Unprotected AI with nonprimary partners (k=1, OR=0.64, 95% CI=0.28–1.43)[105]
		Condom use with AI (k=2, OR=1.59, 95% CI=1.17–2.15)[102,103]
		Number of sex partners (k=2, OR=0.80, 95% CI=0.54–1.16)[102,103]

Results presented are adjusted ORs and 95% CIs from random-effects meta-analysis.
AI, anal intercourse; CI, confidence interval; k, number of intervention arms; OR, odds ratio.

AIDS or STDs. Many group-level interventions also include individual-level components (e.g., HIV counseling and testing). In addition, group-level interventions typically include group discussions, rely on the support of the group and the influence of peers to help foster changes in behavior,[43] and can be delivered to the group by a counselor, facilitator, or peer. The group-level intervention approach often focuses on the development of skills through live demonstrations, role plays, and practice. Skill-building exercises commonly used in group-level interventions for MSM include learning how to use condoms correctly, how to make and implement decisions to reduce risk, and how to negotiate safer sex with partners effectively. Other group-level interventions for MSM are influenced by cognitive–behavioral theory,[77–81] in which group members assess their personal HIV risk, establish HIV risk-reduction goals to either avoid risky behavior or manage behavior more effectively, and monitor progress toward goal achievement.

Effectiveness. Our search identified 21 studies[60,72,82–100] evaluating the effectiveness of group-level HIV behavioral interventions for adult MSM. Of these studies, six
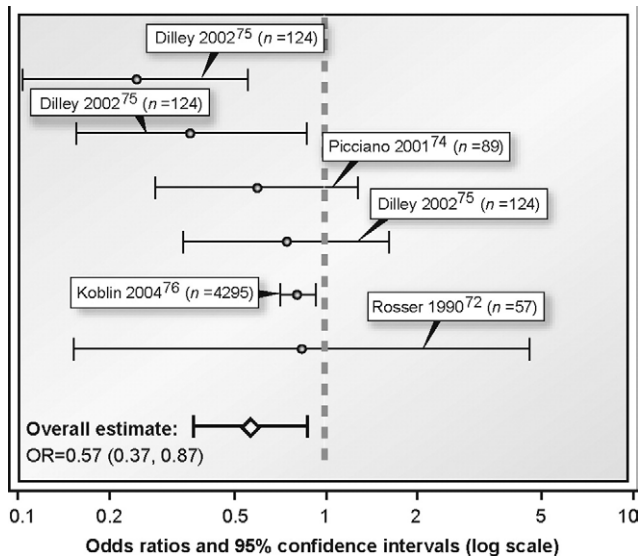
Figure 2. Forest plot of change in any unprotected anal intercourse as measured by six individual-level interventions for adult men who have sex with men (*n*, baseline sample size).

tion,[72,83,84,90–92,94–96,98,99] and all 13 studies had greatest suitability of study design. Details of the 13 qualifying studies[72,83,84,86,87,90–92,94–96,98,99] and their respective interventions are provided in Appendix A.

Evidence of effectiveness in 16 group-level intervention arms reported in 13 qualifying studies[72,83,84,86,87,90–92,94–96,98,99] is summarized in Table 2. The aggregated effect size of 15 intervention arms in 12 studies reporting any UAI is statistically significant (OR=0.73, 95% CI=0.61–0.88, *n*=2480), suggesting a 27% reduced odds of engaging in any UAI among adult MSM in the intervention group (Figure 3). Inspection of the results and the homogeneity test (Q_{14}=13.29, *p*=0.50) suggest reasonable consistency of effects. Stratified analysis by length of follow-up revealed significant intervention effects on any UAI at follow-ups ranging from 0 to 6 months (median 3 months, 13 intervention arms,[72,83,84,86,87,91,92,94–96,98] OR=0.76, 95% CI=0.63–0.92, *n*=2312) and at follow-ups ranging from 8 to 14 months (median 12 months, six intervention arms,[83,86,90,95,96] OR=0.73, 95% CI=0.55–0.98, *n*=915).

Effect size estimates by type of UAI (insertive or receptive) or by partner characteristics (nonprimary or serodiscordant partner) all show reduced odds of un-
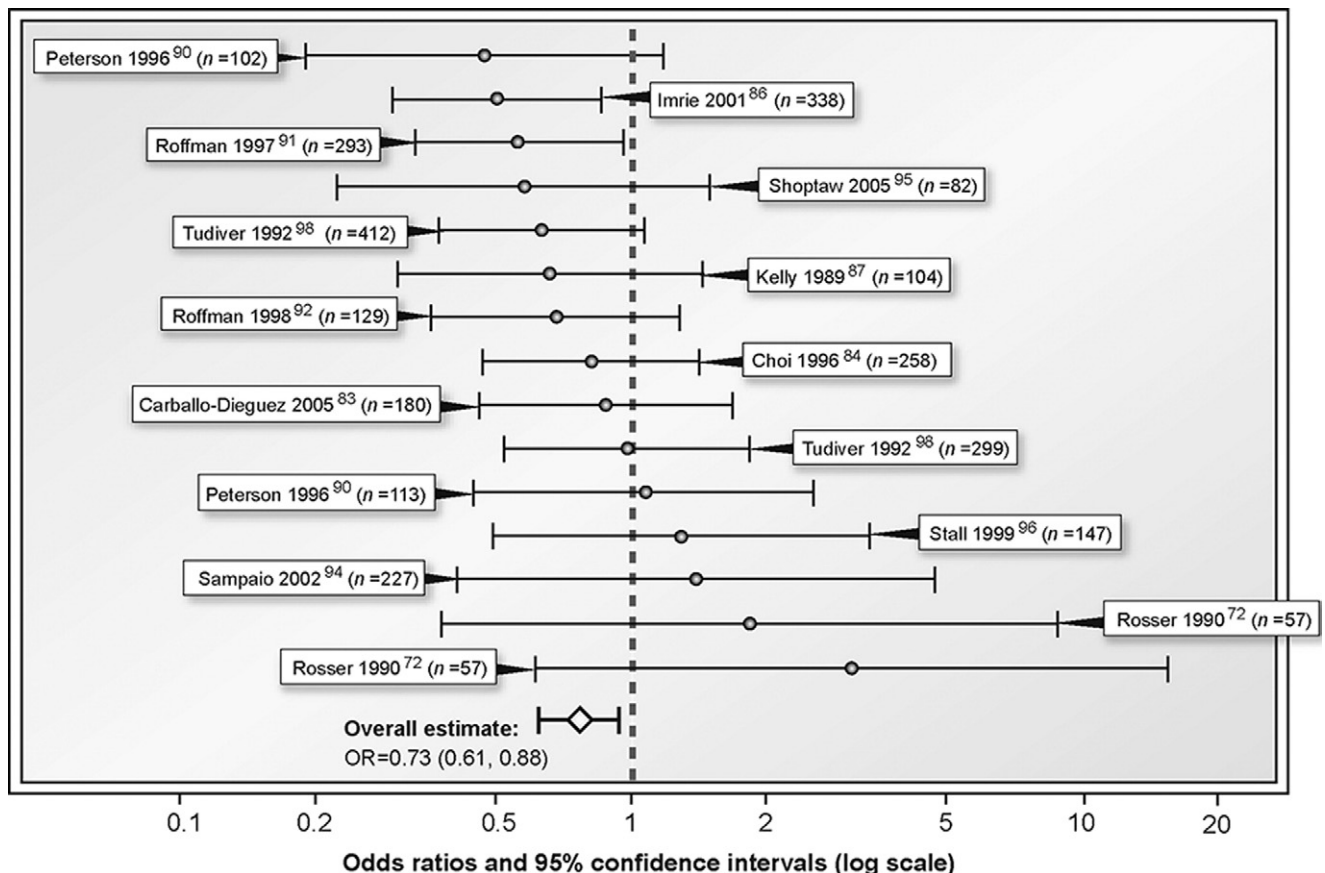
were excluded because of limited quality of execution[60,85,88,93,97,100] and two because of least-suitable design.[82,89] Of the remaining 13 studies, 2 had good quality of execution,[86,87] 11 had fair quality of execu-

Figure 3. Forest plot of change in any unprotected anal intercourse as measured by 15 group-level interventions for adult men who have sex with men (*n*, baseline sample size).

protected AI (Table 2). Two studies[83,95] that measured change in receptive UAI showed significant intervention effects (OR=0.56, 95% CI=0.34–0.92, n=259), but these same studies did not show significant reductions in insertive UAI (OR=0.71, 95% CI=0.27–1.83, n=259). Five intervention arms from four studies[87,91,92,98] showed a significant increased odds of condom use during AI (OR=1.81, 95% CI=1.12–2.93, n=1026). The aggregated effect of these five group-level interventions is associated with an 81% increased odds of using condoms during AI among adult MSM in the intervention groups relative to comparison groups. Six studies[84,87,91,92,95,99] reported a decreased odds of having multiple sexual partners that narrowly missed statistical significance (OR=0.78, 95% CI=0.59–1.02, n=1313). Three studies[87,91,92] did not demonstrate any change in engaging in unprotected oral sex (OR=0.95, 95% CI=0.56–1.60, n=621). One study[86] reported a nonsignificant increased odds of incident bacterial STD infections in the intervention group after 12 months of follow-up (OR=1.84, 95% CI=0.85–3.99).

The 15 group-level interventions that reported any UAI included multiple components and varied in number of sessions, content, deliverer, and delivery method. Eight interventions were delivered over more than one session,[83,87,90–92,95,96,98] five were delivered by trained peer facilitators,[83,90,91,98] and all included group discussions. All but one intervention[72] taught skills, and 11 interventions (reported in nine studies)[83,84,86,87,90,91,95,96,98] used role plays, live demonstrations, or practice for skill building. Interventions having multiple sessions (eight intervention arms, OR=0.72, 95% CI=0.56–0.92, n=1347) or delivered by other MSM (five intervention arms, OR=0.67, 95% CI=0.50–0.89, n=842) were effective. However, interventions having a single session (seven intervention arms, OR=0.80, 95% CI=0.57–1.15, n=1133) or those delivered by non-MSM (10 intervention arms, OR=0.79, 95% CI=0.61–1.02, n=1638) did not demonstrate significant reductions in odds of UAI. In addition, the 11 interventions that included skill building through role plays, live demonstrations, or practice also demonstrated effectiveness (11 intervention arms, OR=0.70, 95% CI=0.57–0.85, n=2070), whereas those without skill building activities did not (three intervention arms, OR=0.87, 95% CI=0.51–1.48, n=408).

According to *Community Guide* rules,[49] the studies in this review provide strong evidence that group-level person-to-person HIV behavioral interventions for adult MSM are effective in changing risky sex behaviors associated with HIV acquisition, as measured by a 27% reduced odds of engaging in UAI and 81% increased odds of using condoms during AI. Significant intervention effects on any UAI were found at both short- and long-term follow-ups. Evidence is insufficient to conclude about intervention effects on other sex behavior and biological outcomes.

Review of Evidence: Community-Level Interventions

Person-to-person interventions delivered to communities seek to influence an individual's HIV risk behavior by modifying attitudes, norms, values, and context of risk behaviors within a defined community.[41,44] By creating peer norms that support safer sex, community interventions may be able to help people maintain behavior change better than approaches that work with isolated individuals.[33] The time needed to implement community-level interventions is generally longer than that needed to implement individual- or group-level interventions, and may be as long as several years.[101] What also distinguishes the community-level approach from individual- or group-level approaches is measurement of the effects of diffusing behavior change at the community level. One community-level intervention approach[102,103] for adult MSM deployed individuals, or groups of individuals, as popular opinion leaders to directly influence their primary contacts. These contacts in turn influenced other people, thereby diffusing social or normative influence from the popular opinion leaders to the larger community. In another community-level intervention,[104,105] young MSM participated in the development of a multifaceted intervention for their community that promoted the perception that sexual safety is valued and expected. This intervention chiefly emphasized person-to-person contacts that included formal and informal peer outreach and small group discussions, but also involved a small publicity campaign to spread awareness of the program throughout the community.

Effectiveness. Our search identified six studies[102,103,105–108] evaluating the effectiveness of community-level HIV behavioral interventions for adult MSM. Of these studies, two were excluded because of limited quality of execution[106,107] and one was excluded because of least suitable design.[108] The remaining three studies[102,103,105] had fair quality of execution and greatest suitability of study design. Details of these three qualifying studies[102,103,105] are provided in Appendix A.

Evidence of effectiveness of three community-level intervention arms reported in three qualifying studies[102,103,105] is summarized in Table 2. The aggregated effect size of the three interventions on any UAI is statistically significant (OR=0.65, 95% CI=0.48–0.89, n=1289) at follow-ups ranging from 4 months in two studies[102,105] to 1 year in one study.[103] Compared with controls, adult MSM in the intervention communities experienced a 35% reduced odds of engaging in any UAI (Figure 4). Inspection of the results and statistical testing (Q_2=1.04, p=0.60) did not indicate significant heterogeneity among effect size estimates for the studies in this meta-analysis.
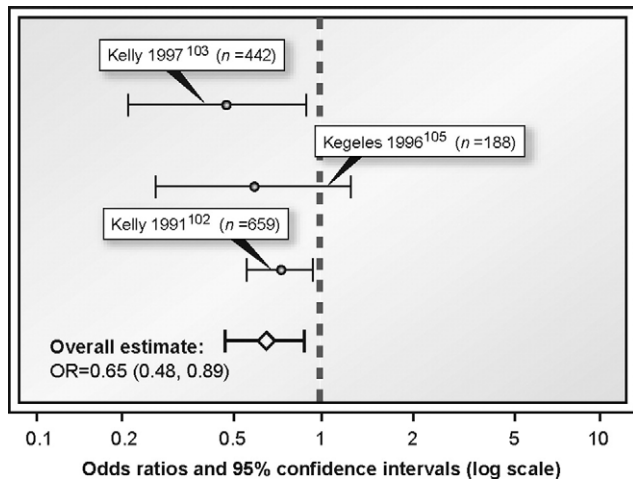
Figure 4. Forest plot of change in any unprotected anal intercourse as measured by three community-level interventions for adult men who have sex with men (*n*, baseline sample size).

Effect sizes by type of UAI or by partner characteristics were reported by too few studies to perform meta-analysis; however, the community-level approach was significantly associated with reduced insertive (OR= 0.60, 95% CI=0.41–0.87) and receptive (OR=0.75, 95% CI=0.55–1.01) UAI in one study.[102] Two studies[102,103] evaluating the Popular Opinion Leader intervention showed a significant 59% increased odds of condom use with AI (OR=1.59, 95% CI=1.17–2.15, *n*=1126). These same two studies[102,103] also reported a nonsignificant decreased odds of having multiple sex partners (OR=0.80, 95% CI=0.54–1.16, *n*=1126).

According to *Community Guide* rules,[49] the studies included in this review provide sufficient evidence that community-level, person-to-person HIV behavioral interventions for adult MSM are effective in changing risky sex behaviors associated with HIV acquisition, as measured by reduced UAI. Evidence is insufficient to conclude about intervention effects on other sex behavior, long-term changes, and biological outcomes.

Results: Part II
Applicability

The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to various settings and MSM populations. Studies included in this body of evidence were conducted predominantly in the U.S., with studies also conducted in Brazil,[94] the United Kingdom,[86] New Zealand,[72] and Canada.[98] Of the 19 qualifying studies in this review, 13 were conducted before 1996, the year highly active antiretroviral treatment (HAART) was introduced.[109] Participants in all of the studies were recruited in a variety of settings, including clinics, community-based organizations, and gay community venues such as bars and public cruising areas.

The body of evidence included interventions delivered to individuals, groups, and communities. Most studies evaluated interventions with follow-ups longer than 3 months, and only two studies failed to achieve at least 80% retention. Comparing the three U.S.-based studies with nonwhite populations[83,84,90] to those U.S. studies whose samples were predominantly white,[74–76,87,91,92,95,96,102,103,105] the magnitude of intervention effects on UAI was smaller in the nonwhite studies (OR=0.80, 95% CI=0.57–1.14) than the predominantly white studies (OR=0.66, 95% CI=0.56–0.79). However, both groups had estimated reductions in UAI attributed to the interventions. Although other studies included varying proportions of nonwhite men (range 5% to 28%), the proportions or numbers were too small to assess the effects of racial or ethnic differences on intervention outcomes.

The median age across all study samples was 33 years (range 23 to 36 years), and in the 15 studies reporting education, at least 50% of participants had some college. The median proportion of UAI reported at baseline was 34%. In addition, 5 of the 21 qualifying studies reported recent injection drug use among the participants (range 3% to 39%) and 4 additional studies reported use of other substances such as marijuana, alcohol, methamphetamine, or cocaine. However, none of these studies examined the relationship between substance use and intervention outcomes.

Given the diversity of study and participant characteristics in this body of evidence, the systematic review development team and the Task Force concluded that each recommended intervention should be applicable across a range of settings and MSM populations, assuming that interventions are appropriately adapted to the needs and characteristics of the MSM population of interest.[110] However, important questions remain about whether and how interventions can be adapted to different cultural contexts, as well as to understudied subgroups, such as MSM of color, non–gay-identified MSM, and substance-using MSM.[111] Although the *Community Guide*'s mandate is to make recommendations for U.S. contexts, we also expect that important issues will arise in attempting to generalize these mostly U.S. studies to international contexts. Nevertheless, this review did include international studies from developed countries on three continents.

Other Positive or Negative Effects

In the body of evidence reviewed here, only two studies[76,86] reported biological outcomes. In a study conducted in London sexual health clinics, Imrie et al.[86] observed a nonsignificant increase in bacterial STD incidence (adjusted OR=1.84, 95% CI=0.85–3.99, *n*=343) despite a concomitant significant decrease in self-reported UAI (OR=0.57, 95% CI=0.33–1.00, *n*=244) after 12 months of follow-up in the interven-

Table 3. Economic evaluation findings: net benefit or cost per infection prevented or cost per quality adjusted life year (QALY) saved

Intervention	Summary measure[a]	Comparison group
Individual-level interventions for HIV behavioral risk reduction		
No studies were identified		
Group-level interventions for HIV behavioral risk reduction		
60–90 minute safer sex lecture plus skills training[116]	Cost per discounted QALY saved: (−)$9757/discounted QALY saved	Control group: 60–90-minute safer sex lecture
Small group workshop format, cognitive-behavioral HIV prevention intervention[112]	Cost discounted QALY saved: <$0/discounted QALY saved	Control group: wait-list group
Community-level interventions for HIV behavioral risk reduction		
Peer opinion leaders endorse risk reduction among gay men[115]	Cost per infection averted: $76,764/infection averted Cost per QALY saved: <$0/QALY saved	Control group: two comparison cities
Peer opinion leaders endorse risk reduction among gay men[114]	Cost per infection averted: $14,073/infection averted Cost per QALY saved: <$0/QALY saved	Control group: two comparison cities
Mpowerment project-peer outreach, Eugene OR[113]	Cost per infection averted Societal perspective (includes volunteer time) Pre-steady to steady state = $41,993–$49,580 per HIV infection (year 1); $7373–$10,578 per HIV infection (year 20) Net program savings Societal perspective (includes volunteer time) Pre-steady to steady state = $285,296–$226,527 (year 1); $2.13 million–$1.46 million (year 20)	Control group: Santa Barbara CA

Note: Systematic reviews of economic evaluations were completed only for recommended interventions. The information provided here is *only a summary.* The complete evidence table can be found at www.thecommunityguide.org/sex.
[a]All summary measures are in 2003 U.S. dollars.
QALY: quality-adjusted life years.

tion group relative to the comparison group. The EXPLORE Study,[76] a trial conducted in six U.S. cities, reported a significant reduction in self-reported UAI (OR=0.81, 95% CI=0.71–0.93) and a borderline significant decrease in incident HIV (OR=0.62, 95% CI=0.36–1.06) after 12 months of follow-up. The two studies reporting nonsignificant and inconsistent effects on biological indicators do not provide a basis for assessing the effects of the intervention on incident disease, which is consistent with the difficulty of powering studies with adequate sample sizes to measure these relatively rare outcomes. Therefore, the Task Force based its recommendations on the demonstrated effects of the interventions on behavioral outcomes only. No other harms or benefits were proposed by the teams or Task Force or identified in this review.

Economic Efficiency

Our search identified five economic evaluation studies[112–116] falling within the scope of our effectiveness review, including two for group-level and three for community-level interventions, all of which are included in the body of evidence (see Table 3). No economic evaluation studies were identified for individual-level interventions. A summary description of each of these studies is provided in Appendix A. All five studies met the quality criteria described in the *Community Guide*'s

economic abstraction form.[70,71] Four of these studies[112,113,115,116] were categorized as "very good." One study,[114] which did not report the timeframe or analytic time horizon, and did not discount future costs and benefits, was rated as "good." In general, in addition to producing health and other benefits, the findings show that these programs generate net economic benefits to society mainly because the costs of preventing HIV infection are far outweighed by the costs of treating HIV or AIDS.

Pinkerton et al.[116] compared the cost effectiveness of a safer sex lecture plus skills training intervention[99] with that of a safer sex lecture alone intervention, both delivered at the group level. The reported incremental cost of the skills training component was $16,599 and direct medical care cost savings were $224,325 (both in 2003 U.S. dollars). Given these parameters, the authors concluded that the skills training component had a cost savings of $9757 per discounted quality-adjusted life year (QALY). A cost–utility analysis[112] of the group-level intervention by Kelly et al.[87] also found that averted medical care costs were significantly higher than intervention program costs. This resulted in a negative cost per discounted QALY, which implies that the intervention is cost saving.

For the community-level interventions, two cost-effectiveness studies[114,115] were conducted on the

Popular Opinion Leader intervention by Kelly et al.[102] The average of costs per HIV infection averted from these two studies was $45,418 in 2003 U.S. dollars. Although the source of cost data and modeling assumptions were different in the two studies, both reported that costs per discounted QALY saved were negative, implying that the original program was cost saving. Kahn et al. reported a range of cost per HIV infection averted for the Mpowerment Project[117] using different timeframes, epidemic scenarios, cost perspectives, and modeling inputs. From a societal perspective that included volunteer time, costs per HIV infection averted were estimated to range from $49,580 in 1 year to $7373 in 20 years, depending on the particular assumption about the HIV prevalence rate. The authors also reported a maximum net program savings of up to $2.13 million over 20 years, based on a societal perspective that included volunteer time.

Barriers to Implementation

A systematic examination of the 19 qualifying studies revealed several barriers to intervention implementation. The barriers most frequently reported in these studies involved the challenges of recruitment, enrollment, and retention of MSM in HIV behavioral interventions. Although investigators in this body of evidence typically cast a wide net to recruit study participants in a variety of venues, some MSM subgroups remain hard to reach because of numerous factors including geographic isolation,[91,102] social isolation,[92,94] fear of being exposed as an MSM,[90,92] and failure of the intervention to address the cultural values and practices of the community.[84,90] Several studies linked difficulties in retaining MSM in HIV behavioral interventions to the frequent perception that interventions either are not sufficiently motivating and captivating,[105] or are irrelevant to personal needs.[87,92] Additionally, time constraints,[75,76] competing interests,[105] and substance use[98] have been identified as influences on participation in prevention programs. These barriers have also been identified in other relevant research literature.[118–121] Barriers to recruitment and enrollment are especially important in low-income minority communities with high HIV seroprevalence, where MSM may be reluctant to acknowledge their homosexual behaviors and may restrict their sexual activity to private clubs, people met through the Internet, or other venues not associated with the gay community.[122,123]

Many studies included in this review employed innovative strategies that address the aforementioned barriers to facilitate intervention implementation. These strategies include delivering intervention sessions entirely over the telephone to overcome geographic boundaries,[74,91] having peer opinion leaders diffuse safe sex messages through social networks to reach isolated MSM,[102,103] and including a variety of training elements in interventions to increase salience and appeal.[76,88] Several studies also incorporated culturally relevant intervention content to address the HIV prevention needs of MSM subgroups, particularly minority MSM[84,90] and substance-using MSM.[95,96]

Additional barriers to intervention participation suggested in the research literature include the influence of motivational factors, such as HIV prevention fatigue[124] (i.e., loss of interest in HIV prevention messages, programs, or counseling) and misconceptions or unwarranted optimism about HIV treatment effectiveness.[125,126] Furthermore, the availability of financial and nonfinancial resources also affects intervention implementation. Individual-level interventions are often more time and skill intensive than group- or community-level interventions. When the availability of professional counselors to deliver individual or group interventions is limited, MSM can be trained to deliver many of those interventions. The implementation of community-level interventions also poses unique challenges. Multifaceted community approaches, such as the Mpowerment Project, require extensive community mobilization and coordination through the cultivation of supportive relationships with key stakeholders.[127] Where gay communities lack the resources or community support to mobilize community-level approaches, small-group or network-based interventions may be feasible alternatives. Implementation of all three intervention types requires assessment of agency capacity to effectively deliver the intervention in various settings, target populations, and cultures while maintaining fidelity to the intervention's "core components."[110,111]

In the U.S., because African-American and Hispanic MSM are less likely to live in predominantly gay communities, interventions will need to reach these men through novel approaches.[128,129] The Internet has been used in several studies as a tool to recruit and enroll MSM into behavioral interventions.[130–132] Another innovative recruitment approach involves a two-stage strategy used for non–treatment-seeking, drug-using MSM.[133] In Stage 1, eligible MSM are invited to participate in discussion groups to reflect on recreational drug use and sex behavior at MSM social gatherings, and to advise investigators on strategies to recruit drug-using MSM into a behavioral intervention. In Stage 2, a more formal behavioral intervention is described and enrollment is offered within the group setting. This "foot-in-the-door" approach resulted in recruitment of 57% of participants into the behavioral intervention. Another recruitment method that is gaining favor as a bias-free method to recruit "hidden" populations of MSM is respondent-driven sampling.[134]

Research Issues

Although we found evidence suggesting that individual-level, group-level, and community-level HIV behavioral interventions are effective in reducing HIV risk behaviors among MSM, important research issues remain. There is a need for further research on understudied subgroups and settings, measurement of behavioral and biological outcomes, core intervention components, and the changing landscape of HIV risk and risk reduction.

Subgroups and settings. Although available results suggest robustness in effectiveness across populations and contexts, differences in effectiveness among subgroups of MSM have not been ruled out. Only three studies conducted in the U.S. focused exclusively on nonwhite MSM,[83,84,90] and the majority of participants in only one international study[94] were nonwhite. Because African-American and Hispanic MSM are disproportionately affected by the HIV epidemic in the U.S.,[135] the need for research on these subgroups of MSM is urgent.[136] Moreover, none of the studies identified in this review specifically targeted non–gay-identified MSM, who may have different HIV prevention needs than gay-identified men.[137,138]

Several reports have linked increased recreational or "club" drug use (e.g., cocaine and crystal methamphetamine) to increased risky sex behavior in adult MSM.[17,139–141] For example, combination of methamphetamines with erectile dysfunction drugs has become increasingly popular, and has raised serious concerns in both the gay and public health communities. Only two studies[95,96] included in this systematic review evaluated interventions targeting substance-using MSM. The findings of these two studies were inconsistent in the direction of change and not significant, and further research is needed.

The interventions in this systematic review were evaluated among participants in a variety of settings, including gay bars, community-based organizations, health clinics, and research study sites. However, according to Fenton and Imrie,[22] a new "sexual marketplace" has emerged that provides greater opportunities for MSM to acquire potential partners in settings not well represented in this body of evidence (e.g., the Internet and "circuit parties"). These high-risk settings, which facilitate access to not only homosexual men but to non–gay-identified and bisexual MSM, increase the potential for rapid spread of STDs.[22] Future research is needed to evaluate behavioral interventions in high-risk venues.

Outcome assessment. Continued improvement is also needed in the quality of behavioral assessment in HIV intervention evaluations. These Task Force recommendations are based on self-reported change in sex behavior that can be potentially biased by faulty recall and social desirability. Studies in this review used different strategies to minimize the bias of self-report, including assurances of confidentiality, the use of self-administered questionnaires, and shorter recall periods. One study[76] used the new technology of audio computer-assisted self-interviewing (ACASI) to enhance the quality of behavioral assessment. ACASI has been shown to increase reporting of sexual contacts of MSM, while providing an acceptable method for collecting self-reports of HIV risk behavior in clinical trials.[142,143] Because self-reported behaviors are subject to potential biases, many investigators have called for the use of biological outcomes (e.g., STDs and HIV) to assess the overall effectiveness of an intervention.[144] Few studies measure biological outcomes because of the extensive costs and large sample sizes required to assess disease acquisition over a long period of time.[145–148]

Like behavioral outcomes, biological outcomes are also subject to potential biases in measurement. STD incidence may be an invalid "surrogate" for HIV incidence[149] because STD acquisition is not only dependent on behaviors such as consistent condom use or frequency of unprotected sex, but also on correct condom use, effectiveness of condoms in preventing different types of STDs, partner selection, acceptance and adherence to STD treatment, and STD prevalence rates within a particular community.[145–148] To assess an intervention's impact on HIV incidence more thoroughly, as well as to understand the complex relationship between behavior and biological outcomes, future intervention evaluations not only need to measure biological endpoints such as STD and HIV incidence, but also develop and use more precise and validated behavioral and biological measures.[148]

Intervention components. The person-to-person HIV behavioral risk reduction approach, as defined in this review, includes a broad class of interventions that work across various groups and settings. What remains to be determined is the identification of intervention components considered to be most effective, least effective, and cost effective. Most behavioral intervention research to date involved a variety of populations, outcome measures, content, duration, and sessions, making it difficult to replicate findings.[150] Results of a recent review[37] indicate that interventions for MSM promoting interpersonal skills training (i.e., negotiation or communication of safer sex) showed positive effects. Among the group-level interventions in this review, effectiveness may have been enhanced by the provision of multiple sessions, the use of MSM deliverers, and the inclusion of role plays, live demonstrations, or practice of skills. Further research is necessary to determine what works best, in what context, and with whom.

Biomedical, technologic, and social changes. HIV behavioral interventions for adult MSM must continue to

evolve to address the challenges of HIV prevention in this population.[151] One way this can be accomplished is by considering and incorporating into interventions biomedical advances, technologic innovations, and social changes in HIV transmission. Advances in technology and medicine over the past decade have drastically altered the social and behavioral landscape of the MSM community. The introduction of HAART in the mid-1990s resulted in expanded treatment options for HIV/AIDS and a dramatic decrease in AIDS mortality.[152] As HIV is increasingly considered to be a chronic and often manageable disease, commitment to reducing sex risk behaviors, as observed in the first decade of the epidemic, may have declined among many MSM after the introduction of HAART.[153] A recent meta-analysis[154] showed that MSM who believed that receiving HAART protects against transmitting HIV had reduced concerns of engaging in unsafe sex, and had engaged in higher rates of unprotected intercourse. This association was seen in HIV-seropositive, HIV-seronegative, and never-tested men. While attitudes toward unsafe sex may have changed due to the availability of HAART, the overall efficacy of HIV behavioral interventions for MSM in reducing sex risk behavior has not diminished after the introduction of HAART.[37] As we now move into an era of greater understanding of HAART treatment optimism, HIV risk-reduction interventions for MSM must continue to refocus beliefs and perceptions on HIV risk behavior.[22,155,156]

Accompanying the dramatic medical advances in treating HIV/AIDS are changes in computer technology (e.g., the Internet, chat rooms, e-mail) that allow for increased social interaction among members of the MSM community. Studies conducted in the U.S., Europe, and Australia have indicated elevated levels of sex risk behavior among MSM seeking and meeting sex partners through the Internet.[157–160] Internet chat rooms provide a venue through which MSM, who may be HIV seropositive or at high risk for STDs, can seek casual sex partners while avoiding face-to-face rejection.[158,161] Although the Internet increases the opportunities for MSM to meet potential sex partners, this communication web also provides expanded opportunities for the broad dissemination of risk-reduction information and the recruitment of diverse MSM subgroups into HIV prevention programs.[130,131,159]

For MSM, HIV behavioral interventions must also consider the rapidly changing social context in which MSM engage in risky unprotected anal sex. The phenomenon of "barebacking," or intentional anal sex without a condom with someone other than a primary partner, has been recently reported in the literature.[162–164] Although HIV-seropositive men typically engage in this behavior with other HIV-seropositive men, one study reported a sizeable proportion of men having partners of negative or unknown serostatus.[163] In a survey of MSM in New York City,[164] the bareback-ing phenomenon was attributed to the increased availability of willing partners identified through Internet chat rooms and websites, confidence in effective treatments for HIV, emotional fatigue regarding HIV prevention messages, and the increased popularity of "club" drugs. Further, MSM who engage in this behavior dramatically increase their risk of acquiring STDs, which in turn increase the risk of HIV acquisition among seronegative MSM.[22]

Discussion

This review addresses the effects of individual-, group-, and community-level HIV behavioral interventions for adult MSM. According to *Community Guide* rules,[49] strong evidence shows that individual-level, person-to-person HIV behavioral interventions for adult MSM are effective in reducing the odds of having unprotected anal sex. Individual-level interventions are believed to have the greatest potential for individual-level behavior change because they are tailored and focused on the specific needs of the client. Although these interventions may be most appropriate for MSM who are difficult to reach with group- or community-level approaches, such as men who wish to remain anonymous, this approach may be limited in reach and may have limited population impact (e.g., in reducing HIV infection rates). Strong evidence[49] also shows that group-level HIV behavioral interventions for adult MSM, particularly those that include a skill-building component, are effective in reducing the odds of having unprotected anal sex and increasing the odds of condom use during anal sex. For community-level HIV behavioral interventions for adult MSM, sufficient evidence shows effectiveness in reducing the odds of unprotected anal sex. Exposure of an HIV risk-reduction intervention to a large number of at-risk individuals in the community can produce substantial community-level change (i.e., greater number of individuals changing behavior) and have widespread population impact.

Group-level intervention characteristics related to greater efficacy in reducing the odds of unprotected anal sex include multiple intervention sessions, delivery by other MSM, and skill building through role plays, live demonstrations, or practice. While these intervention characteristics may not act independently of one another or of other characteristics to reduce HIV risk behaviors of MSM, HIV program planners, prevention providers, and researchers should consider these characteristics when developing or selecting behavioral interventions for MSM.

Regardless of level of delivery, person-to-person HIV behavioral interventions result in significant reductions in the sex risk behavior of adult MSM. These findings provide HIV prevention planners, providers, and funding agencies flexibility in adapting person-to-person behavioral interventions to the needs and resources of

their communities. All three intervention types require formative research to effectively adapt the intervention to setting, participant, and cultural characteristics. Although information on cost effectiveness for individual-level interventions was not available, both the group- and community-level interventions were found to be cost saving. Additionally, deficiencies in methodology of the existing literature were identified. Research gaps including application to diverse populations and settings, quality of outcome measurement, effectiveness of specific components of these interventions, and adaptation of interventions to technologic, social, and environmental changes need to be further explored.

Several limitations should be considered when interpreting the results of this review and meta-analysis. The findings must be viewed within the context of the limitations of the available evidence and the weaknesses inherent in meta-analysis. Although the majority of studies were unblinded and relied on self-reported sexual behavior, which may be open to recall bias and socially desirable responding, many studies took steps to reduce potential bias by ensuring confidentiality and by having participants self-administer sex behavior questions. Most studies asked respondents to self-report sex behaviors over brief recall periods to reduce recall bias. In addition, the samples in many studies were small, self-selected, or selected from very specific venues or settings, and therefore potentially nonrepresentative of MSM in general. However, the principal benefit of meta-analysis involves the synthesis of independent and diverse studies to derive an overall estimate of the effectiveness of the interventions being reviewed. Future intervention evaluation studies are needed to address the HIV prevention needs of a diversity of MSM, particularly non–gay-identified, ethnic/racial minority, and substance-using MSM. Regarding the meta-analysis, the small number of studies for individual-level and community-level interventions did not permit us to perform stratified analyses to identify intervention components associated with intervention efficacy. In addition, the small number of studies included in this review may have limited the statistical power of the analyses and also precluded the use of more sophisticated meta-analytic procedures, such as meta-regression, that not only can control for potential confounders but can also identify moderators of intervention efficacy.

Moving evidence-based behavioral interventions for adult MSM from research into practice is an important step in making a greater impact on the HIV epidemic.[165] As the individual-level, group-level, and community-level interventions highlighted in this review are incorporated into HIV prevention efforts, both in the U.S. and internationally, the focus should also include an assessment of the deployment and effectiveness of these strategies in real-world settings. Deeply rooted social problems and inequities, such as poverty, homelessness, racism, stigma and homophobia, affect HIV risk and can impact the effective delivery of prevention programs in the field.[151] Thus, maximizing the effectiveness of these interventions through continued assessment is critical for a sustainable impact on the HIV epidemic.

In conclusion, this review, along with the accompanying recommendations from the Task Force on Community Preventive Services, should prove a useful and powerful tool for HIV policymakers, program planners, implementers, and researchers. It can help to secure resources and commitment for implementing person-to-person HIV behavioral interventions for adult MSM, and can provide direction for further empirical research in this area.

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Appendix A. Studies measuring the effectiveness of person-to-person HIV behavioral risk reduction interventions for men who have sex with men (MSM).

Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Individual-level interventions				
Dilley et al., 2002[1] (1997-2000) San Francisco, CA Greatest: RCT Good	*Intervention:* Single-session cognitive-behavioral intervention counseling + sex diary *Theory:* Gold's theory of online versus offline thinking, cognitive theory *Comparison:* Treatment (standard HIV C&T only) *Sample Size:* 124 *Race:* 74% white* *Baseline serostatus:* 3% HIV+*	% unprotected anal intercourse (UAI) with nonprimary partner of unknown HIV status	0.36 (0.15-0.86)	6[†] and 12 mo
Dilley et al., 2002[1] (1997-2000) San Francisco, CA Greatest: RCT Good	*Intervention:* Single-session cognitive-behavioral intervention counseling only *Theory:* Gold's theory of online versus offline thinking, cognitive theory *Comparison:* Treatment (standard HIV C&T only) *Sample Size:* 124 *Race:* 74% white* *Baseline serostatus:* 3% HIV+*	% UAI with nonprimary partner of unknown HIV status	0.24 (0.10-0.56)	6[†] and 12 mo
Dilley et al., 2002[1] (1997-2000) San Francisco, CA Greatest: RCT Good	*Intervention:* Sex diary only *Theory:* Gold's theory of online versus offline thinking, cognitive theory *Comparison:* Treatment (standard HIV C&T only) *Sample Size:* 124 *Race:* 74% white * *Baseline serostatus:* 3% HIV+*	% UAI with nonprimary partner of unknown HIV status	0.74 (0.34-1.60)	6[†] and 12 mo

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Rosser, 1990[2] (1987-1988) Auckland, New Zealand Greatest: RCT Limited	*Intervention:* individual HIV prevention counseling (1 session, 20-30 min, 1 d) *Theory:* Not reported *Comparison:* Wait-list *Sample Size:* 57 gay men (25% bisexual*) *Race:* 91% white* *Baseline serostatus:* 4% HIV+*	Inverse of % safe sex (number UAI + CU + monogamous relationship)	0.83 (0.15-4.57)	6 mo
Picciano et al., 2001[3] (1998-1999) Seattle, WA Greatest: RCT Fair	*Intervention:* telephone-based motivation enhancement intervention included immediate counseling by telephone (1 session, 90-120 min, 1 d) *Theory:* Motivational enhancement *Comparison:* Wait-list *Sample Size:* 89 MSM *Race:* 76% white *Baseline serostatus:* 19% HIV+, 78% HIV-	Mean number UAI Mean number of partners Mean CU during anal intercourse Mean unprotected oral intercourse	0.60 (0.28-1.27) 0.96 (0.45-2.06) 1.54 (0.73-3.33) 0.58 (0.27-1.24)	6 wk
Koblin et al., 2004[4] (1999-2004) Boston, MA Chicago, IL Denver, CO New York, NY San Francisco, CA Seattle, WA Greatest: RCT Fair	*Intervention:* 10 one-on-one counseling sessions followed by maintenance sessions every 3 months *Theory:* Information-motivation-behavioral skills model (IMB), social learning theory, motivational enhancement *Comparison:* Treatment (2 HIV C&T sessions per year with Project RESPECT individual counseling) *Sample Size:* 4295 *Race:* 72.5% white, 15.2% Hispanic, 6.5% African American *Baseline serostatus:* 100% HIV-	% UAI % UAI with serodiscordant partners % receptive UAI Incident HIV infection	0.81 (0.71-0.93) 0.81 (0.71-0.93) 0.77 (0.65-0.92) 0.62 (0.36-1.06)	12[†] and 18 mo

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Group-level interventions				
Carballo-Dieguez et al., 2004[5] (1998-2002) New York, NY Greatest: RCT Fair	*Intervention:* Latinos Empowering Ourselves – exercises/games, group discussions, role play/practice, sex diary, cultural competency, and stories (8 sessions, 2 h per session, 8 wk) *Theory:* Freire's theory of HIV prevention; Empowerment *Comparison:* Wait-list *Sample Size:* 180 *Race:* 100% Hispanic *Baseline serostatus:* Not reported	% UAI % insertive UAI % receptive UAI % UAI with nonprimary partner	0.87 (0.46-1.67) 1.07 (0.57-2.04) 0.47 (0.24-0.91) 0.83 (0.42-1.62)	2, 4[†] and 6 mos.
Choi et al., 1996[6] (1992-1994) San Francisco, CA Greatest: RCT Fair	*Intervention*: API Living Well Project - brief counseling, social support, safe sex education, eroticizing and negotiating safe sex (single, 3 h session) *Theory*: Health belief model, theory of reasoned action, social cognitive theory *Comparison*: Wait-list *Sample Size:* 329 *Race:* 37% Chinese, 34% Filipino, 10% Japanese, 8% Vietnamese, 11% Other *Baseline serostatus:* Not reported	% UAI Mean number of partners	0.81 (0.47-1.41) 0.44 (0.28-0.69)	3 mos.

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Imrie et al., 2001[7] (1995-1998) London, England Greatest: RCT Good	*Intervention:* Gay Men Project: cognitive-behavioral intervention with standard STD counseling (2 sessions, 8 h 20 min, 2 d) *Theory:* Transtheoretic model of behavior change, relapse prevention, social cognitive theory, motivational interviewing *Comparison:* Treatment (standard STD counseling) *Sample Size:* 338 *Race:* 91% White *Baseline serostatus:* 2% HIV +, 58% HIV –	% UAI % UAI with serodiscordant partner New STD infections New bacterial STD infections	0.50 (0.30-0.86) 0.52 (0.20-1.34) 1.66 (1.00-2.74) 1.84 (0.85-3.99)	6[†] and 12 mos. 12 mos.
Kelly et al., 1989[8] (1987) Jackson, MS Greatest: RCT Good	*Intervention:* Project ARIES: AIDS risk education, cognitive-behavioral self-management, sexual assertion training, development of relationship skills (12 sessions, 15-18 h, 12 wk) *Theory:* Social learning theory *Comparison:* Wait-list *Sample Size:* 104 *Race:* 87% White, 13% African American/Hispanic *Baseline serostatus:* Not reported	Mean UAI Number of casual partners % CU during anal intercourse Mean unprotected oral intercourse	0.66 (0.30-1.44) 1.18 (0.55-2.56) 8.33 (3.12-25.00) 1.26 (0.58-2.72)	Immediate post-intervention
Peterson et al., 1996[9] (1989-1992) San Francisco, CA Greatest: RCT Fair	*Intervention:* Triple session intervention on AIDS risk education, cognitive-behavioral self-management, assertiveness training, self-identity and support (3 sessions, 9 h, 3 wk) *Theory:* AIDS risk reduction model *Comparison:* Wait-list *Sample Size:* 217 *Race:* 100% African American *Baseline serostatus:* Not reported	% any UAI	0.47 (0.19-1.17)	12[†] and 18 mos.

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Peterson et al., 1996[9] (1989-1992) San Francisco, CA Greatest: RCT Fair	*Intervention:* Single session intervention on AIDS risk education, cognitive-behavioral self-management, assertiveness training, self-identity and support (1 session, 3 h, 1 d) *Theory:* AIDS risk reduction model *Comparison:* Wait-list *Sample Size:* 200 *Race:* 100% African American *Baseline serostatus:* Not reported	% any UAI	1.07 (0.45-2.54)	12[†] and 18 mos.
Roffman et al., 1997[10] (1992-1993) United States, Puerto Rico, Canada Greatest: RCT Fair	*Intervention:* Relapse prevention counseling by telephone to develop coping, relaxation skills, and motivational enhancement (14 sessions + 5 events, min. 21 hours, 14 wk) *Theory:* Relapse prevention *Comparison:* Wait-list *Sample Size:* 293 (19% bisexual) *Race:* 87% White *Baseline serostatus:* 14% HIV+	% any UAI Mean number of partners % CU % any unprotected oral intercourse	0.56 (0.33-0.94) 0.80 (0.56-1.14) 1.89 (1.16-3.03) 1.22 (0.73-2.04)	Immediate post-intervention
Roffman et al., 1998[11] (1989-1991) Seattle, WA Greatest: Non-RCT Fair	*Intervention:* Cognitive-behavioral group counseling on HIV education, motivational enhancement and goal setting (17 sessions, unspecified duration, 18 wk) *Theory:* Reasoned action, health belief model, protection motivation theory, relapse prevention *Comparison:* Wait-list *Sample Size:* 129 (6% bisexual) *Race:* 91% White *Baseline serostatus:* 62% HIV-	Mean occasions of UAI Mean number of male partners Mean occasions CU during anal intercourse Mean occasions unprotected oral intercourse	0.68 (0.36-1.28) 0.81 (0.43-1.54) 1.82 (0.95-3.45) 0.56 (0.30-1.05)	Immediate post-intervention

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Rosser, 1990[2] (1987-1988) Auckland, New Zealand Greatest: RCT Limited	*Intervention:* Eroticizing Safer Sex workshop (1 session, 2-2.5 h, 1 d) *Theory:* Not reported *Comparison:* Wait-list *Sample Size:* 52 *Race:* 91% White *Baseline serostatus:* 4% HIV+*	Inverse of % safe sex (no UAI + CU + monogamous relationship)	1.83 (0.38-8.81)	6 mos.
Rosser, 1990[2] (1987-1988) Auckland, New Zealand Greatest: RCT Limited	*Intervention:* StopAIDS workshop *Theory:* Not reported *Comparison:* Wait-list *Sample Size:* 54 *Race:* 91% White *Baseline serostatus:* 4% HIV+*	Inverse of % safe sex (no UAI + CU + monogamous relationship)	3.08 (0.61-5.50)	6 mos.
Sampaio et al., 2002[12] (1998-1999) Bahia, Brazil Greatest: RCT Fair	*Intervention:* Projeto Contato workshop, including skills training and discussions of feelings and difficulties (1 session, 3-4 h, 1 d) *Theory:* Not reported *Comparison:* Treatment (class lecture on AIDS, information and condoms; 1 session, 1 h, 1 d) *Sample Size:* 227 *Race:* 66% Non-white *Baseline serostatus:* 69% HIV-	% UAI with any partner	1.40 (0.41-4.71)	3[†] and 6 mos.

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Shoptaw et al. 2005[13] (1998-2002) Los Angeles, CA Greatest: RCT Fair	*Intervention:* Cognitive HIV risk reduction intervention group (unspecified sessions and duration, 16 wk) *Theory:* Relapse prevention *Comparison:* Treatment (cognitive behavioral therapy) *Sample Size:* 82 *Race:* 80% White, 13% Latino *Drug Use:* 100% methamphetamine users *Baseline serostatus:* 61% HIV+	% any UAI % insertive UAI % receptive UAI Mean number partners	0.57 (0.22-1.49) 0.41 (0.16-1.05) 0.82 (0.32-2.13) 1.07 (0.40-2.82)	2.5† and 8 mos.
Stall et al., 1999[14] (1992-1993) San Francisco, CA Greatest Fair	*Intervention:* Enhanced continuing recovery groups received standard drug treatment plus coping skills, interpersonal skills, and discussion of sexual issues (32 sessions, 96 h, 16 wk) *Theory:* Social learning theory, ARRM, relapse prevention *Comparison:* Treatment (standard continuing recovery groups) *Sample Size:* 147 *Race:* 78% White *Drug Use:* 100% recovering substance users *Baseline serostatus:* 38% HIV-	% UAI with non-monogamous partner	1.30 (0.50-3.38)	2, 5† and 8 mos.
Tudiver et al., 1992[15] (1990) Toronto, Canada Greatest: RCT Fair	*Intervention:* Serial session group emphasizing relationships, expression of emotions and coping strategies (4 sessions, 8 h, 4 wk) *Theory:* Not reported *Comparison:* Wait-list *Sample Size:* 299 *Race:* Not reported *Baseline serostatus:* 11% HIV+, 27% HIV-*	% any UAI % CU during anal intercourse	0.98 (0.53-1.83) 1.16 (0.69-1.92)	3 mos.

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Tudiver et al., 1992[15] (1990) Toronto, Canada Greatest: RCT Fair	*Intervention:* Single-session AIDS education group (1 session, 3 h, 1 d) *Theory:* Not reported *Comparison:* Wait-list *Sample Size:* 201 *Race:* Not reported *Baseline serostatus:* 11% HIV+, 27% HIV-*	% any UAI % CU during anal intercourse	0.63 (0.37-1.06) 1.16 (0.79-1.72)	3 mos.
Valdiserri et al., 1989[16] (1986-1987) Pittsburgh, PA Greatest: RCT Fair	*Intervention:* Small group lecture plus skills training (2 sessions, 2 h, 1 d) *Theory:* Not reported *Comparison:* Treatment (small group lecture only) *Sample Size:* 584 *Race:* 95% White, 2.5% African American *Baseline serostatus:* 15% HIV-	Mean number of receptive anal sex partners CU during receptive anal intercourse	0.90 (0.64-1.26) 1.39 (0.99-1.92)	6[†] and 12 mos.

Community-level interventions

Kegeles et al., 1996[17] (NR) Eugene, OR Santa Barbara, CA Greatest: RCT Fair	*Intervention:* Mpowerment Project: peer-led intervention, including outreach, small groups, community mobilization, and publicity campaign (ongoing sessions and duration; 8 mo) *Theory:* Diffusion of innovations *Comparison:* Wait-list *Sample Size:* 188 *Race:* 81% White *Baseline serostatus:* 3% HIV+	% any UAI	0.59 (0.32-1.07)	4 mos.

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Author(s) & Date (Study period) Evaluation setting Design suitability: Design Quality of execution	Intervention description and other information	Effect measure	Results OR (95% CI)	Follow-up
Kelly et al., 1991[18] (1989-1992) Biloxi, MS Hattiesburg, MS Monroe, LA Greatest: RCT Fair	*Intervention:* Popular opinion leader: peer leaders endorse behavior change messages (training involved 4 sessions, 6 h; interventions delivered over 4 mo) *Theory:* Diffusion of innovations *Comparison:* Wait-list *Sample Size:* 659 *Race:* 86% White *Baseline serostatus:* Not reported	% any UAI % insertive UAI % receptive UAI % multiple partners CU with any anal intercourse	0.72 (0.51-1.03) 0.60 (0.41-0.87) 0.75 (0.55-1.01) 0.66 (0.48-0.92) 1.64 (1.20-2.33)	4 mos.
Kelly, 1997[19] (1991-1994) 2 cities in each of the following states: WI, NY, WV, WA Greatest: RCT Fair	*Intervention:* Popular opinion leader: popular men advocated benefits of behavior change to peers and HIV education materials placed in bars (training involved 5 sessions, 10 h; intervention delivered over 9 wk) *Theory:* Diffusion of innovations *Comparison:* Treatment (educational materials only) *Sample Size:* 442 *Race:* 90% White, 3% African American, 3% Native American, 2% Hispanic *Baseline serostatus:* Not reported	% any UAI Mean number of partners % CU	0.48 (0.21-0.91) 0.97 (0.67-1.41) 1.56 (1.07-2.26)	12 mo

* Denotes statistics for overall study

† Follow-up used to calculate effect size

CU, condom use; C&T, counseling and testing; OR, odds ratio; RCT, randomized controlled trial; UAI, unprotected anal intercourse

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