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Cost-Effectiveness Analysis of School-Based Treatments for Anxiety Disorders

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Abstract

Background: School-based treatments for anxiety disorders are needed to address barriers to accessing community-based services. A key question for school administers are the costs related to these treatments.
Aims of the Study: This study examined the cost-effectiveness of a school-based modular cognitive behavioral therapy (M-CBT) for pediatric anxiety disorders compared to school-based treatment as usual (TAU).
Methods: Sixty-two school-based clinicians in Maryland and Connecticut were randomized (37 in CBT; 25 in TAU), trained, and enrolled at least one anxious student (148 students in CBT; 68 in TAU). Students (N = 216) were ages 6-18 (mean age 10.9); 63.9% were non-Hispanic White race-ethnicity; and 48.6% were female. Independent evaluators (IEs) assessed outcomes at post treatment and at a one-year follow up. Anxiety related costs included mental health care expenses and the opportunity costs of added caregiver time and missed school days.
Results: The overall M-CBT ICER value of $6917/QALY reflected both lower costs for days absent from school (mean difference: $–117 per youth; p = 0.045) but also lower QALY ratings (mean difference: –0.024; p = 0.900) compared with usual school counseling. Among youth with more severe anxiety at baseline, M-CBT had a more favorable ICER ($–22,846/QALY). Other mental health care costs were similar between groups (mean difference: $–90 per youth; p = 0.328).
Discussion: Although training school clinicians in M-CBT resulted in lower costs for school absences, evidence for the cost effectiveness of a modular CBT relative to existing school treatment for pediatric anxiety disorders was not robustly supported. Findings suggest school-based M-CBT is most cost effective for youth with the highest levels of anxiety severity and that M-CBT could help reduce the costs of missed school. Interpretations are limited due to use of retrospective recall, lack of data on medication use, and small sample size.
Implications for Health Care Provision and Use: Schools may benefit from providing specialized school-based services such as M-CBT for students with the highest levels of anxiety.
Implications for Health Policies: Investment decisions by schools should take into account lower costs (related to school absences), the costs of training clinicians, and student access to CBT in the community.
Implications for Further Research: Replication with a larger sample, service use diaries, and objective school and medical records over a longer period of time is warranted.

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Introduction

Anxiety disorders are common in youth and are associated with significant impairments in academic, social, and behavioral functioning.[1,2] Unfortunately, most youth who struggle with anxiety do not receive any mental health services.[3] Schools help fill treatment gaps for youth with anxiety disorders and other behavioral health concerns. School clinicians (i.e., trained psychologists, social workers, and other counselors) offer onsite access to psychological services, including counseling and psychotherapy. Schools consequently are critical portals of youth access to treatment for anxiety. However, training and experience in delivery of evidence-based treatment for anxiety disorders remains uneven among school mental health clinicians.[4]

Although cognitive behavioral therapy (CBT) is considered among the most effective psychosocial treatments for pediatric anxiety disorders,[5] the comparative cost-effectiveness of disseminating CBT into schools has received scant attention in research. Increasing delivery of CBT in schools is complicated by the fact that many school psychologists and counselors lack training and experience in CBT techniques.[4] Although training all school clinicians in CBT may be desirable from an access perspective, training school clinicians in CBT techniques has associated direct and indirect implementation costs, and training usually results in ongoing costs to sustain staff delivery of CBT, both due to job turnover among school clinicians and due to the need for ongoing clinician re-training and support. As a result, schools and their local and state government partners need

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information about the potential benefits and costs of training additional staff in CBT.

A limited number of European studies suggest that school CBT might substitute for other (non-school) mental health care and may result in lower anxiety-related indirect costs to children and their families.[6,7] In a prior randomized controlled trial (RCT), Creswell *et al.*[7] compared clinical outcomes and cost effectiveness of a parent-guided home CBT to a therapist-provided intervention called ''solution-focused therapy'' for (N = 136) youth ages 5-12 years old with anxiety disorders. Youth outcomes did not differ significantly, with 59% of the parent-guided home CBT group and 69% of youth in the solution focused therapy group experiencing a response, respectively. However, parent-guided CBT was associated with lower direct spending for mental health therapy and lower therapy transportation costs. In a smaller RCT, Southem-Gerow *et al.*[6] compared CBT to usual care in community clinics for youth with anxiety disorders (ages 8-15 years old; *N* = 48). No treatment group differences were found on clinical outcomes or overall costs. However, youth receiving CBT used fewer other outpatient mental health services than those in usual community care. In one of the few school-based studies, Simon and colleagues[8] compared the incremental cost effectiveness of child and parent focused anxiety prevention interventions using a societal perspective and a 24-month time frame with effectiveness expressed as the proportion of youth showing clinical improvement. Their results suggest it may be cost effective to offer evidence-based anxiety interventions to youth identified by screening to be in the top 15% on a standardized anxiety severity rating scale.

The current study contributes to this growing literature by using data from the School-based Treatment of Anxiety Research Study (STARS) to examine the incremental cost-effectiveness of school clinician delivered modular CBT (M-CBT) compared to school-based treatment as usual (TAU). Modular CBT teaches CBT skills using several discrete training modules. STARS sought to test whether M-CBT implemented by school clinicians would result in reduced youth anxiety, improved youth social and academic functioning and quality of life, and reduced economic costs associated with anxiety disorders when compared to TAU. Results for primary outcomes from STARS previously reported in Ginsburg *et al.*[35] did not find robust differences in youth outcomes between M-CBT and TAU. However, both study groups appeared to benefit clinically from intervention and M-CBT was comparatively more effective among youth with more severe anxiety at baseline.

The current study estimated the incremental cost-effectiveness of M-CBT versus TAU, as well as the cost-effectiveness of achieving a treatment response (versus no response) regardless of which treatment was received. Analyses were from a societal perspective, which here encompasses the child, the child's family, and the various payers of mental health care services for children including those services provided by school clinicians. Service costs to public-school systems and local and state education agencies were also represented. Education agencies may be specifically concerned with up front budgetary costs associated with school-based CBT and with any improvement in education outcomes such as improved attendance.[9]

Cost calculations took into account intervention costs plus societal savings from reductions in use of non-school outpatient mental health services, reduced school (missed days) and family costs (parents missed work). Effectiveness was indicated by incremental improvements in the probability of any treatment response and by incremental increases in the mean value of health-related quality of life, using a preference-weighted measure of Quality Adjusted Life Years (QALYs). It was hypothesized that M-CBT would be more cost-effective than TAU due to having a larger health benefit. We also examined whether cost-effectiveness of CBT differed depending on child baseline anxiety severity level.

Methods

STARS Study Design Overview

STARS was a 2 (intervention conditions) x 3 (assessment time points at pre-treatment, post-treatment, one year follow-up) randomized controlled trial with 216 youth with anxiety disorders and 62 school-based clinicians. School-based clinicians in elementary, middle and high schools in Maryland and Connecticut were recruited via district supervisors, professional development seminars, and word-of-mouth. Clinicians who consented to participate were then randomized (by school) and trained in either M-CBT (n=37) or TAU (n=25). Students were recruited via referrals from clinicians, school personnel, parents, or self-referrals. Interested families completed a baseline evaluation and, if the student met inclusion criteria (i.e., had a primary anxiety disorder), youth were then expected to complete 12 weekly therapy sessions and the youth as well as a caregiver completed a post-treatment assessment taken 12 weeks after treatment initiation and one-year post-treatment follow-up assessment. Families were compensated $40 per assessment. Independent evaluators completed study assessments (for additional details see[35]). The primary aims examined whether youth assigned to M-CBT compared to TAU demonstrated greater: (i)) clinical improvement and global functioning, and (ii) reductions in anxiety severity and remission of anxiety diagnoses (i.e., loss of primary disorder and loss of all study inclusion anxiety disorders).

Participants

Two-hundred-sixteen students ages 6-18 years (mean age 10.89; 63.9% Caucasian & 29.7% African American; 48.8% female) who met DSM-IV criteria for a primary anxiety disorder were enrolled in the study (see[35]). Anxiety diagnoses were determined using the *Anxiety Disorders Interview Schedule for DSM-IV, Parent and Child Versions* (ADIS), which is considered the gold standard for assessing

pediatric anxiety disorders. Impairment ratings are generated for each diagnosis using the Clinician Severity Rating (CSR, range = 0-8 $\geq$ 4 required to assign a diagnosis). The ADIS was administered by trained independent evaluators (IEs) who had a masters or doctoral degree (or were enrolled in a graduate program) in a relevant child mental health field. Independent evaluators (masked to treatment condition) conducted all outcome assessments.

Treatment Conditions

M-CBT is a 12-session therapy intervention representing the core CBT skills for anxiety. Specifically, M-CBT consists of seven core modules: psychoeducation, exposure, rewards, cognitive restructuring, problem-solving, somatic/relaxation skills, and relapse prevention. The sequence of administering the modules is flexible; with the exception that psychoeducation and exposure respectively occur first and second and that each subsequent session includes an exposure component. The modules are designed to be covered within 12 weeks and therapists may emphasize those modules that are most relevant for each student. Treatment sessions were administered in an individual format. Treatment as Usual (TAU) served as the comparison group for M- CBT. Students in this condition were provided with interventions by their school clinicians (who did not receive training in MCBT) over a 12 week period. Treatment was delivered to each student individually and did not explicitly include CBT strategies. Rather, this treatment reflected the training and services that school clinicians typically provide (e.g., art, play, supportive therapy).

Measures

Training Cost

Therapists in both conditions participated in a one-day anxiety intervention training session delivered in a school classroom setting (generally on a weekend or after school hours). Training required therapists' voluntary time and the costs associated with the trainer, which in this case were donated by the research project. Trainers were clinical psychologists with advanced clinical training in CBT for pediatric anxiety. Other training resources included printed information for participants and miscellaneous office supplies. We did not include an indirect cost for clinicians' hours in training. The chief reason is that these costs did not differ between the CBT and treatment as usual groups. U.S. school counselors generally are required to complete continuing education hours in order to keep their accreditations current and as a job requirement, and most school counselors when asked report a need for more high-quality continuing education opportunities.[10,11] The CBT training helped school clinicians fulfill this requirement, was voluntary, and occurred during non-work hours. In that sense, participation in the CBT training did not affect counselors' overall training time and did not result in foregone productivity at school. Moreover, counselors may have gained valuable skills as a result of participation in training in CBT; CBT is an evidence-based approach and has various school counseling uses (e.g., in helping children overcome the effects of trauma and improve the quality of their sleep).

Intervention Costs

Clinical encounters or sessions during the treatment phase were tracked using study encounter data project records. By design of the study, total service contacts per child were similar across M-CBT and TAU groups, and consequently total intervention delivery costs per child were also similar. Resources needed to offer the two interventions, M-CBT and TAU, at study sites mainly consisted of the time of school-based clinicians (e.g., school psychologists, social workers, counselors), a minimally furnished room for therapy, and some office supplies (e.g., pens and printed copies of handouts for homework assignments). Personnel time includes clinical and non-clinical administrative time for the M-CBT or TAU providers, who were all employees at participating public schools. The number of sessions per child was multiplied by a cost per one-hour session of $67.07 to obtain a total intervention cost per child. The cost per session was based on the implied one-hour cost of a school psychologist or counselor ($58.33 in 2016) accounting for salary ($37.97 in 2016) plus benefits ($20.36 in 2016), using occupation-specific mean salary and employer benefit costs from the U.S. Bureau of Labor Statistics (BLS)[12,13] plus an additional 15% for indirect costs resulting from school counselors' use of the school building (e.g., office space and access to bathrooms and cafeteria) and from administrative expenses in school counseling programs.[14]

Behavioral Health Care Costs

Information on anxiety-related health care use during the period from baseline to the 12-month follow-up was collected using the *Child and Adolescent Services Assessment* (CASA).[15] The CASA, administered by an independent evaluator, is an inventory of inpatient and outpatient specialty mental health, substance abuse treatment, and general medical services used by youth since the last evaluation. Costs for behavioral health care were calculated by multiplying by a cost per unit of service by the number of service events. Average unit costs for these services (see **Table 1**) were obtained from public mental health fee schedules for Maryland, published research studies, and from professional online sources, and updated to 2018 price levels. The costs of psychotropic medications were not included in the analysis due to concerns about the accuracy and completeness of parent-reported medication information.

Indirect and Total Costs

Costs for Disruptions of Caregiver Work

An indirect cost amount was assigned to each youth for the value of paid and unpaid labor time over the prior 12 months that caregivers lost as a result of managing a child's emotional and behavioral problems with anxiety. Participating caregivers reported partial and full workdays missed and other unpaid volunteer time that they themselves lost plus time lost by other principal caregivers, such as a

Table 1. Unit Price Per Service in U.S. Dollars.

Service	Price (US $)	Units	Data source
Direct cost			
Mental health care services			
Inpatient psychiatric unit	1150	Single visit	Rosenheck et al. 2016[31]
Psychiatrist office visits	114 (77)	Initial visit (subsequent visits)	Maryland Department of Health Public Mental Health System Rates (2016)[31]
Mental health clinic visits	194 (60)		
Psychologist/other non-MD office	124 (41)		
In-home counseling/ crisis services	215	Single visit	www.payscale.com[33]
Crisis hotline	17	Single call	
Medical care			
Inpatient medical unit in general hospital	1150	Single visit	Maryland Department of Health Public Mental Health System Rates (2016)[34]
Emergency department	575		
Primary care office/clinic	138		
Indirect cost			
Missed school day			
Connecticut (Public school)			
Special education	163	Single day	Connecticut State Department of Education. (2015)[20]
General education	86		
Baltimore City (Public school)			
Special education	128	Single day	Maryland State Department of Education (2015)[37]
General education	67		
Missed work day			
Parents wage	9-97	$ per hour	Bureau of Labor Statistics (2016)[16]

spouse or grandparent. The value of forgone paid work time was calculated by multiplying the total days missed by estimated labor cost per hour. Labor cost per hour was assigned to individuals by matching their reported occupation with U.S. Bureau of Labor Statistics estimates of the median of hourly earnings by occupation.[16] An additional 45% was added to the hourly wage to account for the average value of benefits[17] For caregivers who reported losing unpaid labor time the labor cost per hour was assigned using the median of wages among all individuals with similar educational attainment (i.e., less than high school, high school graduate or GED, and college graduate).

Disruption of household times reflect when normal daily routines were interrupted due to child anxiety. All indirect cost estimates were adjusted to reflect costs over a 12-month period.

Cost of School Absences

Each partial or full school day missed results in (indirect) opportunity costs for unused education services.[18,19] Parents indicated the number of partial and full school days that their child missed due to anxiety. To value each school day missed we used an estimate of the average cost of education per student per day based on annual public-school spending per student in the study locations divided by 180, which is the required annual number of school days[20,21] (see **Table 1**). This value represents the average production cost of school education that is recovered via local, state, and federal education taxes. This approach is based on similar calculations used in prior research on the costs of pediatric anxiety.[18,19] The production cost is distinct from the marginal value of a missed school day but may offer a reasonable proxy. Local spending on primary education is assumed to reflect the present value that communities place on education services in the current year. The long-term costs of missed school days to individual children and their families may deviate (higher or lower) from the up-front current-year production cost. One reason is that when children miss a day of school, they forego all future investment returns associated with that day of education, which tend to increase the lifetime cost of missing a school day. Another factor is the extent to which children recover from a missed school day. Missing one school day may not equal the average cost of school because some children might be able to catch-up academically after an absence, which would tend to reduce their costs below an average production cost. On the other hand, a multiday school absence could have the opposite effect – a child who returns from a multiday absence may continue falling further behind academically – and thus an extended absence could lead to higher downstream costs. Little empirical evidence currently exists on these and other sources of individual-level variance in costs of school absences and on a reliable measurement approach.

Total Cost

Cumulative total cost per youth in 2016 $ was calculated by adding up direct and indirect costs across categories for the interventions (M-CBT or TAU), costs for other mental health services, and indirect costs for school absences and caregiver costs from baseline through the one-year follow-up. Time discounting was considered unnecessary given the short one-year time horizon of the intervention and follow-up.

Child Health Utility 9D

The CHU-9D[22] is a parent completed preference-weighted measure of a child's health-related quality of life and is designed to provide a measure of Quality Adjusted Life Years (QALYs).[23-25] CHU-9D has a total of nine dimensions/items with 5 levels within each dimension. The CHU-9D has good construct validity.[25]

Responder Status

Treatment responder status was defined as receiving a Clinical Global Impression Improvement (CGI-I) score of 1 or 2 (scores of 3 to 7 represent treatment non-responders), which corresponds to categories for ''very much improved'' or ''much improved''.[26] We created a binary indicator for response at either post-treatment or 12-month follow-up.

Anxiety Severity

Anxiety severity at baseline was measured using the Clinical Global Impression Severity (CGIS) score.[26] The CGI-S provides a clinician's global rating of illness severity (range 1-7). The CGI-S has good reliability and validity in pediatric anxiety. Youth with baseline CGI-S anxiety ratings in the ''moderate'' and ''marked'' severity range (CGI-S scores of 4 or 5; n=139) were categorized as having moderate anxiety whereas youth with baseline anxiety ratings in the ''severe'' or ''extreme'' range were categorized as severe (scores 6 or higher; n=77).

Demographic Characteristics

The primary caregiver reported on family demographics including child age, gender, and race-ethnicity, and caregiver educational attainment.

Missing Values

Missing values in the outcome variables (i.e., due to attrition) were imputed using *mi impute* multiple imputation in STATA16.[27] Multiple imputations were predicted conditional on baseline demographic variables and treatment group assignment and used a multivariate normal distribution.

Data Analysis

Primary Cost-Effectiveness Analysis

Using multivariable generalized linear model (GLM) regression with covariates,[28] we estimated the marginal treatment group differences in anxiety-related costs, treatment response probability, and QALYs through the 12-month follow-up. GLM models for the cost and QALY outcomes were specified using a negative binomial distribution with a natural logarithm link function. Covariate adjustments in the GLM models were age, gender, parent education (college or higher), and baseline anxiety severity (CGI-S). A sensitivity analysis examined whether baseline anxiety severity moderated intervention effects.

Incremental Cost-effectiveness Ratios (ICERs)

ICERs were formed as the estimated M-CBT – TAU difference in mean of total cost per child divided by the estimated mean difference in QALYs. Bootstrapping was used to assess the level of uncertainty in the ICERs and in the probability that M-CBT was a cost-effective alternative to TAU; we iteratively estimated the GLM outcome models 10,000 times, each time drawing a new bootstrap sample (n*=216) with replacement. This procedure resulted in 10,000 sets of bootstrapped estimates of incremental costs and health effects. We then used these parameter estimates to estimate the probability of M-CBT being a cost-effective alternative to TAU at various specified values of societal willingness-to-pay for a QALY. To form these probabilities, we first monetized the average QALY gain or loss using a threshold value of willingness-to-pay for a QALY. For each willingness-to-pay threshold value, we calculated the incremental net benefit of M-CBT versus TAU in the bootstrap replications and then the fraction of replications with positive net benefit. This process was repeated at different assumed willingness-to-pay threshold values. These resulting cost-effectiveness probabilities were then graphed to display a cost-effectiveness acceptability curve.[29]

Responder Analysis

A second analysis was completed to assess the association between a clinical response to intervention and youth costs and quality of life, regardless of which intervention was received (and controlling for covariates). Like our other multivariate analysis, the responder analysis involved multivariate estimation of costs and QALY ratings conditional on responder status and the same set of covariates (study site, age, gender, race, baseline anxiety). The chief purpose of the responder analysis was to determine whether evaluator-rated response status to anxiety treatment was associated with lower anxiety related costs to youth and their families and schools and associated with higher youth quality of life. As part of the responder analysis, we also examined whether the comparative impacts of M-CBT differed by child baseline anxiety severity.

Results

Sample Characteristics

Descriptive characteristics for the M-CBT (n=148) and TAU (n=68) groups are shown in **Table 2.** Youth ages at baseline ranged from 6-18 years (mean age 10.9); 63.9% were non-Hispanic White race-ethnicity; and 48.6% were female. The two groups were similar on baseline clinical values and demographic characteristics. A greater percentage of caregivers in the M-CBT group had completed college compared with the TAU group (71.3% in M-CBT versus 53.8% in TAU).

Table 2. Baseline Demographic and Clinical Characteristics by Intervention Group.

Variable	Total (N=216)	M-CBT (n=148)	TAU (n=68)
Age (M, SD)	10.9 (3.3)	10.6 (3.1)	11.4 (3.5)
Gender (% Female)	48.6	48.6	48.5
Race/Ethnicity (%)			
Non-Hispanic White	63.9	56.8	47.1
Parent Education (% College or higher)	65.7	71.3	53.8
Primary Diagnosis (%)			
SAD	13.4	15.3	10.8
SOP	21.8	19.5	32.3
GAD	61.6	64.9	54.4
SP	1.4	1.4	1.5
NOS	1.9	1.4	2.9
CGI-S (*M*, *SD*)	5.2 (0.8)	5.2 (0.7)	5.2 (0.8)

Note: M-CBT = Modular Cognitive Behavioral Therapy for Anxiety, TAU = Treatment as Usual. SAD = separation anxiety, SOP = social phobia, GAD = generalized anxiety, SP = specific phobia, NOS = not otherwise specified anxiety disorder. CGI-S = Clinical Global Impression Severity Scale.

Training Costs

Training session costs were estimated to be around $900 per 6-hour training day. This amount is based on compensation levels typical of a doctoral trained clinical psychologist (PhD or PsyD) and a bachelor's trained assistant trainer.[12] Consequently, M-CBT training classes that include 10 trainees may cost around $90 per person. Actual costs for a professional CBT trainer could substantially exceed this research study estimate, but school systems could also implement lower-cost train-the-trainer models.

Services Utilization, School Absences, and Parents Missed Work

Detailed descriptive data on service utilization counts, school absences and parents missed work by treatment group are reported in **Table 3**. Thirty-nine percent of students in M-CBT and 34.0% in TAU used any community mental health services. Over half the students in both study groups were found to have missed at least some school due to problems with anxiety and related emotions.

Cost-effectiveness of M-CBT

Table 4 shows adjusted estimates of the incremental cost, effectiveness, and cost-effectiveness of M-CBT versus TAU. Overall mean costs per youth were $1,588 in the M-CBT group and $1,755 in the TAU group (mean difference: –$167 per youth; p=0.581). M-CBT and TAU intervention delivery costs were similar ($599 for M-CBT and $663 for TAU). Youth in the M-CBT group had significantly lower costs for days absent from school than youth in TAU (mean difference: –$117 per youth; p=0.045). Other mental health care costs w-ere similar between groups (mean difference: –$90 per youth; p=0.328) Although there was no group difference in mean QALYs (p = 0.900), the point estimate for the mean was lower by 0.024 in the M-CBT group. As a result, the ICER was $6917/QALY favoring TAU. In other words, receipt of M-CBT instead of TAU was estimated to result in an incremental reduction in costs for school absences but also in worse quality-of-life outcomes among youth. Confidence intervals around the estimated ICER were wide and included a possibility that M-CBT is more cost-effective than TAU. The degree of statistical uncertainty around this overall estimate is represented in the ICER scatterplot (**Figure 1**) and the probability that M-CBT is cost-effective compared with TAU is represented in the cost-effectiveness acceptability curve (CEAC; **Figure 2**). As shown in the CEAC, the probability that M-CBT is the more cost-effective alternative reaches a peak at very low levels of willingness-to-pay for a QALY and decreases steeply as the threshold value of a QALY increases. At the widely used $100,000 threshold value for cost-effective interventions, the probably that M-CBT is cost-effective compared with TAU is less than 10%.

Cost-effectiveness by Level of Severity

Results from a sensitivity analysis that examined cost-effectiveness separately by whether baseline level of anxiety was severe or moderate are shown in **Table 5** and **Table 6**, respectively. Among youth with severe anxiety, the ICER for M-CBT versus TAU was found to be -$22,846/QALY, indicating both lower mean school and family costs in the M-CBT group ($407 in M-CBT and $1,173 in TAU; p=0.013) and marginally higher QALYs in the M-CBT group (0.895 in M-CBT and 0.869 in TAU; p=0.938). However, confidence intervals around this estimate were again wide and included the possibility that TAU is cost-effective compared with M-CBT. Among youth with moderate

Table 3. CBT Versus TAU Service Use Items by Time Point.

Service Use Items	CBT (N=148)			TAU (N=68)		
	BL (n=148) % yes (M)	Post (n=128) % yes (M)	F12 (n=119) % yes (M)	BL (n=68) % yes (M)	Post (n=60) % yes (M)	F12 (n=53) % yes (M)
Any mental health services	29.1%	27.8%	39.4%	33.8%	26.7%	34.0%
Psychiatric hospital	0%	0.8% (3.0 days)	1.0% (10.0 days)	0%	0%	2.2% (7.0 days)
Psychiatric unit in general hospital	0%	0%	1.0% (4.0 days)	1.6% (1.0 days)	0%	0%
Medical unit in general hospital	0.7% (1.0 days)	0%	0%	3.1% (1.0 days)	0%	0%
In-home counseling/crisis services	0.7% (42.0 visits)	1.6% (13.5 visits)	1.9% (18.0 visits)	6.3% (21.5 visits)	0%	2.2% (4.0 visits)
Called crisis hotline	0.7% (1.0 calls)	0%	0%	3.1% (1.0 calls)	0%	2.2% (1.0 calls)
Been to crisis center	0%	0.8% (3.0 visits)	0%	0%	0%	0%
Outpatient drug/alcohol treatment	0%	0%	0%	0%	1.7% (1 day)	0%
Outpatient mental health center	2.7% (4.3 visits)	4.0% (3.0 visits)	1.0% (3.0 visits)	9.2% (12.7 visits)	3.4% (2 visits)	6.5% (8.0 visits)
Psychiatrist	8.1% (2.8 visits)	12.0% (1.9 visits)	13.5% (3.2 visits)	9.2% (2.0 visits)	6.9% (2.5 visits)	17.4% (1.5 visits)
Outpatient private professional	12.2% (6.4 visits)	6.5% (3.6 visits)	17.3% (8.6 visits)	13.8% (5.6 visits)	6.9% (6.3% visits)	15.2% (7.4 visits)
Family doctor for mental health	14.3% (1.3 visits)	8.8% (1.0 visits)	14.4% (1.4 visits)	15.6% (1.0 visits)	8.5% (2.0 visits)	13.0% (3.0 visits)
Hospital ER	1.4% (1.0 visits)	0.8% (1.0 visits)	0%	3.1% (1.0 visits)	0%	2.2% (1.0 visits)
School guidance counselor, psychologist, or social worker (outside of study)	45.9% (6.3 visits)	16.8% (8.0 visits)	39.4% (18.2 visits)	54.7% (8.6 visits)	23.3% (11.0 visits)	41.3% (9.3 visits)
Referred for special education	24.5%	11.2%	15.5%	21.5%	8.3%	4.3%
Accommodations in regular classroom for behavioral/emotional problems	26.5% (29.8times)	25.6% (42.8 times)	32.7% (38.8 times)	32.7% (23.5 times)	20.0% (43.3 times)	26.1% (43.1 times)
Class for behavioral/emotional difficulties	6.8%	1.6%	2.9%	9.2%	5.1%	4.3%
Class for learning difficulty	13.6%	7.1%	8.7%	9.2%	1.7%	11.4%
Talked to teacher for help with feelings	18.2% (11.3 times)	12.8% (17.0 times)	21.2% (20.7 times)	30.8% (16.4times)	16.9% (10.5 times)	22.2% (21.8 times)
Talked to school nurse for help with feelings	8.8% (7.2 times)	5.6% (6.0 times)	5.8% (4.3 times)	14.1% (10.8 times)	6.9% (2.5 times)	4.3% (1.0 times)
Educational tutoring	7.6% (15.7 times)	8.0% (37.0 times)	5.8% (29.6 times)	12.5% (12.8 times)	10.3% (6.7 times)	2.2% (12.0 times)
Services from Department of Social Services	0.7% (4.0 visits)	0%	0%	0%	0%	0%
Court/juvenile justice services	0%	0%	1.0% (1.0 visits)	0%	0%	4.3% (1.0 visits)
Jail, prison, detention center	0%	0%	1.0% (1.0 days)	0%	0%	0%
Meds for anx., dep., ADHD, other emotional/behavioral difficulties	19.0% (1.4 medications)	22.2% (1.3 medications)	22.3% (1.4 medications)	10.8% (1.3 medications)	13.3% (1.4 medications)	14.9% (1.7 medications)
Other medical/neurological medications	10.9% (1.2 visits)	10.0% (1.4 visits)	8.8% (2.3 visits)	8.9% (1.1 visits)	12.5% (2.3 visits)	22.2% (1.9 visits)
Missed full day of school due to anxiety	41.9% (2.8 days)	54.2% (3.4 days)	53.6% (3.5 days)	58.5% (3.2 days)	57.4% (4.7 days)	61.5% (4.0 days)
Missed partial day of school due to anxiety	47.1% (2.4 days)	47.7% (3.2 days)	46.4% (2.9 days)	45.5% (2.7 days)	51.9% (3.5 days)	61.5% (2.6 days)
Parent missed full day of work due to child school absence	11.9% (1.8 days)	17.8% (1.7 days)	13.3% (2.7 days)	9.2% (2.3 days)	16.7% (3.3 days)	17.9% (4.3 days)
missed partial day of work due to child school absence	17.2% (1.7 times)	22.4% (2.1 times)	15.5% (2.5 times)	20.3% (2.0 times)	27.8% (2.3 times)	23.1% (3.3 times)

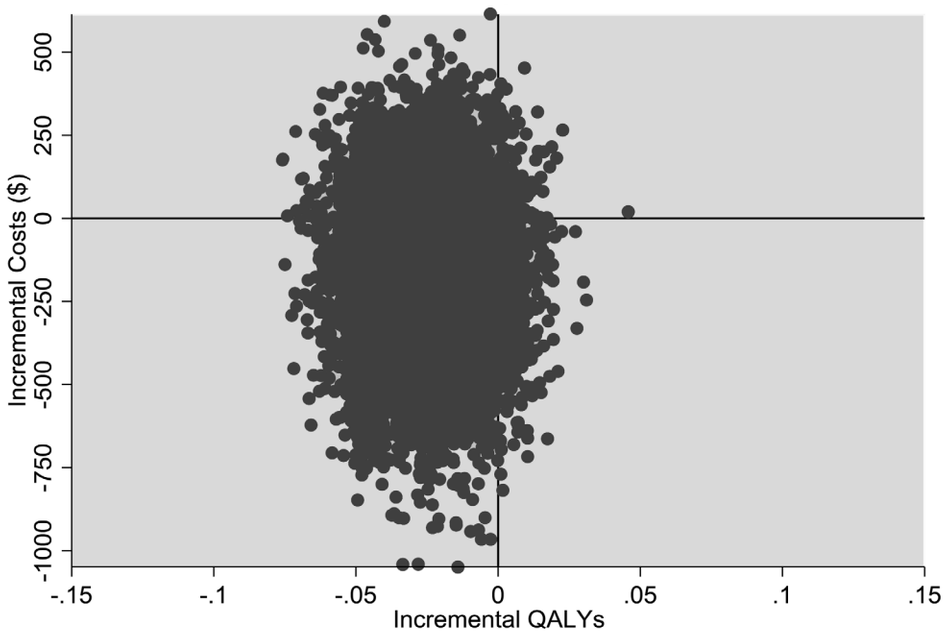

Figure 1. Incremental Cost and Effectiveness of M-CBT Compared with TAU.

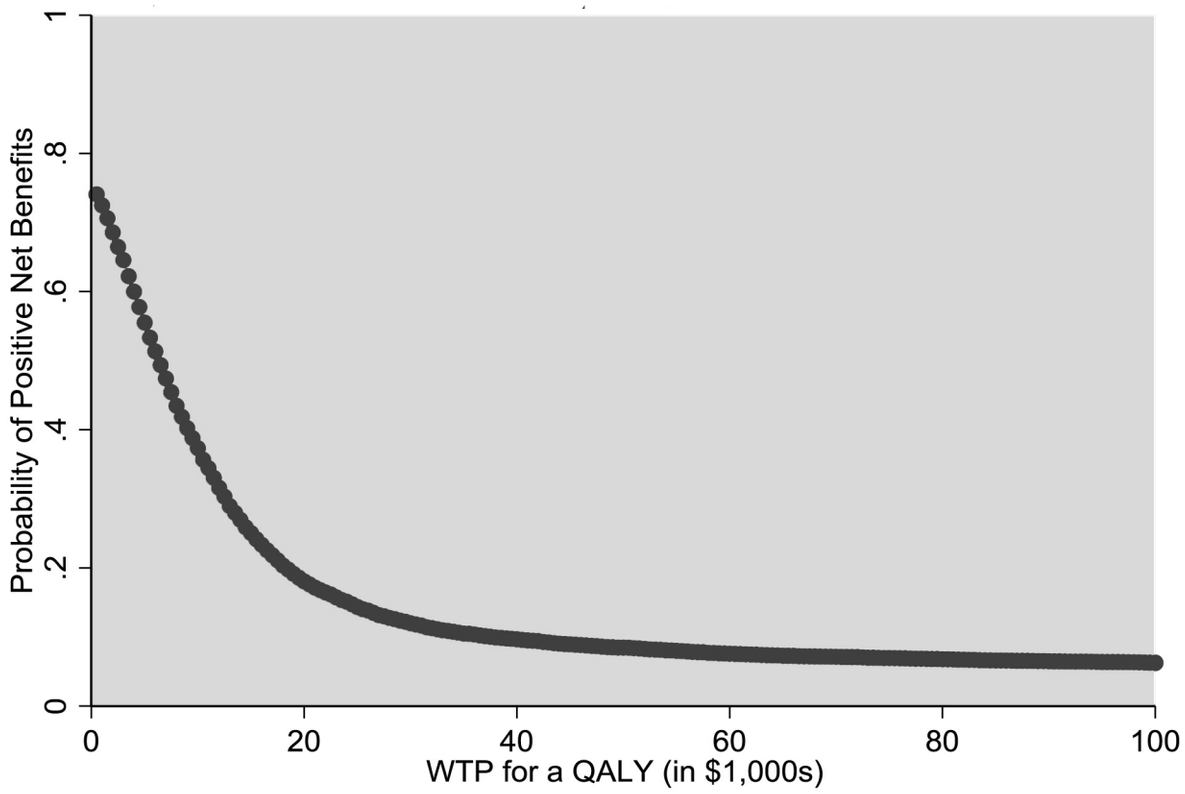

Figure 2. Cost-effectiveness Acceptability Curve for M-CBT versus TAU.

Note: The cost-effectiveness acceptability curve was estimated by bootstrapping the incremental cost and QALY value estimation process with replacement using 10,000 replications. Using these replications, the probability that M-CBT was cost-effective compared with TAU was estimated at different levels of societal willingness-to-pay (WTP) for QALYs.

Table 4. Incremental Cost-effectiveness of M-CBT versus TAU.

Measure	M-CBT Adj. Mean	TAU Adj. Mean	Incremental Cost ($)*	95% CI LL	95% CI UL	chi2	P**
Cost							
Overall costs ($, mean per youth)	1,588	1,755	–166	–677	344	0.30	0.581
Mental health & substance use service delivery cost ($, mean per youth)**	1,115	1,156	–41	–382	300	0.02	0.875
Intervention costs ($, mean per youth)	599	663	–64	–254	125	0.83	0.364
Other mental health & substance abuse cost ($, mean per youth)	518	608	–90	–269	90	0.96	0.328
School & family costs ($, mean per youth)	468	605	–136	–313	39	2.31	0.128
Parent missed work cost ($, mean per youth)	185	186	1	–57	59	<0.01	0.971
Child missed school cost ($, mean per youth)	283	401	–117	–232	–2	4.00	0.045
Effectiveness	**M-CBT Mean**	**TAU Mean**	**Incremental QALYs**	**95% CI LL**	**95% CI UL**	**chi2**	**P**
Responded to treatment (%)	56.7	60.5	–3.8	–32.2	24.5	0.07	0.791
Quality Adjusted Life Years (QALYs, mean)	0.885	0.909	–0.024	–0.407	0.358	0.02	0.900
Incremental cost-effectiveness ratio (ICER)***			$6917/QALY				

Notes:
* The mean incremental effect of M-CBT compared to TAU, estimated using STATA glm with adjustment for age, gender, anxiety, and parent completed college or higher (see text). Negative incremental cost values represent savings. Measured in 2016 dollars.
** chi2 and P correspond to a Chi-square test statistic and corresponding *p*-value for the incremental difference M-CBT versus TAU.
***The ICER represents the CBT – TAU difference in costs divided by the difference in QALYs.

Table 5. Incremental Cost-effectiveness of M-CBT versus TAU, youth with Severe Anxiety (N=77).

Measure	M-CBT Mean	TAU Mean	Incremental Cost ($)*	95% CI LL	95% CI UL	chi2	P
Cost Outcomes							
Overall costs ($, mean per youth)	1,863	2,457	–594	–1,830	641	0.89	0.346
Mental health & substance use service delivery cost ($, mean per youth)**	1,393	1,438	–45	–784	694	0.01	0.905
Intervention costs ($, mean per youth)	592	701	–109	–439	222	0.42	0.519
Other mental health & substance abuse cost ($, mean per youth)	1,200	1,392	–192	–1,023	639	0.20	0.651
School & family costs ($, mean per youth)	407	1,173	–765	–1,371	–160	6.14	0.013
Parent missed work ($, mean per youth)	287	496	–209	–571	154	1.27	0.259
Child absence from school ($, mean per youth)	210	846	–636	–1,046	–226	9.26	0.002
Effectiveness Outcomes	**M-CBT Mean**	**TAU Mean**	**Incremental QALYs**	**95% CI LL**	**95% CI UL**	**chi2**	**P**
Responded to treatment (%)	61.1	49.4	11.7	–33.0	56.3	0.26	0.609
Quality Adjusted Life Years (QALYs, mean)	.895	.869	0.026	–0.623	0.674	0.01	0.938
ICER ($ Cost / QALY)***			–$22,846/QALY				

Notes:
* The mean incremental effect of M-CBT compared to TAU, estimated using STATA glm with adjustment for age, gender, anxiety, and parent completed college or higher (see text). Negative incremental cost values represent savings. Measured in 2016 dollars.
** chi2 and P correspond to a Chi-square test statistic and corresponding *p*-value for the incremental difference M-CBT versus TAU.
*** The ICER represents the CBT – TAU difference in costs divided by the difference in QALYs.

Table 6. Incremental Cost-effectiveness of M-CBT versus TAU, youth with Moderate Anxiety (N=139).

Measure	M-CBT Mean	TAU Mean	Incremental Cost ($)*	95% CI LL	95% CI UL	chi2**	p**
Costs							
Overall costs ($, mean per youth)	1,423	1,490	–67	–615	481	0.06	0.813
Mental health & substance use service delivery cost ($, mean per youth)^{c	944	1,054	–117	–496	274	0.32	0.573
Intervention costs ($, mean per youth)	604	634	–29	–262	204	0.06	0.807
Other mental health {\& substance abuse cost ($, mean per youth)	326	589	–263	–490	-36	5.18	0.022
School & family costs ($, mean per youth)	424	481	–57	–219	105	0.47	0.492
Parent missed work ($, mean per youth)	172	196	–25	–93	44	0.49	0.482
Child absence from school ($, mean per youth)	256	298	–41	–141	57	0.64	0.423
Effectiveness	M-CBT Mean	TAU Mean	Incremental QALYs	95% CI LL	95% CI UL	chi2	p
Responded to treatment (%)	53.8	69.0	–15.1	–23.3	53.6	0.59	0.441
Quality Adjusted Life Years (QALYs, mean)	0.893	0.916	–0.023	–0.509	0.464	0.01	0.927
ICER ($ Cost / QALY)***			$2,913/QALY				

Notes:
* The mean incremental effect of M-CBT compared to TAU, estimated using STATA glm with adjustment for age, gender, anxiety, and parent completed college or higher (see text). Negative incremental cost values represent savings. Measured in 2016 dollars.
** chi2 and P correspond to a Chi-square test statistic and corresponding *p*-value for the incremental difference M-CBT versus TAU.
*** The ICER represents the CBT – TAU difference in costs divided by the difference in QALYs.

anxiety, M-CBT was associated with lower costs per youth for non-school outpatient mental health services ($326 in M-CBT and $589 in TAU; *p*=0.022), but the overall M-CBT/TAU cost difference was small (-$67/per youth; chi2=0.06, *p*=0.813) and with essentially no difference in average QALYs (0.893 in M-CBT versus 0.916 in TAU; chi2=0.01, *p*=0.927). The mean of the ICER was $2,913/QALY, which suggests a preference for TAU.

Costs-effectiveness of Treatment Response

Table 7 shows differences in cost and health related utility outcomes depending on treatment response (responders versus non-responders). Treatment responders, regardless of intervention group, had a savings of $214 per youth ($1,545 for treatment responders versus $1,758 for non-responders, *p*=0.365). The QALY measure was not sensitive to changes in treatment response (*p*=0.938), raising some doubt as to the overall sensitivity of the CHUD-9D to child anxiety symptoms. The overall estimated ICER value of –$9304/QALY suggests treatment response dominates no treatment response at the sample mean as we would expect. Savings from treatment response appeared to be greater among youth (*n*=77) with severe or extreme anxiety at baseline ($808 on average) as compared to youth with mild or moderate anxiety at baseline ($83 on average). As a result, treatment response was more cost-effective, on average, in the severe group (–$42596/QALY) than in the moderate/significant group (–$2594/QALY).

Discussion

Using data from a randomized trial involving youth ages 6-18 with anxiety disorders who received either school-based modular cognitive behavioral therapy (M-CBT) or usual school counseling services (TAU), we found that M-CBT resulted in lower costs for school absences, especially among youth with severe anxiety. However, large confidence intervals limit interpretations of these findings and raise the possibility that M-CBT was not more cost-effective than usual school counseling. The ICER point estimate was $6,917/QALY in the overall sample. This ICER reflects moderately lower costs from pediatric anxiety but also lower QALYs in the M-CBT group, by 0.024 QALYs (0.885 in M-CBT versus 0.909 in TAU). The implied savings from M-CBT were not enough to offset the loss of QALYs from choosing M-CBT over TAU. This unexpected outcome might reflect the strength of usual school counseling, which, like M-CBT, was associated with reductions in youth anxiety over time. Alternatively, ICER point estimates varied widely in bootstrap replications and suggest a possibility that M-CBT is more cost-effective for some groups of youth. In that regard, the ICER estimate among youth with severe levels of anxiety at baseline (–$22,846/QALY) was favorable to M-CBT. These results highlight the potential economic value of identifying and effectively treating students with severe anxiety.

Costs for missed school were on average $118 less per student in the M-CBT group than in the TAU group ($283

Table 7. Incremental Cost-effectiveness of for Responders compared with Non-responders.

Measure	N	Responder mean	Non-responder mean	Incremental cost ($)*	95% CI LL	95% CI UL	chi2	P
Cost per youth ($, mean)**								
Overall	216	1,545	1,758	–214	–677	249	0.82	0.365
Mild/moderate anxiety at baseline	139	1,477	1,394	–83	–573	407	0.11	0.740
Severe/extreme anxiety at baseline	77	1,672	2,480	–808	–1,838	222	2.36	0.124
	N	Responder mean	Non-responder mean	Incremental QALYs	95% CI		chi2	P
Quality Adjusted Life Years (QALYs)								
Overall	216	0.902	0.879	0.023	–0.328	0.375	0.01	0.938
Moderate/significant anxiety at baseline	139	0.913	0.881	0.032	–0.411	0.476	0.02	0.886
Severe/extreme anxiety at baseline	77	0.886	0.868	0.019	–0.583	0.620	<0.01	0.952
				ICER				
ICER values ($/QALY)				($/QALY)				
Overall	216			–9304/QALY				
Moderate/significant anxiety at baseline	139			–2594/QALY				
Severe/extreme anxiety at baseline	77			–42596/QALY				

Notes:
* All values are in dollars in 2016. The mean incremental effects of responder versus non-responder were estimated using STATA glm with adjustment for age, gender, anxiety, and parent and completed college or higher (see text). Negative values of savings represent additional cost compared to TAU.
** Measured in 2016 dollars.
*** The ICER represents the incremental cost (positive) or savings (negative) associated with having an intervention response versus no response divided by incremental QALYs associated with response versus no response.

in M-CBT versus $401 in TAU). This result is consistent with published data showing the school-based programs that target social and emotional health reduce school absences[30] but extend this literature by providing dollar amounts related to saving for treatment targeted at students with an anxiety disorder. Though not reflected in conventional statistical significance used in clinical trials, the estimated means of the cost distribution were less in the M-CBT group than in TAU across every cost category. Sample means for cost outcomes are consistently estimated and unbiased and ultimately it is the means of the distribution that will determine savings at the population level. Consequently, although caution is required when interpreting our findings of non-significant mean cost differences, our results imply that any scaled-up demonstration of M-CBT at the level of a school district or city population would be expected to obtain modest savings.

The potential cost savings from M-CBT must be balanced by the added expense of training school clinicians in M-CBT and suggest that school systems should carefully consider the clinical goals of training school clinicians in M-CBT before investing in broad training programs. Training in this study consisted of a one-day in-person training delivered in a classroom setting, and was estimated to cost around $900 per session. Actual training costs could be higher or lower due to variability in the cost of a trainer. When considering investment in training school clinicians, the cost of training must be weighed against the benefits of in-school access to CBT for students who may not be able to afford seeing an office-based provider in the community. Given the lack of a statistically significant overall cost-effectiveness advantage to M-CBT in this study, schools and their local government agency might decide to train only the number of providers they expect to need in order to serve a target population of youth who may need M-CBT at school. Alternatively, M-CBT might be reserved as a second-line intervention for youth whose anxiety symptoms do not resolve with usual school-based treatment. Such targeted population-health approaches are potentially more efficient than universal M-CBT because they result in savings to local governments as a result of reduced need for specialized clinician training. These and other feasible targeted population-health approaches can allow local government agencies and local school systems to efficiently offer specialized evidence-based school counseling services such as M-CBT.

Regardless of which specific treatment is adopted by schools, data from this study suggest that any effective treatment (i.e., treatments that result in clinical response) is likely to result in cost savings, particularly among youth with the most severe anxiety levels. This finding supports the value of school based interventions for anxiety and highlights the need to evaluate treatment outcomes to guide the selection of treatments which will result in the best outcomes.

Limitations

Despite the novel data presented in this study, results should be interpreted in the context of several limitations. First, the study was designed as a translational effectiveness study, and consequently used training and implementation practices that were designed to work within the constraints of school-based implementation (e.g., minimal M-CBT training) which may have resulted in lower effectiveness of M-CBT. Also, this study did not collect valid data on psychotropic medication use. While rates of psychiatric medication use were similar across groups, we do not know how costs of psychotropic medication affected results. Information about medication use obtained from caregiver interviews suggests medication-based anxiety treatment was relatively low (around 20%) in this sample. Data on direct and indirect costs (e.g., parents missed work) were based on retrospective parent reports, introducing potential bias associated with recall. The absence of statistically significant differences in costs (at $p < 0.05$) may reflect both the typically high sampling variability of empirical cost distributions for child mental health services, wherein only a small minority of youth have any use of some types of expensive services, as well as our limited and unequal sample size (N=216 overall; n=148 in M-CBT; n=68 in TAU), a limitation that was exacerbated by attrition and by unusually intensive use of services among a small number of youth in the sample. Future studies should use service use diaries and objective medical records over a longer period of time.

Conclusions

Training school clinicians in M-CBT resulted in lower costs for school absences, but was not more cost-effective relative to existing school-based psychological counseling. However, mean cost values revealed a pattern of lower costs for community-based mental health care among youth with severe anxiety. School districts might take into account the benefits of fewer school absences as well as the need for evidence-based CBT in schools when deciding whether to invest in training clinicians to deliver CBT for pediatric anxiety. The difficulty and time costs of training clinicians in evidence-based practices, the need to address severe anxiety among youth, and student access to evidence-based psychotherapy in the community are among the factors that may influence the necessity for school clinicians to receive training in CBT.

Implications for School Health

These data suggest that schools who train their clinicians to provide M-CBT to students with a primary anxiety disorder may experience cost savings associated fewer school absences over a one year time period. However, the investment in this specialized training should be weighed against upfront training costs and the prevalence of excessive student anxiety to determine the cost – benefits and feasibility for schools. Schools interested in training their school clinicians in M-CBT should:

- Identify a local trainer and estimate the costs associated with training clinicians in their schools/districts to determine upfront investment costs.
- Determine the number of students with severe anxiety in their school (e.g., by surveying clinicians caseload or conducting screening using such measures as the *Screen for Child Anxiety Related Emotional Disorders*, a free instrument).
- Determine students' level of access to evidenced-based treatment in the community.
- Consider training a limited number of clinicians in M-CBT and reserving these clinicians for students who do not improve with typical school-based treatment approaches.

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