HIV Prevention for Adults With Criminal Justice Involvement: A Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

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We summarized and appraised evidence regarding HIV prevention interventions for adults with criminal justice involvement.

We included randomized and quasi-randomized controlled trials that evaluated an HIV prevention intervention, enrolled participants with histories of criminal justice involvement, and reported biological or behavioral outcomes. We used Cochrane methods to screen 32 271 citations from 16 databases and gray literature. We included 37 trials enrolling n = 12 629 participants. Interventions were 27 psychosocial, 7 opioid substitution therapy, and 3 HIV-testing programs. Eleven programs significantly reduced sexual risk taking, 4 reduced injection drug risks, and 4 increased testing.

Numerous interventions may reduce HIV-related risks among adults with criminal justice involvement. Future research should consider process evaluations, programs involving partners or families, and interventions integrating biomedical, psychosocial, and structural approaches. (*Am J Public Health*. 2014;104: e27–e53. doi:10.2105/AJPH.2014.302152)

SINCE THE INCEPTION OF THE HIV epidemic, populations with criminal justice involvement have experienced an urgent need for HIV prevention and care services. Much of the research in this area to date has focused on HIV risk and prevention in incarceration settings, including both prisons and short-term jails. Incarcerated individuals face overlapping risks for HIV infection: infections are primarily attributed to pre- and postincarceration risk behaviors,[1,2] but risks may also include behaviors in prison (e.g., injection drug use [IDU], sexual activity, tattooing, violence),[3] elevated prevalence of other sexually transmitted infections (STIs), and sociodemographic risk factors such as poverty, racial discrimination, and living in underserved or socially marginalized communities.[3,4] In the United States, approximately 1 in 7 HIV-infected individuals is released from an incarceration facility each year.[5] A recent systematic review of HIV prevalence among prisoners in 152 low- and middle-income countries found prevalence estimates greater than 10% in 20 countries,[6] and a survey of global evidence found elevated HIV prevalence among prisoners worldwide.[3] The population of incarcerated individuals is a large target for intervention; according to the United Nations Office on Drugs and Crime, approximately 10 million people worldwide are held in prison at any one time, and 30 million are incarcerated each year.[7]

Nonincarcerated adults with a history of criminal justice involvement are also at elevated risk of HIV infection because of these same risk factors, and studies have documented high rates of HIV, sexual risk taking, and substance use among probationers and parolees.[8,9] Individuals returning from incarceration to community settings tend to report high rates of condomless sexual activity and drug use,[9–11] compounded by relationship disruptions[12] and difficulty accessing medical services and fulfilling other basic needs.[13,14] The postrelease period is especially characterized by elevated risk taking,[13,15,16] return to preincarceration behaviors,[17] and high HIV incidence.[18] The population of nonincarcerated adults involved with the criminal justice system is also sizeable; in the United States, for example, approximately 4.8 million individuals in the community were under supervision by adult correctional authorities in 2011 (approximately 2% of the population).[19]

Published research supports the need for HIV risk-reduction efforts for individuals with criminal justice involvement in both incarceration and community settings. Combining evidence from both settings in a single systematic review is valuable given the overlap between incarcerated and nonincarcerated individuals, the return of incarcerated individuals to the community, high rates of recidivism and reincarceration, and the design of HIV prevention interventions that include both incarceration-based and postrelease services (e.g., case management, booster sessions). Although previous reviews have examined intervention effectiveness in this population, an up-to-date and rigorous review is needed. Limitations of previous reviews include the lack of systematic search methods,[20,21] the inclusion of a wide range of study designs, or focus on only a subset of studies, such as opioid substitution therapies (OSTs),[22–25] treatment of alcohol use disorders,[26] needle-exchange programs,[27] interventions for women in prison,[28] or interventions in incarceration but not community settings.[3,29,30] We aimed to summarize and appraise the most methodologically rigorous evidence for the effectiveness of HIV prevention efforts among adults with criminal justice involvement, including both incarceration and community settings.

METHODS

This systematic review followed Cochrane Collaboration procedures, which require at least 2 authors and specify guidelines for defining the review question, searching for studies, selecting studies, extracting data, appraising the risk of bias in included trials, and analyzing data.[31] A subset of 26 studies in this review is the subject of a registered Cochrane review of HIV prevention for criminal justice–involved

individuals in community (noncarceration) settings.[32]

Eligibility Criteria

We limited our review to randomized and quasi-randomized controlled trials, as these designs are most appropriate for identifying causal effects. We included trials regardless of the unit of randomization (individuals or clusters). Quasi-randomized trials were those that did not use strictly random assignment, but approximated randomization in a method unlikely to create consistent bias (e.g., alternation, assignment by birthdate).

Participants were adults (aged 18 years or older) with criminal justice involvement, defined as a lifetime history of arrest or conviction of a criminal act. We made no exclusions by geographic location, probation or parole status, type or level of offense, or recency of criminal justice involvement. Some individuals who are arrested may not be convicted of an offense, but we included arrestees in this review regardless of subsequent conviction or plea: arrestees sustain HIV-related risk behaviors such as drug use, and initial contact with the criminal justice system during arrest and processing may provide opportunities for intervention.[33] We also acknowledge that some incarcerated or convicted individuals are innocent of any crime, but we were unable to make exclusions on this basis. Because our focus was the primary prevention of HIV, we excluded studies that only enrolled participants known to be HIV-infected. We also excluded studies of participants who engaged in criminal activity but who lacked involvement with a formal criminal justice system; for example, we excluded studies of individuals who use illicit drugs or engage in sex work unless all participants also reported lifetime history of arrest. We excluded trials that enrolled adults both with and without a history of criminal justice involvement if they did not disaggregate results.

We included trials of any behavioral, social, biomedical, structural, or HIV-testing intervention that was designed to reduce HIV-related risk. We excluded trials of interventions that did not list HIV prevention as a program goal. We made no exclusions by type of intervention staff or setting, including programs that take place in correctional facilities, communities, or both. We included trials with any type of control group (e.g., usual care, no intervention, information about HIV, attention-matched controls, or other HIV prevention services).

We included only studies that reported at least 1 biological or behavioral outcome related to HIV transmission (e.g., STIs, condomless sexual intercourse) or HIV testing uptake. Primary outcomes were HIV and STI incidence. Secondary outcomes were HIV testing and sexual and IDU-related behaviors that convey a risk of HIV infection. We acknowledge that, unlike sexual behavior, IDU-related behavior, or STI or HIV incidence, HIV testing uptake is not indicative of HIV risk, and HIV testing alone may not influence risk behaviors.[34,35]

We decided to include trials of HIV testing interventions in the review for several reasons. First, the choice to undergo HIV testing presents an opportunity for providers to deliver other interventions, such as single-session interventions that may present comparatively less burden for providers.[36] Second, given the large numbers of HIV-infected individuals who are in contact with the criminal justice system each year,[5] HIV testing in this population presents important opportunities for secondary prevention and linkage to care, even if treatment as prevention is not a key focus of this review. Third, new biomedical strategies for HIV prevention such as preexposure prophylaxis (PrEP)[37–39] cannot be introduced without proof of an HIV-negative test result[40]; this makes consent to HIV testing an important prerequisite for access to these new technologies. We determined that maximizing HIV testing uptake would likely be of sufficient interest to practitioners and researchers in this field for inclusion as an outcome in the review. When studies met all other eligibility criteria, we also extracted data on substance use, recidivism, reincarceration, intervention acceptability, and intervention costs as ancillary outcomes.

Information Sources

We searched 16 electronic databases without date, country, or language restrictions through January 6, 2014: PubMed, PsycINFO, EMBASE, CENTRAL, the National Criminal Justice Reference Service, Criminal Justice Abstracts, Global Health, the Cumulative Index to Nursing and Allied Health Literature, the Education Resources Information Center, Applied Social Sciences Index and Abstracts, the Allied and Complementary Medicine Database, Sociological Abstracts, Political Science Abstracts, Social Services Abstracts, Social Sciences Citation Index, and Dissertation Abstracts. Searches included truncated terms specific to criminal justice and HIV or AIDS (Box A, available as a supplement to this article at http://www.ajph.org, shows our PubMed search strategy). We did not include terms specific to "adults" in the search; we reserved any trials that met all eligibility criteria except participant age (i.e., studies among juveniles) for a separate review article.

We searched for gray literature by using the Dissertation Abstracts database, conference abstracts from 2000 onward (including the International AIDS Conference, Conference on Retroviruses and Opportunistic Infections, and meetings of the International Society for Sexually Transmitted Diseases Research, American Psychological Association, American Society of Criminology, Academy of Criminal Justice Sciences, International Society of Criminology), Web sites of international and national agencies (e.g., Joint United Nations Programme on HIV/AIDS, World Health Organization, United Nations Office on Drugs and Crime, United Nations Population Fund, World Bank, Centers for Disease Control and Prevention), cross-referencing included articles and relevant reviews, searching clinical trials.gov to locate ongoing studies, and contacting 68 experts working in this field.

We merged results of the search in Endnote X5 reference management software (Thomson Reuters, Philadelphia, PA) and removed duplicate citations. Two reviewers (K. U. and D. D.) assessed abstracts and full articles for inclusion. K. U. and D. D. independently assessed a subset of 3831 citations for potential eligibility and discussed any disagreements, which established consistent application of the inclusion criteria. We then divided the remaining citations for preliminary assessment, marking potentially relevant references and obtaining all full-text versions. After obtaining the full text of

potentially eligible citations, K. U. and D. D. independently reviewed all full-text articles to decide on study eligibility, resolving any disagreements by discussion and referral to a third reviewer (D. O.). Reviewers were not blind to any aspect of the studies, and reviewers contacted trialists to obtain any information needed to make eligibility determinations.

Data Collection and Assessing Risk of Bias

Two reviewers (K. U. and D. D.) independently extracted descriptive, methodological, and outcome data from included articles into spreadsheets, again resolving disagreements by discussion and referral to a third reviewer (D. O.). We extracted data on all study characteristics specified in the Cochrane Handbook[31] (citation, eligibility, methods, participants, interventions, outcomes, results, and miscellaneous details), as well as information on participation incentives, sample size calculation, intervention acceptability, and cost effectiveness. K. U. and D. D. assessed trials for methodological quality according to the Cochrane Risk of Bias assessment tool.[31] Where multiple reports referred to the same study, we extracted data from all available sources.

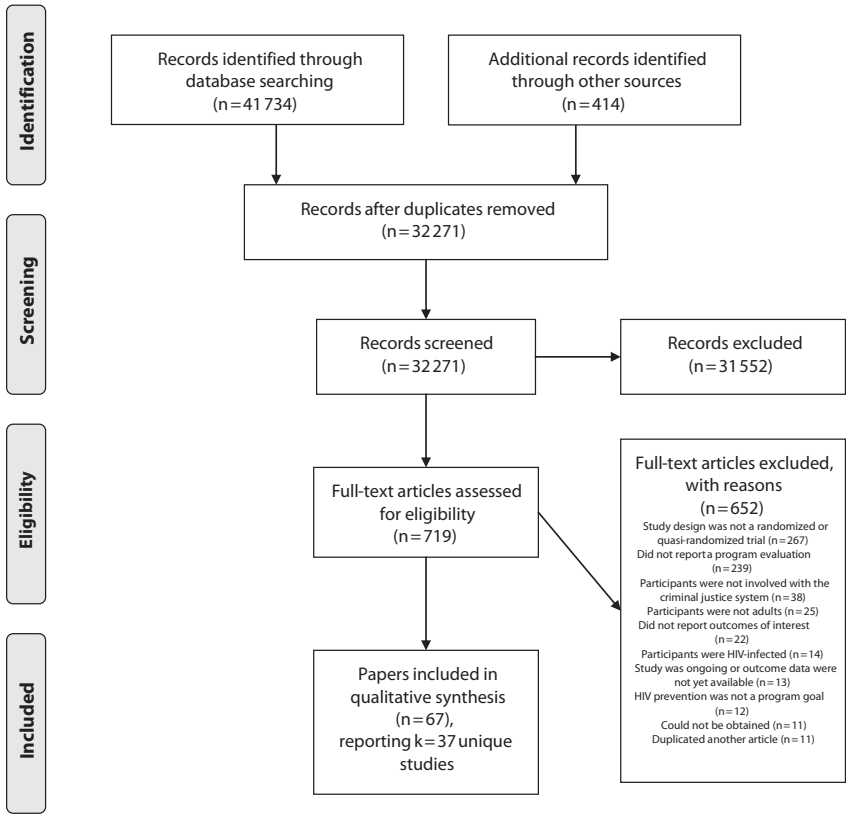
We summarized outcome data as fully as possible in Review Manager 5.2 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark), but many of the data needed for a meta-analysis were missing or incompletely reported across primary trials (e.g., group numbers, number of events for dichotomous outcomes, means and standard deviations for continuous outcomes). These data limitations prevented meta-analysis. Included studies also presented large variation in study designs, control groups, intervention designs, and definition of outcome measures. As a result, although we had prepared a protocol for conducting a quantitative synthesis, we present a narrative synthesis of findings in the text and tables. We did not conduct statistical tests for publication bias, mediators, or moderators of effects because of the same data limitations.

RESULTS

The results of the search are reported in Figure 1. Overall, the search identified 32 271 unique citations, of which 719 appeared to meet eligibility criteria; we were able to obtain full reports for 708. Of these, 67 articles met inclusion criteria; these articles reported k = 37 unique studies, and we designated 1 article for each study as a primary reference.[8,33,42–73] Three primary articles reported multiple studies,[33,47,60] and we designated 33 articles as supplemental reports.[74–106] Of the 267 studies excluded because of study design criteria, the most common study designs were 1-group evaluations (either program descriptions or pre–post designs), followed by contemporaneous nonrandom assignment of participants to groups (e.g., participants self-selected into conditions; different treatments were delivered in different facilities on the basis of logistical constraints), then cohort studies, cross-sectional studies, studies with historical controls, qualitative studies that explored perceived program impacts, and literature reviews.

Description of Trials

Participants. Descriptive information about included trials is reported in Tables 1, 2, and 3. The 37 included studies enrolled n = 12 629 participants at baseline. Participants were primarily from the United States (k = 34; n = 12 047), with additional trials taking place in Australia,[50] China,[55] and Iran.[44] Two trials did not report



Note. Format from Moher et al.[41] For more information, visit http://www.prisma-statement.org. PRISMA 2009 Checklist available as a supplement to this article at http://www.ajph.org.

FIGURE 1—Flow diagram of included studies in a systematic review of HIV risk-reduction interventions in incarceration and community settings.

participant ages, but across the remaining trials, mean participant ages ranged from 25 to 41 years, with a median of 34.5 years. Trials often enrolled single-gender samples: there were 9 trials among men, 12 among women, and 16 among mixed samples (median = 72% male). Across the 32 US trials reporting ethnicity, participant samples were primarily White (≥ 67%) in 6 trials, primarily of non-White race/ethnicity (≤ 33% White) in 14 trials, and mixed in the remaining 12 trials. Trials enrolled participants with a range of criminal justice involvement; at the time the intervention began, participants were incarcerated in residential correctional facilities (k = 19; n = 6329); staying in court-ordered inpatient drug treatment facilities (k = 2; n = 217); in a jail diversion program (k = 1; n = 15); on probation, parole, or work-release (k = 8; n = 3336); or in the community with a mix of supervisory arrangements ranging from parole to no supervision (k = 7; n = 2732). Nine studies provided information about the types of crimes leading to participants' criminal justice involvement: these typically included arrests because of drug crimes, property crimes, and prostitution.

Where reported, the median percentage of participants across studies with a high-school diploma or general equivalency diploma was 54% (k = 20); when studies reported average number of years of education, the median across studies was 11.2 (k = 12). Same-sex sexual orientation or behavior was discussed in only 2 studies,[72,73] which reported small percentages of participants disclosing same-sex sexual behavior or a same-gender primary partner; another study limited enrollment to individuals reporting heterosexual intercourse,[48] and 34 studies did not discuss sexual orientation. Inclusion criteria for enrollment in 23 of the 37 studies required recent substance use or a measure of drug or alcohol dependence (n = 7355). Twenty studies compensated participants for completing assessments or study activities, typically around $10 to $20 for baseline assessments and $25 to $50 for follow-up assessments. Typical recruitment procedures in incarceration facilities included mailings and in-person outreach to incarcerated individuals at the time of intake or a preset time before release; recruitment in community settings included mailings and in-person outreach at times of arrest, release from incarceration, probation visits, or drug court visits.

Interventions. Interventions varied widely across trials. Seven studies assessed OST for drug treatment (n = 967),[44,46,49,50,58,62,67] sometimes paired with psychosocial intervention, with the dual goals of reducing both substance use and associated HIV risk behaviors. These trials included 4 studies of methadone maintenance treatment (MMT), 1 study of buprenorphine maintenance, 1 comparing MMT to buprenorphine maintenance, and 1 comparing MMT to buprenorphine and naloxone (Suboxone) maintenance.

Twenty-seven studies assessed psychosocial strategies for preventing HIV (n = 10 344),[33,42,43,44,47,48,51–55,59–61,63–66,68–73] of which 18 also aimed to reduce drug or alcohol use along with HIV risk. Fifteen of the 27 psychosocial intervention studies declared a theoretical basis for the intervention, which most frequently included motivational interviewing, the health belief model, social cognitive theory, and the transtheoretical model. The psychosocial strategies used a group format (k = 5), an individual format (k = 16), or both group and individual activities (k = 3); 2 trials compared group interventions against individual modalities, and 1 did not state a format. Seven interventions included at least 1 peer-led component, and 4 trials included an active treatment arm that was primarily media-based (computer or video intervention); 6 trials evaluated a form of case management. Dosage of psychosocial interventions ranged from a single 20-minute session to 6 full months of a therapeutic community environment; across trials, the median intervention length was 9 hours.

Finally, 3 trials tested the effect of varying the time or place of offering participants an HIV test, with the goal of optimizing HIV testing behavior.[8,56,57]

Twenty-two of the 37 trials reported at least 1 method for assessing or increasing fidelity of intervention implementation, such as facilitator training and supervision, standardized intervention materials or manuals, attendance logs, fidelity checklists, or review of taped sessions.

Control groups also varied across studies and included no treatment (k = 3), usual care (which could include a range of services varying by local conditions; k = 7), basic information about HIV (k = 6), a diluted or less-intense ("nonenhanced") version of the active treatment (k = 8), an attention-matched control (i.e., identical in dosage and format to the intervention, but focusing on another topic instead of HIV; k = 1), a placebo for 1 OST trial (k = 1), and another active intervention intended to prevent HIV (k = 11).

Study designs and methodological quality. Information about methodological quality was underreported (Tables 4, 5, and 6). Thirty-one studies were randomized controlled trials, of which 11 reported the method of randomization (usually a computer-generated randomized sequence). The 6 quasi-randomized controlled trials "randomized" participants by alternation, assignment by month, or coin flip. Nine studies reported strategies for concealing the allocation sequence from staff responsible for recruitment and enrollment. Analyses were generally conducted on a complete case basis, in which participants are analyzed in original assignment groups but without imputing missing data for dropouts (k = 28).[107] Four studies conducted per-protocol analyses that excluded or reassigned participants who deviated from the intended interventions, and 4 studies employed full intention-to-treat analyses that accounted for dropouts (or had no attrition).[107] The unit of randomization was almost always the individual; in the 3 trials that randomized clusters of participants (by time block or facility), analytic methods for controlling for clustering were not described. Of the 32 studies that commented on baseline equivalence, 13 found group differences at baseline, and 6 of these explicitly described controlling for baseline differences in analyses. With the exception of 1 placebo-controlled trial, no study described methods for blinding participants or personnel to condition. Twenty-eight studies did not describe (or did not use) methods for blinding outcome assessors to reduce risk of detection bias. The longest follow-up ranged from immediate to 14.5 months after baseline, with a median longest

TABLE 1—Participants, Intervention Characteristics, and Retention of Included Studies Evaluating Psychosocial Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Location	Participant Criminal Justice Involvement	Participants (No.; Mean Ages; Race/Ethnicity; Gender)	Intervention; Total Approximate Time	Intervention Setting (Incarceration, Community, or Both)	Control Group	Last Follow-Up; Retention
Alemagno et al.[42]	Ohio	Probation or community supervision	212; 36 y; Primarily minority; Mixed	Computer-based brief negotiation and interviewing intervention; 1 session; 0.33 h	Community	Information: written educational materials about HIV	2 mo; 77%
Baxter[43]	Arizona	Incarcerated	134; About 30 y; Primarily White; Mixed	HIV education and risk assessment; 8 h	Incarceration	Not stated—most likely no treatment	6 mo; not stated
Braithwaite et al.[45]	Georgia	Incarcerated	116; 25.3 y; Primarily minority; Men	1. Active learning peer education, facilitator is HIV-negative former inmate, activities based on social cognitive theory; 12 h 2. Active learning peer education, facilitator is HIV-positive former inmate; 12 h 3. Didactic curriculum with videos; 12 h	Incarceration	Usual care, videos on health promotion and disease	3 mo; 41%
Callahan[47]	Missouri	Community, some on probation, some with lifetime history of arrest	204; 39.5 y; Primarily minority; Women	1. Testing and counseling, well-woman checkup, 4 peer intervention sessions by a health professional paired with a peer leader; 9 h 2. Testing and counseling, well-woman checkup; 1 h	Community	NE: testing and counseling only (NIDA standard intervention)	12 mo; 91%
Callahan[47]	Missouri	Community, some on probation, some with lifetime history of arrest, recruited from drug court	94; 36.5 y; Primarily minority; Women	1. Testing and counseling, well-woman checkup, 4 peer intervention sessions by a health professional paired with a peer leader; 9 h 2. Testing and counseling, well-woman checkup; 1 h	Community	NE: testing and counseling only (NIDA standard intervention)	12 mo; 90%

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TABLE 1—*Continued*

Clarke et al.[48]	Rhode Island	Incarcerated, primarily short-term facility that also serves as a prison	245; 34.57 y; Primarily White; Women	Motivational interviewing–set goals for changing alcohol use behavior, explored barriers to change, made change plan; 1.5 h	Both (1 session while incarcerated, 1 in community)	None: no treatment, received a list of resources	6 mo; 79%
el-Bassel et al.[51]	New York	Incarcerated	159; 32.8 y; Primarily minority; Women	Group sessions on HIV/AIDS prevention, skills building, and social support; 32 h	Both (16 sessions in incarceration, 6 booster sessions in community)	Information: three 2-h group sessions on HIV	1 mo; 64%
Eldridge et al.[52]	Mississippi	Drug offender, court-ordered to drug treatment	117; 34.2 y; Mixed; Women	2 sessions on HIV/STD education, then 4 sessions on behavior skills training, including condom skills, sexual refusal, negotiation, and needle-cleaning; 9 h	Community	Usual care: 2 sessions on HIV and STD education	2 mo; 57%
Fish et al.[53]	New York	Incarcerated	240; Age not reported; Ethnicity not reported; Men	Video, comic book, and risk assessment; 0.5 h	Incarceration	NE: risk assessment only	3 mo; 100%
Grinstead et al.[54]	California	Incarcerated	414; 35.7 y; Mixed; Men	Peer educator intervention by HIV-positive inmates; 0.5 h	Incarceration	Usual care	0.5 mo; 43%
Hser et al.[55]	Shanghai, China	Drug offender, compulsory residential drug treatment	100; 38.7 y; Chinese; Mixed	Strengths assessment based on transitional case management before community reentry, weekly contact with social worker, weekly urine testing, employment assistance, referral to MMT in the event of relapse; 3 mo	Both (began in compulsory residential drug treatment, then continued in the community)	Usual care: strengths assessment before reentry, monthly contact with a social worker, random urine testing approximately monthly	3 mo; 94%
Leukefeld et al.[59]	Connecticut, Delaware, Kentucky, Rhode Island	Incarcerated	444; 34.6 y; Primarily White; Women	5 group sessions in prison focusing on HIV and bloodborne infections, risky relationships, myths about drugs, sexual, relationships, abuse or control, self-protection, safer-sex negotiation, and support. 1 booster in the community 30 d later to boost recall and consider thinking myths; 8.5 h	Both (began in incarceration, then booster sessions in the community)	Information: AIDS awareness video	3 mo; 77%

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TABLE 1—*Continued*

Longshore et al.[60]	Ohio	Community supervision	192; 31.2 y; Mixed; Mixed	TASC case management including links with local service providers, drug testing, and schedules for reporting to criminal justice agents; 6 mo	Community	Other: alternative case management offering services like counseling and drug testing, but outside TASC protocol	6 mo; 69%
Longshore et al.[60]	Oregon	Community supervision	393; 31.6 y; Mixed; Mixed	TASC case management including links with local service providers, drug testing, and schedules for reporting to criminal justice agents; 6 mo	Community	Other: alternative case management offering services like counseling and drug testing, but outside TASC protocol	6 mo; 84%
Lurigio et al.[61]	Illinois	Probation	99; 30 y; Primarily minority; Mixed	1. HIV education delivered in one-on-one format including visual displays, included info about lubricants, condoms, dental dams, cleaning needles; 1 h 2. Same as No. 1, but delivered in a small group format; 1 h. Intervention groups were combined for analysis	Community	1. Attention: matched time, format and activities to No. 1, but subject matter was about heart disease, led by a physician 2. Attention: matched time, format and activities to No. 2, but subject matter was about heart disease, led by a physician. Control groups were combined for analysis	1 mo; 51%
Martin and Scarpitti[65]	Delaware	Parolees	456; 29.4 y; Primarily minority; Mixed	Assertive community treatment, drug treatment and case management including AIDS education; 6 mo	Community	Usual care parole	6 mo; 57%
Martin et al.[63]	Delaware	Probation	706; 34.5 y; Primarily minority; Mixed	2 sessions of a probationer-focused intervention with thought mapping and voluntary HIV testing, booster at 3-month follow-up; 2 h	Community	NE: NIDA enhanced standard intervention with testing; same as intervention group but without the thought mapping	6 mo; 60%

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TABLE 1—*Continued*

Martin et al.[64]	Delaware, Kentucky, Virginia	Incarcerated but scheduled for work release (DE), prison (KY), jail (VA)	534; 33.9 y; Mixed; Mixed	1. Peer-designed DVD intervention matched to participant race and gender, focusing on needle cleaning and condom negotiation, delivered with HIV testing and an educational video; 1 h 2. Health practitioner-administered NIDA standard intervention with HIV testing and educational video; 1 h	Incarceration	Information: testing plus educational video shown to all participants	3 mo; 64%
Marxhausen[66]	Delaware	Parole, work release (reentering the community with a supervised status)	600; Not reported; Mixed; Mixed	One-on-one peer-led intervention focusing on HIV and HCV; 1 h	Community	Other: group-format peer-led intervention The full design of the trial included other arms, but a full report was not available	1 mo (3-mo not available); 74%
Needels et al.[68]	New York	Incarcerated, then community	704; 34.7 y; Not reported; Women	Empowerment group meetings open to all inmates, individual counseling in jail, case management in the community after release designed to regularize lifestyles and lower risk of risk behavior; 12 mo	Both (group sessions in incarceration, then case management in the community)	NE: empowerment groups (with intervention group), but then usual discharge planning with other case management available in the community; Number of hours unclear	15 mo; 73%

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TABLE 1—*Continued*

Prendergast et al.[69]	4 sites, unidentified states	Incarcerated, then community (parolees, some probation)	812; 33.6 y; Mixed; Mixed	Transitional case management–strength assessment 2 mo prerelease, conference call 1 mo prerelease to review discharge plan and mobilize support. Weekly case manager in community for 3 mo, then 3 additional monthly follow-ups for clients needing more help. All participants got substance abuse treatment in jail, referral to publicly funded community treatment (mandated in all study states), and motivational video; 5 mo	Both (strengths-based assessment and conference call in incarceration, then case management in the community)	Usual care: referral to community-based treatment, which included standard supervision and referrals. All participants got substance abuse treatment in jail, referral to publicly funded community treatment (mandated in all study states), and motivational video	9 mo; 84%
Rhodes and Gross[33]	Oregon	Arrestees released after arrest or arraignment; some in community, others escorted from lockup to study site	696; About 33 y; Mixed; Mixed	1. Case management - video, referral guide, and case management program after release. Focused on drug use, HIV prevention, and linkages to other services. Not focused on controlling illegal behaviors; 6 mo 2. Referral–video, referral guide, plus 1 counseling and referral session with a referral specialist; 1 h	Community	Info: video and referral guide about HIV	6 mo; 85%

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TABLE 1—*Continued*

Rhodes and Gross[33]	Washington, DC	Arrestees released after arrest or arraignment; some in community, others escorted from lockup to study site	673; About 35 y; Primarily minority; Mixed	1. Case management—video, referral guide, and case management program after release. Focused on drug use, HIV prevention, and linkages to other services. Not focused on controlling illegal behaviors; 6 mo 2. Referral—video, referral guide, plus 1 counseling and referral session with a referral specialist; 1 h	Community	Info: video and referral guide about HIV	6 mo; 85%
Sacks et al.[70]	Colorado	Incarcerated	468; 35.1 y; Mixed; Women	Therapeutic community, including meetings, seminars, groups, and peer education. Also worked 20 h per week in the prison. Everyone at the facility got mental health services, education, health care, vocational training, and community reintegration training; 6 mo	Incarceration	Other: intensive outpatient program, educational 90-h course focusing on drug use and criminal behavior. Everyone at the facility got mental health services, education, health care, vocational training, and community reintegration training; 90 h	12 mo; 82%
Scott and Dennis[71]	Illinois	Community—reentering from jail treatment program	480; 36.7 y; Primarily minority; Women	Motivational interviews at release and monthly postrelease for 3 mo, with later interviews as needed (quarterly). Focused on feedback for drug use, HIV risk, and illegal activity; barriers that prevent stopping; motivation for change. Referral to treatment of women reporting substance use; 3 h or more	Community	Usual care	3 mo; 96%

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TABLE 1—*Continued*

Weir et al.[72]	Oregon	Probation, parole, and recently incarcerated	530; 35.7 y; Mixed; Women	1. HIV and IPV intervention. Up to 12 one-on-one counseling intervention sessions over 3 mo. All groups got counseling and testing for HIV, HCV, and STDs, and handbook of community services; 13 h 2. Same as No. 1 but without discussing IPV; 13 h	Community	NE: counseling and testing for HIV, HCV, and STDs, and handbook of community services; 1 h	9 mo; 84%
Wolitski[73]	California, Mississippi, Rhode Island, Wisconsin	Incarcerated, then released	522; About 23 y; Primarily minority; Men	Project START, 2 individual sessions before release focusing on HIV, hepatitis, and STI knowledge, personal risk-reduction plan, skills training, community reentry; 4 postrelease sessions review and update the plan and discuss barriers, additional sessions as needed; 5.5 h	Both (sessions before and after release)	NE: nonenhanced, 1 session, HIV, STD, and hepatitis risk assessments with risk reduction planning	5.5 mo; 77%

Note. IPV = intimate partner violence; MMT = methadone maintenance treatment; NE = a lesser or nonenhanced version of the experimental intervention; NIDA = National Institute on Drug Abuse; STD = sexually transmitted disease; TASC = Treatment Alternatives to Street Crime.

follow-up time of 6 months across studies. Median retention across studies was 77% at longest follow-up; 23 studies commented on sources or effects of attrition. Only 5 studies presented a power calculation justifying sample size.

Twenty-two of the 37 studies reported using a biological measure at baseline or any follow-up, most commonly urine testing for drug use (k = 12), hair testing for drug use (n = 2), unspecified testing for morphine (k = 1), a cervical swab for STIs (k = 1), oral testing for HIV (k = 1), and blood testing for HIV, hepatitis C, and other STIs (k = 5). Despite the fact that at least 6 studies conducted STI testing, however, only 4 studies reported HIV or STI incidence outcomes. Thirty-two studies assessed sexual or IDU behaviors; of those reporting methods of assessment, 2 studies used audio computer-assisted self-interviewing (ACASI), 5 used written questionnaires, and 23 used interviewer-administered questionnaires. Four studies did not report a sexual or IDU behavior, but assessed the proportion of participants who accepted HIV testing according to direct observation or medical records. Self-report measures of sexual behavior, IDU behavior, drug use, and recidivism varied and often appeared to be developed for individual studies, although several used assessments such as the Texas Christian University HIV/AIDS Risk Assessment, the HIV Risk-Taking Behavior Scale, the Criminal Justice Drug Abuse Treatment Studies intake form, the Timeline Followback approach for assessing substance use, and the National Institute on Drug Abuse Risk Behavior Assessment questionnaire; look-back periods for behavioral outcomes ranged from 14 days to 12

TABLE 2—Participants, Intervention Characteristics, and Retention of Included Studies Evaluating Opioid Substitution Therapy Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Location	Participant Criminal Justice Involvement	Participants (No.; Mean Age; Race/Ethnicity; Gender)	Intervention; Total Approximate Time (Hours or Months)	Intervention Setting (Incarceration, Community, or Both)	Control Group	Last Follow-Up; Retention
Bayanzadeh and Afshar[44]	Tehran, Iran	Incarcerated	100; 35.7 y; Iranian; Men	MMT plus CBT group therapy focusing on drug use; 1 daily intervention of CBT and skills, plus 1 weekly harm-reduction class and 1 weekly family education visit; 6 mo	Incarceration	Other: nonmethadone treatment of addictions plus psychotherapeutic medications	6 mo; 58%
Brown et al.[46]	Wisconsin	Jail diversion–drug court or treatment	15; 27.5 y; Primarily White; Mixed	1. Treatment in a specialist treatment facility (for opioid-dependent offenders) with buprenorphine and naloxone (Suboxone); 12 mo 2. Treatment in the specialist treatment facility with MMT; 12 mo	Community	Other: treatment in a primary care facility with buprenorphine and naloxone (Suboxone); 12 mo	13.5 mo; Not known
Cropsey et al.[49]	Alabama	Probation or parole, community supervision	36; 31.8 y; Primarily White; Women	Buprenorphine and weekly study visit to discuss adherence, side effects, and medication management, dosage ranged from 8 to 12 mg/day and was based on weekly assessment; 12 wk	Community	Placebo with similar counseling	5.5 mo; 100%
Dolan et al.[50]	New South Wales, Australia	Incarcerated	382; 27 y; Primarily White; Men	MMT, started on 30 mg and increased by 5 mg every 3 d until 60 mg achieved; 4 mo	Incarceration	None: waitlist for MMT	48 mo; 65%

Continued

TABLE 2—*Continued*

Kinlock et al.[58]	Maryland	Incarcerated, then community	211; 40.3 y; Primarily minority; Men	1. 12 weekly sessions of drug abuse education, a meeting with the study counselor, and MMT while in prison (beginning at 5 mg and increasing 5 mg every 8 d up to 60 mg) then referred to the program's community-based facility within 10 d of release; 12 wk 2. Same as No. 1, but MMT not provided during incarceration (provided through postrelease referral instead); 12 wk	Both (began in incarceration, then continued after release)	Other: group education sessions and individual counseling only, advised to seek drug abuse treatment in the community at a publicly funded program according to standard procedures	14.5 mo (12 mo after release); 97%
Magura et al.[62]	New York City	Incarcerated, short term	133; 39 y; Primarily minority; Men	MMT: 30 mg/day stepped up to 70 mg per day where indicated, referral upon release; 10–90 d	Incarceration	Other: buprenorphine, 4 mg stepped up to 32 mg where indicated; 10–90 d	6 mo; 61%
McKenzie et al.[67]	Rhode Island	Incarcerated	90; 40.7 y; Primarily White; Mixed	1. Prerelease MMT starting at 5 mg then increasing by 2 mg daily until target dose or release (average MMT lasted 15 d prerelease); 1 HIV risk-reduction and overdose prevention counseling session; referral and funding for a postrelease drug treatment program in community for 12 wk full-time and 12 wk part-time; 26 wk total 2. Same as No. 1, but without prerelease MMT; 24 wk total	Both (began during incarceration, then continued after release)	NE: 1 HIV risk-reduction and overdose prevention counseling session, referral to community MMT program without $ assistance)	6 mo (12 mo not available); 69%

Note. CBT = cognitive–behavioral therapy; MMT = methadone maintenance treatment; NE = a lesser or nonenhanced version of the experimental intervention.

TABLE 3—Participants, Intervention Characteristics, and Retention of Included Studies Evaluating HIV Testing Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Location	Participant Criminal Justice Involvement	Participants (No.; Mean Age; Race/Ethnicity; Gender)	Intervention; Total Approximate Time	Intervention Setting (Incarceration, Community, or Both)	Control Group	Last Follow-Up; Retention
Gordon et al.[8]	Maryland, Rhode Island	Probation or parole	697; 38.7 y; Primarily minority; Mixed	Offered HIV testing directly at the correctional facility in a private office; 5 min	Community	Other: given a card with clinic information and detailed directions for testing at a community testing site (off-site from the corrections office)	Unclear how long they waited for testing to occur; 100%
Kavasery et al.[57]	Connecticut	Incarcerated	298; 35 y; Mixed; Men	1. Offered testing the same day as entry; 5 min 2. Offered testing the next day after entry; 5 min	Incarceration	Other: offered testing 1 week after entry	0 mo; 76%
Kavasery et al.[56]	Connecticut	Incarcerated	323; 33.6 y; Mixed; Women	1. Offered testing the same day as entry; 5 min 2. Offered testing the next day after entry; 5 min	Incarceration	Other: Offered testing 1 week after entry	0 mo; 83%

months, but typically were 1 to 3 months.

Outcomes

We report the results from primary trials in Table 7. Outcomes are defined here as short-term for assessments occurring less than 6 months from baseline, medium-term at 6 to 12 months from baseline, and long-term at 12 months or longer from baseline. Where a study reported multiple assessments in the same time category (e.g., 6 and 9 months), results from the longer follow-up are reported. For each outcome, we describe the number of trials reporting the outcome of interest, the maximum number of participants across trials retained at the follow-up assessments, statistically significant findings ($P<.05$) favoring intervention or control groups, and the number of participants represented in comparisons that reached statistical significance. We approximated the number of participants at follow-up for some studies with incomplete reporting; where these studies contribute to totals in this analysis, the total is expressed with a less-than-or-equal-to symbol ("≤"). Where a behavioral outcome was reported by 3 or fewer trials (e.g., sharing tattoo needles), it is not included here.

Biological outcomes. Three studies reported HIV infection outcomes, all at short-term follow-up (n = 456).[41,50,55] All findings were nonsignificant with control groups including usual care,[55] no treatment or waitlist,[50] and information only.[42] Two studies reported a measure of STI (n = 285),[48,50] including hepatitis C virus incidence[50] and time until a positive STI test,[48] and both used no-treatment or waitlist controls. Group differences in STI measures were nonsignificant in both studies at short-, medium-, and long-term follow-up.

Sexual behavior. Seventeen studies reported a measure of condomless sexual intercourse at any follow-up (n = 5219).[42,47,55,58–60,63–65,68–73] Three studies (n = 1161) reported significant group differences favoring a peer-designed DVD intervention over a standard video at short- and medium-term follow-up,[64] favoring motivational interventions focusing on HIV or HIV plus intimate partner violence over standard counseling and testing at short- and medium-term follow-up,[72] and favoring a multisession individualized intervention over a single-session control.[73] One study identified a significant difference in the opposite direction at long-term follow-up (n = 511),[68] showing that women released from jail who received case management services after jail-based empowerment groups reported a significantly higher frequency of recent condomless sexual intercourse compared with participants who attended the empowerment groups without case management.

Eleven studies reported a measure of number of sexual partners (n = 3211).[33,42,43,47,52,58,59,63,68] Only 1 study found a significant group difference (n = 94) at long-term follow-up, favoring the addition of a "well-woman" checkup and peer-led intervention to a testing and counseling intervention for women recruited from drug courts.[47]

Nine studies reported a measure of condom use (n ≤ 1220).[33,42–44,52,54,55,61] Three studies reported evidence of a significant intervention benefit, all at short-term follow-up (n = 228). These results favored the addition of behavior skills training to a standard educational

TABLE 4—Methodological Characteristics of Included Studies Evaluating Psychosocial Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Study Design	Method of Randomization	Unit of Randomization; Unit of Analysis	Baseline Differences	Power Calculation	Type of Analysis	Results of Any Attrition Analyses
Alemagno et al.[42]	RCT	Not reported	Individual; Individual	Yes	Not reported	Complete case	Injection drug users in experimental group were more likely to drop out
Baxter[43]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	Not reported
Braithwaite et al.[45]	RCT	Not reported	Facility; Individual	Not reported	Not reported	Complete case	Not reported
Callahan[47]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	Not reported
Callahan[47]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	Not reported
Clarke et al.[48]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	No differential attrition by condition
el-Bassel et al.[51]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	No differences between dropouts and returnees, follow-up rates for experimental and controls were similar
Eldridge et al.[52]	RCT	Not reported	3-wk admission blocks; Individual	No differences	Not reported	Complete case	No difference between completers and noncompleters by race, income, relationship, or crack cocaine use; no difference between intervention conditions
Fish et al.[53]	Quasi-RCT	Coin flip	Individual; Individual	Not reported	Not reported	Complete case	Not reported
Grinstead et al.[54]	Quasi-RCT	Alternation	Week of participants' release from prison; Individual	No differences	Not reported	Per protocol	Returnees were more likely to be married or in committed relationship than dropouts
Hser et al.[55]	RCT	Computer-generated randomization sequence	Individual; Individual	No differences	Not reported	Complete case	Attrition similar across study arms
Leukefeld et al.[59]	RCT	Computer-generated with Research Randomizer	Individual; Individual	Yes[a]	Not reported	Complete case	Dropout did not vary by site
Longshore et al.[60]	RCT	Not reported	Individual; Individual	Yes[a]	Not reported	Complete case	No differences between dropouts and returnees
Longshore et al.[60]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	No differences between dropouts and returnees
Lurigio et al.[61]	RCT	Not reported	Individual; Individual	Not reported	Not reported	Complete case	Returnees did not differ from entire original sample

Continued

TABLE 4—*Continued*

Martin and Scarpitti[65]	RCT	Not reported	Individual; Individual	Yes	Not reported	Complete case	Not reported
Martin et al.[63]	RCT	Not reported	Individual; Individual	Not reported	Not reported	Complete case	Not reported
Martin et al.[64]	RCT	Computer-generated urn randomization	Individual; Individual	No differences	Not reported	Complete case	Not reported
Marxhausen[66]	RCT	Not reported	Individual; Individual	Not reported	Yes, 99% power to detect an effect size of 0.25, at $\alpha = 0.05$	Complete case	Attrition analyses not reported, but noncompletion of questions occurred at a similar rate between groups among the participants who were retained at follow-up
Needels et al.[68]	RCT	Not reported	Individual; Individual	Yes[a]	Not reported	Complete case	Not reported
Prendergast et al.[69]	RCT	Computer-generated sequence, urn randomization	Individual; Individual	Yes	Not reported	Per protocol	Completers did not differ from noncompleters at 3 mo, but at 9 mo completers were more likely than noncompleters to have history of prostitution or pimping and crack use. At 3 mo, the balance between groups shifted and treatment group was more likely to have lifetime GHB use than controls; at 9 mo the treatment group was more likely to have lifetime suicidal ideation.
Rhodes and Gross[33]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	No differences between groups; no differences between completers and baseline sample
Rhodes and Gross[33]	RCT	Not reported	Individual; Individual	No differences	Not reported	Complete case	No differences between groups; no differences between completers and baseline sample
Sacks et al.[70]	RCT	Not reported	Individual; Individual	Yes[a]	Not reported	Complete case	No differences between groups at 6 mo or 12 mo

Continued

TABLE 4—Continued

Scott and Dennis[71]	RCT	Computer-generated sequence using grand urn	Individual; Individual	No differences	Target sample size was 425 for 80% power (2-tail), assuming 90% retention	Complete case	Not reported
Weir et al.[72]	RCT	Computer-generated	Individual, numbers balanced within each block of 30; Individual	Yes[a]	Not reported	Complete case	No differences in attrition by group, no differences between completers and dropouts
Wolitski[73]	Quasi-RCT	Assignment based on month of recruitment in 2 states and month of anticipated release in 2 states	Individual; Individual	Yes	Not reported	Complete case	No differences between dropouts and completers

Note. GHB = gamma-hydroxybutyrate; RCT = randomized controlled trial.
[a]Study reported explicit methods for handling baseline differences in outcome analyses.

intervention for women court-ordered to drug treatment,[52] favored a peer-led intervention over usual care for incarcerated men,[54] and favored individual and small-group HIV education over an attention-matched control for adult probationers.[61]

Eight studies reported results by using a composite index of sexual risk behavior (n = 1185).[43,45,46,51,52,62,66,70] Of these, 2 found a significant intervention benefit at any follow-up (n = 131). One trial among incarcerated men found that an educational intervention led by an HIV-negative peer was significantly more beneficial than usual care at short-term follow-up.[45] The other trial was a pilot study enrolling n = 15 individuals from a jail diversion program: participants who received MMT or combination buprenorphine and naloxone at a specialist treatment facility for opioid-dependent individuals reported significantly safer behaviors at medium-term follow-up than participants who received buprenorphine and naloxone in a primary care setting.[46]

Six studies reported a measure of all sexual activity (compared with sexual abstinence; n ≤ 961).[42,44,50,54,55,58] No study found a significant difference between experimental conditions at any time point, using a range of control groups that included information, usual care, no treatment, or an alternative HIV prevention intervention.

Six studies reported a measure of engagement in transactional sexual intercourse (n = 1637).[47,55,63,68,70] Of these, only one found a significant benefit,[70] showing that incarcerated women randomized to take part in a therapeutic community intervention for 6 months were less likely than participants in outpatient treatment to report having sexual intercourse in exchange for money or drugs at medium-term follow-up (n = 314). By contrast, 1 intervention found a significant iatrogenic effect at long-term follow-up (n = 511),[68] finding that female jail releasees who received case management services and attended jail-based empowerment groups were more likely to report having sexual intercourse in exchange for money or drugs compared with controls who did not receive case management.

Five studies reported any measure of sexual intercourse under the influence of drugs or alcohol (n = 1289).[42,58,60,68] One reported a significant intervention benefit at medium-term follow-up (n = 329),[60] favoring case management using the Treatment Alternative to Street Crime model over alternative case management for drug-using probationers and parolees who reported a high baseline frequency of recent sexual intercourse under the influence. One trial reported a significant iatrogenic effect at long-term follow-up (n = 511),[68] finding a higher frequency of recent sexual intercourse under the influence among female jail releasees who attended empowerment groups along with receiving case management, compared with controls who solely attended the empowerment groups.

Injection drug use behavior. Seventeen studies reported a measure of self-reported incidence or frequency of IDU at any follow-up (n ≤ 4173).[33,42–44,49,50,54,55,58,63,65–67,70,71,73] Of these, 3 studies found evidence of significant intervention benefit (n = 835); 2 of these were trials of MMT for incarcerated men. In one trial, men who received MMT reported a lower incidence and

TABLE 5—Methodological Characteristics of Included Studies Evaluating Opioid Substitution Therapy Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Study Design	Method of Randomization	Unit of Randomization; Unit of Analysis	Baseline Differences	Power Calculation	Type of Analysis	Results of Any Attrition Analyses
Bayanzadeh and Afshar[44]	Quasi-RCT	Alternated row numbers in a list of participants, stratified by type of drug use	Individual; Individual	Yes	Not reported	Complete case	Not reported
Brown et al.[46]	RCT	Not reported	Individual; Individual	No differences	Not reported	Could not be determined	Not reported
Cropsey et al.[49]	RCT	Random numbers table	Individual; Individual	Yes	Not reported	ITT, no attrition	No attrition
Dolan et al.[50]	RCT	Drew cards from an envelope	Individual, balanced within blocks of 10; Individual	No differences	Yes, powered to detect change in heroin use, not HIV or HCV; 90% power to detect a 23% difference in heroin use at $P = .01$	Complete case	No, but attrition did not appear to differ between groups
Kinlock et al.[58]	RCT	Not reported	Individual, balanced within each block of 9; Individual	No differences	Yes, 90% power to detect a small-to-medium effect size	Complete case	At 6 mo, dropouts had higher rates of self-reported heroin use 30 d before incarceration
Magura et al.[62]	RCT	Prenumbered envelopes inside sealed envelopes	Individual; Individual	Yes[a]	Not reported	Per protocol	No differences between the 2 conditions in attrition
McKenzie et al.[67]	RCT	Computer-generated urn randomization stratified by race and gender	Individual; Individual	No differences	Not reported	Per protocol	Not reported

Note. ITT = intention to treat; RCT = randomized controlled trial.
[a]Study reported explicit methods for handling baseline differences in outcome analyses.

frequency of heroin and other drug injection at short-term follow-up compared with waitlist controls[50]; in the other trial, men receiving MMT also reported a lower incidence of IDU at medium-term follow-up compared with controls who received alternatives to MMT.[44] The third trial found that participants who received 6 months of case management after arrest were less likely to report IDU compared with controls who viewed an educational video, as well as participants who viewed the video and received a single counseling session, but effects were not sustained at medium-term follow-up.[33] Too few events occurred for meaningful analyses in 2 studies.[42,73]

Twelve studies reported a measure of self-reported needle sharing or use of sterile injection equipment ($n \leq 2605$).[33,42–44,50,54,55,58,61,62,72] Of these, 4 found a significant group difference at any time point ($n = 1005$). Three of these also reported significant benefits for incidence and frequency of IDU, described previously.[33,44,50] The 2 trials of MMT for incarcerated men found that MMT recipients were less likely to report sharing IDU equipment at short-term follow-up compared with waitlist controls,[50] and were less likely to report sharing IDU equipment at medium-term follow-up compared with controls who received other forms of drug treatment.[44] The trial of case management found that participants who received case management were less likely than educational video recipients to share needles, even when the video viewers also received a single counseling session; also, among those who did share needles, case management recipients were more likely to clean needles before use than those who received the video without counseling.[33] Similar to the results for the frequency of IDU, these effects were not sustained beyond short-term follow-up. The fourth study found that incarcerated participants who received HIV education and risk assessment reported sharing fewer types of drug use equipment than no-treatment controls.[43] Too few events occurred for meaningful analysis in 1 study.[42]

HIV testing behavior. Six studies ($n = 1770$) assessed interventions aiming to increase HIV testing

TABLE 6—Methodological Characteristics of Included Studies Evaluating HIV Testing Interventions in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

Study	Study Design	Method of Randomization	Unit of Randomization; Unit of Analysis	Baseline Differences	Power Calculation	Type of Analysis	Results of Any Attrition Analyses
Gordon et al.[8]	RCT	Computer-generated sequence	Individual; Individual	Yes	Not reported	ITT, no attrition	No attrition
Kavasery et al.[57]	Quasi-RCT	Alternation	Individual; Individual	No differences	Not reported	ITT, dropouts were considered like test refusals	Dropouts were attributable to early release, and were more likely to have been incarcerated before
Kavasery[56]	Quasi-RCT	Alternation	Individual; Individual	No differences	Yes, 80% power to detect 22% difference between arms given baseline uptake of 60%	ITT, dropouts were considered like test refusals	Dropouts were attributable to early release, and they had less opiate-positive results and were less likely to be jailed for drug or sexual offenses

Note. ITT = intention to treat; RCT = randomized controlled trial.

behavior.[8,42,53,56,57,61] Four found significant differences at short-term follow-up (n = 1481), favoring a computer-based intervention over written information,[42] on-site testing at probation offices over off-site referrals,[8] offering immediate or next-day testing over 1-week postponed testing for men entering jail,[57] and offering next-day testing over immediate or 1-week postponed testing for women entering jail.[56]

Ancillary Outcomes

Drug use behavior. Twenty-four studies reported an assessment of drug use at any follow-up (n ≤ 5874),[33,44–47,49,50,52,54,55,58,60,62,63,65–71] including all 7 trials that tested OST strategies. Drug use data were derived from biological testing alone in 3 studies[44,49,55] self-report alone in 17 studies,[33,45–47,52,54,60,62,63,66,67,69–71] and both types of measures in 4 studies.[50,58,65,68] Ten studies found a significantly favorable intervention effect at any time point (n = 1975), including 3 studies with a favorable intervention effect for a biological outcome assessment (n = 249).[44,49,58] Programs showing benefit included 5 OST interventions, demonstrating evidence for MMT compared with waitlist controls at short-term follow-up,[50] MMT compared with non-MMT treatment alternatives at medium-term follow-up[44,58] and long-term follow-up,[58] prerelease MMT compared with a postrelease MMT referral at medium- and long-term follow-up,[58] postrelease MMT referral compared with controls receiving no referral at medium-term follow-up,[58] buprenorphine compared with placebo at short-term follow-up,[49] and prerelease MMT compared with postrelease referrals to funded community treatment.[67]

The other 5 trials with significant evidence of treatment benefit tested psychosocial interventions. One trial found significant benefit for an educational intervention led by HIV-positive peers compared with usual care at short-term follow-up.[45] The results of another trial favored peer education and "well woman" checkups compared with HIV testing alone at long-term follow-up.[47] Findings of a third trial favored case management using the Treatment Alternatives to Street Crime model compared with other case management services at medium-term follow-up, but only among probationers and parolees who reported using a larger number of drugs at baseline.[60] A fourth trial found significant benefit for participation in a 6-month prerelease therapeutic community compared with outpatient treatment at medium- and long-term follow-up.[70] The final trial found a benefit of case management services at short-term follow-up compared with a single-session counseling session with a video, and compared with viewing the video alone.[33] In contrast to these studies, 1 study found a significant iatrogenic effect (n = 90): among participants who agreed to urine testing for drug use, parolees in Assertive Community Treatment case management were more likely to test positive than usual care controls.[65]

Recidivism. Eleven studies measured reincarceration at any follow-up (n = 3687),[33,50,58,62,65,67,68,70,71,73] of which 6 reported using a data source other than self-report (e.g., state records, study records of whether follow-up interviews took place in correctional facilities).[33,62,67,70,73] Of

TABLE 7—Study Outcomes and Number of Participants at Follow-Up Assessments for Sexual Behavior, Injection Drug Use Behavior, and HIV Testing in a Systematic Review of HIV Risk-Reduction Interventions in Incarceration and Community Settings

				Sexual Behavior			Injection Drug Use Behavior			HIV Testing		
Study	No.[a]	Setting[b]	Control[c]	Short[d]	Medium	Long	Short	Medium	Long	Short	Medium	Long
Psychosocial interventions												
Alemagno et al.[42]	212	Comm	Info	163			109[e]			163*		
Baxter[43]	134	Incarc	None		94			134*				
Braithwaite et al.[45]	116	Incarc	UC	116*								
Callahan[47]	204	Comm	NE			204						
Callahan[47]	94	Comm	NE			94*						
Clarke et al.[48,f]	245	Both	None									
el-Bassel et al.[51]	159	Both	Info	100								
Eldridge et al.[52]	117	Comm	UC	57*								
Fish et al.[53]	240	Incarc	NE							239		
Grinstead et al.[54]	414	Incarc	UC	≤121*			≤74					
Hser et al.[55]	100	Both	UC	94			94					
Leukefeld et al.[59]	444	Both	Info	344								
Longshore et al.[60]	192	Comm	Other		134							
Longshore et al.[60]	393	Comm	Other		329*[g]							
Lurigio et al.[61]	99	Comm	Attention	50*			50			50		
Martin and Scarpitti[65]	456	Comm	UC		119			119				
Martin et al.[63]	706	Comm	NE		420			420				
Martin et al.[64]	534	Incarc	Info	343*								
Marxhausen[66]	600	Comm	Other	294			229					
Needels et al.[68]	704	Both	NE			Iatrogenic, 511						
Prendergast et al.[69]	812	Both	UC	692	681							
Rhodes and Gross[33]	696	Comm	Info	513	561		513*	561				
Rhodes and Gross[33]	673	Comm	Info	571	568		574	568				
Sacks et al.[70]	468	Incarc	Other		314*	370		388	370			
Scott and Dennis[71]	480	Comm	UC	462			462					
Weir et al.[72]	530	Comm	NE	391*	446*		391	446				
Wolitski[73]	522	Both	NE	397	372*		401[e]	376[e]				
OST interventions												
Bayanzadeh and Afshar[44]	100	Incarc	Other		69			69*				
Brown et al.[46]	15	Comm	Other		15*							
Cropsey et al.[49]	36	Comm	Placebo				36					
Dolan et al.[50]	382	Incarc	None	253			253*					
Kinlock et al.[58]	211	Both	Other	206	203	194	206	203	194			
Magura et al.[62]	133	Incarc	Other	81			81					
McKenzie et al.[67]	90	Both	NE					62				

Continued

TABLE 7—Continued

Testing interventions				
Gordon et al.[8]	697	Comm	Other	697*
Kavasery et al.[57]	298	Incarc	Other	298*
Kavasery et al.[56]	323	Incarc	Other	323*

[a]Number of participants randomized at baseline.
[b]Setting: Incarc = the intervention took place wholly in an incarceration setting; Comm = the intervention took place wholly in a community setting; Both = the intervention began in an incarceration setting and continued in the community.
[c]Control groups: Attention = like the experimental group in time and format, but not focused on HIV; Info = information about HIV; NE = a lesser or nonenhanced version of the experimental intervention; None = no intervention; Other = another HIV prevention intervention; Placebo = a placebo; UC = usual care.
[d]Short-term follow-up was defined as < 6 mo from baseline; medium-term was from 6 to < 12 mo, and long-term was 12 mo or longer.
[e]Too few events occurred for meaningful analysis.
[f]This study did not report group comparisons for behavioral outcomes; the outcome of relevance for this review was sexually transmitted infection incidence.
[g]This effect was significant only among participants who reported high levels of baseline risk.
*Statistically significant effect at $P < .05$, in a direction favoring any intervention group over controls; iatrogenic = statistically significant effect at $P < .05$, in a direction favoring controls over the intervention group; results without an asterisk or "iatrogenic" next to the number of participants at follow-up did not reach statistical significance, given a significance level of $P < .05$.

the 11 studies, 3 found a significant group difference at any time point (n = 878). One found that participants who received prerelease MMT and counseling were less likely to report reincarceration at short-term but not medium-term follow-up, compared with participants who received postrelease MMT referral and counseling, and compared with participants who received counseling only.[58] Another study found that participants who received case management were less likely to report reincarceration at short-term but not medium-term follow-up, compared with participants who watched an educational video with or without a single counseling session.[33] Among participants in a third study who had been reincarcerated, those who had participated in a therapeutic community reported a longer time period before reincarceration occurred, compared with participants who received outpatient treatment.[70] One study reported an iatrogenic effect (n = 414), finding that participants who received multiple pre- and postrelease counseling sessions on HIV and reentry were more likely than participants who received a single HIV risk-reduction session to self-report reincarceration at short-term follow-up; this effect disappeared at medium-term follow-up and may be explained by participant tracking strategies at 1 trial site.[73]

Ten studies measured recidivism by arrest at any follow-up (n = 3477),[33,55,60,62,67–71] of which 5 reported using a data source other than self-report (e.g., state records).[33,60,70,71] Of the 10 studies, 2 found significantly protective intervention effects at any follow-up (n = 899). One found that the addition of case management after HIV-related jail empowerment groups led to a reduced likelihood of arrest with serious charges at long-term follow-up, compared with participants who did not receive case management.[68] The other trial evaluated a therapeutic community, and it found that the therapeutic community participants were less likely than outpatient participants to report overall arrest at medium- but not long-term follow-up, and less likely to report arrest for an offense other than parole violation at medium-term follow-up.[70] One study found a significant iatrogenic effect (n = 378), suggesting that participants who received case management using the Treatment Alternatives to Street Crime model had more arrests according to probation records at medium-term follow-up, compared with participants who received case management that did not use that model.[60]

Seven studies reported any measure of recidivism by self-reported criminal activity at any follow-up (n = 2649).[33,58,60,70,71] Of these, 3 found a significant difference between groups at any time point (n = 1157). One found that the addition of prerelease MMT to counseling led to significant reductions in frequency of criminal activity at short- and medium-term follow-up[58]; this study also found a benefit of prerelease MMT compared with a postrelease MMT referral at short-term follow-up. A second study found that participants who received 6 months of case management were less likely to report recent criminal activity at medium- but not short-term follow-up, compared with participants who viewed an educational video or who received both the video and a single counseling session.[33] Finally, a third study found that

participants who spent 6 months in a therapeutic community before release from incarceration were less likely to engage in criminal activity and drug-related activity at both medium- and long-term follow-up compared with participants in an intensive outpatient program.[70]

Intervention acceptability. Ten studies reported information about intervention acceptability or participant satisfaction.[42,44,50,51,52,55,58,59,61,62] Four assessed an OST intervention for drug treatment, and all found a low incidence of adverse events,[50,58] high ratings for participant satisfaction with treatment,[44,50] willingness to recommend the treatment to others,[44] and a high proportion of participants who intended to remain on treatment in the future (which was higher among participants receiving buprenorphine compared with those receiving MMT).[62] Among the 6 studies of psychosocial interventions that assessed acceptability, acceptability was also high according to satisfaction outcomes,[53,59,61] and general descriptions of participant and staff reception.[42,51,55]

Intervention costs. Five trials commented on intervention cost.[42,54,63,72,73] Two trials noted that staff training and time may be comparatively costly for psychosocial interventions delivered in a one-on-one format,[63,72] and 2 trials noted potential cost savings associated with a peer-led intervention for incarcerated men[54] and a computer-based intervention for a mixed-gender sample of individuals on probation.[42] A formal cost assessment was available for only 1 study, which found that a multisession intervention with services in both correctional facilities and the community cost approximately $1830 per participant (2009 dollars), whereas a single-session prerelease intervention cost approximately $690 per person.[73] The authors concluded that the multisession intervention would be cost-effective if it prevented 1 HIV transmission per 753 participants released from prison.

DISCUSSION

Reducing the risk of HIV infection is a critical priority for adult populations with criminal justice involvement, given overlapping risks such as IDU and noninjection drug use, transactional sexual intercourse, condomless sexual intercourse, high rates of STI, and inadequate access to HIV prevention and other medical services. The past few decades have brought intervention efforts in both community and incarceration settings, via modalities such as OST, case management, counseling and HIV testing, media-based interventions, peer-led interventions, and motivational interviewing, but these have not yet been aggregated in a systematic review. In this review, we assessed descriptive information, methodological details, and results of 37 randomized and quasirandomized controlled trials of interventions that aimed to prevent HIV among adults with criminal justice involvement.

Our analysis suggests that although many interventions do not appear to influence behavioral or biological outcomes in this population (when compared with various controls, many of which also included some HIV prevention services), a range of intervention options show promise. We identified 11 trials demonstrating a significant protective effect of an intervention on a measure of sexual risk behavior,[45–47,52,54,60,61,64,70,72,73] 4 trials demonstrating a significant benefit for HIV risk behaviors related to IDU behavior,[33,43,44,50] and 4 trials demonstrating ways to maximize the uptake of HIV testing services in this population.[8,42,56,57] No intervention has yet demonstrated a benefit for both a sexual and an IDU behavior, despite the efforts of 18 trials that reported results in both categories.[33,42–44,50,54,55,56,61–63,65,66,70–73] Biological outcomes were underreported, and no study reported a significant program effect on HIV or STI at follow-up. Although several studies identified iatrogenic effects on 1 or more outcomes,[60,65,68,73] it does not appear that HIV risk-reduction efforts in this population cause systemic harm; these effects were often explained in primary trials as isolated or chance findings.

Because data limitations prevented a meta-analysis, we cannot comment with certainty on mediators, moderators, or the core program components responsible for program effects. Data on individual program effects should also be interpreted with the control group in mind. These trials, however, offer a variety of intervention options for service providers in different settings. Of particular interest are the 15 interventions that demonstrably reduced self-reported sexual or IDU-related risk behavior compared with controls.[33,43–47,50,52,54,60,61,64,70,72,73] Eight of these programs were delivered all or in part in incarceration settings before release[43–45,50,54,64,70,73]; effective programs for all-male samples included prerelease MMT,[44,50] peer-led HIV education programs using an individual[54] or group[45] format, and motivational interviewing with sessions before and after community reentry.[73] For incarcerated mixed-gender or all-female samples, protective effects were observed for several psychosocial programs, including a DVD program developed by peers,[64] a 6-month therapeutic community for drug-using incarcerated women,[70] and an educational program delivered by health educators.[43] Among programs delivered solely outside incarceration settings, 7 trials showed evidence of benefit for mixed-gender and all-female samples after arrest, under community supervision, and in court-ordered residential drug treatment.[33,46,47,52,60,61,72] Effective interventions included several types of case management[33,60]; one-on-one or group-based HIV education delivered by peer leaders[47] or health educators[52,61,72]; services integrating HIV prevention with medical checkups[47] or intimate partner violence intervention[72]; and a pilot study comparing specialized drug treatment to treatment in primary care.[46]

We concur with previous systematic reviews suggesting that OST in prison may reduce drug-related[22] and HIV-related risks.[23,29] We also agree with reviews suggesting the effectiveness of certain behavioral interventions in this group.[20,21] Our results overlap with a large review of randomized and nonrandomized studies of HIV prevention efforts in prison settings, including voluntary testing, condom provision, needle-exchange programs, bleach programs, safe tattooing initiatives, OST, drug-free units, and drug supply reduction.[3] Because correctional policies may be unsupportive of structural interventions in incarceration settings, such as condom provision, needle-exchange initiatives, and bleach

programs, we note that this review did not identify any trials of these approaches. This does not mean that such programs are ineffective; to the contrary, previous empirical research suggests that these initiatives are feasible, do not threaten security, and lead to greater use of condoms and sterile injection equipment in prison settings.[3] Our review of this literature would support policy modifications to enable a wider variety of HIV prevention efforts, integrating structural interventions alongside psychosocial programs, drug treatment, and larger societal efforts to reduce the impact of incarceration and criminal justice involvement on individuals and communities at risk for HIV.

Strengths

This review has many strengths. To our knowledge, this is the first systematic review to synthesize evidence of effectiveness for all HIV risk-reduction interventions serving adults with criminal justice involvement. We limited this review to the evidence most appropriate for demonstrating causal effects by including only randomized and quasi-randomized controlled trials; we also limited our review to the most relevant outcome data through our exclusive focus on behavioral and biological outcomes, rather than HIV knowledge or attitudinal outcomes. Our search for trial evidence was highly sensitive, without limits for language, date, participant age, geography, or study design terms.

To our knowledge, we are among the first in this area to search not only databases of public health literature, but also databases of criminal justice scholarship (e.g., Criminal Justice Abstracts, National Criminal Justice Reference Service). These databases contributed 4773 unique citations to our search and yielded 1 primary article encompassing 2 studies,[60] as well as 2 supplemental reports.[103,105] We add to previous literature by including data on intervention acceptability, cost, and outcomes such as drug use and recidivism.

Generalizability and Limitations

Several limitations affect the generalizability of findings. Despite our international search, we found only 3 studies outside the United States. Variation across correctional systems and state or federal laws may limit the generalizability of these results to non-US settings, and even from 1 US state to another. Thus, although some of these effective interventions may be transferable to other locations, it will be important to investigate feasibility and acceptability before doing so. The characteristics of participants in the included trials may also limit generalizability in some scenarios; for example, 6 trials enrolled primarily White participants; 9 and 12 trials were limited to female or male participants, respectively; participants' criminal justice involvement (where reported) derived from property and drug-related crimes; and average ages across trials had a mean of 34.5 years (which may limit generalizability to younger samples). Data limitations prevented a meta-analysis, which hampered our ability to conduct subgroup analyses by participant and intervention characteristics. Publication bias is an unavoidable limitation of systematic reviewing, and we may have missed unpublished or ongoing trials; we also did not include studies indexed after January 2014. We did not control for the use of multiple statistical tests: this review reports the results of 358 statistical tests, of which 75 reached statistical significance in either direction at a level of $P < .05$.

This review is also challenged by methodological weaknesses and underreporting across primary trials, particularly missing information about method of randomization, concealment of the allocation sequence from recruitment staff, blinding of outcome assessors, impacts and sources of attrition, sample size calculations, fidelity of program implementation, and intervention acceptability and costs. With the complexity of reporting results in a narrative format, we chose to report methodological details and study outcomes separately, rather than organizing our presentation of results according to methodological quality; a meta-analysis would have facilitated a more integrated approach. Incomplete outcome reporting is a key concern for this review, particularly for biological outcomes such as HIV and STI testing. Self-reported outcome data are an inevitable limitation of sexual behavior results; we also note that, despite several studies that used biological outcomes for the assessment of drug use, biological assessments were underused, and no study used biological outcomes to measure injection behaviors (e.g., inspection for injection stigmata). The limitations of self-reported data are well-known,[108,109] but these results may still be useful for the assessment of drug use and sexual behavior.[110–112]

Future Research

Areas for future research. Many studies in this review found evidence of reductions in sexual and IDU-related HIV risk behaviors among adults with criminal justice involvement. But we lack an understanding of the program elements that may drive these effects, and there is little guidance to understand how participant characteristics, implementation fidelity, and features of the intervention setting may influence program effectiveness. In light of the promising outcomes of 5 peer-led interventions for reducing sexual risk behavior,[45,47,54,64,70] especially in incarceration settings, further research might consider the mechanisms by which peer intervention influences behavior among parolees, probationers, and incarcerated adults. Peer education programs may also reduce disciplinary infractions among peer educators themselves, suggesting multiple types of benefits in incarceration settings.[113] Interventions that reduce both sexual risk and risks related to IDU should also be a priority, and the results of this review suggest that combining OST with HIV-related psychosocial interventions may be a promising direction. Moreover, there is little information available to guide service providers seeking to implement evidence-based interventions for this population; ongoing research should incorporate process evaluations and prioritize data on program acceptability, cost, and strategies for adapting or transferring effective interventions.

Several populations appear to be underrepresented in the research base to date. Research in non-US settings using randomized or quasi-randomized methods, particularly in low- and middle-income countries, would be an important addition to the evidence base on HIV prevention for adults with criminal justice involvement. Additional studies are also needed to expand HIV prevention efforts for sexual minority

adults in this population; research has documented high STI risk among men who have sex with men in incarceration settings,[114,115] but this review identified no trials of HIV prevention efforts in this subpopulation. Comparatively few studies have investigated HIV prevention efforts in drug courts or compulsory residential drug treatment, presenting another avenue for future work. Almost every trial tested an individually focused intervention, but several interventions mobilized family support through family education[44] or a prerelease conference call.[69] Given the linkages between relationship stability and risk among adults with criminal justice involvement and their partners,[2,12,116] there is an opportunity for further efforts to integrate partners and families. We also did not identify any randomized trials testing structural interventions such as needle exchange programs[24,27] or segregation of sexual-minority inmates in incarceration settings.[114,117]

Finally, additional research may seek to integrate lessons from psychosocial HIV prevention, OST, and advances in biomedical HIV prevention (e.g., PrEP, postexposure prophylaxis, male circumcision). No randomized study has yet examined the effectiveness of a biomedical HIV prevention strategy in this population. Given findings in this review showing promise for OST in this population, as well as recent evidence that antiretroviral PrEP can reduce HIV risk among people who inject drugs,[38] future research may identify opportunities for clinical interventions combining drug treatment with biomedical HIV prevention technologies such as PrEP or postexposure prophylaxis. Initiating these combinations may be appropriate for incarcerated individuals before or immediately after release, as the time immediately following release from incarceration may be a particularly risky period for HIV exposure.

Methodological recommendations for future research. Our results identify many ways to improve the design and reporting of future research. Although conducting randomized trials in incarceration settings is challenging, these examples demonstrate that randomization is feasible in some facilities. For trials that use random assignment, we urge more complete reporting of methodological details such as method of randomization, method of concealing allocation sequence from recruitment personnel, and methods of blinding outcome assessors. When randomized trials take place in a single facility, there is a heightened possibility for contamination across trial arms because of information sharing among participants in intervention and control groups. Multisite evaluations are logistically complicated in this context,[118] but multisite studies that randomize entire facilities to treatment conditions may minimize contamination issues. Future trials should make every effort to use and report biological endpoints, including testing for HIV, hepatitis C, other STIs, and drug use; although testing is expensive for individual trials, research funders and HIV prevention research networks could make concerted efforts to support the use of these measures. Even if results for an individual study are prone to floor effects, improved reporting of biological endpoints will facilitate efforts to aggregate results across studies—particularly if other sources of underreporting such as methodological details and outcome data are corrected.

Because incomplete outcome reporting was observed, we encourage trialists to report group comparisons for all outcomes at every follow-up, including group sizes, means, standard deviations, and number of dichotomous events. Where possible, analyses of trial data should account for dropouts, cluster randomization, and baseline differences. Relatively few trials used ACASI methods for assessing behavioral outcomes, and we encourage the use of ACASI as a potential strategy for limiting self-report bias,[119–123] although we recognize its limitations[124–126] and potential logistical barriers to its use in incarceration settings. We also encourage the use of standardized and previously validated measures for sexual behavior, IDU behavior, and drug use activity, both to improve internal validity and to facilitate the aggregation of results in meta-analyses. ■

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Contributors

K. Underhill and D. Operario conceptualized the review, designed searches, and prepared the protocol. K. Underhill ran electronic database searches. K. Underhill and D. Dumont assessed citations and full articles for inclusion, extracted data on study characteristics, assessed trials for methodological quality, and analyzed data, referring any disagreements to D. Operario. All authors prepared and reviewed the article for submission.

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This is a systematic review of the literature; there were no human participants. No institutional review board review was required.

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