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Abstract

Objectives: To test the potential impact of a critical curriculum on psychiatric medications designed for child welfare workers.

Method: In a quasiexperimental, longitudinal study, the monthly proportion of medicated foster children and the average number of prescriptions per medicated child at Agency 1 (669 clients) exposed to the CriticalThinkRx curriculum were compared to Agencies 2–9 (3,346 clients) in the same two-county service network. Data were collected during 6 months of preintervention, 1 month of intervention, and 9 months of postintervention. Practitioners were not informed of data collection.

Results: During postintervention months 1–8, the proportion of medicated children declined from 17.5% to 11.0% at Agency 1, while the mean proportion rose slightly at Agencies 2–9, statistically significant effects. At 9 months, the proportion at Agency 1 rose again though not reaching preintervention level. Average numbers of prescriptions per child remained unchanged.

Conclusion: Use of CriticalThinkRx may reduce psychiatric prescribing in foster care.

Keywords: Child welfare, foster care, mental health, education, outcome study, intervention, program evaluation, quasiexperiment, children, population, psychiatric medication, evidence-based practice, evidence-based medicine

Children residing in foster care have been found to receive psychotropic medications 2–3 times more frequently than other children of similar ages (Raghavan et al., 2005). Among Medicaid-insured medicated foster children in a Southwestern state, antidepressants, stimulants, and antipsychotics had each been dispensed to over 55% of children, with little variation by diagnostic grouping; over 40% of these children received drugs from more than three classes (Zito et al., 2008). Such prescribing may be driven by factors other than the children's needs for emotional well-being, as suggested by Raghavan, Lama, Kohl, and Hamilton (2010) who observed different medication rates among children in contact with child welfare agencies in California (7%) compared to Texas (20%). A social worker formerly a child in foster care, observed that many foster children might manifest disturbing or distressing behavior, but they are reacting normally to abuse and to abandonment, and she questions the ethics of diagnosing and medicating these children (Stenslie, 2008). An analysis of children receiving child welfare and protective services over 3 years distinguished groups with low, increasing, and high medication use. In reference to children with low use, those with increasing use over time were mainly characterized by a history of physical abuse (Leslie, Raghavan, Zhang, & Aarons, 2010).

Researchers, practitioners, and laypersons have voiced concern about medicating children for common behavior problems because of the manifold toxicity that may result from such practices (Jacobs, Dickstein, & Libelt, 2001). An editorial in the *Journal of the American Medical Association* critiqued the widespread prescription of antipsychotic drugs to children and called for the primary use of less risky interventions (Varley & McClellan, 2009). Children who take antipsychotics often experience large weight gain,

pathological changes in cholesterol levels, and other adverse cardiological, metabolic, and neurological effects (Correll et al., 2009; Jerrell & McIntyre, 2008). A 12-year longitudinal study of chronically medicated adults showed that antipsychotics likely cause brain atrophy (Ho, Andreasen, Zibell, Pierson, & Magnotta, 2011). Significant brain volume changes have been observed after only 3 weeks of use in medication-naive subjects (Chua et al., 2009). These findings acutely raise concerns about antipsychotics' impact on the developing brain, as the drugs have become firstline agents for various presenting problems and age groups, far outside their limited Food and Drug Administration–approved indications (Alexander et al., 2011). Findings of iatrogenic morbidity occur against a backdrop of skepticism about the validity of industry-sponsored pediatric psychoactive drug trials, given the astonishing examples of conflicts of interest, disease mongering, and doctoring of research findings documented in that field (Healy, 2012). According to the American Psychological Association (APA) Working Group on Psychoactive Medications for Children and Adolescents (2006), in child psychopharmacology ''most evidence for efficacy is limited to acute symptomatic improvement, with only limited attention paid to functional outcomes, long-term durability, and safety of treatments'' (p. 15). Yet in pediatric trials of antipsychotics and antidepressants, even acute improvement regularly pales in comparison to placebo (Sparks, Duncan, Cohen, & Antonuccio, 2010). In sum, current psychotropic drug prescription patterns with youth have far outpaced the research evidence for drugs' safety and efficacy (Varley & McClellan, 2009; Zito et al., 2008). Safer and relatively well-tested psychosocial interventions for children who manifest a wide range of emotional

problems are available and can be delivered by psychosocial helping professionals (APA Working Group, 2006; Landsverk, Burns, Stambough, & Rentz, 2009).

Despite the above concerns, few interventions to reduce psychotropic drug prescriptions in child welfare settings have been devised or evaluated. Some state-level regulations in Florida have shown remarkable short-term results. Requiring a consultant physician to approve antipsychotic drug prescriptions for children under 6 years submitted for reimbursement to that state's Medicaid program decreased prescriptions by 75% in 1 year (from 3,167 in 2007 to 844 in 2008), while the number of physicians submitting prescriptions dropped by 40% (435 to 265; Hundley, 2009). Educational interventions targeting physicians have occasionally been evaluated, such as efforts to minimize psychotropic prescriptions to older nursing home residents (e.g., Westbury, Jackson, Gee, & Peterson, 2010) or to curtail the coprescription of multiple antipsychotics simultaneously (e.g., Baandrup et al., 2010).

Previous work suggested that decisions to prescribe psychotropic medications to children in complex systems of care are rarely made solely by medical professionals (Cohen, 2006). Social workers are heavily involved in child welfare and the provision of services to foster care children and foster families. The authors' conversations and observations with social workers in Florida indicated that these practitioners routinely discussed medication options with foster parents; arranged for, transported children to, and occasionally observed or participated in psychiatric or medication evaluations; filled out and presented affidavits to the counties' youth judges seeking approval to have medications prescribed to foster care children when parental rights had been suspended; and regularly monitored medication compliance among children and foster families once

a prescription was written. These activities suggest that nonmedical child welfare practitioners play nonnegligible roles in initiating and maintaining the psychotropic medication of children. Altogether, this made it both sensible and intriguing to target such practitioners to test an educational intervention aiming to decrease irrational psychotropic prescriptions to foster care children. Midkiff and Wyatt (2010) evaluated a brief evidence-based educational intervention employing critical thinking regarding bioreductionism and biological psychiatry, which changed the beliefs of a group of 76 mental health practitioners (mostly psychologists, counselors, and social workers), but the intervention was not intended to change prescribing patterns.

The present study aimed to test the possible impact of CriticalThinkRx, an independent and publicly funded educational intervention on psychotropic medications targeting social work practitioners, on two prespecified quantitative psychotropic drug prescription outcomes in the population of children in foster care in Miami-Dade and Monroe counties of South Florida.

The CriticalThinkRX Curriculum

The CriticalThinkRx educational intervention on psychotropic medications was developed at the Florida International University School of Social Work in 2006–2007 (Cohen & Sengelmann, 2008), with a grant from the U.S. Attorneys General Consumer and Prescriber Grant Program (CPGP). Funds for the CPGP itself came from the 2004 multistate settlement of consumer fraud claims regarding the marketing of the anticonvulsant drug gabapentin by Warner Lambert. The CPGP required that the curriculum, target health care practitioners, include content on pharmaceutical industry marketing and discuss how to evaluate drug information critically.

CriticalThinkRx was designed to provide nonmedical practitioners and advocates in child welfare and mental health an evidence-based, critical view of the entire life cycle of psychotropic medications, with special focus on ethical and clinical issues in child psychopharmacology. Systematic literature searches identified over 1,000 relevant articles, chapters, books, and media reports. These were inspected and a large portion were critically evaluated, summarized, and organized iteratively into the course contents and formatted into presentation slides and video. The contents were then reviewed by independent psychopharmacology experts from psychiatry, psychology, counseling, law, and social work.

The final curriculum was organized into eight modules (628 slides, 445 references), covering, respectively: (1) the background, orientation, funding, and purpose of the curriculum, (2) public health and economic perspectives on psychotropic medication prescriptions to children, (3) the drug testing and regulatory drug approval process and environment, (4) pharmaceutical industry influences on prescribing, (5) indications, uses, safety, and efficacy reviews of four main psychotropic medication classes (stimulants, antidepressants, antipsychotics, and anticonvulsants), (6) legal, ethical, and training issues for nonmedical practitioners, (7) professional roles and best practices concerning medication management, and (8) a critique of the *Diagnostic and Statistical Manual of Mental Disorders*–based (DSM, American Psychiatric Association, 2000) diagnoses of children and adolescents and a review of psychosocial interventions with troubled children.

The principal stated ethical stance of the curriculum was ‘‘First, do no harm.’’ For example, while desired and desirable effects of psychoactive medications were identified,

polypharmacy was singled out as having especially harmful potential. The concluding module proposed the following overarching guidelines, derived from the entire course evidence, that, medication of children with psychotropic drugs be avoided unless (1) evidence-based psychosocial interventions have been exhausted, (2) rationally anticipated benefits of psychotropic drug treatment outweigh the risks, (3) the person or entity authorizing drug administration is fully informed, and (4) close monitoring of, and appropriate means of responding to, treatment emergent effects are in place. A treatment-emergent adverse effects checklist designed specifically for the curriculum as well as supplements designed for each module (brief individual and group exercises, practice-related questions for study, and one peer-reviewed article) were also provided. The curriculum is freely available at www.criticalthinkrx.org and some of its contents are being updated in 2013.

Method

Population

In 2007, the foster care system in South Florida's Miami-Dade and Monroe counties (estimated 2008 combined population: 2.57 million) was made up of nine independent, nonprofit private agencies that provided foster care services to approximately 4,000 youths aged under 18 years. All agencies dealt only with children in foster care (and their natural and foster families), contracted for funding from a single central coordinating and overseeing body (itself contracting with the State of Florida), and operated in principle from uniform state-defined assessment and intervention guidelines. In 2006, one of these agencies, known only to the investigators as one of the largest of this service network, was approached and offered the opportunity to receive the

CriticalThinkRx curriculum (then being developed by D.C. and I.S.) as a free staff development program at a future date. The agency, named Agency 1 in this article, accepted the offer, and became the index agency in this study. No other considerations were involved in this nonrandom selection of Agency 1. The other eight agencies in the network, named Agencies 2–9, thus became the comparison agencies.

Data Source and Study Design

In 2007, the Florida Safe Families Network (FSFN) statewide database was being established, in which child welfare practitioners posted, each month, for each child in their active caseload, service-related data. From the central coordinating body overseeing the nine agencies, the researchers formally requested permission to obtain FSFN data pertaining to psychotropic medications prescribed to foster children served by the agencies as well as some service- and outcome-related variables including the children's placement history. The coordinating body agreed to extract from FSFN, for any child served by the agencies and receiving at least one prescription for any psychotropic agent, only the following variables: (1) anonymized individual identifier, (2) date of birth, (3) gender, (4) race, (5) ethnicity, (7) name of drug (or drugs), (8) dosage, (9) name of prescriber, (10) start date of prescription, and (11) reason for prescription (the last, a substitute for the absence in the FSFN database of DSM or other psychiatric diagnoses).

The study protocol called for a 15-month study: a 6-month preintervention period, a 1-month intervention period during which only Agency 1 practitioners would be exposed to CriticalThinkRx, and an 8-month postintervention period. Starting in October 2007, raw FSFN data on the 11 variables listed above for each child in each agency with at least one active prescription were routed directly to the researchers every month, along

with the total active client count for each agency. Although data collection was scheduled to end in December 2008, one additional month of data was serendipitously obtained, thus extending the postintervention period to January 2009 (to 9 months, or 16 months for the study in total). Figure 1 shows the flow of agencies through the different stages of the study.

Conditions for a Natural Experiment as an Intervention trial

Importantly, because the data obtained from FSFN contained no personally identifying information on any foster child or agency practitioner, they were considered public data under Florida law. As a result, it was not necessary to obtain permission from each individual agency, or informed consent from their clients, client surrogates, or practitioners, to collect the data, and the researchers decided to inform no agency or their practitioners, including Agency 1, that prescription data on their clients would be monitored prospectively as part of a research study. These unusual conditions created a natural experiment (Babbie, 2008), wherein the researchers did not manipulate any conditions in any of the eight comparison agencies while eliminating (or at least largely reducing) any expectation bias in the index agency slated to receive the intervention. The study was approved by the Office of Research Integrity of Florida International University.

Natural experiments provide opportunities for scientific reasoning and discovery by means of nonexperimental, observational methods (Freedman, 1991). They are often used in fields such as economics and political science, where randomization is rarely possible but where data derived from circumstances approximating an experiment are available (Dunning, 2010). Dunning (2008) suggests viewing natural experiments on a

continuum, based on the degree to which research participants are assigned to treatment as if the study were randomized. From this perspective, identifying potential confounds, such as self-selection into treatment, becomes crucial. Key aspects of the present study suggest that it lies on the plausible end of the ‘‘as-if-random’’ continuum: (1) No clients, practitioners, or physician prescribers were aware that they were taking part in a study; (2) clients had no ability to self-select into any particular agency; and (3) clients were not selected for service by agencies based on any clinical criteria (selection was based solely on area of residence, with each agency responsible for a set portion of the counties' territory).

The Intervention

In April 2008, during the 7th month of data collection, D.C. and I.S. presented the CriticalThinkRx curriculum to the direct service staff of Agency 1 as a staff development program. The first session was attended by 57 workers of the approximately 90 direct service employees of the agency. Based on a brief spot survey filled out by 38 persons present before the session actually started, there were at least 30 women and 8 men, mean age was 37.2 years, and 7 held a high school diploma, 7 an associate's degree, 13 a bachelor's, 10 a master's, and 1 a doctoral degree. Eight held state licensure as clinical social workers, one as a mental health counselor, and one as a registered nurse. None of these 38 reported ever having taken a course or training focused on psychotropic medications.

Once a week for four consecutive weeks, two CriticalThinkRx modules in video format were projected on a large screen in the conference room of Agency 1. On its own initiative, Agency 1 informed the participants that it would provide those who attended

all four sessions a $50 gift certificate. At the first session, attendees were provided with a binder and a printed copy of that session's module and supplementary materials. By the fourth session, a complete printed copy of the eight modules and all supplementary materials had been given to each attendee. Despite scheduling each session to last 120 min, it usually lasted about 75 min due to the agency's or individual staff members' competing obligations in the unpredictable context of child welfare practice. As a result, beyond the module projected on screen, few issues were discussed by the presenters or participants during each session though the projection was frequently and momentarily halted as attendees briefly expressed reactions and views and described case situations. Attendees were encouraged to review the printed modules and materials distributed to them, but it is unknown to what extent they did so. Each week, Agency 1 replayed the video (minus presenters) for its staff who had missed it. Attendees who desired it received a certificate for three continuing education credits for state licensure for each session attended. The number of attendees (in sessions with presenters and in replay sessions) varied from 57 for the first session, to 46, 40, and 35 for the remaining sessions, respectively. In all, 60 of the approximately 90 Agency 1 workers participated in the training program: 48.3% attended all four sessions, 13.3% attended three, 18.3% attended two, and 20% attended a single session. Following the final session, the presenters ended contact with Agency 1.

Data Preparation

At the end of data collection, each monthly data report extracted from the FSFN database and routed to the researchers required cleaning to consolidate prescription data under each medicated child and to harmonize widely varying spellings of medication and

prescriber names and descriptions of dosage amounts. There were several limitations to the data. Despite other variables in a given case clearly indicating a prescription, the names for about 12%–14% of prescribed medications were missing from each monthly report. These missing names were distributed nearly equally across all agencies. The variables for dosages and reason for prescription were also too incomplete or vague and were therefore excluded from the analysis. Similarly, names of physicians responsible for about 14% of prescriptions were missing (but only for Agencies 2–9 data), also reducing the usability of that variable. Finally, Agencies 5 and 7 closed during the study, contributing data for 9 months and 14 months, respectively. The reliability of all cleaning procedures was confirmed on the entire series of the 16 original monthly data reports before data analysis formally began.

Data Analyses

Two outcome variables were prespecified in the present evaluation of the curriculum's impact: (1) the proportion of children in the agencies' active monthly caseload receiving 1 prescriptions (number of children receiving 1 prescriptions divided by total number of children served by the agency monthly) and (2) the number of discrete prescriptions recorded for each child (a measure of polypharmacy).

We chose a two-tiered analytic strategy commonly used in natural experiments (Dunning, 2010). First, we present descriptive results, comparing unadjusted medication prevalences between Agency 1 and Agencies 2–9 for each outcome, by month. We weighted the means of Agencies 2–9 according to the number of children served by each agency per month. This first strategy rests on ''design-based'' inference (Dunning,

2004): the assumption that the design of the natural experiment is strong enough to allow analyzing the data based only on a difference of means.

Second, we use a statistical modeling approach with model based inference, which allows formal statistical testing for potential differences apparent in the empirical growth plots from the previous strategy. Analyses were performed using the SAS (2010) statistical software. Mixed models were used to handle the correlated longitudinal data derived from repeated measurements (Singer & Willett, 2003). Each model was built based on the empirical plots of trajectories of the outcome variables, with Agencies 2–9 used as the comparison group to estimate any differences. Our primary interest was the interaction between intervention effect and time (Agency and Month). Regarding the first outcome, we hypothesized that during the preintervention phase (first 6 months), regardless of initial differences between Agency 1 and Agencies 2–9 in the proportion of medicated children, these proportions would run parallel; but during the postintervention phase (last 9 months), the proportion of medicated children in Agency 1 would decrease while no change would occur in Agencies 2–9. A linear mixed model was used to test this hypothesis.

Regarding the second outcome, we similarly hypothesized that the number of prescriptions per child would follow parallel paths during the preintervention phase but would decline only in Agency 1 during the postintervention phase. Here, we first tested the appropriateness of assuming either a Poisson or negative binomial distribution. A model of Poisson distribution assumes that the variance equals the observed mean. When the true variance exceeds the mean (overdispersion), a negative binomial distribution fits the data better. In this sample where every child was medicated, there is no zero value in

the outcome variable. Thus, a zero-truncated negative binomial (ZTNB) analysis was first performed, while simultaneously testing the dispersion parameter. If the latter was significantly larger than zero, the ZNTB model would be held as final, otherwise a zero-truncated Poisson model would be used (SAS, 2011)

Results

Demographic and Clinical Findings

At the start of the study, Agency 1 had the second largest active caseload of the nine agencies in the network (669 clients under 18 years of age in October 2007) compared to 777, 595, 426, 395, 334, 298, 289, and 232 clients for Agencies 2–9, respectively, for a total of 3,346 comparison clients. Agency 1 also had nearly double the proportion of children with 1 prescription compared to Agencies 2–9 (17.5% vs. 9.7%). As Table 1 shows, this difference existed despite quite comparable gender and ethnic/racial compositions of the medicated clients between Agency 1 and Agencies 2–9. Also, Table 1 shows that the distribution of prescribed psychoactive medication classes was similar in both groups of children at the start of the study. Excluding drugs with missing names, 36 different drugs were prescribed at the start of the study, although only 5 made up over 50% of prescriptions: the stimulants amphetamine/dextroamphetamine (17%) and methylphenidate or dexmethyphenidate (12.5%), the antipsychotics risperidone (11.1%) and aripiprazole (6.7%), and the antidepressant escitalopram (5.6%).

Descriptive Analyses

Throughout the preintervention period, the proportion of medicated children at Agency 1 and Agencies 2–9 (first prespecified outcome) held steady within *1%; for Agency 1, it ranged from 16.4% to 17.5%, and for Agencies 2–9, the weighted mean

proportion ranged from 8.8% to 9.8% (Figure 2). Beginning 1 month after the intervention, the proportion of medicated children at Agency 1 declined, and continued to decline over the next 7 months, from a high of 17.3% to 11.0%, while the mean proportion of medicated children in Agencies 2–9 rose slightly, from 9.9% to 10.6%. During the last (unexpected) month of data collection, a spike in the proportion of medicated children occurred at Agency 1 (+3.5%) as well as in the mean proportion of medicated children in Agencies 2–9 (+0.6%, driven by Agency 4: +3.3%). For Agency 1, however, this spike did not bring the prevalence of medicated children near preintervention levels. As for the mean number of prescriptions per child in Agency 1 and Agencies 2–9 (second prespecified outcome), it remained virtually unchanged throughout the whole study (Figure 3).

Model-Based Multivariate Analyses

As described, our models tested for differences in changes in both outcome variables between Agency 1 and Agencies 2–9 during the preintervention period and postintervention periods. Table 2 provides the mixed model parameter estimates for the proportion of children in each agency receiving 1 prescriptions. At the start of the study, the estimated proportion of medicated children in Agency 1, represented by Agency, is significantly higher than the estimated mean proportion of medicated children in Agencies 2–9, represented by the intercept, by 8.551 (p=.014). Throughout the study, Agencies 2–9, unexposed to any intervention, had a rise of 0.087 ($p < .001$) in their monthly proportion of medicated children, represented by month. The interaction Month Agency during the preintervention period represents the difference in change (-0.152, p=.373) in the outcome between Agency 1 and Agencies 2–9 before the exposure to the

intervention. The interaction of Month X Agency during the postintervention period represents the difference of change (-0.361, p=.014) in the outcome after exposure to the intervention. These results are interpreted as follows: at the start of the study, Agency 1 had a higher proportion of medicated children. During the preintervention period, the trajectories of Agency 1 and Agencies 2–9 remained parallel until the start of the postintervention period. Thereafter, the trajectories diverge, with the proportion of medicated children in Agency 1 declining by a rate of 0.361% per month compared to Agencies 2–9.

Table 3 similarly reports the ZTNB model parameter estimates for the number of discrete prescriptions recorded for each child. At the start of the study, this estimated incidence rate ratio for Agency 1, represented by agency, is 1.515 times higher (p= .001) than for Agencies 2–9, represented by the intercept. Throughout the study, the estimated mean number of prescriptions per child per month for Agencies 2–9 represented by month, was 0.997 (p=.474). As represented by the interactions of Month Agency, the trajectory of this outcome variable for Agency 1 compared to Agencies 2–9 did not significantly diverge during the preintervention or the postintervention periods. The dispersion parameter was estimated as 0.188 (larger than zero, p=.001). Thus, this ZTNB model was kept. These findings suggest that at the beginning of the study, medicated children in Agency 1 received more polypharmacy than those in Agencies 2–9, and throughout the study no significant difference occurred between the two groups' change in this outcome.

Discussion and Application to Social Work

To our knowledge, this is the first attempt to evaluate an educational intervention for social workers that aimed to produce reductions in psychiatric prescribing to children in foster care. The proportion of children receiving one or more prescriptions for a psychotropic drug written by physicians decreased statistically significantly in Agency 1 immediately following its exposure to the curriculum CriticalThinkRx and continued to decrease each month for the next 7 months. By contrast, a small but statistically significant increase in the weighted mean proportion of children under medication was observed among the eight comparison agencies unexposed to the curriculum. The number of psychiatric medication prescriptions per child (a measure of polypharmacy), however, remained at near constant levels in Agency 1 and the comparison agencies throughout the study.

The built-in limitations of this natural experiment, where randomly selecting one of the nine agencies in the population to receive the curriculum was not possible, preclude concluding that the observed difference in the one decreased outcome variable is due to Agency 1 practitioners' exposure to the course. Other factors, such as a regression to the mean (Agency 1 had an obviously higher proportion of medicated children at baseline), might contribute to the finding. Some unknown event in the community might have contributed also. The nine agencies operated in two counties containing over 50 zip codes, and ranging from extremely urban to the Florida Keys, suggesting that some territory-based variables may have played a role in the outcomes, although our initial exploration using 2000–2010 census variables yielded no coherent findings or correlations. Some unknown differences between agencies (staff qualifications,

administration, clientele, etc.) may also have played a role. Nonetheless, we feel confident in ruling out these alternative possibilities because no difference in the rate of change of the proportion of medicated children between the two sets of agencies was observed during the full 6 months before the intervention, and Agency 1 began to differentiate itself immediately after the intervention. Overall, the extended length of both the preintervention and postintervention periods, and the inclusion of all agencies (operating from the same assessment and intervention guidelines) within two counties, provide reasonable grounds to attribute at least some of the observed difference in the first outcome variable to Agency 1 practitioners' exposure to the curriculum. That practitioners in any agency were, as far as we know, unaware that psychotropic prescriptions to their clients were being monitored in a prospective study further strengthens the internal validity of this study.

However, if the curriculum is responsible for the observed change, the actual mechanism(s) of change remains unknown. The design of this evaluation study precluded answering just how exposing child welfare workers to a comprehensive critical curriculum on psychotropic medications would lead to fewer children receiving a prescription. Based on poststudy interviews with two child welfare workers in Agency 1, we suggest potential mechanisms through which reduced prescriptions could have occurred. Social workers may have been less likely to refer new children for a psychiatric/medication evaluation at intake, or less likely to suggest that foster parents consult with a psychiatrist when a child acted out. Rather, social workers exposed to the course could have been more likely to wait for spontaneous improvement in the situation, to work more closely with the foster parents, and/or to exhaust available psychosocial

remedies before recommending, referring for, or discussing psychotropic medications. This explanation would, for example, help to explain changes in proportions of medicated children due to newly enrolled children in Agency 1, as well as no changes in the numbers of medications per children.

Change persisted for 7 months, then prescription rates rose at Agency 1 during the last study month although they remained below preintervention levels. This late spike in prescriptions was explained by these workers as a result of the substantial turnover of staff in child welfare agencies including Agency 1. Unable to obtain from Agency 1 employment durations of the workers who initially participated in the study, we could not determine whether such an association existed. In addition, about 62% of the 60 attendees (only 41% of 90 Agency 1 workers) attended at least three sessions (at least six of the eight modules). Even concluding that CriticalThinkRx led the exposed workers to change their professional behavior such that fewer children in their caseloads received medications, we cannot know how evenly this may have been done. Nor did we know which specific Agency 1 program areas the attendees worked in. As well, only some attendees may have been influenced by the course and others not. If the former— whose behavior produced lower prescription rates as a result of the course—left, the eventual uptick in prescriptions which occurred 8 months after the intervention could result. Second, it is expected that the effects of an educational intervention lessen over time. This is taken for granted at many agencies, for example, in terms of annual training requirements. A former pharmaceutical industry detail representative communicated that in his experience making presentations to busy or distracted health care practitioners to persuade them to adopt new pharmaceutical products, the intended effect lasted typically

for about 6 months, after which a booster session was required to maintain it (Shahram Ahari, personal communication, May 13, 2010). The hurried conditions of the curriculum presentation to Agency 1 in April 2008, as described earlier, may be considered in light of this anecdotal but informed opinion. It suggests that a process of brief but ongoing educational/staff development opportunities might accomplish more profound or more lasting changes in psychotropic prescription patterns to foster children. Booster sessions, for example, have demonstrated moderate effectiveness in maintaining treatmentinduced effects reached through behavioral therapy (Whisman, 1990).

The intervention studied here represents only one potential approach toward addressing the problem of overprescribing in foster care. Undoubtedly, other approaches also have utility. Using an external qualified and independent child psychiatrist to approve Medicaid reimbursement-eligible prescriptions before these are filled in pharmacies, which reduced atypical antipsychotic prescriptions to very young children in Florida, is another reasonable and likely cost-effective strategy. However, this particular strategy may work best for more unusual prescriptions, such as of antipsychotics to preschoolers, while keeping more ordinary, ''standard-of-care'' prescriptions from oversight. More broadly, a recent report from the Government Accountability Office (GAO) called for states to implement oversight measures for the medicating of foster youth (GAO, 2011). A multifaceted approach including both caseworker education and independent clinical oversight of prescriptions is likely to be most effective.

Interpreting statistical results of any intervention evaluation must consider its ''loss function,'' that is, the cost and risk attached to the intervention (Ziliak & McCloskey, 2008, pp. 15–16). CriticalThinkRx, available at no or very low cost to

agencies and taking minimal time, appears attractive in this regard. Moreover, social workers exposed to CriticalThinkRx receive education on a topic germane to their daily practice activities, one about which they may not know sufficiently to practice competently. Not starting children on psychotropic drugs may produce benefits. For starters, many of the prescribed drugs are very expensive, and their expenditures have severely strained State Medicaid budgets while delaying exploring systematic psychosocial alternatives to medications (Wong, Gomory, Cohen, & Lacasse, 2011). Naturally, the potential for iatrogenic harm is also greatly reduced. On the other hand, we had no access to clinical or other servicerelated data on the foster children in this study. Ideally, examination of some clinical measures of the children (such as educational, behavioral, and psychological assessments, placement history, and foster family circumstances) would be performed in order to ensure that unmedicated children were not faring worse as a result of not being medicated.

This study took place in two counties in Florida, where significant media and policy attention has been paid to the issue of the medicating of foster children. The rates of medication observed in the two counties' foster children are much lower than those found in several other surveys, including surveys in the same state. However, intersite variations in medication practices have been reported even in similar systems of care within the same geographical area such as the Veteran's Administration; it is hypothesized that differences in pharmaceutical company marketing practices across different sites may have an impact (Weissman, 2002). Although no overt industry marketing to the child welfare practitioners in this study was expected at the time of this study, idiosyncratic and varying marketing to the child psychiatrists, who write

prescriptions for the foster children in the two counties and who file Medicaid claims for their prescriptions, would have been expected (Laforgia, 2011). Thus, external validity of the findings remains a concern. If substantially higher or lower medication rates than the ones observed in this study were the norm, it is unclear how or whether the CriticalThinkRx curriculum would have performed.

The quality of the data must also withstand scrutiny, as ultimately all inferences and conclusions can only rest on how the data were generated. That names of about 11–14% of medications were missing, that dosage data were either missing or impossible to interpret sensibly, that the names of prescribing physicians were missing for approximately 14% of prescriptions, and that the indications for prescriptions had too frequently been recorded in FSFN ambiguously, suggest that some of the data in the remaining variables may have been of comparably poor quality. On the other hand, for the remaining nine variables that we obtained monthly, quality and consistency appeared to be good. Such limitations may be inevitable in databases to which multiple individuals in multiple settings, with widely varying skills, task-appropriate training, and motivations contribute. Poststudy, we were informed that the psychotropic medication data in FSFN would be monitored by a dedicated staff person in each agency for quality control and consistency. Future research involving this database— arguably very close to the world of child welfare practice with foster children—may show correspondingly more valid data on all variables.

In conclusion, we observed a predicted reduction in the proportion of children receiving psychotropic medications in a large foster care agency exposed to the CriticalThinkRx curriculum, compared to the weighted mean proportion of children in

the eight comparison agencies in the same two-county service network unexposed to the curriculum. Although not a randomized controlled trial, several features of the study design, which closely resembles that of a natural experiment, suggest that exposure to the curriculum produced the persistent change. If so, it still remains unclear what specific mechanism or mechanisms accounted for the change. Given the importance of the topic, both for social work practitioners and for foster children, these findings warrant a replication in another area of the state or country, with equal attention given to outcomes and processes.

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Table 1. Sociodemographic characteristics of children receiving ≥ 1 psychoactive medication prescription, and distribution of medication classes, at start (October 2007) and end (January 2009) of study

Socio-demographic characteristics	October 2007			January 2009		
	Numbers (%) of children receiving one or more prescription					
	Agency 1 (n=117/669)	Agencies 2-9 (n=325/3346)	χ^2	Agency 1 (n=102/718)	Agencies 2-9 (n= 252/2355)	χ^2
Male	66 (56.4)	198 (60.9)	0.728	62 (60.8)	154 (61.1)	0.003
Female	51 (43.6)	127 (39.1)		40 (39.2)	98 (38.9)	
< 7 yrs of age	3 (2.6)	13 (4.0)	0.621	0 (0.0)	7 (2.8)	2.932
7-12 yrs	44 (37.6)	126 (38.7)		33 (32.3)	82 (32.5)	
13-17 yrs	70 (59.8)	186 (57.2)		69 (67.7)	163 (64.7)	
Non-Hispanic Black	55 (53.0)	167 (51.4)	0.992	43 (42.2)	131 (52.0)	8.317*
Non-Hispanic White	17 (14.6)	75 (13.9)		5 (4.9)	26 (10.3)	
Hispanic White	28 (23.9)	65 (20.0)		33 (32.4)	53 (21.0)	
Other	17 (8.5)	48 (14.8)		21 (20.6)	42 (16.7)	
Drug class	**Numbers (%) of prescriptions in each medication class[1]**					
Stimulant	70 (31.3)	156 (30.8)	6.63	50 (26.5)	136 (35.1)	Fisher's exact test 11.732*
Antidepressant	60 (26.8)	108 (21.3)		51 (27.0)	78 (20.2)	
Antipsychotic	60 (26.8)	134 (26.5)		59 (31.2)	100 (25.8)	
Other[2]	7 (3.1)	35 (6.9)		5 (2.6)	28 (7.2)	
Unknown[3]	27 (12.1)	73 (14.4)		24 (12.7)	45 (11.6)	
Total	224 (100)	506 (100)		189 (100)	387 (100)	

* $p < .05$

[1] Totals exceed numbers of medicated children as some children received > 1 prescription

[2] This category groups benzodiazepines, lithium, and anticonvulsants

[3] The name of the medication was missing, but other variables (e.g., dosage, prescriber) indicated a prescription.

Figure 1. Change over 16 months in the proportion of children receiving ≥ 1 prescriptions in Agency 1 and Agencies 2-9 (vertical line indicates Agency 1's month of exposure to intervention; weighted mean proportion used for Agencies 2-9)

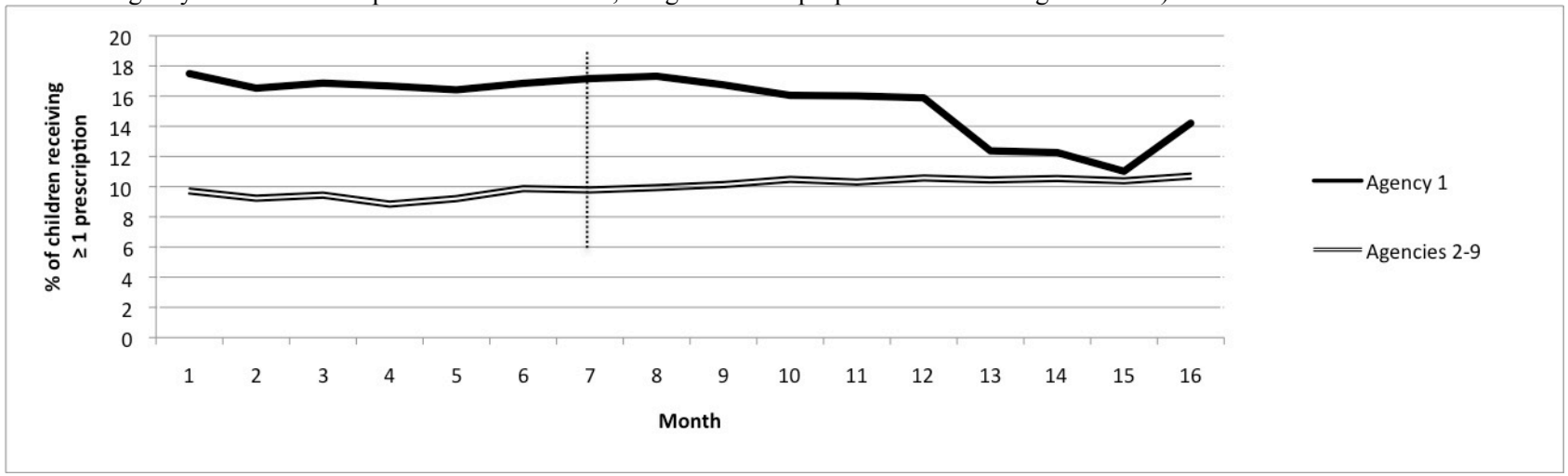

Figure 2. Change over 16 months in the number of prescriptions per child in Agency 1 and Agencies 2-9 (vertical line indicates Agency 1's month of exposure to intervention)

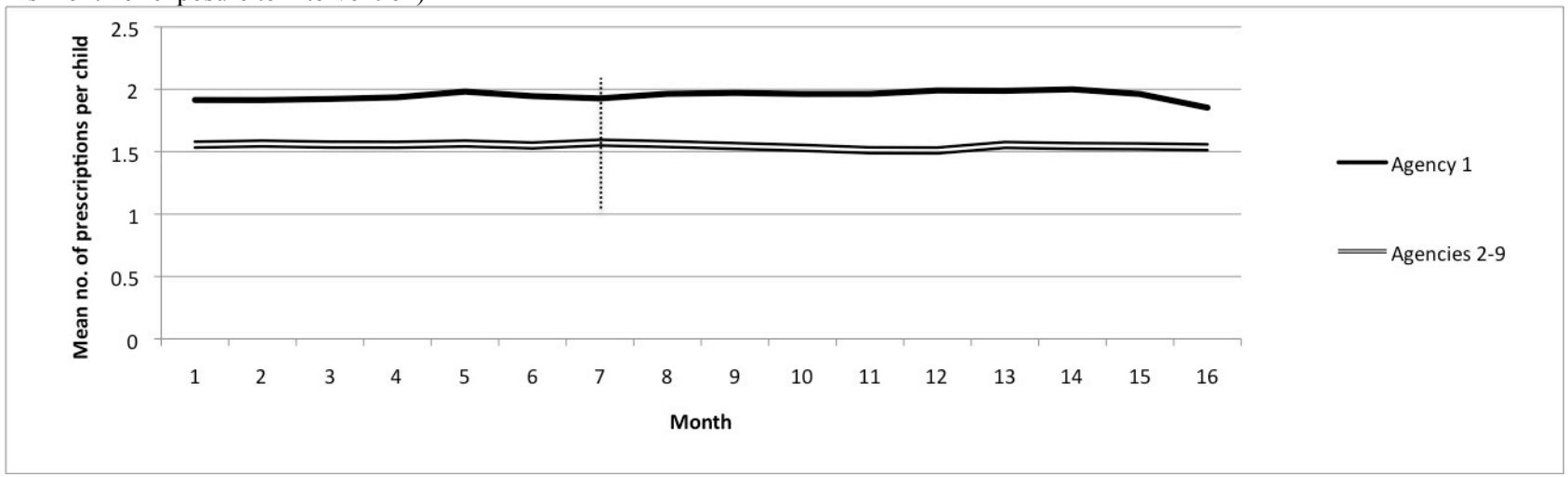

Table 2. Linear mixed model parameters of change over time in proportions of children receiving ≥ 1 prescription

Variable	Estimate	S.E.	95% confidence intervals	*t*
Intercept	9.063	0.876	7.347 — 10.780	10.351**
Agency	8.551	2.625	3.407 — 13.695	3.258*
Month	0.087	0.026	0.037 — 0.137	3.400**
Month • Agency (Pre-intervention)	–0.152	0.170	–0.486 — 0.181	–0.895
Month • Agency (Post-intervention)	–0.361	0.073	–0.505 — –0.217	–4.914**

* $p < .01$, ** $p < .001$

Table 3. Zero-truncated negative binomial model parameters of change over time in the number of prescriptions per child

Variable	Incidence Rate	S.E.	95% CI	*t*
Intercept	0.852	0.049	0.774 – 0.938	-3.275*
Agency	1.515	0.083	1.287 – 1.784	4.990*
Month	0.997	0.005	0.988 – 1.006	-0.716
Month • Agency (Pre-intervention)	1.010	0.015	0.981 – 1.041	0.675
Month • Agency (Post-intervention)	1.007	0.008	0.991 – 1.022	0.852

* $p < .001$