



Comparing Medicaid Expenditures for Standard and Enhanced Therapeutic Foster Care

Paul Lanier^{1,2} · Roderick Rose³ · Marisa Elena Domino^{2,4}

Accepted: 25 April 2023

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2023

Abstract

Therapeutic foster care (TFC) is a service for children with high behavioral health needs that has shown promise to prevent entry into more restrictive and expensive care settings. The purpose of this study was to compare Medicaid expenditures associated with TFC with Medicaid expenditures associated with an enhanced higher-rate service called Intensive Alternative Family Treatment (IAFT). We conducted a secondary analysis of Medicaid claims in North Carolina among children entering care in 2018–2019. Using propensity score analysis with difference-in-difference estimation, we compared monthly Medicaid expenditures before and after initiating TFC and IAFT ($N=5472$ person-months). Youth entering IAFT had higher expenditures prior to treatment than those entering TFC. Both standard TFC and IAFT were associated with a downward trend in expenditures following treatment initiation. Both TFC and IAFT reverse a trend of increasing Medicaid costs prior to care among children with high behavioral health needs.

Keywords Mental health services · Medicaid · Cost analysis · Adolescent

Children with a mental health diagnosis have about 3 times higher medical costs compared to children without a diagnosis (Tkacz & Brady, 2021). Nationally, the Medicaid program covers over one-third of all children (0–18 years) and pays for about half of the total costs of inpatient hospitalization and emergency departments visits for child mental health conditions (Kaiser Family Foundation, 2022; Torio et al., 2015). Among the program's child population (ages 3–17 years), children with mental health conditions account for 19% of the total population and 55% of all Medicaid spending (Douppnik et al., 2020).

As rates of mental health concerns in children and adolescents have increased dramatically in recent years, identifying cost-effective evidence-based treatments is imperative to

minimize the increasing financial burden on the health care system (Curtin, 2019; Cutler et al., 2022; Tkacz & Brady, 2021; Twenge et al., 2019). One such potential treatment is therapeutic foster care (TFC, also called treatment foster care), a mental health service for children and adolescents with severe emotional and behavioral symptoms (Åström et al., 2020; Farmer et al., 2010; McMillen et al., 2015; Reddy & Pfeiffer, 1997). TFC services are provided outside of the child's home of origin in a structured in-home environment with a trained professional therapeutic treatment parent. The intent of TFC is not to provide an open-ended or permanent placement; rather, the focus of this short-term intervention (typically 6–9 months) is to stabilize crisis situations and equip the child and their family for successful recovery once the child transitions back home. In fact, TFC is often used as a step-down placement between institutional settings and home. In contrast with traditional foster care, children placed in TFC homes may or may not be involved with the child welfare system. Several manualized TFC programs have been rigorously evaluated and, overall, TFC has garnered sufficient evidence to support its dissemination across the U.S. (Åström et al., 2020; Hahn et al., 2005; Turner & Macdonald, 2011). In most cases, TFC services are reimbursable through public and private insurance.

✉ Paul Lanier
planier@email.unc.edu

¹ School of Social Work, UNC Chapel Hill, 325 Pittsboro Street, Chapel Hill, NC 27599-3550, USA

² Cecil G. Sheps Center for Health Services Research, UNC Chapel Hill, Chapel Hill, USA

³ School of Social Work, University of Maryland, College Park, USA

⁴ Center for Health Information and Research, College of Health Solutions, Arizona State University, Tempe, USA

However, little is known about the costs of TFC services and trends in expenditures before and after care.

Although evidence shows that TFC programs are, on average, effective for children with behavioral health disorders, recent adaptations of existing evidence-based models have addressed the need for higher-intensity services for children with greater needs (Seibert et al., 2018). For example, most standard TFC program guidelines allow for multiple children in the same treatment home, including siblings of the focal child, other non-sibling children receiving treatment, as well as biological or adoptive children of the treatment parents (Washington State Department of Children, Youth, & Families, 2019). However, some children require more individualized care and consequently, may be better served in homes without other children. Some states now support multiple levels of treatment intensity for TFC programs and adjust eligibility requirements and reimbursement rates to allow provider agencies and treatment parents to appropriately serve children with higher needs (Seibert et al., 2018).

Few research studies have compared the effectiveness of standard TFC to intensive TFC services (Lanier et al., 2021a, b; Rose et al., 2021). Further, although a prior cost analysis compared TFC to group care in Sweden, no known studies have provided a cost analysis of different levels of TFC intensity, let alone in the U.S. specifically (Åström et al., 2020). Understanding the comparative costs of care for standard vs. higher-intensity TFC services will better equip policymakers and health plans to structure incentives for appropriate use of both services. For this reason, this study examines Medicaid costs for children who received either standard TFC or intensive TFC using statewide longitudinal claims data spanning multiple years and adjusting for measurable differences in the children using care in each setting.

Need for Adolescent Behavioral Health Services is Growing

Untreated serious behavioral health disorders in adolescence are associated with a host of poor outcomes for health and well-being Costello & Maughan 2015; (Lanier et al., 2021a, b; U.S. Surgeon General, 2021). Yet epidemiologic trends suggest current mental health systems are failing to support children and youth because of inadequate access to evidence-based practices (U.S. Surgeon General, 2021). In light of substantial evidence that the COVID-19 pandemic greatly exacerbated mental health challenges, the U.S. Surgeon General released a national advisory statement on protecting youth mental health (U.S. Surgeon General, 2021) and the American Academy of Pediatrics, American Academy of Child and Adolescent Psychiatry, and Children's Hospital Association declared a national emergency in child and adolescent mental health (American Academy of Pediatrics,

2021). Given that half of all mental health conditions start by age 14 years, there is a clear and urgent need for early detection and appropriate treatment during this developmental stage to promote lifelong health and well-being among children and adolescents in the U.S. (Kessler et al., 2005; Merikangas et al., 2010).

To provide these much-needed services and supports, policymakers and insurers must identify and expand cost-effective community-based treatment options. Despite the availability of evidence-based interventions such as TFC in many communities, ensuring access to high-quality services remains an ongoing challenge, leaving many children and adolescents with mental health needs at risk of a host of adverse outcomes in years to come. The opportunity for community-based treatment options to enhance cost-effective mental health service provision is even clearer when compared to the institutional care settings where many children and youth receive care. A growing body of evidence is highlighting the ineffective and potentially iatrogenic effects of congregate institutional care delivered in hospital settings and psychiatric residential treatment facilities, even as placement rates in institutional settings are increasing in some locations (Erol et al., 2010; Lanier et al., 2020; National Disability Rights Network, 2021). Although in principle institutional settings should be a last resort for behavioral health care, the short supply of quality community-based services and cost-effective interventions is driving demand for more costly institutional care.

Effectiveness and Costs of Therapeutic Foster Care

The current array of evidence-based TFC services for children with serious behavioral health problems grew out of early deinstitutionalization efforts in the 1950s (Åström et al., 2020). In the decades following, several randomized controlled trials of manualized TFC programs generated initial evidence of TFC's effectiveness. Although early TFC models had similar elements to current models (e.g., care coordination and a team approach to treatment), manualized interventions substantially improved the training, supervision, and support for treatment parents delivering TFC over time (Farmer et al., 2010). The California Evidence-Based Clearinghouse for Child Welfare currently lists two TFC programs for adolescents that are either "well-supported by research evidence" or "supported by research evidence": Treatment Foster Care Oregon (TFCO) and Together Facing the Challenge.

Beyond potentially improving desired outcomes more than traditional institutional care, TFC approaches may also be more cost-effective. One study examined the total costs of TFCO compared to residential and group care

(Bergström & Højman, 2016). Based on their finding that children placed in TFCO spent on average 64 fewer days in locked settings, the authors estimated annual cost savings *per child* of \$183,520 over residential care and \$40,640 over residential homes. Summarizing the economic systematic review of TFCO, the authors conclude that TFCO is “worth investing in” while noting that more studies are needed to further examine the costs and outcomes of TFC (Åström et al., 2020, p. 364).

Intensive Alternative Family Treatment

In recent years, several states have authorized funding for an additional level of TFC, described as “intensive” TFC, which provides higher reimbursement rates for TFC placements for children with greater needs and prior failed placements (Seibert et al., 2018). A recent review reported that three states have implemented intensive TFC options. In NC, the intensive TFC model is known as Intensive Alternative Family Treatment (IAFT®) and is funded through Medicaid Early and Periodic Screening, Diagnostic, and Treatment benefits. IAFT requires treatment parents to be trained in an evidence-based TFC model: either Together Facing the Challenge or Treatment Foster Care Oregon (Seibert et al., 2018). Further, the program requires treatment parents to participate in additional training, supervision, and quality improvement activities. In this arrangement, the implementing IAFT agency contracts with provider agencies, which in turn contract with individual treatment foster parents to deliver IAFT. The implementing agency also manages referral coordination and Medicaid authorization for services.

Although IAFT and TFC are similar because IAFT requires treatment parents to be trained in an evidence-based TFC model, there are important differences. IAFT services intentionally target children with the greatest behavioral health needs, as evidenced by prior failed TFC or other residential placements or by a prior exit from a higher level of care (e.g., hospitalization or psychiatric residential treatment facility). The implementing agency maintains a statewide database of providers and works with managed care organizations to quickly identify and place children with appropriate IAFT providers and treatment parents. IAFT, which has a higher treatment intensity than standard TFC, requires that there are no other children in the home, additional training for the treatment parent, daily contact with a care coordinator, and weekly team meetings and engagement with the child’s family of origin. Compared to standard TFC, IAFT also requires more frequent contact between the treatment parent and the agency supervisor and between members of the treatment team. IAFT further differs from standard TFC by requiring daily behavior tracking, which is subsequently used for quality improvement through coaching and training.

Research Questions

Evidence from quasi-experimental studies indicates that among youth with or without prior institutionalization, IAFT reduces the likelihood of subsequent admission to psychiatric residential treatment facilities (PRTFs) by 23% and 28%, respectively, compared to usual care (Lanier et al., 2021a, b; Rose et al., 2021). Given the high costs of PRTFs, it is reasonable to expect potential cost savings associated with an intervention that reduces use of higher levels of care. However, the per diem reimbursement for IAFT at the time of this study was more than twice that of standard TFC (\$214, compared to \$88 for TFC). This higher cost reflects a higher-acuity population and expectations for more intensive services, fidelity monitoring, and quality assurance processes. It is unknown to what extent the higher reimbursement for IAFT relates to trends in expenditures for youth served by the program, and in comparison to standard TFC.

No known studies have examined the net effects of standard TFC (hereafter, “TFC”) on Medicaid spending trajectories. Prior quasi-experimental studies have compared IAFT to usual care, which included TFC placements as well as other types of services (Lanier et al., 2021a, b; Rose et al., 2021). Although these studies demonstrated that IAFT reduced the rate of PRTF admissions, they did not assess whether the higher reimbursement rate for IAFT could be offset by future cost savings resulting from better child health outcomes, which would prevent more expensive and restrictive placements. Additionally, appropriate use of TFC and IAFT services can strengthen the system of care at the community level by reducing the burden on other community-based providers by providing an option between outpatient treatment and residential or hospital-based treatment. To fill the gap in the literature left by these prior findings, this study compared costs of IAFT and TFC, adjusting for selection bias into these modalities. To this end, the present study asked the following questions: (1) What are the average behavioral health costs over time to Medicaid for youth who received TFC or IAFT? (2) Does placement in TFC or IAFT change the trajectory of Medicaid spending? (3) Are there post-treatment differences in costs over time for youth who received IAFT, relative to youth who receive TFC, adjusting for observable baseline characteristics?

Methods

This study extracted measures of utilization and expenditures from existing statewide Medicaid claims and eligibility data. In addition to describing costs to Medicaid over time for both programs, a secondary goal of this study was to compare cost trends between TFC and IAFT. All study

procedures were reviewed by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill. No economic pre-analysis plan was developed. All data management and analyses were performed in SAS Version 9.

Data & Sample Selection

We assumed the perspective of North Carolina Medicaid for the economic evaluation and used enrollment and claims data from 2011 to 2020 obtained by [blinded for peer review] through a data use agreement to sample youth for this study, calculate per capita costs over time, and estimate the overall and service-specific cost difference between TFC and IAFT during the study period of January 1, 2018 to February 29, 2020. Data from 2011 to 2018 was used to identify and exclude youth with prior TFC or IAFT placements to ensure only youth with a first admission to TFC or IAFT were included. The study end date was chosen to ensure that COVID-19 did not influence the study results. During the study period, the state did not have any capitated managed care arrangements, except for a behavioral health carve-out to regional organizations. Encounter data from these regional entities and fee-for-service medical claims were pooled for this analysis.

We used a sample accrual period for IAFT or TFC initiation of January 1, 2018 to June 30, 2019 to allow for a sufficient follow-up period after service initiation. This allows for a minimum expenditures time horizon of 8 months following initiation for the follow-up period. We identified a cohort of youth meeting the following criteria: (1) was age 6–18 years on January 1, 2018; (2) had 12 months of continuous participation in Medicaid (allowing for gaps of up to 31 days); (3) was not also eligible for Medicare; (4) did not receive IAFT services during a lookback period between January 1, 2011 and January 1, 2018; and (5) was placed in an IAFT or TFC home during the accrual period.

To extract a matched comparison group using propensity score analysis, we first pre-screened the comparison sample to remove potential comparison youth with characteristics not observed in the IAFT treatment group (Bifulco, 2012; Cook et al., 2008). As a result of this pre-screening, youth were limited to those with disruptive behavior disorder (i.e., conduct disorder or oppositional defiant disorder) or attention deficit hyperactivity disorder (ADHD), and youth who had contact with a community behavioral health agency. We also removed youth with Tourette's syndrome and youth eligible for Medicaid due to Temporary Assistance for Needy Families, blindness or disability, pregnancy, or refugee assistance because no youth in IAFT had these characteristics. This process identified a pool of 1190 youth: 128 receiving IAFT and 1162 receiving TFC. The following section describes the approach we used to identify and balance the treatment (IAFT) and comparison (TFC) groups.

Pre-treatment Balance Using Propensity Score Analysis

A propensity score model was developed using pre-treatment variables (between January 1, 2018 and the date of IAFT/TFC placement) that were a priori hypothesized to affect Medicaid spending: individual characteristics (race, age, and gender); ZIP code-level rural-urban characteristics (using Rural-Urban Commuting Area codes pertaining to rural, micropolitan, small town, and urban/suburban communities [U.S. Department of Agriculture Economic Research Service, n.d.]); diagnoses of a learning or intellectual-developmental disability or a mental or behavioral health disorder (anxiety, depression, suicide attempt or self-injury, Autism spectrum disorder, bipolar disorder, disruptive behavior disorder, ADHD, adjustment disorder, attachment disorder, psychosis, post-traumatic stress disorder, or substance use disorder); prescribing of a psychotropic drug (antipsychotics, stimulants, sedatives, anxiolytics, mood stabilizers, and antidepressants); and service utilization (psychotherapy and psychiatry, diagnostic assessment, crisis services, intensive in-home services, child and adolescent day treatment, community health providers, level III and IV residential placement, substance abuse treatment services, PRTF, and other mental health services). Diagnosis, prescription drugs, and services were measured as a count of total claims prior to treatment initiation in order to capture the presence and the magnitude of each variable.

For the first stage propensity model, using a SAS macro, multiple stepwise procedures were run using a modified *t*-to-enter criterion ($|t| > 0.99$) with collinearity and separation diagnostics to test all possible two-way interactions and quadratic terms for these predictors (Guo & Fraser, 2015; Rosenbaum & Rubin, 1984). After all variations of this stepwise procedure were run, the model with the highest pseudo- R^2 statistic that was not collinear or separated (partially or completely) was chosen as the final model. The matching procedure identified 128 comparison youth (total $N = 256$). To examine balance between the matched treatment and comparison groups, the absolute standardized mean difference (ASMD) was calculated for each covariate. Covariates with standardized differences < 0.20 were considered adequately balanced.

Measures

The treatment variable was an indicator that a youth received services through IAFT during the sample accrual period ($IAFT_i = 1$) or not ($IAFT_i = 0$), the latter of which indicated receipt of TFC services. Cost outcomes were generated from Medicaid reimbursement data on the total cost, or amount paid on fee-for-service (FFS) claims and amounts reimbursed through managed behavioral care organizations (i.e., encounters). We included FFS claims because although the state provides behavioral health services through regional carve-outs, some youth receive mental and behavioral health

care through providers who are not behavioral health specialists, such as family physicians.

Expenditures were expressed in first quarter 2020 constant dollars using the personal consumption expenditures index for health care services (Aizcorbe et al., 2018; Federal Reserve Bank of St. Louis, n.d.). Given the 26-month duration of the study period, the adjustment had little effect on the results. For each month in which a youth was enrolled in Medicaid, costs were then summed at the member-month level to calculate individual-level trends over time in behavioral health costs as an average per member per month (PMPM). These trends were centered on the month in which each youth first received services through the program of their assignment, IAFT or TFC (i.e., in this month, the time variable T_{ci} was set to zero [i =individual; c =centered]). Values for T_{ci} ranged from -18 to 25 . A period variable P_{it} identified months prior to initiation ($P_{it} = 0$) and months after initiation ($P_{it} = 1$) to facilitate the DD analysis (t =month). Preliminary analyses indicated no significant differences in costs for physical health services, so they were excluded from this analysis. Two models were estimated: one that contained all behavioral health expenditures (i.e., including embedded expenditures for TFC/IAFT) and a second model that excluded the embedded costs for TFC/IAFT services.

Covariates in the second stage expenditure models included individual characteristics such as race (White, Black or African-American, American Indian or Alaska Native, Asian or Pacific Islander), ethnicity (Hispanic), gender (male/female) as coded by participants at the time of Medicaid enrollment; age on January 1, 2018; and eligibility for Medicaid due to foster care placement. Rural-Urban Commuting Area (RUCA) codes were used to identify whether youth resided in a rural community, small town, micropolitan area, or metropolitan area. There were few missing values (for the rurality variable, $n = 3$; for race, $n = 5$) and complete case analysis was used in all models. The pediatric comorbidity index was calculated as an indicator of overall health status (Sun et al., 2021).

Difference-in-Differences (DD) Analysis

We estimated a longitudinal DD model combining (a) an interrupted time series of months since treatment initiation with (b) a comparison group design. The Bayesian Information Criterion from models estimated with full maximum likelihood was used to identify the best-fitting model, and the reported models in Table 2 are based on restricted maximum likelihood. The DD was implemented as an interaction between period P_{it} and treatment assignment $IAFT_i$ using the following equation:

$$Y_{it} = b_0 + b_T T_{ci} + b_Q T_{ci}^2 + b_P P_{it} + b_{IAFT} IAFT_i + b_{DD} P_{it} IAFT_i + Xb_X + r_{it} + e_i \quad (1)$$

Other terms included in the models tested for fit include interactions between P_{it} , $IAFT_i$, and both T_{ci} and T_{ci}^2 . We assumed that errors r_{it} and e_i (a) were distributed normally with mean zero variance σ^2 and τ respectively, and (b) were compound symmetric. The estimated treatment effect is b_{DD} : the difference in costs between IAFT and TFC at the time of treatment initiation ($T_{ci} = 0$). To summarize the patterns in cost across the two conditions, in the context of 3-way interactions with a linear and quadratic time variable, we graphed the predicted cost trends for each treatment condition before and after initiation. The long-term trends observed (i.e., 18–25 months before and after initiation) supported our assumption that treatment differences would explain the observed change in cost trajectory (commonly known as the parallel trends assumption.) Further, we conducted placebo regressions with hidden treatment transitions in the 6 months prior to and after treatment initiation, in addition to the actual treatment.

Results

Sample Description and Group Balance Diagnostics

Table 1 presents descriptive characteristics of the study sample and model balance results. Propensity score matching successfully reduced the differences between the IAFT treatment and TFC comparison group. Although the matching procedure reduced differences in two groups with varying levels of need for services, the IAFT group tended to have a higher average number of claims for almost all diagnoses, medications, and services, reflecting the generally higher-need nature of this service population. After propensity score matching, we observed significant reductions in the absolute standardized mean difference (ASMD) to the <0.20 threshold in all but four covariates. The IAFT treatment group had a higher average number of claims that included a prescription for antipsychotics (ASMD=0.26) and mood stabilizers (ASMD=0.25); more claims for services provided by a community behavioral health agency (ASMD=0.26); and more claims pertaining to a diagnosis of suicide attempt/ideation (ASMD=0.22). The differences in antipsychotics and mood stabilizers were nevertheless reduced relative to the pre-balanced data. Groups were balanced on demographic characteristics: the IAFT group was 34% Black, 50% female, and 22% resided in a micropolitan geographic area.

Table 1 Descriptive characteristics of IAFT treatment group and balance with matched TFC comparison group

Child demographic	IAFT (<i>n</i> = 128)		TFC (<i>n</i> = 128)		ASMD
	<i>N</i>	%	<i>N</i>	%	
Sex (Female)	62	49.6	65	52.0	0.05
Race (Black)	42	33.6	48	38.4	0.13
Geographic area (Micropolitan)	27	21.6	28	22.4	0.00
Diagnosis/disorder (count of claims)	Mean	<i>SD</i>	Mean	<i>SD</i>	ASMD
Attention-deficit/hyperactivity	27.4	49.7	22.0	56.7	0.08
Adjustment disorder	16.0	61.8	6.1	31.9	0.18
Anxiety or PTSD	51.1	110.2	34.3	89.5	0.14
Autism spectrum	2.5	14.8	0.1	1.2	0.16
Attachment	0.8	8.6	0.2	1.5	0.06
Bipolar	8.2	26.8	6.1	26.6	0.07
Disruptive behavior	34.4	73.2	28.0	64.1	0.11
Depression	14.4	39.4	10.3	31.3	0.10
Learning/intellectual disability	2.2	10.0	1.4	7.6	0.12
Suicide attempt/self-injury	4.0	14.2	1.6	4.2	0.22
Substance use	2.8	18.2	1.4	11.5	0.08
Attachment	0.8	8.6	0.2	1.5	0.06
Psychosis	1.4	5.0	0.9	4.9	0.09
Services					
Day treatment	5.4	22.6	3.3	19.0	0.07
Community behavioral health	72.2	103.4	46.4	70.4	0.26
Crisis services	0.9	2.6	0.4	1.4	0.13
Diagnostic assessment	0.1	0.4	0.1	0.2	0.09
Intensive in-home services	15.3	27.7	10.7	22.4	0.20
Level III/IV residential	9.6	40.9	10.8	39.1	0.03
Psychiatric residential treatment facility	9.6	26.4	7.2	24.1	0.14
Prescriptions					
Antipsychotic	4.7	5.5	3.5	4.4	0.26
ADHD	4.7	6.1	3.9	4.8	0.13
Anxiety	0.2	0.9	0.1	0.7	0.09
Antidepressant	4.2	5.2	3.4	5.7	0.13
Mood stabilizer	2.7	5.0	1.8	3.6	0.25
Amphetamine	2.2	5.0	1.7	4.3	0.06
Methylphenidate	1.6	4.4	1.3	3.5	0.08

ASMD Absolute standardized mean difference, IAFT Intensive alternative family treatment, TFC Therapeutic foster care

Table 2 Results of models estimating medicaid per member per month expenditures on behavioral health services

	Model 1: IAFT/TFC costs included				Model 2: IAFT/TFC costs not included			
	Est.	SE	<i>t</i>	<i>p</i>	Est.	SE	<i>t</i>	<i>p</i>
Intercept	6792.32	978.93	6.94	< 0.001	6485.47	1036.25	6.26	< 0.001
Month	183.24	146.79	1.25	0.212	193.63	149.85	1.29	0.196
Month squared	-9.30	10.23	-12.01	0.363	-8.72	10.44	-0.83	0.404
Treatment group (IAFT)	1558.49	708.74	2.20	0.029	1566.91	734.93	2.13	0.034
Before/after treatment	-1585.67	487.69	-3.25	0.001	-3827.60	497.81	-7.69	< 0.001
Before/after treatment* group (IAFT)	2075.88	676.55	3.07	0.002	-1255.56	690.60	-1.82	0.069

Models control for child demographic characteristics, geographic area, pediatric comorbidity index

Although IAFB and TFC do not have an established cut point for the length of time (days) in care to constitute service completion or dropout, another important descriptive difference between the two groups was the service utilization length of time. The median length of stay for the IAFB group was 241 days compared to a median of 173 days for the TFC group. Only 4% of the IAFB group had a length of stay of less than 30 days, compared to 10% of the TFC group. IAFB youth tended to stay in treatment for a longer period of time relative to TFC youth.

Cost Analysis

Figures 1 and 2 show the longitudinal growth curves generated from the DD models and are useful for interpreting the model estimates presented in Table 2. Fit statistics for the *embedded cost* model supported the specification of the 3-way interaction and all marginal interactions of period, time or time-squared, and treatment. The trends over time showed that costs for youth placed in TFC increased, but did so at a decreasing rate prior to initiation. Costs for youth placed in IAFB also increased over time, but at an increasing rate prior to initiation, indicating that even after propensity score matching, children placed in IAFB used more services prior to initiation. On average, predicted costs were \$1558 higher for youth in IAFB prior to initiating (b_p ; $p < .05$). After initiation, costs for youth placed with IAFB initially increased by \$2076 (b_{IAFB} ; $p < .05$). However, costs in this group rapidly declined, while costs for youth placed with TFC leveled off. Reflecting the difference between IAFB and TFC in the change in PMPM in the post-treatment period, the coefficient for the 3-way interaction of time, period, and treatment was $-\$468$ ($p < .05$).

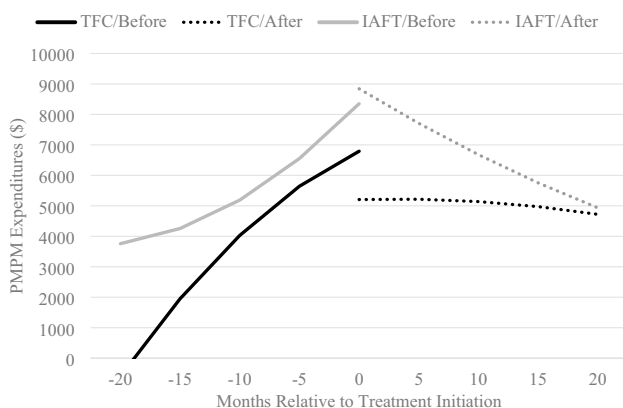


Fig. 1 Visualization of final model depicting cost curves in the months before and after treatment initiation including TFC and IAFB expenditures

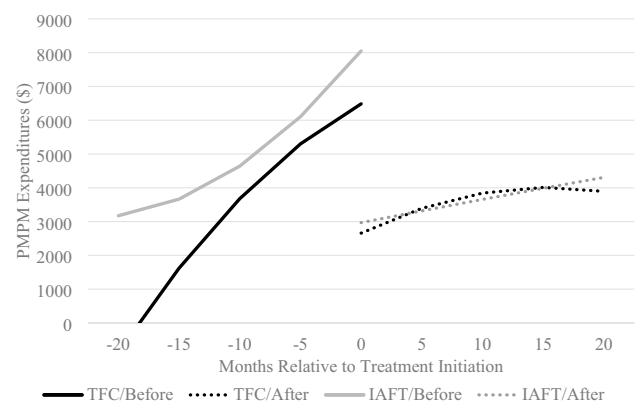


Fig. 2 Visualization of final model depicting cost curves in the months before and after treatment initiation excluding TFC and IAFB expenditures

In the second model presented in Table 2 and visually represented in Fig. 2, the *costs of TFC/IAFB were excluded* to demonstrate the trend in costs external to these programs. Comparing the post-treatment initiation side of the time trends for both Figures indicates the marginal difference in total costs attributed to IAFB/TFC relative to other services. As expected, the predicted trends prior to treatment initiation were identical comparing Figs. 1 and 2. In Model 2, the average costs for both groups fell upon program initiation, with youth placed in TFC showing a drop of \$3828 (b_p ; $p < .05$). Although the predicted costs for youth placed in IAFB dropped by this amount plus an additional \$1256 (b_{DD}), this increment was not statistically significant. As shown by the overlapping post-treatment curves in Fig. 2, the differences between the two groups in costs observed prior to treatment were largely eliminated after treatment initiation.

In both models, the long-term predicted trends observed before and after treatment initiation support the parallel trends assumption. Although the predicted trends were not exactly parallel prior to initiation, the trends for IAFB are both substantially altered (with a shift and change in slope or a shift and change in convexity) whereas there is primarily a vertical shift and otherwise undisturbed trend for the TFC group. The placebo regressions lend additional support that the observed effect did not reflect a hidden treatment; the only placebo effect observed was at +1 month after initiation, and only in the embedded cost model.

Ancillary analyses included a bivariate comparison of the most utilized services and the average cost per member for these services. There was no significant difference between youth who entered TFC and IAFB in the average cost for these services. However, youth in IAFB were more likely to receive psychiatric hospitalization (73% versus 55%, $\chi^2 = 8.21$, $p = .004$) and less likely to receive outpatient psychotherapy (77% versus 89%, $\chi^2 = 7.03$, $p = .008$).

Discussion

The purpose of this study was to compare the behavioral health care costs to a state Medicaid program for standard and enhanced therapeutic foster care. To our knowledge, this is the first analysis of Medicaid costs for TFC, an established evidence-based treatment for serious mental health concerns, and the first study to compare costs of standard TFC with an enhanced TFC program called IAFT. Using a propensity-matched sample of 256 youth who entered TFC or IAFT for the first time during an 18-month period, the results of this cost analysis yield three policy-relevant findings with major implications for financing community-based children's mental health treatment.

First, youth who enter TFC services showed rapidly increasing Medicaid costs prior to treatment initiation. Figures 1 and 2, the predicted cost curve begins approximately 20 months prior to service initiation and shows a large gap between children placed with TFC and those placed with IAFT. In the month prior to service initiation, the average predicted costs to Medicaid increased to over \$6000 in monthly costs per child. A study using national data from 2009 to 2011 reported \$2000 in average annual expenditures for treating mental health disorders, confirming that children who enter TFC/IAFT services are a very expensive and high utilization group (Davis, 2014).

Second, although evidence of effectiveness for improvements in child functioning and quality-of-life should guide the selection and dissemination of interventions, our findings indicate that in addition to evidence that TFC/IAFT improves child outcomes, TFC/IAFT services also control health care system costs. The rising costs of care for youth who enter TFC and IAFT stop increasing at treatment initiation and decline in subsequent months. Comparing IAFT to TFC youth, the decline in monthly spending is offset by IAFT's higher reimbursement cost. However, within 5 months of placement in IAFT, average monthly costs of care fell below levels observed immediately prior to treatment, and by 20 months after treatment average monthly costs of care were reduced by about \$2000 per month among youth in TFC and \$4000 in youth placed in IAFT.

Third, when costs of TFC and IAFT were removed from the cost analysis (Model 2, Fig. 2), there were little substantive differences in the estimated cost curves for the two groups in the post-treatment period. This finding indicates that, after treatment, TFC and IAFT have similar expected costs and overall service utilization outside of the TFC/IAFT program, despite the fact that TFC and IAFT serve groups with differing levels of need and prior service use. IAFT is reimbursed at a higher rate than standard TFC to reflect the higher intensity of the service, greater training

requirements for the treatment parent, and the greater need of the youth referred to IAFT. Because the external costs for the two groups are equal when TFC/IAFT program costs are removed, the current reimbursement differences may appropriately reflect the differences in need and service intensity.

Taken together, these findings support the expansion of TFC and IAFT services as well as the reimbursement differential for higher intensity services. One critical barrier to expansion is the difficulty of recruiting and retaining high-quality TFC/IAFT providers (Seibert et al., 2018). Future research should examine whether financial incentives (i.e., higher reimbursement, value-based payments) can attract and retain treatment parents and encourage provider agencies to offer these services. A cost-benefit analysis incorporating the substantial costs to families and caregivers (e.g., time and travel) would also help bring to light the potential net savings resulting from diverting children with high behavioral health needs away from restrictive settings.

Limitations

The results of this study should be considered in light of several limitations. First, this is a statewide study of children enrolled in the Medicaid program in North Carolina. Findings may not be generalizable to private insurance systems or to other state Medicaid programs. Further, findings present averages across the entire state. There is likely heterogeneity in access and quality of services across different regions of the state. Although we used a doubly robust approach to estimation (i.e., combining PSM with conditional DD models), youth receiving IAFT consistently exhibited a higher level of need than youth receiving TFC. This difference is captured in the empirical models by the higher average monthly costs of IAFT youth prior to treatment initiation and their commensurate higher reimbursement costs. DD requires an assumption of parallel trends (i.e., that the selection effect observed prior to treatment would remain at the same level in the absence of treatment), which in this case is an untestable counterfactual condition. This limitation could be overcome in future research by using a randomized design. Further, the current study only examines costs in the form of Medicaid expenditures, meaning our analysis potentially did not capture the full range of costs impacted by TFC and IAFT care. Future studies should examine the additional costs that accrue to youth, families, providers, and other service providers not captured in Medicaid costs to better understand the financial impact of TFC and IAFT for families and the health care systems that serve them.

Conclusion

TFC and IAFT provide community-based care for children and youth with high behavioral health needs. Findings from this analysis of Medicaid expenditures indicate that both TFC and IAFT programs control costs of care among children with high need and behavioral health service utilization. By providing a higher intensity and higher reimbursement service, such as IAFT, systems of care can differentiate and tailor services based on need while promoting economic efficiency. Future work is needed to appropriately incentivize providers and develop community-based services with even greater precision to meet the needs of children and families.

Acknowledgements The database infrastructure used for this project was funded by the Cecil G. Sheps Center for Health Services Research; the Department of Health Policy and Management, UNC Gillings School of Global Public Health; the CER Strategic Initiative of UNC's Clinical and Translational Science Award (UL1TR001111); and the UNC School of Medicine.

Declarations

Conflict of interest This research was funded by Rapid Resource for Families, the developer of Intensive Alternative Family Treatment. One author (Lanier) had a consulting relationship with Rapid Resource for Families prior to this study.

Research Involving Human Participants This study was reviewed by (blinded for review) and determined to be exempt.

References

- Aizcorbe, A., Baker, C., Berndt, E. R., & Cutler, D. M. (2018). *Measuring and modeling health care costs*. University of Chicago Press.
- American Academy of Pediatrics (2021). *AAP-AACAP-CHA declaration of a national emergency in child and adolescent mental health*. <https://www.aap.org/en/advocacy/child-and-adolescent-healthy-mental-development/aap-aacap-cha-declaration-of-a-national-emergency-in-child-and-adolescent-mental-health/>
- Åström, T., Bergström, M., Håkansson, K., Jonsson, A. K., Munthe, C., Wirtberg, I., Wiss, J., & Sundell, K. (2020). Treatment foster care Oregon for delinquent adolescents: A systematic review and meta-analysis. *Research on Social Work Practice, 30*(4), 355–367. <https://doi.org/10.1177/1049731519890394>
- Bergström, M., & Højman, L. (2016). Is multidimensional treatment foster care (MTFC) more effective than treatment as usual in a three-year follow-up? Results from MTFC in a Swedish setting. *European Journal of Social Work, 19*(2), 219–235. <https://doi.org/10.1080/13691457.2015.1030361>
- Bifulco, R. (2012). Can nonexperimental estimates replicate estimates based on random assignment in evaluations of school choice? A within-study comparison. *Journal of Policy Analysis and Management, 31*(3), 729–751. <https://doi.org/10.1002/pam.20637>
- Cook, T. D., Shadish, W. R., & Wong, V. C. (2008). Three conditions under which experiments and observational studies produce comparable causal estimates: New findings from within-study comparisons. *Journal of Policy Analysis and Management, 27*(4), 724–750. <https://doi.org/10.1002/pam.20375>
- Costello, E. J., & Maughan, B. (2015). Annual research review: Optimal outcomes of child and adolescent mental illness. *Journal of Child Psychology and Psychiatry, 56*(3), 324–341. <https://doi.org/10.1111/jcpp.12371>
- Curtin, S. C., & Heron, M. (2019). Death rates due to suicide and homicide among persons aged 10–24: United States, 2000–2017. *Nchs Data Brief, 352*, 1–8.
- Cutler, G. J., Bergmann, K. R., Doupnik, S. K., Hoffmann, J. A., Neuman, M. I., Rodean, J., Zagel, A. L., & Zima, B. T. (2022). Pediatric mental health emergency department visits and access to inpatient care: A crisis worsened by the COVID-19 pandemic. *Academic Pediatrics, 22*(6), 889–891. <https://doi.org/10.1016/j.acap.2022.03.015>
- Davis, K. (2014). *Statistical brief #440: Expenditures for treatment of mental health disorders among children, Ages 5–17, 2009–2011: Estimates for the U.S. civilian noninstitutionalized population*. Agency for Healthcare Research and Quality. https://meps.ahrq.gov/data_files/publications/st440/stat440.pdf
- Doupnik, S. K., Rodean, J., Feinstein, J., Gay, J. C., Simmons, J., Bettenhausen, J. L., Markham, J. L., Hall, M., Zima, B. T., & Berry, J. G. (2020). Health care utilization and spending for children with mental health conditions in Medicaid. *Academic Pediatrics, 20*(5), 678–686. <https://doi.org/10.1016/j.acap.2020.01.013>
- Erol, N., Simsek, Z., & Münir, K. (2010). Mental health of adolescents reared in institutional care in Turkey: Challenges and hope in the twenty-first century. *European Child & Adolescent Psychiatry, 19*(2), 113–124. <https://doi.org/10.1007/s00787-009-0047-2>
- Farmer, E. M. Z., Burns, B. J., Wagner, H. R., Murray, M., & Southerland, D. G. (2010). Enhancing “usual practice” treatment foster care: Findings from a randomized trial on improving youths’ outcomes. *Psychiatric Services, 61*(6), 555–561. <https://doi.org/10.1176/ps.2010.61.6.555>
- Federal Reserve Bank of St. Louis. (n.d.). *U.S. Bureau of Economic Analysis, personal consumption expenditures: Services: Health care (chain-type price index)*. <https://fred.stlouisfed.org/series/DHLCRG3Q086SBEA>
- Guo, S., & Fraser, M. W. (2015). *Propensity score analysis: Statistical methods and applications* (2nd ed.). SAGE Publications.
- Hahn, R. A., Bilukha, O., Lowy, J., Crosby, A., Fullilove, M. T., Liberman, A., Moscicki, E., Snyder, S., Tuma, F., Corso, P., & Schofield, A. (2005). The effectiveness of therapeutic foster care for the prevention of violence. *American Journal of Preventive Medicine, 28*(2), 72–90. <https://doi.org/10.1016/j.amepre.2004.10.007>
- Kaiser Family Foundation (2022). *KFF’s state health facts. Data source: Census Bureau’s March Current Population Survey, 2017–2021* <https://www.kff.org/other/state-indicator/health-insurance-coverage-of-children-0-18-cps/>
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 593. <https://doi.org/10.1001/archpsyc.62.6.593>
- Lanier, P., Feely, M., & Fraser, M. E. (2021). Child mental health policy. In W. J. Hall, P. Lanier, J. M. Jenson, & M. W. Fraser (Eds.), *Social policy for children and families: A risk and resilience perspective* (pp. 139–186). SAGE Publications, Inc.
- Lanier, P., Jensen, T., Bryant, K., Chung, G., Rose, R., Smith, Q., & Lackmann, L. (2020). A systematic review of the effectiveness of children’s behavioral health interventions in psychiatric residential treatment facilities. *Children and Youth Services Review, 113*, 104951. <https://doi.org/10.1016/j.childyouth.2020.104951>
- Lanier, P., Chung, G., & Rose, R. (2021a). A quasi-experimental study of intensive alternative family treatment to prevent entry of youth to psychiatric residential treatment. *Child and Adolescent*

- Social Work Journal, 39, 303–311. <https://doi.org/10.1007/s10560-021-00758-9>.
- McMillen, J. C., Narendorf, S. C., Robinson, D., Havlicek, J., Fedoravicius, N., Bertram, J., & McNelly, D. (2015). Development and piloting of a treatment foster care program for older youth with psychiatric problems. *Child and Adolescent Psychiatry and Mental Health*, 9(1), 23. <https://doi.org/10.1186/s13034-015-0057-4>.
- Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., Benjet, C., Georgiades, K., & Swendsen, J. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Survey replication–adolescent supplement (NCS-A). *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(10), 980–989. <https://doi.org/10.1016/j.jaac.2010.05.017>
- National Disability Rights Network (2021). *Desperation without dignity: Conditions of children placed in for profit residential facilities*. https://www.ndrn.org/wp-content/uploads/2021/10/NDRN_Desperation_without_Dignity_Final.pdf
- Reddy, L., & Pfeiffer, S. (1997). Effectiveness of treatment foster care with children and adolescents: A review of outcome studies. *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(5), 581–588. <https://doi.org/10.1097/00004583-199705000-00007>
- Rose, R. A., Chung, G., & Lanier, P. (2021). Effectiveness of intensive alternative family treatment on reducing re-admissions to psychiatric residential treatment facilities. *Journal of Emotional and Behavioral Disorders*, 29(2), 113–124. <https://doi.org/10.1177/1063426620980700>.
- Rosenbaum, P. R., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, 79(387), 516–524.
- Seibert, J., Feinberg, R., Ayub, A., Helburn, A., & Gibbs, D. (2018). *State practices in treatment/therapeutic foster care*. Rapid Resource for Families. <https://ncrapidresource.org/wp-content/uploads/2019/12/State-Practices-in-Treatment-Foster-Care.pdf>
- Sun, J. W., Bourgeois, F. T., Haneuse, S., Hernández-Díaz, S., Landon, J. E., Bateman, B. T., & Huybrechts, K. F. (2021). Development and validation of a pediatric comorbidity index. *American Journal of Epidemiology*, 190(5), 918–927. <https://doi.org/10.1093/aje/kwaa244>.
- Tkacz, J., & Brady, B. L. (2021). Increasing rate of diagnosed childhood mental illness in the United States: Incidence, prevalence and costs. *Public Health in Practice*, 2, 100204. <https://doi.org/10.1016/j.puhip.2021.100204>.
- Torio, C. M., Encinosa, W., Berdahl, T., McCormick, M. C., & Simpson, L. A. (2015). Annual report on health care for children and youth in the United States: National estimates of cost, utilization and expenditures for children with mental health conditions. *Academic Pediatrics*, 15(1), 19–35. <https://doi.org/10.1016/j.acap.2014.07.007>
- Turner, W., & Macdonald, G. (2011). Treatment foster care for improving outcomes in children and young people: A systematic review. *Research on Social Work Practice*, 21(5), 501–527. <https://doi.org/10.1177/1049731511400434>.
- Twenge, J. M., Cooper, A. B., Joiner, T. E., Duffy, M. E., & Binau, S. G. (2019). Age, period, and cohort trends in mood disorder indicators and suicide-related outcomes in a nationally representative dataset, 2005–2017. *Journal of Abnormal Psychology*, 128(3), 185–199. <https://doi.org/10.1037/abn0000410>.
- U.S. Department of Agriculture Economic Research Service. (n.d.). *2010 Rural-urban commuting area (RUCA) codes*. <https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/documentation/>
- U.S. Surgeon General (2021). *Protecting youth mental health*. <https://www.ncbi.nlm.nih.gov/books/NBK575984/>
- Washington State Department of Children, Youth, & Families. (2019). *Behavior rehabilitation services handbook*. Washington State Department of Children.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.