Multidimensional Family Therapy as a community-based alternative to residential treatment for adolescents with substance use and co-occurring mental health disorders

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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, Liddle, 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, Sitzer, 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,
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 Rynbroek, 2005; Fishman, Clemmey, & Adger, 2003; Grela, 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, Ringelstein, & 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, 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 (Florida Supplement to the ASAM http://sfhbn.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 assessment.

(footnote continued)

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

2 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.
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 (Gatzche, 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 ± 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 ± 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 (χ² (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
The 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 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; RTBLF 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 < .05, d = 0.77), delinquent behaviors (Mean Slope = −0.04, SE = 0.17, p = 0.5, 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 = 0.34, 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, SE = 0.07, d = 0.07, p < .05), and suppression effects were assessed in each class simultaneously.

### Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intake</th>
<th>2 month FU</th>
<th>4 month FU</th>
<th>12 month FU</th>
<th>18 month FU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MDFT M (SD)</td>
<td>RT M (SD)</td>
<td>MDFT M (SD)</td>
<td>RT M (SD)</td>
<td>MDFT M (SD)</td>
</tr>
<tr>
<td>Substance use problems</td>
<td>61.25 (20.94)</td>
<td>63.95 (24.24)</td>
<td>40.96 (12.81)</td>
<td>35.44 (10.24)</td>
<td>39.57 (12.02)</td>
</tr>
<tr>
<td>Externalizing symptoms</td>
<td>60.17 (13.40)</td>
<td>59.18 (14.73)</td>
<td>51.26 (12.09)</td>
<td>53.20 (12.09)</td>
<td>53.10 (11.25)</td>
</tr>
<tr>
<td>Internalizing symptoms</td>
<td>51.59 (11.82)</td>
<td>50.63 (13.17)</td>
<td>46.13 (10.95)</td>
<td>48.63 (10.95)</td>
<td>48.07 (10.98)</td>
</tr>
<tr>
<td>30-day substance use frequency</td>
<td>33.40 (19.05)</td>
<td>27.57 (18.01)</td>
<td>6.75 (10.39)</td>
<td>3.04 (6.69)</td>
<td>5.31 (7.74)</td>
</tr>
<tr>
<td>Delinquent behaviors</td>
<td>1.15 (1.40)</td>
<td>1.28 (1.65)</td>
<td>0.99 (1.10)</td>
<td>0.99 (1.25)</td>
<td>1.08 (1.22)</td>
</tr>
</tbody>
</table>

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.

* Variable log transformed.
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
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 was fairly small, and the results may ultimately prove 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.

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Growth factor mean</th>
<th>Treatment differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
<td>In-treatment slope</td>
</tr>
<tr>
<td></td>
<td>Estimate SE</td>
<td>Estimate SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug use problem severity</td>
<td>63.00*** 2.13</td>
<td>−12.39*** 1.13</td>
</tr>
<tr>
<td>Externalizing symptoms</td>
<td>66.35*** 5.28</td>
<td>−5.41*** 2.15</td>
</tr>
<tr>
<td>Internalizing symptoms</td>
<td>61.27*** 5.33</td>
<td>−6.87*** 1.87</td>
</tr>
<tr>
<td>Substance use frequency</td>
<td>30.51*** 1.75</td>
<td>−12.78*** 0.94</td>
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<td>Early Placement Class</td>
<td>N/A N/A N/A N/A</td>
<td>N/A N/A N/A N/A</td>
</tr>
<tr>
<td>Late Placement Class</td>
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<td>N/A N/A N/A N/A</td>
</tr>
<tr>
<td>Minimal Placement Class</td>
<td>N/A N/A N/A N/A</td>
<td>N/A N/A N/A N/A</td>
</tr>
<tr>
<td>Delinquent behaviors</td>
<td>1.21*** 0.14</td>
<td>−0.14* 0.07</td>
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<tr>
<td>Early Placement Class</td>
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<td>N/A N/A N/A N/A</td>
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<tr>
<td>Late Placement Class</td>
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<td>N/A N/A N/A N/A</td>
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<tr>
<td>Minimal Placement Class</td>
<td>N/A N/A N/A N/A</td>
<td>N/A N/A N/A N/A</td>
</tr>
</tbody>
</table>

*p < .05.
**p < .01.
***p < .001.
Vital for policymakers, funders, clinical directors, and parents to know that residential treatment (RT) for youth with serious co-occurring substance use and mental health disorders is needed but not always received. 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. 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 Multidimensional Family Therapy (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.

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.

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References


