FAMILY PROCESS

Family-Based HIV and Sexually Transmitted Infection Risk Reduction for Drug-Involved Young Offenders: 42-Month Outcomes

CYNTHIA L. ROWE*
LINDA ALBERGA*
GAYLE A. DAKOF*
CRAIG E. HENDERSON†
ROCIO UNGARO*
HOWARD A. LIDDLE*

This study tested a family-based human immunodeficiency virus (HIV)/sexually transmitted infection (STI) prevention approach integrated within an empirically supported treatment for drug-involved young offenders, Multidimensional Family Therapy (MDFT). A randomized, controlled, two-site community-based trial was conducted with 154 youth and their parents. Drug-involved adolescents were recruited in detention, randomly assigned to either MDFT or Enhanced Services as Usual (ESAU), and assessed at intake, 3, 6, 9, 18, 24, 36, and 42-month follow-ups. Youth in both conditions received structured HIV/STI prevention in detention and those in MDFT also received family-based HIV/STI

*Department of Public Health Sciences, University of Miami Miller School of Medicine, Miami, FL.
†Department of Psychology, Sam Houston State University, Huntsville, TX.
Correspondence concerning this article should be addressed to Cynthia Rowe, Department of Public Health Sciences, Center for Treatment Research on Adolescent Drug Abuse, University of Miami Miller School of Medicine; 1120 N.W. 14th Street, Miami, FL 33136. E-mail: crowe@med.miami.edu

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prevention as part of ongoing treatment following detention release. Youth in both conditions and sites significantly reduced rates of unprotected sex acts and STI incidence from intake to 9 months. They remained below baseline levels of STI incidence (10%) over the 42-month follow-up period. At Site A, adolescents who were sexually active at intake and received MDFT showed greater reduction in overall frequency of sexual acts and number of unprotected sexual acts than youth in ESAU between intake and 9-month follow-ups. These intervention differences were evident through the 42-month follow-up. Intervention effects were not found for STI incidence or unprotected sex acts at Site B. Intensive group-based and family intervention in detention and following release may reduce sexual risk among substance-involved young offenders, and a family-based approach may enhance effects among those at highest risk. Site differences in intervention effects, study limitations, clinical implications, and future research directions are discussed.

Keywords: Adolescents; Families; Human Immunodeficiency Virus; Sexually Transmitted Infection; Juvenile Justice; Detention; Intervention

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Juvenile justice involved adolescents frequently have significant drug use problems. Due to early age at first intercourse, infrequent use of condoms, and other risk behaviors (Teplin, Abram, McClelland, Washburn, & Pikus, 2005), these young people are at high risk for acquiring human immunodeficiency virus (HIV) and sexually transmitted infections (STIs). Adolescence is a critical risk period for HIV transmission (Lightfoot, 2012), and STI rates among detained youths are several times higher than those for adolescents generally (Golzari, Hunt, & Anoshiravani, 2006). Incarcerated youth are not only among the most vulnerable populations for HIV/STI infection, but are also least adequately served (Donenberg, Paikoff, & Pequegnat, 2006). Substance use and delinquency influence sexual risk taking into young adulthood (Aalsma, Tong, Wiehe, & Tu, 2010; Oshri, Tubman, Morgan-Lopez, Saavedra, & Csizmadia, 2013; Tolou-Shams et al., 2007), thus it is imperative to develop effective interventions to interrupt this cycle of risk (Donenberg et al., 2006; Teplin et al., 2005).

Behavioral interventions with adolescents can increase condom use, increase safe sex practices, and reduce incident STIs (Johnson, Scott-Sheldon, Huedo-Medina, & Carey, 2011). However, serious questions remain about the impact of existing interventions on the most vulnerable youth (Lightfoot, 2012), including ethnic minorities and those with highest familial and behavioral risk (Jackson, Geddes, Haw, & Frank, 2012; Liddle, 2014; Prado, Lightfoot, & Brown, 2013). HIV prevention programs for adolescents that do not address systemic risk factors have shown small effects on behavioral change and rarely sustain improvements beyond 1 year (DiClemente, Salazar, & Crosby, 2007; Noar, 2008; Pedlow & Carey, 2003).

HIV/STI prevention programs have been developed and delivered in juvenile justice settings (Tolou-Shams et al., 2011), yet methodological limitations and lackluster results leave questions about their efficacy (Bryan, Schmiege, & Broaddus, 2009; Magura, Kang, & Shapiro, 1994; Robertson et al., 2011; Schlapman & Cass, 2000; Shelton, 2001). For instance, a sexual risk reduction intervention with incarcerated adolescent girls was more effective than health education on social and condom use skills postintervention, but effects were not sustained at 9 months (Robertson et al., 2011). Another HIV prevention program incorporated in juvenile drug court showed no effects on sexual risk at 3 months (Tolou-Shams et al., 2011). More effective HIV/STI prevention for this population is needed (DiClemente et al., 2007).

Youth at highest risk may need comprehensive interventions that address systemic factors and leverage the power of the family (Brown et al., 2014; Lightfoot, 2012; Sutton, Lasswell, Lanier, & Miller, 2014). Changes at the family level may be more powerful and long-lasting because parents exert continued influence following intervention (Donenberg et al., 2006; Pequegnat & Bray, 2012). Research indicates that family-based approaches for adolescent substance abuse and delinquency achieve more significant and sustained effects than individual and group-based modalities (Liddle, Rowe, Dakof, Henderson, & Greenbaum, 2009; Rowe, 2012; Sawyer & Borduin, 2011; Sexton & Datachi, 2014). Family-based HIV prevention can also improve parents' communication and influence (DiIorio, McCarty, Resnicow, Lehr, & Denzmore, 2007; Murry, Berkel, Brody, Gibbons, & Gibbons, 2007; Pequegnat & Bray, 2012), increase condom use (DiIorio et al., 2007), reduce substance-related sexual risk behaviors (Prado et al., 2012), and decrease sexual activity (McBride et al., 2007). HIV-risk reduction can be incorporated into family therapy for adolescent substance abusers (Hops et al., 2011), and integrated interventions may improve health status among youth infected with HIV (Letourneau et al., 2013). Family therapy may have potential to reduce sexual risk among adolescents.

This study explored whether an integrative family-based model implemented with drug-involved youth in detention centers and following their release could reduce youths' HIV-associated risk behaviors. A randomized, controlled, two-site community-based trial was conducted to test an integrated HIV-risk reduction intervention within Multidimensional Family Therapy (MDFT; Liddle, 2016; Liddle, Dakof, Henderson, & Rowe, 2010). We hypothesized that youth who received MDFT would show more rapid decreases in risky sexual behavior than youth in Enhanced Services as Usual (ESAU) between intake and 9-month follow-up. We also hypothesized that youth in MDFT would maintain lower levels of risk up to 42-month follow-up.

METHOD

Design

The study was a 2-treatment (MDFT and ESAU) by 2-site (Miami-Dade County and Pinellas County, FL) by 8-time point (intake, 3, 6, 9, 18, 24, 36, and 42 months) randomized controlled trial. It was conducted within the context of a large NIH-funded collaborative of nine research centers studying a range of topics at the intersection of criminal justice and substance abuse treatment services called the NIDA "CJ-DATS" ("Criminal Justice-Drug Abuse Treatment Services"). Following the Cochrane Risk of Bias Tool (Modified) for Quality Assessment of Randomized Controlled Trials, we sought to maximize scientific rigor by: (1) using an urn-randomization sequence generator for random assignment; (2) concealing condition to participants and researchers before assignment; (3) minimizing loss of outcome data (data capture rates above 97%); (4) blinding study condition to outcome assessors; and (5) making the study protocol available in clinicaltrials.gov (NCT01910324) and reporting on all outcome variables.

Design limitations

The study also had inherent limitations. For instance, complete blinding was not possible given that investigators were necessarily informed of treatment condition in order to deliver services and collect data from providers. Additionally, investigator bias cannot be ruled out given that the MDFT treatment was developed by the investigative team. Further, not all variables of interest (e.g., family functioning) could be included in the large assessment battery that was made standard across study sites and all protocols of the NIDA research collaborative. Finally, the study sample was not large and was restricted

by gender (fewer females than males) and severity (excluding youth at highest risk for direct placement) in order to target youth in detention who were most likely to return to the community for treatment.

Study Sample

Youth were enrolled in the study while incarcerated in juvenile detention facilities in Pinellas (Site A; $n = 69$) and Miami-Dade (Site B; $n = 85$) Counties, FL. At Site A, youth were recruited from the Pinellas Regional Juvenile Detention Center, a 120-bed secure facility. Youth at Site B were recruited from the Miami-Dade Regional Juvenile Detention Center, a 226-bed secure facility. Eligible adolescents: (1) were ages 13–17; (2) had a parent/guardian to participate in assessments and intervention; (3) demonstrated substance use during screening or records review; and (4) were not being placed directly from detention. This last criterion was important to ensure that youth could continue intervention in the community. A total of 154 participants were enrolled out of 170 youth who screened eligible, yielding a 90% response rate (see Figure 1).

Participants averaged 15 years of age and were primarily male (82%) and ethnically diverse (60% African American, 22% Hispanic). More than 60% were from single-parent homes and average annual family income was $18,000. Participants averaged 5 lifetime arrests. They were primarily cannabis users (32% dependent, 29% abusers); 12% were alcohol dependent; 8% were alcohol abusers; and 6% were dependent on another drug. Psychiatric diagnoses were also common: 43% had symptoms consistent with conduct disorder; 13% with generalized anxiety disorder; 21% with attention-deficit/hyperactivity disorder; and 9% with major depressive disorder. Ten percent of teens tested positive for an STI at detention release. Sample characteristics from each site are detailed in Table 1.

Study Procedures

This two-site randomized, controlled trial of MDFT versus ESAU was conducted in collaboration with two secure, short-term detention facilities with youth who were pending adjudication/disposition. Research staff met with eligible youth in detention and their parents in their homes to describe the study and obtain informed consent. An intake assessment was completed separately with parents and youth following consent, and participants were then randomly assigned to either MDFT ($n = 76$) or ESAU ($n = 78$). An urn-randomization program was used to maximize equivalence of the intervention groups on four variables: gender, age, number of lifetime arrests, and past 90-day substance use. Follow-up assessments were conducted at 3, 6, 9, 18, 24, 36, and 42 months and participants were compensated for their time to complete each interview. The study was approved by the University of Miami IRB and all participating institutions.

Intervention conditions

Both conditions were intensive and included "phase 1" interventions in detention and "phase 2" interventions in the community. Detention center services available to youth at both sites and in both conditions included school, crisis intervention, and health care. A 1-hour standardized in-detention HIV/STI prevention group was provided to all youth, derived from CDC-endorsed HIV prevention strategies with juvenile justice involved youth (DiIorio et al., 2007; Magura et al., 1994). It was delivered by trained detention center professionals as part of regular activities to: (1) enhance awareness about HIV/STIs, (2) identify risk, and (3) review prevention strategies and interventions. Adolescents viewed a psychoeducational video and participated in a question and answer session.

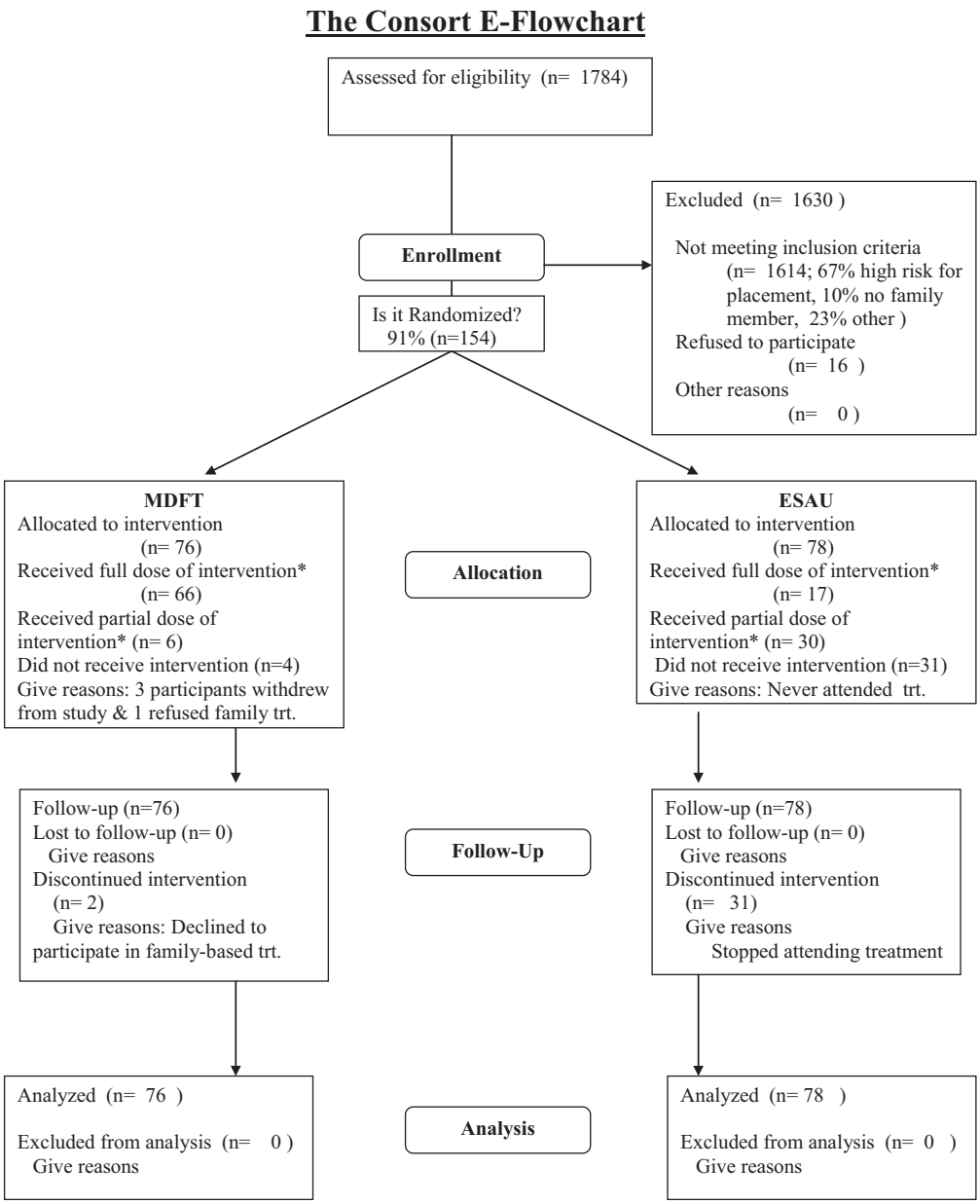

FIGURE 1. CONSORT Chart.

Multidimensional Family Therapy

This intervention is an adaptation of a multiple-systems adolescent substance abuse and delinquency treatment (Liddle, 2014, 2016) that has been well validated in a series of rigorous clinical trials determined to be of the highest quality science in the field (Darwiche & de Roten, 2014). It attends to four main intervention areas: teen, parent, family, and community systems. MDFT was adapted for this study to include a "phase 1" in-detention module intervening immediately after the youth's arrest, between 3 and 14 days in

TABLE 1
Sample Characteristics by Site and Intervention Condition

Variable	Miami		Pinellas		*p*
	MDFT	ESAU	MDFT	ESAU	
Demographics					
Age [*M* (*SD*)]	15.51 (1.30)	15.33 (1.16)	15.36 (1.06)	15.42 (0.94)	.861
Gender [*n* (%)]					.001
Male	38 (88)	40 (95)	25 (76)	25 (69)	
Female	5 (12)	2 (5)	8 (24)	11 (31)	
Ethnicity/race [*n* (%)]					<.001
African American	28 (68)	34 (81)	12 (38)	20 (57)	
White, non-Hispanic	1 (2)	1 (2)	17 (53)	11 (32)	
Hispanic	12 (30)	7 (17)	3 (9)	4 (11)	
Family income (Median)	$15,000	$16,500	$30,000	$21,948	.003
Family structure [*n* (%)]					.108
Single-parent	26 (61)	23 (55)	24 (73)	27 (75)	
Two-parent	8 (19)	7 (17)	6 (18)	2 (6)	
Other	9 (20)	12 (28)	3 (9)	7 (19)	
Clinical characteristics					
# Lifetime arrests	3.58 (1.37)	4.12 (2.28)	5.24 (1.95)	7.00 (5.27)	<.001
Age first used drugs [*n* (%)]	12.44 (4.59)	13.07 (3.27)	12.52 (1.82)	12.75 (2.38)	.817
Diagnosis[a] [*n* (%)]					
Cannabis abuse	14 (33)	13 (31)	11 (33)	6 (17)	<.001
Cannabis dependence	2 (5)	4 (10)	20 (61)	23 (64)	
Alcohol abuse	3 (7)	0 (0)	4 (12)	6 (17)	<.001
Alcohol dependence	0 (0)	1 (2)	10 (30)	7 (19)	
Other substance abuse	0 (0)	1 (2)	1 (3)	2 (6)	.001
Other substance dependence	0 (0)	0 (0)	3 (9)	6 (17)	
# Comorbid conditions [*M* (*SD*)]	0.98 (1.34)	1.21 (1.82)	3.42 (2.89)	4.64 (2.33)	<.001
Family Member Drug Problem [*n* (%)]	13 (30)	12 (29)	24 (73)	32 (89)	<.001
Family Member in CJ System [*n* (%)]	20 (47)	19 (45)	26 (84)	29 (94)	<.001

Note. Probability value represents two-tailed probability of site comparisons using independent-samples *t*-tests for continuous outcomes and χ^2 for categorical. CJ = Criminal Justice.

[a]Probability values for Cannabis, Alcohol, and Other Substances represent comparisons of no diagnosis, abuse diagnosis, and dependence diagnosis by research site for each substance (or group of substances in the Other category).

detention. In "phase 2," MDFT continued with youth and families for 4 months after release (Liddle et al., 2010).

The second adaptation of MDFT for the current study was the integration of a family-oriented HIV/STI prevention module during "phase 2," the outpatient phase in the community (Marvel, Rowe, Colon, DiClemente, & Liddle, 2009). Youth and their parents continued their ongoing individual and family therapy in MDFT as well as participating in two 2-hour interactive multifamily groups to: (1) enhance awareness about STIs and HIV, (2) personalize sexual and drug-associated behaviors that increase risk for HIV and STIs, and (3) increase communication and condom-use skills. Each group provided opportunities for didactic presentation, discussion and skills building exercises with youth and parents separately, and family communication and practice together. Homework between groups encouraged family discussion. The intervention was described fully in a previous

publication (Marvel et al., 2009), including the empirical and clinical bases for such an approach and how teens are encouraged to share with parents sensitive details about sexual interactions and intimate relationships.

Enhanced Services as Usual

The intensive ESAU condition provided a strong comparison to MDFT approximating typical services substance-involved adolescents would receive within and following release from detention but with increased monitoring and fewer barriers to treatment. At each site, one community treatment provider delivered substance abuse treatment on an outpatient basis after youth were released from detention (Site A: Operation PAR; Site B: Here's Help, Inc.). Each client was provided with a primary counselor and participated in two groups per week for about 4 months. Group therapy topics included self-esteem enhancement, decision-making skills, stress/anger management, communication skills, refusal skills, sexual health, and health education. The groups incorporated didactic information, experiential activities, and group process techniques guided by CBT principles.

Intervention Fidelity

Participation in the interventions was recorded to monitor and evaluate fidelity to the prescribed intervention parameters. The in-detention HIV prevention groups were attended by 100% of youth in MDFT (33/33) and 97% of youth in ESAU (35/36) at Site A, and 98% of youth in MDFT (42/43) and 98% of youth in ESAU (41/42) at Site B. The MDFT-HIV groups were attended by 82% of MDFT participants at Site A (27/33) and 86% of MDFT participants at Site B (37/43). Ninety-two percent of adolescents received a full dose of MDFT (6 hours or more per month), and 8% received a partial dose. In ESAU, 24% received a full dose of intervention (4 hours or more per month), and 36% received a partial dose.

Measures

Measures were administered at all assessment points. Data capture rates were above 97% at all time points. Measures were administered to youth and parents separately by assessors who were blind to intervention assignment and study hypotheses.

Demographic information

Demographic information was obtained during the intake interview, including youth age, gender, race/ethnicity (African American, Hispanic, White non-Hispanic), family composition (two parent, step-parent, single parent), mother's education, family income, age of first drug use, and juvenile probation status.

Timeline Follow Back of Sexual Behaviors

This measure (Weinhardt et al., 1998) was administered to determine the extent of risky sexual activity in the 90 days prior to each assessment (Malow & Cremer, 1997). The Timeline Follow Back of Sexual Behaviors obtains retrospective reports of daily sexual experiences and condom use using a calendar and other memory prompts to stimulate recall. It demonstrates strong psychometric properties (Weinhardt et al., 1998).

Incident STIs

Urine samples were collected from adolescents at detention discharge and all follow-up assessments. Laboratory assays used amplified DNA technology to detect Chlamydia Tra-

chomatis, Neisseria Gonorrhoeae, and Trichomonas Vaginalis. Sensitivity was 93–97% and specificity was 95–98%. If positive, the adolescent was taken to see a clinician (MD or ARNP) for immediate free treatment.

HIV infection

The FDA-approved OraSure HIV-1 Oral Specimen Collection Device was used by trained Research Assistants to test for HIV-1 antibodies at the 42-month follow-up. The simple procedure extracts antibodies from the blood vessels in the mucous membranes in the mouth with more than 99% accuracy. The Project Director notified the appropriate public health authorities and immediately arranged healthcare in the case of positive results.

Data Analytic Approach

Multidimensional Family Therapy and ESAU were compared using a 2 (intervention) by 8 (time) repeated measures intent-to-treat design. Clinical change was analyzed with latent growth curve (LGC) modeling (Curran & Hussong, 2003). Missing data were infrequent (2%) and handled with full information maximum likelihood estimation, assuming data were missing at random.

Latent growth curve modeling using Mplus (Version 7.01; Muthén & Muthén, 2008–2013) proceeded in three stages. First, we tested a series of growth curve models representing possible forms of growth (i.e., no change, linear change) to determine the best fitting form of the individual change trajectories. Second, we added intervention condition as a covariate to the models to test if the two interventions differed on initial status of the outcome variable (intercept parameter) and the impact of intervention type on change over time (slope parameter). Intervention effects were demonstrated by a statistically significant slope parameter as tested by a pseudo-z test. We also examined site differences by including site, intervention condition, and the site-by-intervention condition interaction in the LGC models. As a significant site by intervention interaction would indicate that treatment differences in study outcomes differ across site, collapsing intervention effects across sites would lead to erroneous conclusions (Feaster, Mikulich-Gilbertson, & Brincks, 2011). Therefore, in the case of any significant site by intervention interactions, we examined treatment differences separately within site.

Distributions for the outcome variables deviated substantially from normality due to a large number of participants reporting the absence of the outcome (i.e., zero-inflation, Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013). We used two-part growth curve modeling to accommodate these data distributions in which we estimated separate but correlated continuous and categorical LGC models in the same analysis (Liddle et al., 2009). We also used a natural log transformation to further improve the normality of the outcome trajectories. Change was modeled using a piecewise growth specification, with trajectories representing initial change (between intake and 9-month follow-up), maintenance of gains (between 9- and 24-month follow-up), and long-term follow-up (24–42 months). We used an intent-to-treat model including all randomized participants in the outcome analyses.

RESULTS

Demographic and Clinical Characteristics

The distributions for participant demographic and clinical characteristics by site are shown in Table 1. At intake, youth from Site A had a greater degree of impairment

than Site B: more lifetime arrests, higher percentage of substance dependence, higher number of comorbid psychiatric diagnoses, and higher rates of family substance use and criminality.

Time Effects

Across conditions, unconditional two-part growth models revealed that both the proportion of youth reporting no sexual activity (Slope estimate = −0.17, *SE* = .09, *pseudo z* = −2.00, *p* = .045) and using protection during sex (Slope estimate = −0.18, *SE* = .09, *pseudo z* = −2.04, *p* = .042) increased from intake to 9 months. There was no additional change in these variables after 9 months. Overall, among those engaging in sex, there was a significant increase in the number of sex acts (Slope estimate = 0.09, *SE* = .02, *pseudo z* = 3.86, *p* < .001) and unprotected sex acts (Slope estimate = 0.12, *SE* = .03, *pseudo z* = 4.54, *p* < .001) from 9 to 24 months. The proportion of youth testing positive for STIs significantly decreased from 10% at detention discharge to 5% at the 9-month follow-up (Slope estimate = −0.51, *SE* = .24, *pseudo z* = −2.08, *p* = .037). Overall STI incidence did not significantly change at subsequent follow-ups. Only one ESAU participant and no MDFT participants tested positive for HIV.

Intervention Effects

There was a significant site-by-intervention interaction for the continuous part of each outcome between intake and 9 months (Total Number of Sex Acts: Slope estimate = −0.14, *SE* = .06, *pseudo z* = −2.22, *p* = .026; Number of Unprotected Sex Acts: Slope estimate = −0.18, *SE* = .07, *pseudo z* = −2.58, *p* = .010). Therefore, results below are presented separately by site (Table 2; Figures 2 and 3).

Frequency of sex acts

There were no intervention differences for youth abstaining from sex (i.e., the categorical part of the two-part model) at either site. However, at Site A, youth who were initially sexually active reported having sex fewer times between intake and 9 months in MDFT than in ESAU (Slope estimate = −0.09, *SE* = .05, *pseudo z* = −1.96, *p* = .05, *d* = .17). These initial differences were maintained through 24- (Slope estimate = 0.10, *SE* = .07, *pseudo z* = 1.49, *ns*) and 42-month follow-ups (Slope estimate = −0.07, *SE* = .08, *pseudo z* = −0.92, *ns*). At Site B, there were no intervention differences (Intake-9 month: Slope estimate = 0.02, *SE* = .04, *pseudo z* = 0.64, *ns*; 9–24 month: Slope estimate = 0.06, *SE* = .06, *pseudo z* = 0.96, *ns*; 24–42 month: Slope estimate = −0.06, *SE* = .05, *pseudo z* = −1.08, *ns*).

Number of unprotected sex acts

No intervention differences were found for youth abstaining from sex. However, at Site A, youth who were initially sexually active reported a larger decrease in unprotected sex acts between intake and 9 months in MDFT than ESAU (Slope estimate = −0.11, *SE* = .05, *pseudo z* = −2.23, *p* = .03, *d* = .22). These differences were maintained through 24- (Slope estimate = 0.12, *SE* = .07, *pseudo z* = 1.72, *ns*) and 42-month follow-ups (Slope estimate = −0.10, *SE* = .08, *pseudo z* = −1.25, *ns*). No intervention differences were evident at Site B (Intake-9 month: Slope estimate = 0.04, *SE* = .05, *pseudo z* = 0.75, *ns*; 9–24 month: Slope estimate = 0.06, *SE* = .07, *pseudo z* = 0.87, *ns*; 24–42 month: Slope estimate = −0.07, *SE* = .06, *pseudo z* = −1.17, *ns*).

STI incidence

The site-by-intervention interaction for STIs was not statistically significant. As noted above, rates of STIs across conditions decreased from intake to 9 months and remained

TABLE 2

Descriptive Statistics for Risky Sex Outcomes by Intervention Condition and Study Site

	Intake		3 Month FU		6 Month FU		9 Month FU		18 Month FU		24 Month FU		36 Month FU		42 Month FU	
Variable	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)	MDFT *M* (*SD*)	ESAU *M* (*SD*)
Site A																
Number of unprotected sex acts	21.79 (26.97)	18.58 (35.78)	13.70 (25.78)	10.88 (25.33)	8.30 (10.82)	10.88 (16.30)	14.24 (23.10)	15.31 (25.94)	10.67 (19.51)	26.90 (43.74)	25.84 (39.43)	32.31 (48.57)	30.21 (40.46)	26.03 (42.44)	25.19 (33.99)	41.69 (55.04)
Total number of sex acts	31.24 (36.55)	25.08 (41.92)	20.27 (37.48)	14.12 (27.20)	12.18 (14.36)	15.53 (22.56)	19.82 (27.69)	19.74 (32.79)	16.42 (32.74)	37.53 (60.19)	32.76 (48.23)	39.75 (55.22)	39.00 (52.07)	30.03 (46.21)	33.75 (43.21)	45.43 (61.21)
% Testing positive for STI (*n*, %)	3 (9)	7 (19)	2 (6)	3 (9)	1 (3)	2 (6)	0 (0)	3 (9)	0 (0)	4 (13)	3 (9)	2 (6)	2 (6)	2 (6)	1 (3)	1 (3)
Site B																
Number of unprotected sex acts	18.21 (24.68)	15.69 (22.52)	12.98 (21.56)	13.15 (21.48)	11.14 (14.72)	9.17 (13.17)	14.24 (20.78)	11.55 (20.87)	17.23 (20.87)	6.36 (8.65)	24.72 (30.00)	12.58 (17.55)	36.40 (38.37)	17.19 (25.26)	26.32 (38.03)	20.28 (28.12)
Total number of sex acts	29.49 (39.66)	26.69 (38.75)	19.63 (32.34)	22.41 (34.43)	19.40 (25.01)	16.34 (23.37)	24.51 (35.27)	18.85 (32.30)	30.73 (40.94)	11.32 (14.90)	38.49 (43.58)	21.89 (27.71)	53.43 (56.32)	25.95 (37.74)	37.05 (51.74)	31.31 (39.12)
% Testing positive for STI (*n*, %)	4 (9)	2 (5)	3 (7)	3 (8)	2 (5)	3 (8)	1 (3)	1 (3)	2 (8)	0 (0)	1 (3)	3 (8)	4 (11)	3 (8)	2 (6)	4 (12)

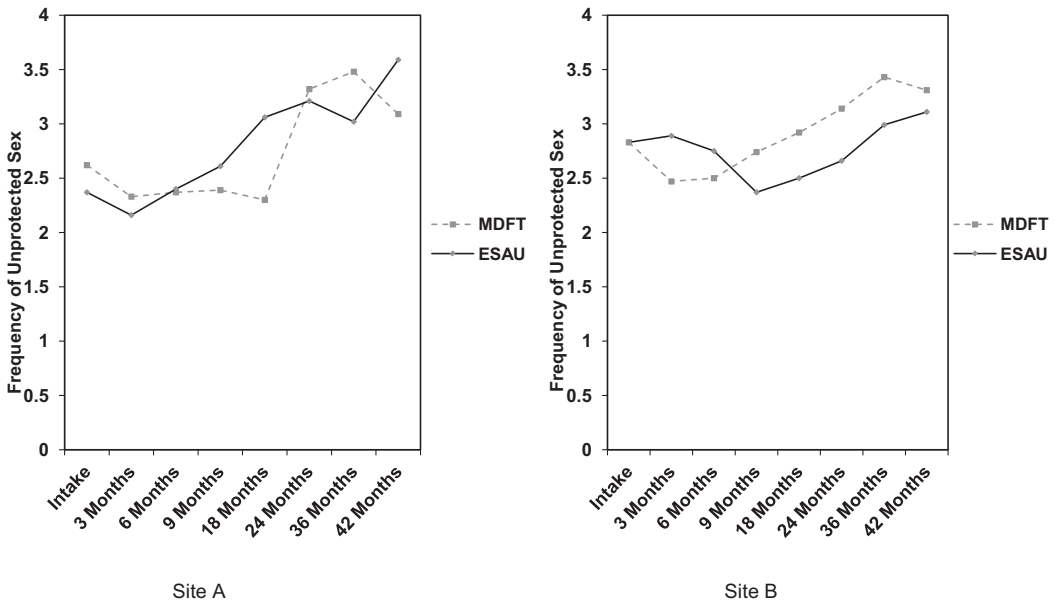

FIGURE 2. Change in Log-Transformed Frequency of Unprotected Sex Among Initially Sexually Active by Condition and Site.

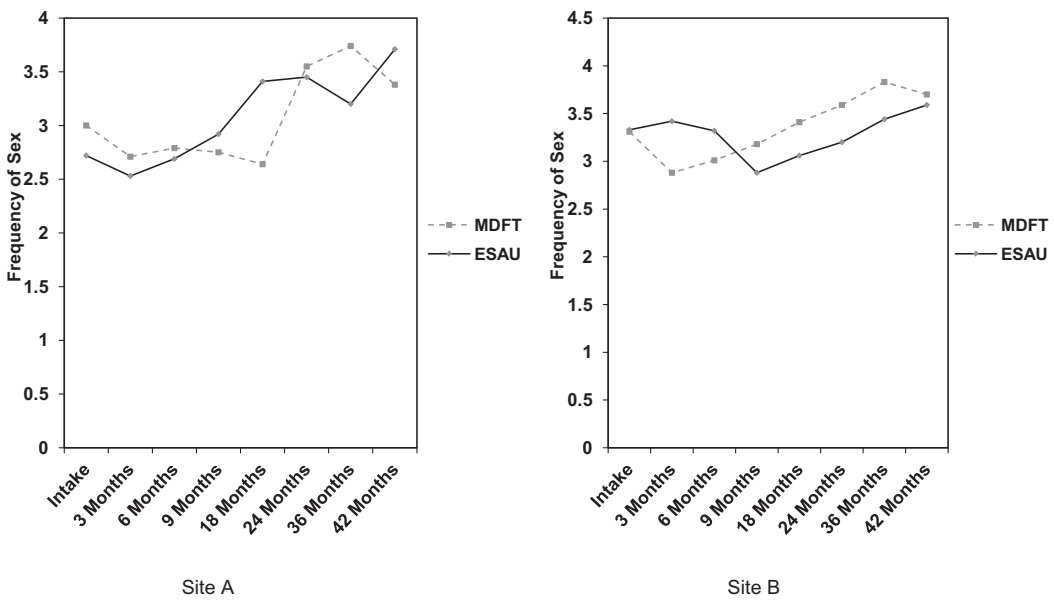

FIGURE 3. Change in Log-Transformed Frequency of Sex Among Initially Sexually Active by Condition and Site.

stable through 42 months; there were no intervention differences (Intake-9 month: Slope estimate = −0.24, *SE* = .52, *pseudo z* = −0.45, *ns*; 9–24 month: Slope estimate = 0.13, *SE* = .56, *pseudo z* = 0.23, *ns*; 24–42 month: Slope estimate = 0.12, *SE* = .32, *pseudo z* = 0.35, *ns*).

DISCUSSION

The results suggest that intervening with drug-involved young offenders with structured HIV/STI prevention while in detention and providing ongoing intensive substance abuse treatment following release using both family- and group-based intervention reduces sexual risk behaviors. Youth in both conditions and at both sites significantly reduced rates of unprotected sex acts and STI incidence from intake to 9 months. Across conditions and sites, youth in these relatively intensive treatments maintained lower than baseline levels of STI incidence over the entire 42-month follow-up period; however, other indices suggest that additional intervention may be needed to maintain initial gains following both interventions.

The study also provides some support for the efficacy of a family-based intervention to reduce STI and HIV risk for substance-involved young offenders. Specifically, at Site A, adolescents who were sexually active at intake showed greater reduction in overall frequency of sexual acts and number of unprotected sexual acts in MDFT than in ESAU between intake and 9-month follow-ups. These intervention differences were maintained through the 42-month follow-up. Site B did not show differences by intervention condition either among sexual abstainers or those who were sexually active at intake. STI incidence did not differ by condition at either site, yet the significant reduction between intake and 9 months and lower than baseline levels across 42-month follow-ups is encouraging given that STIs generally rise during these critical years. In sum, the advantage of MDFT over ESAU appeared only in terms of youth who were sexually active at intake and only at Site A. These effects persisted through the 42-month follow-ups.

It is not clear exactly why intervention differences were found to favor MDFT for youth who were sexually active at intake at Site A but not Site B. Previous findings show that MDFT's effects on substance use are more pronounced for more severely impaired adolescents (Henderson, Dakof, Greenbaum, & Liddle, 2010; Rigter et al., 2013). Considering previous research demonstrating MDFT's enhanced effects with more impaired youth, it may be that MDFT's effects were pronounced at Site A because youth presented with greater severity at intake. This can only be speculated given the small sample size and lack of power to analyze fully. Further investigation with a larger sample size is warranted to confirm this hypothesis.

This study advances the knowledge base consistent with recommendations to increase the potency of adolescent sexual risk reduction interventions through family intervention (Sutton et al., 2014). Recognizing the importance of parents as the primary educators and influencers on their children, family context has emerged as a prominent focus for researchers and health educators as they develop the next generation of HIV preventions (Lightfoot, 2012; Pequegnat & Bray, 2012). Families influence adolescents' HIV risk through: (1) parental monitoring, (2) warmth and support, (3) parental attitudes, and (4) communication (Donenberg et al., 2006). There have been recent efforts to include parents in youth HIV prevention, but CDC's "High Impact HIV/AIDS Prevention Project (HIP)" includes only one that involves parents (Focus on Youth plus ImPACT). More focus on families is indicated (Brown et al., 2014; Lightfoot, 2012).

This study also addresses a major public health concern that the most vulnerable youth for HIV/STIs, those with comorbid substance abuse, delinquency, and sexual risk behaviors, are inadequately served by existing programs. Early HIV prevention studies with substance-involved young offenders showed limited behavioral effects (Schlapman & Cass, 2000). These findings are among the only positive outcomes of HIV/STI prevention with substance-involved young offenders, supporting both family- and group-based interventions.

The study's significance is enhanced by its focus on multiply impaired youth; not only the breadth but the depth of their impairments make this sample different than those recruited from schools or health clinics. This study also provided longer follow-ups than previous adolescent-focused HIV/STI prevention studies (Lyles et al., 2007; Pedlow & Carey, 2003). Effects of adolescent sexual risk reduction interventions generally weaken over time (DiClemente et al., 2007; Pedlow & Carey, 2003), and trajectories in this study also showed increases in sexual activity after 9 months, yet it has also been shown that family-focused interventions may be able to maintain effects given the sustained influence of parents.

Study limitations. We also acknowledge drawbacks in the study design, some of which were set out in the Methods, and place the findings in the context of these limitations. First, the sample size was not large, and analyses and interpretation of results were complicated by site differences. The most rigorous analytical strategies to address site differences require much larger sample sizes than was available in this study (Feaster et al., 2011). Females represented only a small proportion of the sample and gender effects also could not be accounted for in the analyses given the small sample size; however, we erred on the side of inclusiveness in order to be able to generalize the results as widely as possible. Perhaps restricting the sample to males and delivering a more gender-focused model would have been more effective. Clearly, a more highly powered study would have enabled more fine-tuned analysis and interpretation.

It is also important to note that the most entrenched adolescents in the juvenile justice system (those being placed immediately from detention) were not included in this study given that they could not participate in interventions in the community following release, thus the results do not apply to the most severe youth in incarceration. Additional research targeting these adolescents most separated from familial and community supports is certainly warranted.

We also acknowledge that we lack a no-treatment control group and a comparison of MDFT with psychoeducation only that would enable us to determine the effects of the interventions in comparison to inactive intervention. Of course, given the treatment needs of this sample, no-treatment control groups were not an option; however, we acknowledge the limitations of the conclusions that may be drawn based on the design. A benchmarking strategy was considered to address this concern, yet it was not a viable alternative given that this was the first study of MDFT to examine high-risk sexual behaviors, and all MDFT trials have included active treatments as the comparison conditions. However, in order to offer some context for interpretation, we provide a mean effect size for substance use outcomes derived across 9 randomized controlled trials of MDFT: (d = .25, SD = 0.08, range = −0.62 to 1.16) and note that the effect sizes reported in this study for Site B (d = 0.17 for frequency of sex acts and d = .22 for number of unprotected sex acts) are within one standard deviation of the mean effect size.

In addition, given limited measurement of important family variables in the assessment battery, we were not able to analyze possible changes in the family environment as a result of intervention. Finally, differences in dosage may lead to the conclusion that ESAU was more cost-effective and thus appealing to funders given that fewer services were provided for similar results. An economic evaluation would be needed to be confident in making such assumptions.

These results suggest that substance-involved adolescents in the juvenile justice system can reduce HIV/STI risk with both family- and group-based intervention. Adolescents in this study were responsive to intensive group and family intervention, and it was possible to integrate both into ongoing substance abuse treatment in the community. Clinicians may be encouraged that youth and parents were able to discuss sexual relationships and behaviors in an open and positive way, perhaps even more than

therapists expected (see Marvel et al., 2009). Systems-level barriers were surmounted in order to implement interventions in an integrated and seamless way that addressed substance use, delinquency, and sexual risk (see Liddle et al., 2010). The overall clinical implications are that integrated, cross-systems interventions can be implemented in both group and family contexts and appear to have at least initial benefit for this population.

IMPLICATIONS AND CONCLUSIONS

Drug-involved adolescents in the juvenile justice system, among the highest risk groups for HIV and STIs, require comprehensive, effective interventions to interrupt the negative cycle of interrelated risk behaviors. Longer term interventions of this kind may be indicated with those who continue to demonstrate risky sexual behaviors. Given promising findings for the family-based intervention with sexually active youth at one site, further investigation of systemic HIV/STI prevention seems warranted, and efforts to incorporate family-based interventions within the juvenile justice system are recommended. Future research on group-based substance abuse treatment with HIV/STI prevention may also be fruitful based on findings. Although not definitive or without significant study limitations, these findings highlight the potential benefit of families to help vulnerable youth through integrated, systemically focused interventions.

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