



# Multidimensional Family Therapy as a community-based alternative to residential treatment for adolescents with substance use and co-occurring mental health disorders<sup>☆,☆☆</sup>

Howard A. Little<sup>a</sup>, Gayle A. Dakof<sup>a,\*</sup>, Cynthia L. Rowe<sup>a</sup>, Craig Henderson<sup>b</sup>, Paul Greenbaum<sup>c</sup>, Wei Wang<sup>c</sup>, Linda Alberga<sup>a</sup>

<sup>a</sup> University of Miami Miller School of Medicine, Miami, FL, USA

<sup>b</sup> Sam Houston State University, Huntsville, TX, USA

<sup>c</sup> University of South Florida, Tampa, FL, USA

## ARTICLE INFO

### Keywords:

Residential treatment  
Multidimensional Family Therapy  
Substance use  
Dual diagnosis  
Adolescents

## ABSTRACT

This randomized clinical trial (RCT) compared Multidimensional Family Therapy (MDFT) with residential treatment (RT) for adolescents with co-occurring substance use and mental health disorders on substance use, delinquency, and mental health symptoms. Using an intent-to-treat design, 113 adolescents who had been referred for residential treatment were randomly assigned to either RT or MDFT in the home/community. The sample was primarily male (75%) and Hispanic (68%) with an average age of 15.4 years. Seventy-one percent of youth had at least one previous residential treatment placement. Participants were assessed at baseline and at 2, 4, 12 and 18 months post-baseline. During the early phase of treatment (baseline to 2 months), youth in both treatments showed significant reductions in substance use [substance use problems ( $d = 1.10$ ), frequency of use ( $d = 1.36$ )], delinquent behaviors ( $d = 0.18$ ) and externalizing symptoms ( $d = 0.77$ ), and youth receiving MDFT reported significantly greater reductions in internalizing symptoms than youth receiving RT ( $d = 0.42$ ). In phase 2, from 2 to 18 months after baseline, youth in MDFT maintained their early treatment decreases in substance use problems ( $d = 0.51$ ), frequency of use ( $d = 0.24$ ), and delinquent behaviors ( $d = 0.42$ ) more effectively than youth in RT. During this period, there were no significant treatment differences in maintenance of gains for externalizing and internalizing symptoms. Results suggest that Multidimensional Family Therapy is a promising alternative to residential treatment for youth with substance use and co-occurring disorders. The results, if supported through replication, are important because they challenge the prevailing assumption that adolescents who meet criteria for residential treatment cannot be adequately managed in a non-residential setting.

## 1. Introduction

Residential treatment has typically been the recommended intervention for youth with substance use and mental health disorders who have not responded to less restrictive treatments, require stabilization, present a danger to themselves or their families, or demonstrate a public safety risk (Drake, O'Neal, & Wallach, 2008; Winters, Tanner-Smith, Bresani, & Meyers, 2014). Most youth referred to residential treatment present with a spectrum of substance use, mental health, and delinquency problems (Riggs, 2003; Rowe, Little, Greenbaum, & Henderson, 2004; Weiner, Abraham, & Lyons, 2001). Either as an antecedent or consequence of significant substance use and mental

health challenges, youth referred to residential substance abuse treatment evidence impairment in many areas of life, including educational/vocational, family, social, and legal (Deas & Brown, 2006; Subramaniam, Stitzer, Clemmey, Kolodner, & Fishman, 2007; Toumbourou et al., 2007; Wise, Cuffe, & Fischer, 2001).

Present evidence does not permit firm conclusions about the effectiveness of residential treatment or the treatment of adolescents with substance use and co-occurring mental health disorders. There are relatively few rigorous studies on the effectiveness of residential treatment for adolescents. Existing studies are often hampered by weak designs, and there are few randomized clinical trials comparing residential treatment to alternative treatments (Edelen, Slaughter,

<sup>☆</sup> Trial Registry Name: ClinicalTrials.gov, Identified NCT01737632.

<sup>☆☆</sup> Funding: This work was supported by the National Institute on Drug Abuse [grant # P50DA011328].

\* Corresponding author at: Department of Public Health Sciences, University of Miami Miller School of Medicine, Miami, FL, USA.  
E-mail address: [gdakof@umail.miami.edu](mailto:gdakof@umail.miami.edu) (G.A. Dakof).

McCaffrey, Becker, & Morral, 2010; Toumbourou et al., 2007; Tripodi, 2009). Nevertheless, important indications of evidence for the effectiveness of residential treatment can be gleaned from evaluations and quasi-experimental designs. For example, studies suggest that residential treatment reduces adolescent symptoms and improves their psychosocial functioning (Bean, White, Neagle, & Lake, 2005; Black & Chung, 2014; Caldwell & Van Rybroek, 2005; Fishman, Clemmey, & Adger, 2003; Grella, Hser, Joshi, & Rounds-Bryant, 2001; Hair, 2005; Morral, McCaffrey, & Ridgeway, 2004; Winters, Stinchfield, Opland, Weller, & Latimer, 2000). This appears especially true for youth who complete treatment (Jainchill, Hawke, DeLeon, & Yagelka, 2000) and participate in aftercare (Godley, Godley, Dennis, Funk, & Passetti, 2006). Recent research suggests exemplary outcomes among youth who spend sufficient (i.e., 1–6 months), but not too much, time (10 months or more) in a residential program (Strickler, Mihalo, Bundick, & Trunzo, 2016). Nevertheless, residential treatment gains appear to diminish after discharge (Brown, D'Amico, McCarthy, & Tapert, 2001; Hser et al., 2001; Morral et al., 2004). Finally, studies comparing residential to non-residential alternative treatments are uncommon. However, when they have been done, they typically reveal no treatment differences among modalities (Barth et al., 2007; Henggeler et al., 1999; Kwok, Yuan, & Ougrin, 2016; Mattejat, Hirt, Wilkin, Schmidt, & Remschmidt, 2001; Weisz et al., 2013).

The high costs of residential treatment, findings suggesting diminishing effects following discharge, no significant treatment modality differences, and the disruption to youth and families created by out-of-home placements are all cause for concern. For these reasons, many policymakers in both the United States and Europe have turned to intensive outpatient and in-home treatments as alternatives to residential care (Heggeness & Davis, 2010). However, policy makers are turning to community-based treatments without the benefit of rigorous research to support this policy change. To our knowledge, there are no randomized clinical trials comparing non-residential to residential substance use treatment for adolescents.

Family-based treatments are utilized as an alternative to residential treatment because they have a strong evidence base supporting their effectiveness with adolescent problems (Tanner-Smith, Wilson, & Lipsey, 2012; Van der Pol, Machteld, et al., 2017). Intensive family-based treatments effectively reduce family and community environmental risk factors that contribute to adolescent problems and successfully keep teens from costly out-of-home placements (Hoagwood, Burns, Kiser, Ringeisen, & Schoenwald, 2001; Liddle et al., 2006). Multidimensional Family Therapy (MDFT), a family-based treatment, is an effective non-residential treatment for adolescent substance use, delinquency, and mental health disorders (Dakof et al., 2015; Greenbaum et al., 2015; Henderson, Dakof, Greenbaum, & Liddle, 2010; Liddle et al., 2001; Liddle, Dakof, Turner, Henderson, & Greenbaum, 2008; Liddle, Rowe, Dakof, Henderson, & Greenbaum, 2009; Rigter et al., 2013; Rowe et al., 2016; Schaub et al., 2014; Van der Pol, Henderson, Hendriks, Schaub, & Rigter, 2017). Given MDFT's effectiveness in treating adolescent substance use and delinquency, it seems reasonable to suggest that MDFT might be a viable non-residential alternative for youths with co-occurring mental health disorders referred for residential substance use treatment.

In order to address the important empirical question of whether non-residential treatment may be equally or more effective than residential treatment, we report results from an intent-to-treat (ITT) randomized clinical trial (RCT) comparing residential treatment (RT) with a non-residential alternative, Multidimensional Family Therapy (MDFT), for the treatment of substance use, delinquency, and symptoms associated with mental health disorders. We hypothesized that: (1) in the early phase of treatment,<sup>1</sup> RT youth (being in a controlled

environment) would show superior outcomes to youth in MDFT (being in the community); and (2) from 2 to 18 months, youth receiving MDFT would sustain treatment gains more significantly than youth who received RT.

## 2. Materials and methods

### 2.1. Sample characteristics

Eligible participants were: (a) between the ages of 13 and 18, (b) diagnosed with a substance use disorder and at least one comorbid psychiatric disorder; (c) referred and approved by the State of Florida Department of Children and Families (DCF) for state-subsidized residential, dual diagnosis substance use treatment<sup>2</sup> (Florida Supplement to the ASAM <http://sfbhn.org>); (d) known to have failed a previous treatment for a substance use disorder, or presenting with severe symptoms warranting a higher level of care either because of safety reasons or because this treatment was ordered by a judge; (e) living in the custody of a parent/caregiver (i.e., not in DCF custody) at the time of referral to residential treatment; and (f) not currently suicidal, demonstrating psychotic symptoms, or diagnosed with autism spectrum or intellectual disability disorders. Referrals came from a substance use assessment and stabilization facility that received referrals primarily from the juvenile justice and child welfare systems (67%), or directly from juvenile justice (18%), child welfare (3%), educational institutions (2%), or the adolescent/family (10%).

### 2.2. Assessments and procedures

The University of Miami Institutional Review Board (IRB) approved and monitored the study. Youth were randomly assigned to MDFT ( $n = 57$ ) or RT ( $n = 56$ ) using an urn randomization procedure to ensure equivalence of intervention groups on the following variables: gender, age, ethnicity, number of previous treatment episodes, and number of psychiatric diagnoses. All participants who were randomized ( $N = 113$ ) were included in the intent-to-treat analyses. Youth were assessed at baseline and at 2, 4, 12, and 18 months after baseline. Youth and parents were compensated for their participation at the following rates: \$50 each for baseline, 2 and 4-month assessments, and \$100 for the 12 and 18-month assessments.

### 2.3. Treatments

MDFT and RT were administered by two separate DCF-licensed provider organizations. Both treatments were delivered over a 6- to 9-month period. In both treatments, primary therapists worked within a multidisciplinary team, assisted by a case manager (MDFT) and milieu staff (RT). MDFT was provided by the Adolescents and Families Clinic (AFC) at the University of Miami Miller School of Medicine. The Adolescent Treatment Program (ATP), the RT in this study, was provided by the Village South, Inc., a well-established and large community-based substance use treatment provider in Miami.

The same board-certified adolescent psychiatrist conducted an initial evaluation and diagnosis with all adolescents in both treatments according to DSM-V criteria. This same psychiatrist also saw all youth in the study on an as-needed basis for ongoing psychiatric care and

(footnote continued)

Average retention for youth enrolled in RT ranges from only a few weeks to 3 months (e.g., Grella et al., 2001; Landrum, Knight, Becan, & Flynn, 2015).

<sup>2</sup> The residential treatment program (RT) was the first referral option for the most seriously impaired, dually diagnosed youth in Miami-Dade and Monroe Counties in South Florida, and thus youth with substance use disorder and only Oppositional Defiant Disorder or Mild to Moderate Conduct Disorder were not referred to this program. Youth with substance use disorder and severe conduct disorder were eligible. Youth with substance use disorder, mild CD and major depression were eligible, as were those with substance use and other co-occurring disorders other than ODD or mild to moderate CD.

<sup>1</sup> Early phase of treatment was defined as 2 months from baseline in order to maximize the chances that RT youth would still be in RT at the first post-baseline assessment.

medication management. The initial evaluation consisted of a structured interview alone with the youth that was conducted in one or two sessions depending on the needs of the youth. The psychiatrist also interviewed the parents/caregivers and the primary therapist to complete the evaluation. Youth who were on medications met with the psychiatrist at least monthly for medication management.

### 2.3.1. Residential substance use treatment

Particular care was given to site selection. As an aspect of maximizing internal validity, we chose a residential treatment program that was representative of contemporary programs, had specified treatment philosophy and components, and utilized evidence-based practices. The ATP is based on a social learning approach that emphasizes positive reinforcement for appropriate coping and other behaviors; accountability; and the development of coping, emotional regulation, drug refusal and social skills. It integrates cognitive behavioral therapy (CBT) and Motivational Interviewing (MI) into the daily program. The ATP program assumes that it is essential to separate the referred adolescent from both the home and community to achieve stability. Youth received individual and group therapy, psychiatric services as needed, vocational training, education, and recreational therapy in a structured environment that was both nurturing and challenging. Family members were included in an assessment and treatment planning session at the beginning of treatment, regularly informed about youth's participation and progress, and offered monthly parent support groups.

### 2.3.2. Multidimensional Family Therapy

In MDFT (Liddle, 2002) therapists work individually with each family. Therapists work in four treatment domains—the adolescent, parent, family and community. At various times throughout the intervention, therapists have sessions alone with the adolescent, alone with the parent(s), and with the adolescent and parent(s) together.

Treatment advances in three stages: Stage I: developing therapeutic alliances and motivation; Stage II: promoting change in emotions, thoughts and behaviors; and Stage III: reinforcing change and termination from treatment. The goals of the adolescent domain are to improve emotion regulation and coping skills, help teens communicate more effectively with their parents and other adults, and enhance social competence and alternatives to substance use and delinquency. The therapist presents as a strong ally to the youth and helps teens feel safe to reveal the truth about themselves. This is accomplished by the therapist being nonjudgmental; helping the parents control their anger and disappointment and move to a more compassionate and problem-solving stance; encouraging the youth to have positive goals (to dream and hope); and highlighting for the youth the discrepancies between goals and continued substance use and delinquency. The parent domain focuses on increasing the parents' behavioral and emotional involvement and attachment with their adolescent; reducing parental conflict and enhancing teamwork; and helping parents find practical and effective ways to influence their teen. Family sessions aim to decrease conflict, deepen emotional attachments, and improve communication and problem-solving skills. The community domain fosters the youth's and family's competency with social systems (e.g., school, juvenile justice, recreation) and helps young people and families advocate for themselves in these important systems.

## 2.4. Treatment fidelity

Both treatments used adherence procedures developed in previous research studies on MDFT and residential treatment (Hogue et al., 1998; Hogue, Liddle, Dauber, & Samuolis, 2004; Holland, 1986). In order to demonstrate that therapists adhered to the parameters of the treatments (i.e., session frequency and duration), therapists in MDFT completed weekly contact logs to record the type (i.e., youth, parent, family, community) and length of each therapy session. Residential treatment daily logs were completed by ATP staff members to

document the amount and type of therapeutic services received (e.g., group and individual therapy sessions, psychiatric consultations, educational/vocational services, and re-entry activities).

Evaluation of treatment contacts revealed that both interventions were delivered in accordance with their prescribed treatment parameters. We report percentage of therapeutic contacts received in residential treatment given that the nature of the “therapeutic milieu” is such that intervention dosage could be considered to be 24 h a day, 7 days a week. In the residential program, on average, adolescents completed 61% of the weekly prescribed amount of treatment services, 63% of the weekly prescribed educational/vocational activities, and 60% of the prescribed number of re-entry activities. Youth in MDFT averaged 3.28 h per week ( $SD = 1.74$ ) of family, parent, and adolescent sessions, as prescribed in MDFT for this level of intervention. Consistent with MDFT parameters (see Rowe et al., 2013), participants received the following average (median) amount of treatment in the four domains of MDFT: adolescent alone (24.7 h), parent(s) alone (8.4 h), family (37.8 h), and community (11.5 h).

Observational ratings of therapy sessions were also used to document fidelity to both treatments and differentiate the interventions provided in individual and family sessions. Video recordings of individual and family sessions were selected for rating using the Therapist Behavior Rating Scale (TBRS), a standardized observational adherence rating system (Hogue et al., 1998; Hogue, Liddle, & Rowe, 1996). Thirty-one (27%) of MDFT and RT cases were randomly selected for adherence rating. For each case, one session from the middle stage of therapy was randomly selected to be rated. Trained raters rated the therapy sessions on the extensiveness with which the therapists adhered to core interventions. Raters demonstrated an interrater reliability ( $ICC_{(1,2)}$ ) of 0.86. Results from TBRS ratings indicate that therapists provided distinct interventions, with MDFT therapists receiving higher scores on the overall MDFT dimension ( $t [29] = 3.62, p = .001$ ), as well as family interventions ( $t [29] = 2.81, p = .009$ ), interventions with parents ( $t [29] = 2.92, p = .012$ ), and engagement ( $t [29] = 2.58, p = .015$ ). MDFT and RT therapists did not differ on adolescent interventions. Residential therapy clinicians received higher scores than MDFT therapists on cognitive behavioral therapy (CBT) interventions, but these differences were not statistically significant ( $t [29] = -1.59, p = .124$ ).

Equivalence testing procedures (Göttsche, 2006; Tryon, 2001) were used to compare the mean MDFT adherence score obtained in the current study to MDFT benchmarks reported in a previous study (Hogue et al., 2004). Following Fals-Stewart and Birchler (2002), we used an equivalence interval (EI) of  $\pm 10\%$  around the mean MDFT adherence score obtained by Hogue et al. (2004). The reference group mean was 31.09 ( $SD = 8.37$ ) and the EI was  $\pm 3.10$ ; the obtained test group mean was 31.18 ( $SD = 8.06$ ), making the 90% CI 28.06 to 34.30. Therapists in the current study thus obtained *even higher scores* than previous benchmarks.

## 2.5. Measures

Measures were administered to adolescents at baseline and at each post-baseline assessment, assessing variables of interest over each previous 30-day period. Efforts were made to keep assessors unaware of study hypotheses and treatment to which the youth were assigned.

### 2.5.1. Substance use

Two measures were used to assess substance use: The Personal Experience Inventory (PEI; Winters & Henly, 1989) and the Timeline Follow-Back Method (TLFB; Sobell & Sobell, 1992). Specifically, we used the PEI Personal Involvement with Chemicals (PIC) scale, a 29-item scale focusing on psychological and behavioral aspects of substance use and related consequences in the previous 30 days. The PIC demonstrates excellent reliability and validity across diverse adolescent samples (Winters, Latimer, Stinchfield, & Egan, 2004).

The TLFB measured youths' substance consumption (Sobell & Sobell, 1992). The measure has been widely used in drug use treatment studies with adults and adolescents (Leccese & Waldron, 1994). The version of the TLFB administered in the current study obtained 30-day reports of daily substance use. A frequency of substance use score was created by summing the total number of substances used over the 30-day period in question.

### 2.5.2. Delinquent behaviors

Youth completed the National Youth Survey (NYS) Self Report Delinquency Scale, SRD, a well-validated and frequently used instrument (Elliott, Ageton, Huizinga, Knowles, & Canter, 1983). The SRD assesses criminal behavior and delinquent acts based on the Uniform Crime Report (Elliott & Huizinga, 1984). We used the General Delinquency Scale, which is a summary measure of the frequency of both minor and serious delinquent activity.

### 2.5.3. Mental health symptoms

Youth completed the Externalizing and Internalizing subscales of the Youth Self-Report (YSR; Achenbach, 1991) to assess internalizing and externalizing symptoms and distress. The YSR is a widely used and validated measure of adolescent symptoms and behaviors.

## 2.6. Statistical approach

MDFT and RT were compared on the following primary outcomes: (1) substance use, (2) frequency of delinquent behaviors, (3) externalizing symptoms, and (4) internalizing symptoms. Participant change was analyzed using latent growth curve (LGC) modeling (Curran & Hussong, 2003). LGC treats change in outcome as a continuous process, estimating growth parameters in terms of intercepts representing average baseline level, and slopes representing average rate of change over time. Individual differences are captured in random variances for the growth parameters, providing estimates of individual variation around the average group intercept and slope estimates. Consistent with our hypotheses, we modeled growth trajectories for piece-wise change using two distinct, clinically meaningful trajectories: baseline through 2 months post-baseline (representing change during the early treatment phase), and 2 months to 18 months after baseline (representing change during mid- to late-treatment and post-treatment). The variance in the early treatment phase slope trajectory was set to zero to identify the model. Time was coded as the number of months since baseline.

LGC models using Mplus (Muthén & Muthén, 1998–2010) controlled for adolescent age, gender, and time in treatment by entering these variables as covariates. All randomized participants were included in analyses regardless of amount of treatment received (i.e., intent-to-treat). Robust maximum likelihood estimation was used to minimize bias due to non-normal outcome variables. Natural log transformation was used to improve the normality of the measure of delinquent behavior. Full information maximum likelihood (FIML) estimation was used to handle missing data under the missing at random (MAR) assumption (Graham, 2009).

Youth in this study were at high risk for being placed in a long-term juvenile justice or residential substance use treatment facility at some time during the study assessment window because of the severity of substance use symptoms and delinquency, number of psychiatric diagnoses, and the number of previous substance use treatment placements. McCaffrey, Morral, Ridgeway, and Griffin (2007) caution that behavioral frequency data such as TLFB-assessed substance use and the number of delinquent acts committed as measured by the SRD are subject to selection and suppression effects when placement in a controlled environment such as prison/jail or a residential substance use or mental health treatment facility is not taken into account. Therefore, we treated TLFB and SRD outcomes differently than other outcomes that were less susceptible to such biases (i.e., substance use problem severity

as measured by the PEI and externalizing and internalizing symptoms as measured by the YSR). For example, internalizing and externalizing symptoms could be present either in placement or in the community, and were analyzed using conventional LGC procedures. For TLFB and SRD outcomes, a latent class pattern mixture model analysis (LCPMM; Morgan-Lopez & Fals-Stewart, 2007) was conducted to control for potentially biased reports of substance use and delinquent behaviors. LCPMM is an extension of Growth Mixture Modeling (GMM) that can take into account participants' different longitudinal patterns present in data such as post-treatment placements. GMM identifies subgroups (latent classes) of individuals with similar growth trajectories; individuals within each latent class share the same average intercept and slope. LCPMM extends GMM by addressing the probability of placement at each month of the 18-month assessment window and forms latent classes of participants with similar placement probabilities and outcome trajectories. As we have done in previous GMM studies (Henderson et al., 2010), we examined treatment effects simultaneously within each latent class. This allowed us to evaluate treatment comparisons to be made between clients with approximately equivalent placement patterns.

## 3. Results

### 3.1. Baseline characteristics

Between-treatment equivalence was tested using chi-square tests (for categorical variables) and analyses of variance (for continuous variables) on demographic characteristics, diagnoses, and pretreatment status on the outcome variables. There were no significant differences ( $p < .05$ ) between treatment groups at baseline on any variable. These results are summarized in Tables 1 and 2.

### 3.2. Response and attrition rates

One-hundred sixty-eight adolescents were screened. Of these, 132 (78%) were eligible for the study and 113 consented, yielding an 85% response rate. An a priori power analysis suggested that the sample size would yield power of 0.80. Nineteen eligible participants refused the study because parents were not willing to accept non-residential treatment (53%), refused RT (31%), or did not want any treatment (16%). The study had very little missing data: 1% at 2 months post-baseline, 4% at 4 months post-baseline, 5% at 12 months post-baseline, and 2% at 18 months post-baseline. There was no difference in assessment completion rates between the two interventions ( $X^2(1, N = 113) = 1.83, p = .18$ ). Youth receiving MDFT remained in treatment longer than youth receiving residential treatment ( $M = 6.5 [SD = 2.0]$  vs.  $3.7 [SD = 3.0]$  months;  $t(111) = 5.81, p < .001$ ). See Fig. 1 for the CONSORT flow chart.

### 3.3. Identifying the latent classes

Results of the LCPMM indicated that three latent classes provided the best representation of the heterogeneity in placement patterns. Placement probabilities for each class are shown in Fig. 2. The first class (Early Placement; Class 2 in Fig. 2) represented 18% of participants who showed high probabilities of being placed in a controlled environment (following their original admission in RT by study design) toward the beginning of the follow up period (defined between 3 and 9 months from baseline). By the end of the follow up period, defined as between 10 and 18 months from baseline, these individuals tended to be discharged from their placements and living at home. Members of the second class (Late Placement; Class 1 in Fig. 2) represented 11% of participants and also had high probabilities of out-of-home placements, but the placements tended to occur later in the assessment window. These individuals showed only moderate probabilities of being placed in a controlled environment between 3 and 9 months post-baseline. The

**Table 1**  
Sample characteristics.

Variable	MDFT	Residential	Overall
Age [M (SD)]	15.38 (1.12)	15.34 (1.04)	15.36 (1.07)
Gender [n (%)]			
Male	42 (75)	42 (74)	84 (75)
Female	14 (25)	15 (26)	29 (25)
Ethnicity/race [n (%)]			
African American	11 (20)	10 (17)	20 (18)
White, non-Hispanic	7 (12)	8 (14)	15 (13)
Hispanic	38 (70)	39 (70)	77 (68)
Family income (median)	20,400	18,000	18,771
Mother's education [n (%)]			
< High school	13 (24)	23 (41)	36 (32)
High school graduate	34 (62)	25 (45)	59 (52)
College graduate	8 (14)	7 (13)	15 (13)
Family structure [n (%)]			
Single parent	25 (45)	20 (35)	45 (40)
Two parent	12 (21)	10 (18)	22 (20)
Blended	14 (25)	15 (26)	29 (26)
Other	5 (9)	12 (21)	17 (15)
Parental criminal involvement [n (%)]	21 (37)	17 (30)	38 (33)
Parental substance use [n (%)]	28 (49)	24 (43)	52 (46)
Adolescent justice involved	45 (81)	46 (82)	91 (81)
DSM-V Diagnosis [n (%)]			
Cannabis use disorder	52 (100)	49 (100)	101 (100)
Alcohol use disorder	38 (73)	34 (69)	72 (71)
Stimulants or opioid use disorder	18 (35)	15 (31)	33 (33)
Conduct disorder	39 (68)	42 (88)	81(77)
ADHD	13 (23)	9 (19)	22 (21)
MDD	9 (16)	10 (21)	19 (18)
Number of diagnoses [M (SD)]	4.16 (3.21)	3.50 (3.40)	3.83 (3.31)
Age first used drugs [n (%)]			
< 12	22 (39)	22 (39)	44 (39)
12–14	30 (53)	28 (50)	58 (51)
15–18	5 (8)	6 (11)	11 (10)
Number previous substance use treatment episodes [n (%)]			
0	13 (23)	11 (19)	24 (21)
1	26 (46)	25 (43)	51 (45)
2 or more	17 (31)	22 (38)	39 (34)
Previous residential treatment [n (%)]			
0	17 (30)	16 (28)	33 (29)
1	32 (57)	30 (52)	62 (54)
2 or more	7 (13)	12 (20)	19 (17)

vast majority of the youths constituted the third class. This group, 72% of the sample (*Minimal Placement*), had low probabilities of being in placement during the entire assessment window (3–18 months).

In reporting results for the LCPMM analyses, we focus on the group

**Table 2**  
Descriptive statistics for outcome variables.

Variable	Intake		2 month FU		4 month FU		12 month FU		18 month FU	
	MDFT	RT								
	M (SD)									
Substance use problems	61.25 (20.94)	63.95 (24.24)	40.96 (12.81)	35.44 (10.24)	39.57 (12.02)	38.10 (14.83)	39.20 (14.74)	41.82 (17.59)	39.21 (12.69)	41.43 (14.63)
Externalizing symptoms	60.17 (13.40)	59.18 (14.73)	51.26 (9.23)	53.20 (12.09)	53.10 (11.25)	52.28 (10.80)	49.26 (11.28)	49.90 (9.34)	49.03 (10.92)	51.04 (8.77)
Internalizing symptoms	51.59 (11.82)	50.63 (13.17)	46.13 (8.28)	49.63 (10.95)	48.07 (10.98)	49.14 (12.84)	45.72 (8.87)	48.45 (10.67)	45.96 (9.79)	47.04 (9.57)
30-day substance use frequency	33.40 (19.05)	27.57 (18.01)	6.75 (10.39)	3.04 (6.69)	5.31 (7.74)	5.07 (10.70)	8.75 (13.83)	9.77 (13.98)	8.89 (12.24)	9.51 (14.10)
Delinquent behaviors <sup>a</sup>	1.15 (1.40)	1.28 (1.65)	0.99 (1.10)	0.99 (1.25)	1.08 (1.22)	0.66 (0.98)	0.60 (0.97)	0.69 (1.12)	0.55 (1.00)	0.75 (1.10)

Note: Substance Use Problems measured by the Personal Experience Inventory. Frequency of Substance Use measured by a 30-day TLFB for days of any drug use, including alcohol. Internalizing and Externalizing Symptoms measured by the Youth Self-Report. Delinquent Behaviors measured by the SRD.

M = mean, SD = standard deviation.

<sup>a</sup> Variable log transformed.

of adolescents who were less likely to be placed in a controlled environment following treatment (the Minimal Placement class, see below) for two reasons: (1) the results are less influenced by selection and suppression effects, and (2) the majority of participants (72%) were in this class. However, as noted above, treatment effects were assessed in each class simultaneously.

### 3.4. Outcomes

See Table 2 for means and standard deviations for outcome measures and Table 3 for growth parameters and treatment effect estimates.

#### 3.4.1. Phase I: outcomes for early treatment phase – baseline to 2 months

Contrary to study hypotheses, RT youth did not improve during early treatment more than MDFT youth. Youth in both treatments showed a significant decrease in substance use problems and frequency (PEI Mean Slope = -12.39, standard error [SE] = 1.13, *pseudo z* = -10.69, *p* < .001, *d* = 1.10; TLFB Mean Slope = -12.78, SE = 0.94, *pseudo z* = -13.59, *p* < .001, *d* = 1.36); externalizing symptoms (Mean Slope = -5.41, SE = 2.15, *pseudo z* = -2.52, *p* < .005, *d* = 0.77), delinquent behaviors (Mean Slope = -0.14, SE = 0.07, *p* = .05, *d* = 0.18), and internalizing symptoms (Mean Slope = -6.87, SE = 1.87, *pseudo z* = -3.67, *p* < .001, *d* = 1.10). The only treatment difference during this early phase was that youth in MDFT demonstrated a significantly greater decrease in internalizing symptoms than youth in RT (slope coefficient on treatment = 2.60, SE = 0.92, *pseudo z* = 2.81, *p* < .01, 95% CI = 0.76 to 4.44, *d* = 0.42).

#### 3.4.2. Phase II: outcomes for 2–18 months after baseline

We examined the extent to which the treatment gains obtained early in treatment were maintained. We hypothesized that overall, MDFT would maintain treatment gains better than RT. Results suggest that for substance use problems, youth receiving MDFT maintained their treatment gains over time, while youth in RT reported an increase in substance use problems from the early treatment phase (PEI; slope coefficient for treatment = 0.72, SE = 0.22, *pseudo z* = 3.28, *p* < .01, 95% CI = 0.28 to 1.16, *d* = 0.51; see Fig. 3). With respect to frequency of substance use (TLFB), youth in the minimum placement class who received MDFT showed significantly less growth than youth in the minimum placement class who received RT (slope coefficient for treatment = 0.41, SE = 0.20, *pseudo z* = 1.96, *p* < .05, 95% CI = 0.00 to 0.81, *d* = 1.18). With respect to frequency of delinquent behaviors, youth in the minimal placement class who received MDFT maintained their earlier treatment gains. Youth randomized to RT showed an increase in delinquent behaviors (slope coefficient for treatment = 0.04,

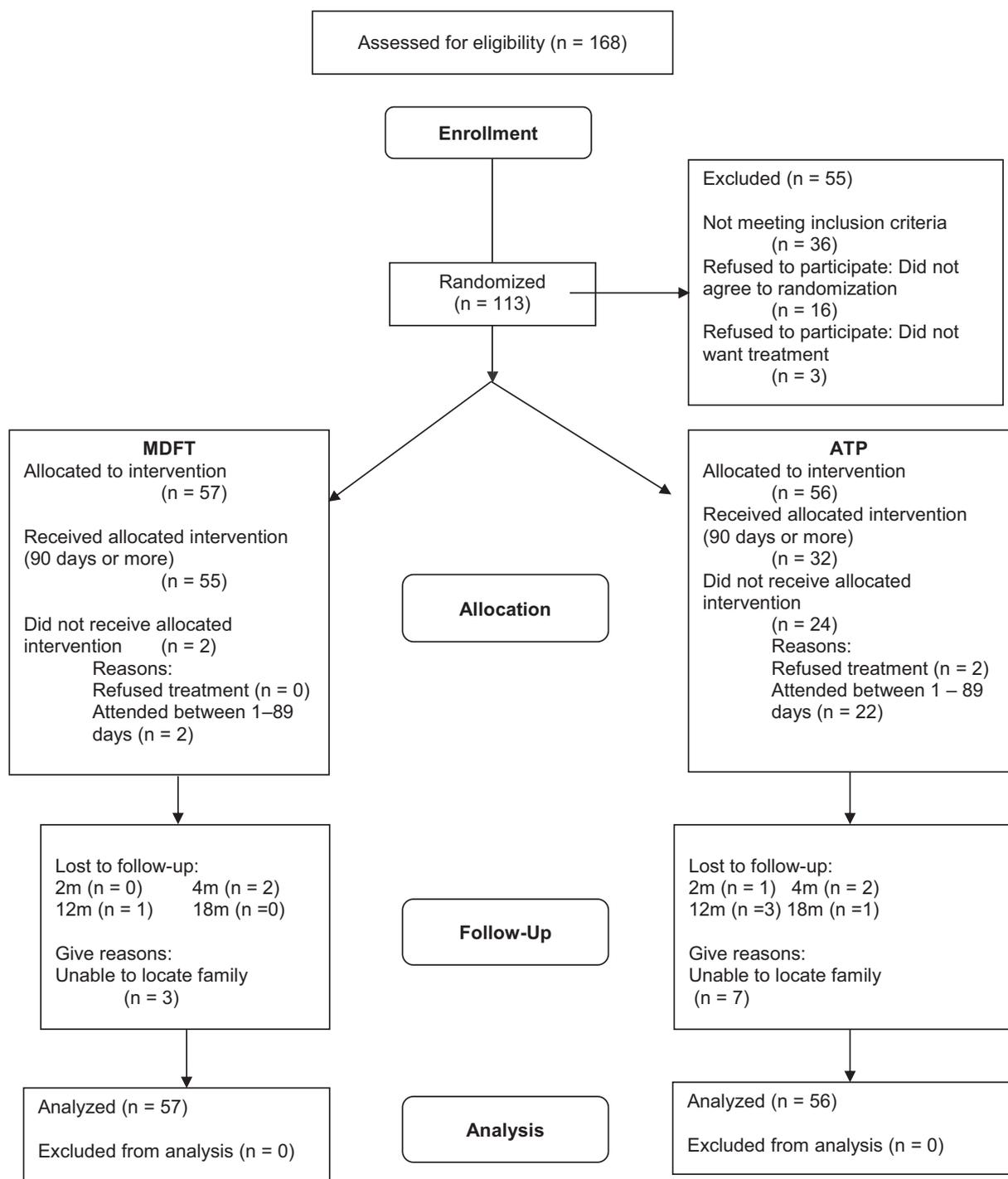


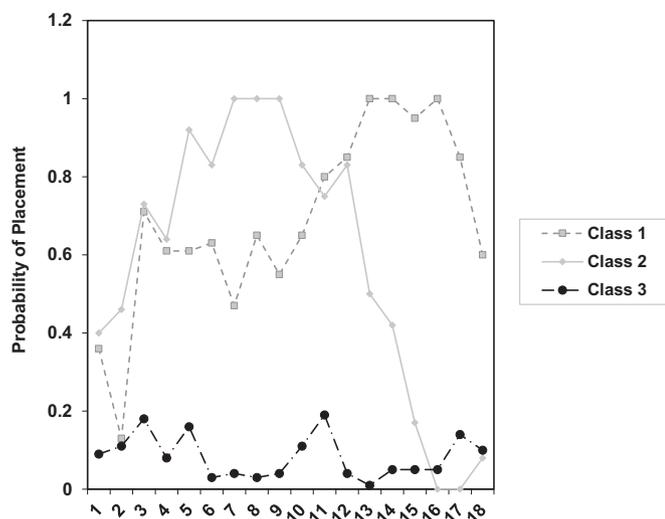
Fig. 1. CONSORT flow diagram.

SE = 0.02, pseudo z = 2.43, p < .05, d = 0.42). There were no differences between the two treatment modalities on mental health symptoms. Treatment gains were stable in both treatments through 18 months post-baseline (Externalizing Symptoms: Mean Slope = -0.40, SE = 0.26, pseudo z = -1.54, ns, d = 0.46; Internalizing Symptoms: Mean Slope = 0.27, SE = 0.31, pseudo z = 0.87, ns, d = 0.35).

#### 4. Discussion

This study examined the relative clinical effectiveness of residential and non-residential treatment for adolescent substance use,

delinquency, and mental health problems among youth who had been referred for residential treatment. Contrary to the hypothesis that RT would be more effective than MDFT during the early phase of treatment, defined in this study as 2 months post-baseline, results indicated that youth in both interventions achieved considerable gains. During this early treatment phase, youth in both treatments showed statistically significant decreases in substance use, delinquency, and mental health symptoms. The effect sizes were generally large ranging from 1.36 (TLFB frequency of substance use) to 0.77 (SRD- General Delinquency Scale). Youth in both treatments decreased their substance use by 80% or more during the first two months of treatment. It should be noted that youth in MDFT showed a significantly greater decrease in

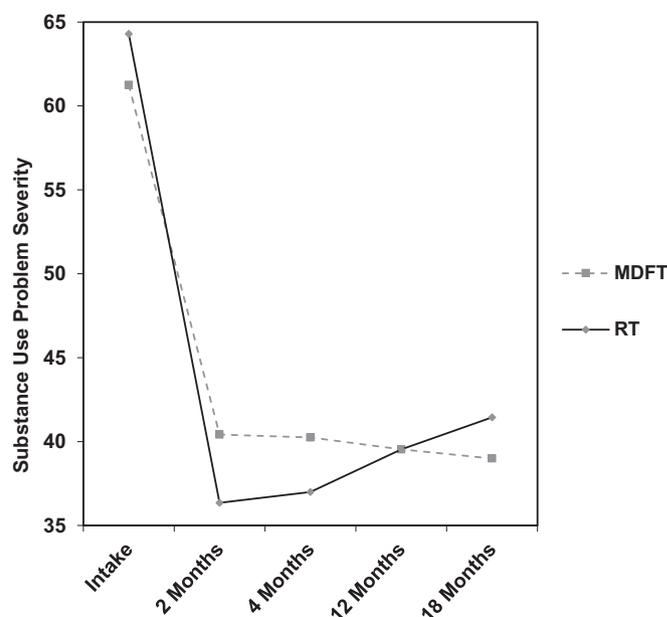


**Fig. 2.** Probabilities of placement in long-term residential facility by latent class.  
 Note. Class 1 = Late Placement. Class 2 = Early Placement. Class 3 = Minimal Placement.

internalizing symptoms than their RT counterparts during early treatment. The results concerning early phase treatment effects, if supported through replication, are important because they challenge the prevailing assumption that adolescents who meet criteria for residential treatment cannot be adequately managed in a non-residential setting (European Monitoring Centre for Drugs and Drug Addiction, 2014; Reif et al., 2014).

Comparing the two treatments between early treatment and 18 months after intake, residential treatment did not demonstrate any outcomes that were significantly better than the non-residential alternative. Moreover, MDFT maintained its early treatment gains significantly better than RT on substance use problems, substance use frequency, and delinquent behaviors. Both treatments maintained early treatment reductions of mental health symptoms.

Several limitations of the current study should be noted. First, the study compared only one non-residential treatment and one residential treatment program in one community, and thus generalizability to other programs and communities cannot be assumed. Second, the sample, although diverse, was primarily male (75%) and Hispanic (68%), and hence generalizability must be done cautiously. Third, the sample size was fairly small, and the results may ultimately prove



**Fig. 3.** Model-estimated substance use problem severity mean trajectories for MDFT and RT.  
 Note. MDFT = Multidimensional Family Therapy. RT = residential treatment.

unstable in a replication with a larger sample size. Fourth, with respect to the frequency of substance use and delinquent behaviors (but not for substance use problem severity, externalizing and internalizing symptoms) the significant findings pertained to the minimal placement class, 72% of the sample. This group, by and large, remained living in the community during (for MDFT only) and after treatment (for both groups). Therefore, the favorable results concerning substance use frequency and delinquent behaviors for the youth receiving MDFT should be generalized cautiously to adolescents who are more likely to be placed in secure facilities. Finally, it is possible that youth who met eligibility criteria for the study may not have been as severe as all youth referred for residential treatment nationwide.

At the same time, the study also has significant strengths, including a conservative intent-to-treat longitudinal design, high participant response rate, rigorous treatment fidelity monitoring, adequate adherence in both treatments, and minimal missing data. Also, 86% of the sample was Hispanic or African American, populations that historically have been under-represented in health and mental health care research

**Table 3**  
 Means and standard errors for growth factors and treatment effects for outcome variables.

Outcome measure	Growth factor mean						Treatment differences					
	Intercept		In-treatment slope		Slope post-baseline		Intercept		In-treatment slope		Slope post-baseline	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Drug use problem severity	63.00***	2.13	-12.39***	1.13	0.12	0.11	-0.75	4.80	-3.88	2.56	0.72**	0.22
Externalizing symptoms	66.35***	5.28	-5.41*	2.15	-0.40	0.26	-2.49	2.78	0.93	1.11	0.10	0.13
Internalizing symptoms	61.27***	5.33	-6.87**	1.87	0.27	0.31	-3.37	2.46	2.60**	0.92	< 0.01	< 0.01
Substance use frequency	30.51***	1.75	-12.78***	0.94	0.28**	0.09	N/A	N/A	N/A	N/A	N/A	N/A
Early Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	-2.20	4.90	2.77	3.31	-0.27	0.23
Late Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	-6.84	5.69	4.43	3.41	-0.19	0.44
Minimal Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	-6.54	4.50	1.01	2.34	0.41*	0.21
Delinquent behaviors	1.21***	0.14	-0.14*	0.07	-0.02*	0.01	N/A	N/A	N/A	N/A	N/A	N/A
Early Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	0.06	0.42	-0.08	0.24	< 0.01	0.02
Late Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	< 0.01	0.31	-0.03	0.16	< 0.01	0.02
Minimal Placement Class	N/A	N/A	N/A	N/A	N/A	N/A	0.17	0.30	-0.24	0.14	0.04*	0.02

\*  $p < .05$ .  
 \*\*  $p < .01$ .  
 \*\*\*  $p < .001$ .

(Kagawa-Singer, 2000; Steinka-Fry, Tanner-Smith, Dakof, & Henderson, 2017; Waheed, Hughes-Morley, Woodham, Allen, & Bower, 2015).

Plant and Panzarella (2009) assert that youth and safety outcomes of residential treatment need to be superior to non-residential care outcomes among similarly impaired youth in order to justify the higher financial and personal costs associated with residential care. The results of this study suggest that residential outcomes were not superior to a family- and community-based alternative. By this logic, residential placement cannot be justified for certain youth. In this study, we did not find RT to be superior to a non-residential alternative, MDFT. This finding adds to a growing consensus in child and adolescent substance use and mental health treatment that in certain circumstances non-residential treatments may produce outcomes that are equal to or better than residential or institutional care (e.g., De Swart et al., 2012; Henggeler et al., 1999; Kwok et al., 2016; Strijbosch, Huijs, Stams, Wissink, & van der Helm, 2015; Weisz et al., 2013).

Although the results of this study suggest that many youths referred to RT might benefit more from non-residential alternatives than from RT, the results by no means suggest that all youth referred to residential treatment would benefit more from a family-based treatment such as MDFT. There is and always will be a strong need for RT, especially for youth at high risk of overdose, suicide, who present a public safety risk, or are without family members who can be involved in treatment. With the current opiate epidemic, it is certainly the case that stabilization and residential treatment may be indicated to save young people's lives. Importantly and significantly, efforts are underway to improve residential treatment by improving assessment and placement procedures, integrating RT with high-quality continuing care services, and bringing evidence-based practices into residential settings (Bettmann & Jaspersen, 2009; Boswell, Cain, Oswald, McAleavey, & Adelman, 2017; Brunette, Mueser, & Drake, 2004; Godley et al., 2006; Hoogeveen, Vogelvang, & Rigter, 2017; James, Alemi, & Zepeda, 2013).

## 5. Conclusion

According to the National Survey on Drug Use and Health (SAMHSA, 2017), in 2016 over 1 million youth between the ages of 12 and 17 needed substance use treatment, and only 180,000 received any treatment whatsoever, leaving over 900,000 untreated youth. Given that approximately 15% enroll in residential care (SAMHSA, 2016), it is vital for policymakers, funders, clinical directors, and parents to know whether the benefits of residential treatment outweigh their costs in comparison to less restrictive, non-residential, alternatives such as MDFT. In the current study, MDFT produced outcomes that were equal to or better than RT in both the short- and long-term, suggesting that Multidimensional Family Therapy is a viable, less-costly alternative to RT for youth with serious co-occurring substance use and mental health disorders.

## Acknowledgements

We thank Arlene Pena Gonzalez, MD, Tanya Quille, Ph.D. Lissette Perez Colon, MA, Jessica Marchena, MA, Elda Kanzki Velasco, Ph.D., Juan Carlos Gonzalez, MA, Val Jackson, MA, Michael Miller, MA, Ed McGowen, Matt Gissen JD, and Eve Sakran for their contributions to this study. We also thank the youth, parents, and families who participated in the study.

## References

- Achenbach, T. M. (1991). *Manual for the Youth Self-Report and 1991 Profile*. Burlington, VT: University of Vermont, Department of Psychiatry.
- Barth, R. P., Greeson, J. K., Guo, S., Green, R. L., Hurley, S., & Sisson, J. (2007). Outcomes for youth receiving intensive in-home therapy or residential care: A comparison using propensity scores. *American Journal of Orthopsychiatry*, 77(4), 497–505. <http://dx.doi.org/10.1037/0002-9432.77.4.497>.
- Bean, P., White, L., Neagle, L., & Lake, P. (2005). Is residential care an effective approach for treating adolescents with co-occurring substance abuse and mental health diagnoses? *Best Practices in Mental Health*, 1(2), 50–60.
- Bettmann, J. E., & Jaspersen, R. A. (2009). Adolescents in residential and inpatient treatment: A review of the outcome literature. *Child & Youth Care Forum*, 38, 161–183.
- Black, J. J., & Chung, T. (2014). Mechanisms of change in adolescent substance use treatment: How does treatment work? *Substance Abuse*, 35(4), 344–351. <http://dx.doi.org/10.1080/08897077.2014.925029>.
- Boswell, J. F., Cain, N. M., Oswald, J. M., McAleavey, A. A., & Adelman, R. (2017). Interpersonal pathoplasticity and trajectories of change in routine adolescent and young adult residential substance abuse treatment. *Journal of Consulting and Clinical Psychology*, 85(7), 676–688. <http://dx.doi.org/10.1037/ccp0000219>.
- Brown, S. A., D'Amico, E. J., McCarthy, D. M., & Tapert, S. F. (2001). Four-year outcomes from adolescent alcohol and drug treatment. *Journal of Studies on Alcohol and Drugs*, 62(3), 381–388.
- Brunette, M. F., Mueser, K. T., & Drake, R. E. (2004). A review of research on residential programs for people with severe mental illness and co-occurring substance use disorders. *Drug and Alcohol Review*, 23(4), 471–481.
- Caldwell, M. F., & Van Rybroek, G. J. (2005). Reducing violence in serious juvenile offenders using intensive treatment. *International Journal of Law and Psychiatry*, 28(6), 622–636.
- Curran, P. J., & Hussong, A. M. (2003). The use of latent trajectory models in psychopathology research. *Journal of Abnormal Psychology*, 112(4), 526–544. <http://dx.doi.org/10.1037/0021-843X.112.4.526>.
- Dakof, G. A., Henderson, C., Rowe, C. L., Boustani, M., Greenbaum, P. E., Wang, W., & Liddle, H. A. (2015). A randomized clinical trial of family therapy in juvenile drug court. *Journal of Family Psychology*, 29(2), 232–241. <http://dx.doi.org/10.1037/fam0000053>.
- De Swart, J. J. W., Van den Broek, H., Stams, G. J. J. M., Asscher, J. J., Van der Laan, P. H., Holsbrink-Engels, G. A., & Van der Helm, G. H. P. (2012). The effectiveness of institutional youth care over the past three decades: A meta-analysis. *Children and Youth Services Review*, 34(9), 1818–1824. <http://dx.doi.org/10.1016/j.childyouth.2012.05.015>.
- Deas, D., & Brown, E. S. (2006). Adolescent substance abuse and psychiatric comorbidities. *Journal of Clinical Psychiatry*, 67(7), e02. <http://dx.doi.org/10.4088/JCP.0706e02>.
- Drake, R. E., O'Neal, E. L., & Wallach, M. A. (2008). A systematic review of psychosocial research on psychosocial interventions for people with co-occurring severe mental and substance use disorders. *Journal of Substance Abuse Treatment*, 34(1), 123–138. <http://dx.doi.org/10.1016/j.jsat.2007.01.011>.
- Edelen, M. O., Slaughter, M. E., McCaffrey, D. F., Becker, K., & Morral, A. R. (2010). Long term effect of community-based treatment: Evidence from the Adolescent Outcomes Project. *Drug and Alcohol Dependence*, 107(1), 62–68. <http://dx.doi.org/10.1016/j.drugalcdep.2009.09.008>.
- Elliott, D. S., Ageton, S. S., Huizinga, D., Knowles, B. A., & Canter, R. J. (1983). *The prevalence and incidence of delinquent behavior: 1976–1980. National estimates of delinquent behavior by sex, race, social class, and other selected variables*. Boulder, CO: Behavioral Research Institute.
- Elliott, D. S., & Huizinga, D. (1984). The relationship between delinquent behavior and ADM problems. *National Youth Survey Report no. 28*. Boulder, CO: Behavioral Research Institute.
- European Monitoring Centre for Drugs and Drug Addiction (2014). Residential treatment for drug use in Europe. *EMCDDA papers*. Luxembourg: Publications Office of the European Union.
- Fals-Stewart, W., & Birchler, G. R. (2002). Behavioral couples therapy with alcoholic men and their intimate partners: The comparative effectiveness of bachelor's and master's level counselors. *Behavior Therapy*, 33, 123–147.
- Fishman, M., Clemmey, P., & Adger, H. (2003). Mountain Manor Treatment Center: Residential adolescent addictions treatment program. In S. J. Stevens, & A. R. Morral (Eds.). *Adolescent substance abuse treatment in the United States: Exemplary models from a national evaluation study* (pp. 135–154). New York: Haworth Press.
- Godley, M. D., Godley, S. H., Dennis, M. L., Funk, R. R., & Passetti, L. L. (2006). The effect of assertive continuing care on continuing care linkage, adherence and abstinence following residential treatment for adolescents with substance use disorders. *Addiction*, 102(1), 81–93.
- Götzsche, P. C. (2006). Lessons from and cautions about noninferiority and equivalence randomized trials. *JAMA: The Journal of the American Medical Association*, 295(10), 1172–1174.
- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549–576.
- Greenbaum, P. E., Wang, W., Henderson, C. E., Kan, L., Hall, K., Dakof, G. A., & Liddle, H. A. (2015). Gender and ethnicity as moderators: Integrative data analysis of Multidimensional Family Therapy randomized clinical trials. *Journal of Family Psychology*, 29(6), 919–930. <http://dx.doi.org/10.1037/fam0000127>.
- Grella, C. E., Hser, Y. I., Joshi, V., & Rounds-Bryant, J. C. (2001). Drug treatment outcomes for adolescents with comorbid mental and substance use disorders. *Journal of Nervous and Mental Disease*, 189(6), 384–392.
- Hair, H. J. (2005). Outcomes for children and adolescents after residential treatment: A review of research from 1993 to 2003. *Journal of Child and Family Studies*, 14(4), 551–575.
- Heggness, M. L., & Davis, E. E. (2010). Factors influencing length to stay in out-of-home placements: Are human services and correction placements different? *Children and Youth Services Review*, 32(5), 749–757.
- Henderson, C. E., Dakof, G. A., Greenbaum, P. E., & Liddle, H. A. (2010). Effectiveness of Multidimensional Family Therapy with higher severity substance-abusing adolescents: Report from two randomized controlled trials. *Journal of Consulting and Clinical*

- Psychology*, 78(6), 885–897. <http://dx.doi.org/10.1037/a0020620>.
- Henggeler, S. W., Rowland, M. D., Randall, J., Ward, D. M., Pickrel, S. G., Cunningham, P. B., & Santos, A. B. (1999). Home-based multisystemic therapy as an alternative to the hospitalization of youths in psychiatric crisis: Clinical outcomes. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38(11), 1331–1339.
- Hoagwood, K., Burns, B., Kiser, I., Ringeisen, H., & Schoenwald, S. K. (2001). Evidence-based practice in child and adolescent mental health services. *Psychiatric Services*, 52(9), 1179–1189.
- Hogue, A., Liddle, H. A., Dauber, S., & Samuolis, J. (2004). Linking session focus to treatment outcome in evidence-based treatments for adolescent substance use. *Psychotherapy: Theory, Research, Practice, Training*, 41(2), 83–96.
- Hogue, A., Liddle, H. A., & Rowe, C. L. (1996). Treatment adherence process research in family therapy: A rationale and some practical guidelines. *Psychotherapy: Theory, Research, Practice, Training*, 33(2), 332–345.
- Hogue, A., Liddle, H. A., Rowe, C. L., Turner, R. M., Dakof, G. A., & LaPann, K. (1998). Treatment adherence and differentiation in individual versus family therapy for adolescent substance abuse. *Journal of Counseling Psychology*, 45(1), 104–114.
- Holland, S. (1986). Measuring process in drug abuse treatment. In G. DeLeon, & J. T. Ziegenfuss (Eds.), *Therapeutic communities for addictions: Readings in theory, research and practice* (pp. 169–181). Springfield, IL: Charles E. Thomas.
- Hoogveen, C. E., Vogelvang, B., & Rigter, H. (2017). Feasibility of inpatient and outpatient Multidimensional Family Therapy for improving behavioral outcomes in adolescents referred to residential youth care. *Residential Treatment for Children & Youth*, 34, 61–82. <http://dx.doi.org/10.1080/0886571X.2016.1268945>.
- Hser, Y., Grella, C. E., Hubbard, R. L., Hsieh, S., Fletcher, B. W., Brown, B. S., & Anglin, M. D. (2001). An evaluation of drug treatment for adolescents in 4 US cities. *Archives of General Psychiatry*, 58(7), 689–695.
- Jainchill, N., Hawke, J., DeLeon, G., & Yagelka, J. (2000). Adolescents in therapeutic communities: One-year posttreatment outcomes. *Journal of Psychoactive Drugs*, 32(1), 81–94.
- James, S., Alemi, Q., & Zepeda, V. (2013). Effectiveness and implementation of evidence-based practices in residential care settings. *Children and Youth Services Review*, 35, 642–656. <http://dx.doi.org/10.1016/j.childyouth.2013.01.007>.
- Kagawa-Singer, M. (2000). Improving the validity and generalizability of studies with underserved US populations: Expanding the research paradigm. *Annals of Epidemiology*, 10(8 Suppl), S92–S.
- Kwok, K. H., Yuan, S. N., & Ougrin, D. (2016). Review: Alternatives to inpatient care for adolescents and children with mental health disorders. *Child and Adolescent Mental Health*, 21(1), 3–10. <http://dx.doi.org/10.1111/camh.12123>.
- Landrum, B., Knight, D. K., Becan, J. E., & Flynn, P. M. (2015). To stay or not to stay: Adolescent client, parent, and counselor perspectives on leaving substance abuse treatment early. *Journal of Child & Adolescent Substance Abuse*, 24(6), 344–353. <http://dx.doi.org/10.1080/1067828X.2013.8944088>.
- Leccese, M., & Waldron, H. B. (1994). Assessing adolescent substance abuse: A critique of current measurement instruments. *Journal of Substance Abuse Treatment*, 11(6), 553–563. <http://dx.doi.org/10.1016/j.jbr.2011.03.031>.
- Liddle, H. A. (2002). *Multidimensional Family Therapy for adolescent cannabis users. Cannabis Youth Treatment (CYT) series: Vol. 5*. Rockville, MD: Center for Substance Use Treatment, Substance Use and Mental Health Services Administration.
- Liddle, H. A., Dakof, G. A., Parker, K., Diamond, G. S., Barrett, K., & Tajeda, M. (2001). Multidimensional Family Therapy for adolescent drug abuse: Results of a randomized clinical trial. *American Journal of Drug and Alcohol Abuse*, 27(4), 651–688. <http://dx.doi.org/10.1081/ADA-100107661>.
- Liddle, H. A., Dakof, G. A., Turner, R. M., Henderson, C. E., & Greenbaum, P. E. (2008). Treating adolescent drug abuse: A randomized trial comparing Multidimensional Family Therapy and Cognitive Behavior Therapy. *Addiction*, 103(10), 1660–1670. <http://dx.doi.org/10.1111/j.1360-0443.2008.02274.x>.
- Liddle, H. A., Rowe, C. L., Dakof, G. A., Henderson, C. E., & Greenbaum, P. E. (2009). Multidimensional Family Therapy for young adolescent substance abuse: Twelve-month outcomes of a randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 77(1), 12–25. <http://dx.doi.org/10.1037/a0014160>.
- Liddle, H. A., Rowe, C. L., Gonzalez, A., Henderson, C. E., Dakof, G. A., & Greenbaum, P. E. (2006). Changing provider practices, program environment, and improving outcomes by transporting Multidimensional Family Therapy to an adolescent drug treatment setting. *American Journal on Addictions*, 15(Suppl. 1), 102–112. <http://dx.doi.org/10.1080/10550490601003698>.
- Mattejat, F., Hirt, B. R., Wilkin, J., Schmidt, M. H., & Remschmidt, H. (2001). Efficacy of inpatient and home treatment in psychiatrically disturbed children and adolescents: Follow-up assessment of the results of a controlled treatment study. *European Child & Adolescent Psychiatry*, 10(Suppl. 1), 171–179.
- McCaffrey, D. F., Morral, A. R., Ridgeway, G., & Griffin, B. A. (2007). Interpreting treatment effects when cases are institutionalized after treatment. *Drug and Alcohol Dependence*, 89(2–3), 126–138. <http://dx.doi.org/10.1016/j.drugalcdep.2006.12.03>.
- Morgan-Lopez, A. A., & Fals-Stewart, W. (2007). Analytic methods for modeling longitudinal data from rolling therapy groups with membership turnover. *Journal of Consulting and Clinical Psychology*, 75(4), 580–593.
- Morral, A. R., McCaffrey, D. F., & Ridgeway, G. (2004). Effectiveness of community-based treatment for substance abusing adolescents: 12-month outcomes for youths entering Phoenix Academy or alternative probation dispositions. *Psychology of Addictive Behaviors*, 18(3), 257–268.
- Muthén, L. K., & Muthén, B. O. (1998–2010). *Mplus user's guide* (6th edition). Los Angeles, CA: Muthén & Muthén.
- Plant, R. W., & Panzarella, P. (2009). Residential treatment of adolescent substance use disorders: Evidence-based approaches and best practice recommendations. In C. Leukefeld, T. P. Gullotta, & M. Stanton-Tindall (Eds.), *Adolescent substance abuse: Evidence Based Approaches to prevention and treatment* (pp. 135–255). NY: Springer.
- Reif, S., George, P., Braude, L., Dougherty, R. H., Daniels, A. S., Ghose, S. S., & Delphin-Rittman, M. E. (2014). Residential treatment for individuals with substance use disorders: Assessing the evidence. *Psychiatric Services*, 65(3), 301–312. <http://dx.doi.org/10.1176/appi.ps.201300242>.
- Riggs, P. D. (2003). Treating adolescents for substance abuse and comorbid psychiatric disorders. *Science & Practice Perspectives*, 2(1), 18–29.
- Rigter, H., Henderson, C., Pelc, I., Tossmann, P., Phan, O., Hendriks, V., ... Rowe, C. L. (2013). Multidimensional Family Therapy lowers the rate of cannabis dependence in adolescents: A randomized controlled trial in Western European outpatient settings. *Drug and Alcohol Dependence*, 130(1–3), 85–93. <http://dx.doi.org/10.1016/j.drugalcdep.2012.10.013>.
- Rowe, C. L., Alberga, L., Dakof, G. A., Henderson, C. E., Ungaro, R., & Liddle, H. A. (2016). Family-based HIV and STI risk reduction for drug-involved youth offenders: 42-month outcomes. *Family Process*, 55(2), 305–320.
- Rowe, C. L., Liddle, H. A., Greenbaum, P., & Henderson, C. E. (2004). Impact of psychiatric comorbidity on treatment outcomes of adolescent drug abusers. *Journal of Substance Abuse Treatment*, 26(2), 129–140. [http://dx.doi.org/10.1016/S0740-5672\(03\)00166-1](http://dx.doi.org/10.1016/S0740-5672(03)00166-1).
- Rowe, C. L., Rigter, H., Gantner, A., Mos, K., Nielsen, P., Phan, O., & Henderson, C. (2013). Implementation fidelity of Multidimensional Family Therapy in an international trial. *Journal of Substance Abuse Treatment*, 44(4), 391–399. <http://dx.doi.org/10.1016/j.jbsat.2012.08.225>.
- Schaub, M. P., Henderson, C. E., Pelc, I., Tossmann, P., Phan, O., Hendriks, V., ... Rigter, H. (2014). Multidimensional Family Therapy decreases the rate of externalising behavioural disorder symptoms in cannabis abusing adolescents: Outcomes of the INCANT trial. *BMC Psychiatry*, 14(1), 26.
- Sobell, L. C., & Sobell, M. B. (1992). Timeline Follow-Back: A technique for assessing self-reported ethanol consumption. In J. Allen, & R. Litten (Eds.), *Measuring alcohol consumption: Psychosocial and biological methods* (pp. 41–72). Totowa, NJ: Humana Press.
- Steinka-Fry, K. T., Tanner-Smith, E. E., Dakof, G. A., & Henderson, C. (2017). Culturally sensitive substance use treatment for racial/ethnic minority youth: A meta-analytic review. *Journal of Substance Abuse Treatment*, 75, 22–37. <http://dx.doi.org/10.1016/j.jbsat.2017.01.006>.
- Strickler, A., Mihalo, J. R., Bundick, M. J., & Trunzo, A. C. (2016). Relationship between time in residential treatment and youth outcomes: Results from a cross-site 5-year analysis. *Journal of Child and Family Studies*, 25(1), 1860–1870. <http://dx.doi.org/10.1007/s10826-015-0347-8>.
- Srijbosch, E. L. L., Huijs, J. A. M., Stams, G. J. J. M., Wissink, I. B., & van der Helm, G. H. P. (2015). The outcome of institutional youth care compared to non-institutional youth care for children or primary school and early adolescents: A multi-level meta-analysis. *Children and Youth Services Review*, 58, 208–218. <http://dx.doi.org/10.1016/j.childyouth.2015.09.018>.
- Subramaniam, G. A., Stitzer, M. A., Clemmey, P., Kolodner, K., & Fishman, M. J. (2007). Baseline depressive symptoms predict poor substance use outcome following adolescent residential treatment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 46(8), 1062–1069.
- Substance Abuse and Mental Health Service Administration (SAMHSA) (2016). *Treatment Episode Data Set (TEDS): 2004–2014. National Admissions to Substance Abuse Treatment Services. BHSIS series s-84, HHS publication no. (SMA) 16-4986*. Rockville, MD: US Substance Abuse and Mental Health Services Administration.
- Substance Abuse and Mental Health Services Administration (SAMHSA) (2017). *Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health. HHS publication no. SMA 17-5044, NSDUH series H-52*. Retrieved from <https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.htm>.
- Tanner-Smith, E. E., Wilson, S. J., & Lipsey, M. W. (2012). The comparative effectiveness of outpatient treatment for adolescent substance abuse: A meta-analysis. *Journal of Substance Abuse Treatment*, 44(2), 145–158. <http://dx.doi.org/10.1016/j.jbsat.2012.05.006>.
- Toumbourou, J. W., Stockwell, T., Neighbors, C., Marlatt, G. A., Struge, J., & Rehm, J. (2007). Interventions to reduce harm associated with adolescent substance use. *The Lancet*, 369(9570), 1391–1401.
- Tripodi, S. J. (2009). A comprehensive review: Methodological rigor of studies on residential treatment centers for adolescents. *Journal of Evidence-Based Social Work*, 6, 288–299.
- Tryon, W. W. (2001). Evaluating statistical difference, equivalence, and indeterminacy using inferential confidence interval: An integrated alternative method of conducting null hypothesis statistical tests. *Psychological Methods*, 6, 371–386.
- Van der Pol, T. M., Henderson, C. E., Hendriks, V., Schaub, M. P., & Rigter, H. (2017). Multidimensional Family Therapy reduces self-reported criminality among adolescents with a cannabis use disorder. *International Journal of Offender Therapy and Comparative Criminology*. <http://dx.doi.org/10.1177/0306624X16687536> (Advance online publication).
- Van der Pol, T. M., Machteld, H., Noom, M. J., Stams, G. J. M., Doreleijers, T. A. H., van Domburgh, L., & Vermeiren, R. R. J. M. (2017). Research review: The effectiveness of multidimensional family therapy in treating adolescents with multiple behavior problems – A meta-analysis. *Journal of Child Psychology and Psychiatry*, 58(5), 532–545. <http://dx.doi.org/10.1111/jcpp.12685>.
- Waheed, W., Hughes-Morley, A., Woodham, A., Allen, G., & Bower, P. (2015). Overcoming barriers to recruiting ethnic minorities to mental health research: A study of recruitment strategies. *BMC Psychiatry*, 15. <http://dx.doi.org/10.1186/s12888-015-0484-z>.
- Weiner, D. A., Abraham, M. E., & Lyons, J. (2001). Clinical characteristics of youths with substance use problems and implications for residential treatment. *Psychiatric Services*, 52(6), 793–799.

- Weisz, J. R., Kuppens, S., Eckshtain, D., Ugueto, A. M., Hawley, K. M., & Jensen-Doss, A. (2013). Performance of evidence-based youth psychotherapies compared with usual clinical care: A multilevel meta-analysis. *JAMA Psychiatry, 70*(7), 750–771. <http://dx.doi.org/10.001/jamapsychiatry.2013.1176>.
- Winters, K. C., & Henly, G. A. (1989). *The Personal Experience Inventory test and user's manual*. Los Angeles, CA: Western Psychological Services.
- Winters, K. C., Latimer, W. W., Stinchfield, R. D., & Egan, E. (2004). Measuring adolescent drug abuse and psychosocial factors in four ethnic groups of drug-abusing boys. *Experimental and Clinical Psychopharmacology, 12*(4), 227–236. <http://dx.doi.org/10.1037/1064-1297.12.4.227>.
- Winters, K. C., Stinchfield, R. D., Opland, E., Weller, C., & Latimer, W. W. (2000). The effectiveness of the Minnesota model approach in the treatment of adolescent drug uses. *Addiction, 95*(4), 601–613.
- Winters, K. C., Tanner-Smith, E. E., Bresani, E., & Meyers, K. (2014). Current advances in the treatment of adolescent drug abuse. *Adolescent Health, Medicine, and Therapeutics, 5*, 199–210.
- Wise, B. K., Cuffe, S. P., & Fischer, T. (2001). Dual diagnosis and successful participation of adolescents in substance abuse treatment. *Journal of Substance Abuse Treatment, 21*(3), 161–165.