Two-Year Evaluation of the Effectiveness of the Department of Child Services (DCS) Psychotropic Consultation Program

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Executive Summary

This executive summary describes the key findings of an independent evaluation of the Indiana Department of Child Services (DCS) Psychotropic Consultation Program. The program was designed to monitor and optimize the safety and effectiveness of psychotropic medication use among children and adolescents in the care of DCS. The statewide effort was planned and implemented in partnership with the Indiana University School of Medicine Department of Psychiatry. Utilizing criteria outlined by the Indiana Psychotropic Medication Advisory Committee (PMAC), nurse and physician specialists in child and adolescent psychiatry identified and reviewed outlier cases not in compliance with state guidelines. Outlier cases were identified using three criteria: 1) having six or more concurrent prescriptions for different psychotropic medications; 2) having a psychotropic prescription and being <4 years old; and 3) having a prescription for a psychotropic medication not FDA-approved for use in children. If an outlier was found to be problematic after full review, a peer-to-peer consultation between a physician in IU Psychiatry and the child's prescribing physician was conducted to discuss the case and provide advice regarding indication, prescribing practices, monitoring and documentation, behavioral therapies, and any other issues. If necessary, cases ware followed up after six months to ensure that psychotropic prescriptions were in compliance with PMAC guidelines.

Since the inception of the DCS Psychotropic Consultation Program, IU Psychiatry has processed a total of 605 outlier cases, and conducted a total of 279 peer-to-peer medication consultations with prescribing physicians. Despite a small number of persistently problematic physicians, a large majority of reviews resulted in agreement between specialist consultants and prescribing physicians, and concerns remained in only a minority of cases. Common violations of the prescribing criteria outlined by the Indiana Psychotropic Medication Advisory Committee included the following: concurrent prescription of four or more unique psychotropic medications, insufficient evidence for a particular agent, medications not appropriate for a child's condition, multiple medication changes being made simultaneously, insufficient psychotherapy or other behavioral interventions, and inadequate monitoring and documentation of side effects.

Drawing on a statistical analysis of Medicaid data, the following patterns were observed among youth in the treatment group 12 months after peer-to-peer consultation:

- Estimated number of psychotropic medications declined from four to about three
- The predicted probability of receiving six or more prescriptions concurrently decreased from 0.50 to 0.26
- The predicted probability of taking a potentially unsafe, off-label medication fell from 0.50 to 0.28
- The predicted probability of inpatient psychiatric hospitalization among youth with more severe psychiatric problems fell from 0.50 to 0.22
- Average monthly healthcare expenditures declined from an estimated $20K to $12K
- The number of outlier cases meeting criteria for review declined from a high of 99 in September of 2015 to a low of 15 in October of 2017

Though results were overwhelmingly positive, attempts to increase laboratory monitoring and access to behavioral therapy services were unsuccessful, suggesting a need for some program modifications. However, in all, the findings of this independent evaluation indicate that the DCS Psychotropic Medication Program resulted in significant improvements in prescribing practices and reductions in health services utilization among children and adolescents under the care of DCS, exceeding programmatic expectations for changes in outcomes.

Two-Year Evaluation of the Effectiveness of the Department of Child Services (DCS) Psychotropic Consultation Program

The Department of Child Services (DCS) Psychotropic Consultation Program was initiated on June 1, 2015. In partnership with DCS, the Indiana University School of Medicine Department of Psychiatry has been contracted to monitor and optimize psychotropic medication use in children and adolescents in the care of the state by reviewing outlier cases. Outlier cases are those deemed potentially problematic, utilizing criteria outlined by the Indiana Psychotropic Medication Advisory Committee (PMAC). The following report constitutes an evaluation of the success of the program to date.

Outlier Case Review Procedures

Referral into the program occurs via three methods: 1) Direct referral from DCS; 2) Direct referral from a project staff member reviewing medication data; and 3) Data-driven referral through an analysis of Medicaid prescription data. These procedures balance the need to target the most problematic cases, as identified by DCS or project staff, with the ability to conduct an unbiased evaluation of the effectiveness of the intervention.

Data-driven referral involves flagging outlier cases and randomizing them to an "immediate review" group or "delayed review" control group using a computer algorithm. The algorithm relies on three criteria: 1) having six or more concurrent prescriptions for different psychotropic medications (i.e. not different dosages or multiple prescriptions for the same medication, which would indicate tapering or refilling); 2) having a psychotropic prescription and being less than or equal to three years old; and 3) having a prescription for a psychotropic medication that is not FDA approved for use in children (e.g. long-acting and injectable antipsychotics). This entire referral process is repeated monthly, generating new lists of outliers for review.

Once flagged as outliers, each case is reviewed by the project RN, who determines whether it meets criteria for intervention. If so, a case file is created and medical records are obtained. The full set of records is then reviewed by the RN and/or a project psychiatrist to assess need for the peer-to-peer review intervention. At this point, any case randomized to the delayed control group is tabled, but is automatically reviewed after a six-month waiting period. Moreover, any case determined to be very concerning is automatically prioritized for the peer-to-peer review intervention, regardless of its status as randomized immediate or delayed review group.

Cases in need of review that were randomized to the immediate intervention group move to scheduling, and peer-to-peer reviews are conducted with prescribing physicians. If follow-up is needed, the case is re-reviewed after a specified amount of time. In addition, any case that has received the peer-to-peer intervention which reappears on the flagged outlier list after a 6-month waiting period is also automatically reviewed again.

Once identified, the outlier cases are randomly assigned by PET staff to a case review group or a non-reviewed comparison group. Two versions of the list – one blind version that is distributed to staff responsible for inputting data from chart reviews and one labeled version for staff who coordinate case reviews with physicians – are sent to IU Psychiatry by the PET. Thus, the sampling and review processes are kept completely separate to minimize bias. Because IU Psychiatry cannot simultaneously review all outlier cases, this does not constitute a withholding of the intervention. Rather, all outlier cases will eventually be eligible for intervention. Control cases are entered back into the sample for review after 6 months.

There is a separate pipeline for outlier cases referred directly by DCS or project staff. These move automatically to the full medical records review and skip the randomization process. In other words, if the case is deemed problematic, the peer-to-peer intervention is scheduled as quickly as possible.

Outlier Case Review Progress

A detailed classification system is used to track the progress and various pathways of outlier cases through review. There are four classification categories reflecting different levels of review, from RN review only to full peer-to-peer intervention plus follow-up review. The number of cases in each category for the project to date are presented in **Table 1**. Since the inception of the DCS Psychotropic Consultation Program, IU Psychiatry has processed a total of 605 cases. In all, 279 peer-to-peer medication consultations have been completed with prescribing physicians.

Table 1. Classification categories for the Indiana DCS Psychotropic Consultation Program

Category	N
A. Does not meet criteria for peer-to-peer review after RN review of prescription data	149
B. Does not meet criteria for peer-to-peer review after psychiatrist or psychologist review of full medical records	79
C. Meets criteria for peer-to-peer review	
Randomized to delayed intervention	124
Randomized to immediate intervention	202
Direct referral	82
D. Additional review requested following intervention	
Follow-up records review	97
Secondary full peer-to-peer review	29
Total unique cases processed (A+B+C)	**605**

Evaluation Methods

This evaluation provides information about the effectiveness of the DCS Psychotropic Medication Consultation Program at the conclusion of its second year. Since March 2016, the Program Evaluation Team (PET) has received monthly evaluation data from DCS. The RedCap database developed to collect and synthesize basic information about outlier cases for the purposes of tracking case progress and submitting letters to physicians is the source of much of the data in this report. In addition, the PET has constructed an electronic database, also in RedCap, to facilitate the extraction of information from patient charts, as well as data storage and analysis. These are used to collect supplementary information on results of case review and children's medication and mental health outcomes.

In May 2017, the Program Evaluation Team (PET) received a large data extract from ACS State Healthcare which covers the period of July 1, 2014 to May 10, 2017. These data are used to

examine health services utilization and physical and mental health outcomes at least 6 months prior to the intervention (i.e., medication consultation) and at least 2 months after the intervention. The actual period of observation varies depending when a child was flagged for review, and ranges from 8 to 34 months.

Sample. The evaluation primarily draws on a sample of 234 youth whose prescribing physicians participated in a psychotropic medication consultation with a child psychiatrist (i.e., the treatment group) during the period of observation. The demographic characteristics of youth in the treatment group are presented in **Table 2**, and reflect the broader composition of youth under DCS supervision who were flagged for inappropriate prescribing practices. Just over a third are girls, while nearly two-thirds are boys. The majority are white (72%) or black (24%), and mean age is 10.66. Most live in residential placements (64%) or in DCS foster homes (34%).

Table 2. Characteristics of youth in the treatment group, June 2015-March 2017 (N=234)

	% (N)[1]	Mean (SD)
Gender		
Girl	37.4% (83)	
Boy	62.2% (138)	
Transgender	0.5% (1)	
Race		
White	71.8% (168)	
Black	23.9% (56)	
Hispanic	3.0% (7)	
Asian	0.4% (1)	
Other/unknown	0.9% (2)	
Age (years)		10.66 (3.81)
Placement type		
Residential	63.8% (118)	
LCPA	2.2% (4)	
DCS foster home	34.1% (63)	

[1] N's may not sum to 234 due to missing data.

Measures. Our evaluation provides a description of the concerns noted by child psychiatrists regarding inappropriate prescribing practices during the course of DCS case reviews. In addition, information regarding number of consultations per prescriber, prescriber response to the peer-to-peer consultation, and remaining concerns is presented. These descriptive statistics have consistently been included in 90-day reports, but are aggregated here to demonstrate patterns over the course of the program.

For the first time, we also incorporate an analysis of the effectiveness of the intervention vis-à-vis significant and measurable change in physicians' prescribing practices and children's outcomes. Observations are aggregated by month, such that measures reflect whether a particular outcome ever occurred in a given month, or how many times it occurred during a given month. Our measures of ***prescribing practices*** include the maximum number of concurrent medications, prescribing 6 or more unique psychotropic medications concurrently, prescribing any medications not FDA approved for use in children, and the presence of lab

orders (a potential indicator of prescription monitoring). Measures of ***health services utilization*** include total monthly healthcare expenditures, any inpatient psychiatric admission, any other hospitalizations, number of psychotherapy or applied behavior analysis (ABA) visits, and any emergency department (ED) visits. Measures of ***physical and mental health outcomes*** potentially associated with overprescribing include evidence of any services associated with a diagnosis of type II diabetes, hypertension, dystonia, and self-harm. Finally, as a ***global measure of impact*** on the prescribing behavior of physicians serving youth under the care of DCS, we also track the number of individual cases flagged for review over the course of our observation.

Analysis. Descriptive statistics are employed to provide information about the frequency, central tendency, and dispersion of key variables of interest. Bivariate statistics (t-tests and chi-square tests) are used to evaluate mean differences in Medicaid outcomes in the 12-month period before and after the intervention among youth in the treatment group, providing a simple snapshot of pre- and post-consultation conditions.

The final set of analyses uses fixed effects negative binomial and logistic regression to examine how outcomes changed over time before and after the intervention. It draws on youth in the treatment group to estimate growth and declines in outcomes for those that received the intervention. For each outcome, estimates are based on all youth in the treatment group who experienced any changes in those outcomes over time. For example, how does the intervention affect the likelihood that a child who was prescribed an unsafe medication is taken off of that medication following peer-to-peer consultation? Because the intervention targets specific prescribing behaviors, this is a better approach to evaluating its effectiveness. That is, we can focus our assessment on the cases where specific problems have occurred in the past.

This approach has at least two additional advantages over the simple bivariate analysis. First, the regression models can account for trajectories, or incremental changes over time. For example, we might expect that inappropriate prescribing practices increase steadily prior to the intervention (e.g., as medications are added without removing ineffective ones). In contrast, those same practices are likely to decline over time (rather than instantaneously) after consultation with a child psychiatrist, as medications are gradually tapered and removed. A simple, bivariate analysis is likely to mask the magnitude of these important changes. Second, fixed effects regressions model within-person change, capturing how a child differs from him or herself at other time points (here, time points that occur before versus after the intervention). Consequently, all characteristics of children that are unlikely to change over time (e.g., gender, race, socioeconomic status, diagnosis, etc.) are controlled, and it easier to attribute some measure of causality to the intervention.

The fixed effects regressions include a measure of time (in months) before and after the intervention. In addition, because they estimate within-person changes, these models effectively control for all characteristics of patients that do not change over time (e.g., gender, race, family socioeconomic background).

Evaluation Results

Descriptive statistics on consultation characteristics are presented in **Table 3**. About half of physicians flagged for inappropriate prescribing practices participated in only one peer-to-peer consultation, and an additional one-fifth participated in two. However, about one-quarter of prescribers were flagged and received the intervention three or more times. This may indicate that while most prescribers benefit from the consultation and change their behaviors, there is a

sizeable minority of physicians that does not follow the directives of the IU Psychiatry specialists, or does not apply what they have learned to their other patients. Two physicians have been particularly problematic in this regard, with one receiving the intervention 16 times, and another 25 times. However, despite the issue of repeated interventions, prescriber response to the review was generally positive, with 87% agreeing with the advice provided, and only 6% disagreeing. Finally, the consulting specialist had no remaining concerns in the majority of cases following the intervention (80%).

Table 3. Consultation characteristics, June 2015 to March 2017 (N=234 consultations; N=95 prescribers)

	% (N)
# consultations per prescriber	
1	54.7% (52)
2	20.0% (19)
3	8.4% (8)
4	6.3% (6)
5 or more	9.5% (10)
Prescriber response	
Agreed with advice	86.8% (203)
Disagreed with advice	6.4% (15)
Neither/unclear response	6.8% (16)
Concerns remain after consult	
No	79.5% (186)
Yes	20.5% (48)

Table 4 presents the frequencies of concerns noted by child psychiatrists regarding psychotropic medication regimens during case reviews. The most common concern regarding medication quantity or combination was four or more unique psychotropic medications being prescribed concurrently. This problem was noted in 62% of cases flagged for review. Other concerns that emerged with regularity were dosages exceeding Indiana PMAC recommendations (9%), and two or more antidepressants or antipsychotics being prescribed simultaneously (12%). In the area of indication, the most prevalent concern was insufficient evidence for a particular agent (30%), followed closely by a medication being inappropriate for a child's diagnosis or symptoms (25%). Also common were absence of any DSM or ICD diagnoses (11%), and prescription of medications contraindicated for children in a particular age range (10%). With respect to prescribing procedures, multiple medication changes were made simultaneously in nearly one-fifth of cases flagged for review, while ineffective medications were retained while new ones were added in 9% of cases. Insufficient behavioral interventions were also evident, with common concerns being insufficient psychotherapy (28%) and lack of behavioral interventions for medication-related weight gain (12%). Finally, inadequate documentation, monitoring, or follow-up occurred regularly among flagged cases. Inadequate monitoring of required laboratory tests was noted in 32% of cases, and inadequate documentation of vital signs, physical exams, side effects, and other evidence of appropriate follow-up occurred in 35% of cases.

Table 4. Frequencies of concerns noted by child psychiatrists regarding psychotropic medication regimens during case reviews (N=234).

Concern	N	% of reviewed
Medication quantity or combination		
4 or more psychotropic medications prescribed	145	62.0%
2 or more antidepressants prescribed	15	6.4%
2 or more antipsychotics prescribed	12	5.1%
2 or more benzodiazepines prescribed	1	0.4%
2 or more stimulants prescribed	1	0.4%
2 or more lithium-based agents prescribed	0	0.0%
3 or more sedative hypnotics prescribed	1	0.4%
3 or more anticonvulsants prescribed	2	0.9%
Dosage exceeds recommendations	21	9.3%
Indication		
Medication not appropriate for diagnosis/symptoms	58	24.8%
Medication with no clear psychiatric indication	9	3.9%
Medication contraindicated for child in age range	23	9.8%
Insufficient evidence for a particular agent	71	30.3%
Excessive or inappropriate use of PRN	1	0.4%
Absence of DSM/ICD diagnosis	26	11.1%
Prescribing procedures		
Polypharmacy attempted before single agent	12	5.1%
Ineffective medications maintained while new added	21	9.0%
Multiple medication changes made simultaneously	42	18.0%
Initial dose too high or dosage escalated too quickly	3	1.3%
Indication for PRN and max doses not provided	3	1.3%
Recommended medication taper not completed	15	6.4%
Insufficient behavioral interventions		
Current psychotherapy is insufficient	66	28.2%
Inadequate psychotherapy trial before medication	14	6.0%
Absence of caregiver training for preschoolers	10	4.2%
Lack of behavioral interventions for weight gain	27	11.5%
Inadequate documentation, monitoring, or follow-up		
Insufficient documentation of side effects	27	11.5%
Inadequate monitoring of lab tests	74	31.6%
Inadequate monitoring of vital signs	25	10.7%
Inadequate documentation (e.g. physical exam, vitals)	56	23.9%
Insufficient monitoring for suicidal ideation	0	0.0%
Insufficient frequency for clinical follow-up	2	0.9%
No cardiology referral for known cardio problem	2	0.9%
Referral not made to child psychiatrist after 3 months	17	7.3%

Bivariate statistics reflecting differences in Medicaid outcomes in the months before and after the intervention among youth in the treatment group are presented in **Table 5**. With respect to physician prescribing practices, the average number of medications prescribed per patient did not differ significantly in the 12-month period before and after the intervention. However, the percent of patients taking a dangerously high number of psychotropic medications (six or more) declined from 56% to 41% (p<.01). Also, the percent of patients being prescribed potentially unsafe medications not FDA-approved for children decreased from 36% to 24% (p<.001). The intervention did not significantly affect the percent of patients for whom lab tests were ordered.

There were significant changes in health services utilization before and after the intervention (see **Table 5**). Average health expenditures per month decreased from $21.7K in the 12-month period before the medication consultation to $11.8K in the 12 months after (p<.05), suggesting significant cost savings associated with the DCS Psychotropic Medication Consultation Program. Psychotherapy visits did not increase, as expected. However, the rate of inpatient psychiatric admission dropped from 50% to 34% following peer-to-peer consultation (p<.01), and other hospitalizations reduced from 45% to 27% (p<.01). Emergency department visits also decreased precipitously from 55% to 37% (p<.01).

Table 5. Prescribing practices, health services utilization and health outcomes before and after psychotropic medication consultation

	Pre-Consultation[1]		Post-Consultation		
	Mean	%	Mean	%	t/X[2]
Prescribing Practices					
# Psych Meds	3.57		3.43		0.74
Ever taking 6+ Meds		56.1%		41.4%	6.74**
Any Unsafe Meds		35.7%		23.6%	5.52***
Any Lab Tests Ordered		47.8%		39.5%	2.19
Health Services Utilization					
Health Expenditures/Month	$21,663.46		$11,783.95		2.48**
# Psychotherapy visits	3.37		2.96		0.72
Any Inpatient Psych Hosp.		49.7%		34.4%	7.53**
Any Other Hospitalization		45.2%		26.8%	11.63**
Any ED Visit		54.8%		36.9%	10.06**
Health Outcomes					
Any Type II Diabetes		2.6%		0.6%	1.83
Any Hypertension		2.6%		0.6%	1.83
Any Dystonia		1.9%		0.0%	3.03
Any Self-Harm		6.4%		8.3%	0.42

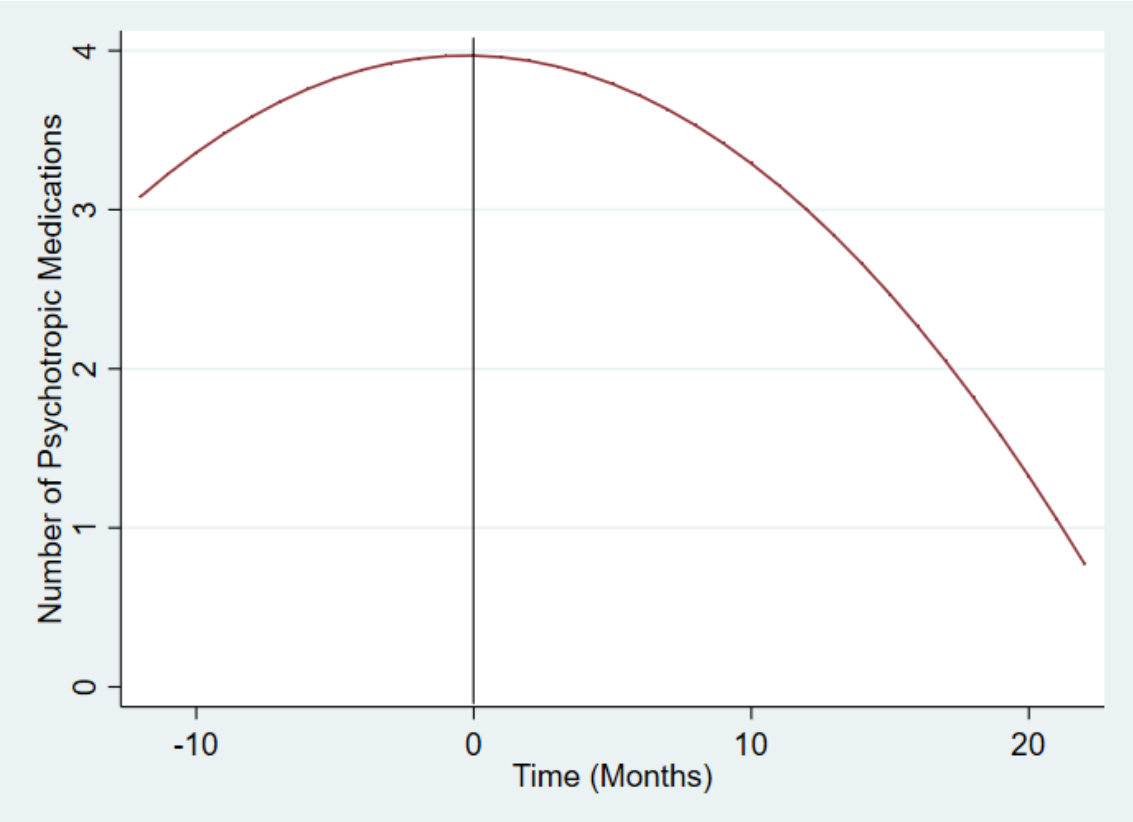
[1] The Pre-Review statistics reflect youth in the treatment group in the year prior to the medication consultation; The Post-Review reflects youth in the treatment group in the year after the medication consultation.

With respect to health outcomes, there were no significant changes (see **Table 5**). This may be due to the small numbers of youth with these health conditions, making it difficult to detect meaningful change. Alternatively, the period of observation following the intervention may not have been sufficiently long to observe improvements. Also, the available measures (i.e., a reduction in health services associated with these outcomes) are insensitive and imprecise

indicators of diabetes, hypertension, and dystonia, and serve only as proxies in the absence of information about blood glucose levels, blood pressure, and observations of symptoms.

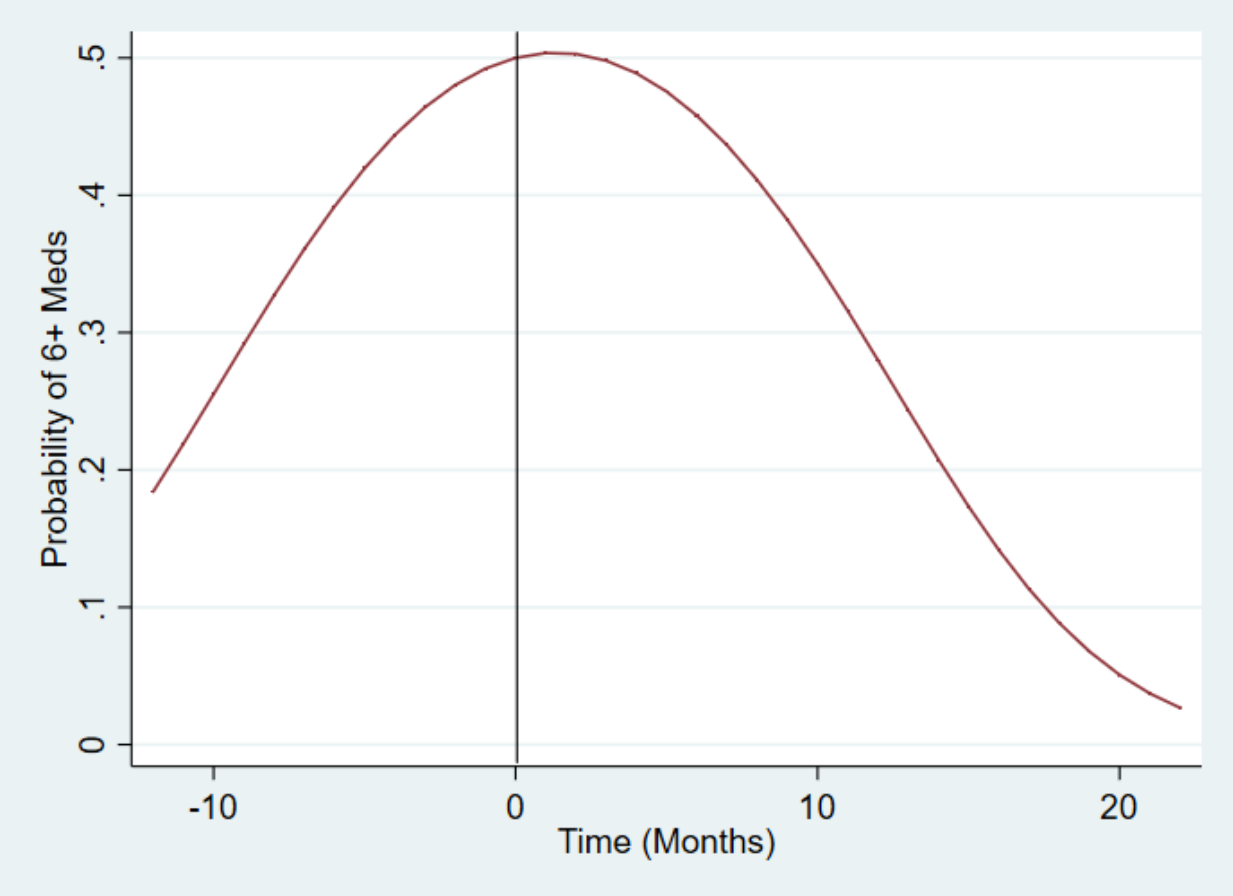
Figures 1-9 present predicted values or predicted probabilities from regression models. These depict changes in outcomes of interest over time that occurred before or after the peer-to-peer consultation intervention. We begin by examining prescribing practices. As shown in **Figure 1**, absent the intervention, the average number of unique psychotropic medications prescribed concurrently to youth flagged for review increased over time from about three prescriptions in a given month in June 2015 to four prescriptions one year later. This estimate reflects trends among youth in the treatment group before the intervention. In contrast, following the intervention, the number of concurrent prescriptions declines from four to less than one by the end of the observation period. This same prescribing practice can also be evaluated by observing the probability that a child is taking a dangerously high number of psychotropic medications. As shown in Figure 2, the probability of receiving six or more unique prescriptions concurrently increased from 0.18 to 0.50 without any intervention. Following peer-to-peer consultation, the probability dropped to 0.04. There is less than a 0.0001% probability that these patterns occurred due to chance rather than to the intervention (i.e., p<.0001).

Figure 1. Change over time in predicted number of psychotropic medications in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.0001

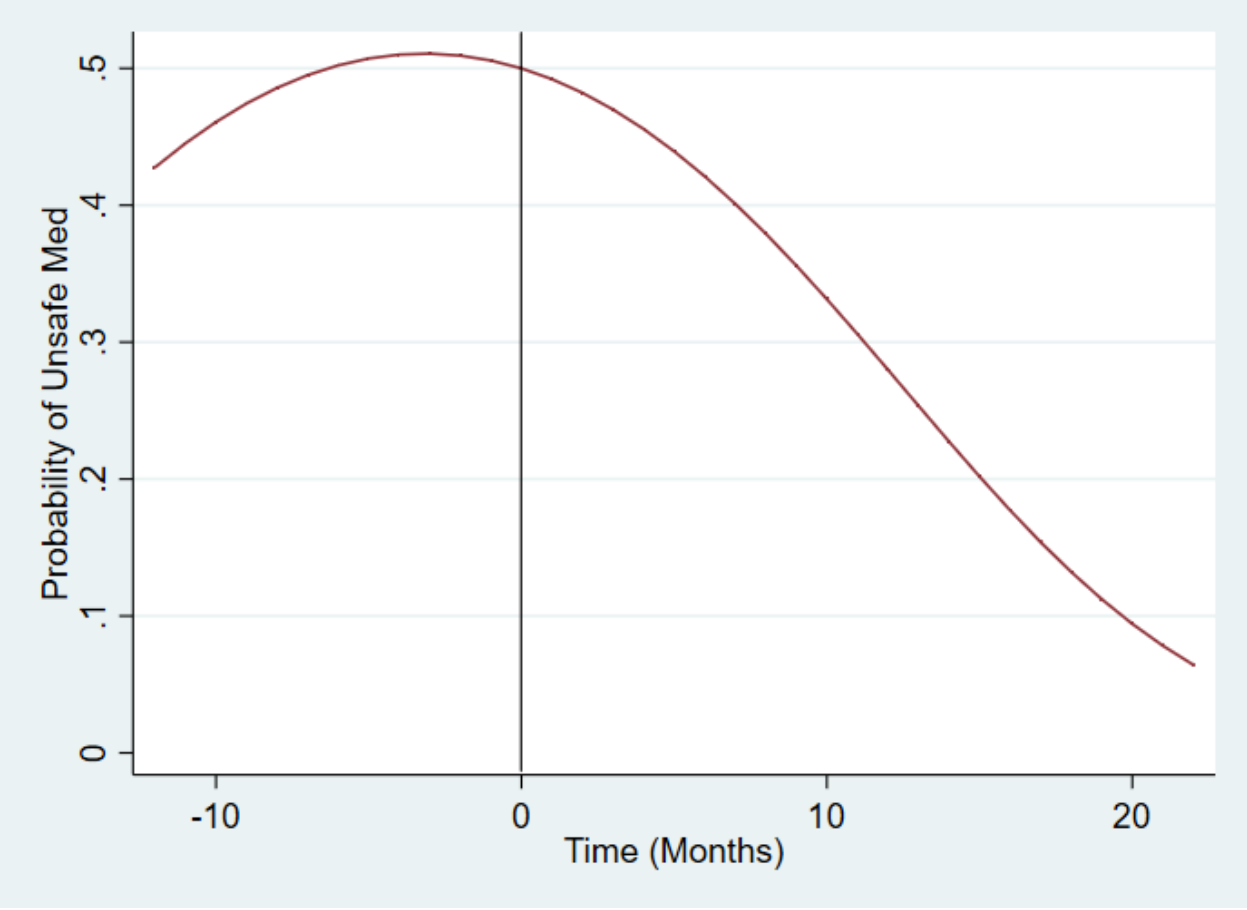
Figure 2. Change over time in predicted probability of having six or more concurrent distinct psychotropic medication prescriptions in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.0001

Figure 3 depicts change over time in the probability that a child is prescribed a medication that is not FDA-approved for use in children in a given month. Recall that these estimates focus on any youth who ever received one of these unsafe medications at any point during the observation period (N=65). Therefore, the probabilities are higher than would be expected in the sample as a whole (see Table 5). In this subsample, without intervention the probability of being prescribed an off-label medication increased from 0.43 to 0.52. However, after the intervention, the probability of taking an off-label medication fell from 0.50 to 0.07, suggesting that a majority of physicians changed their prescribing behaviors as a result of the intervention. There is less than a 0.0001 probability that these patterns occurred due to chance rather than to the intervention (i.e., p<.0001).

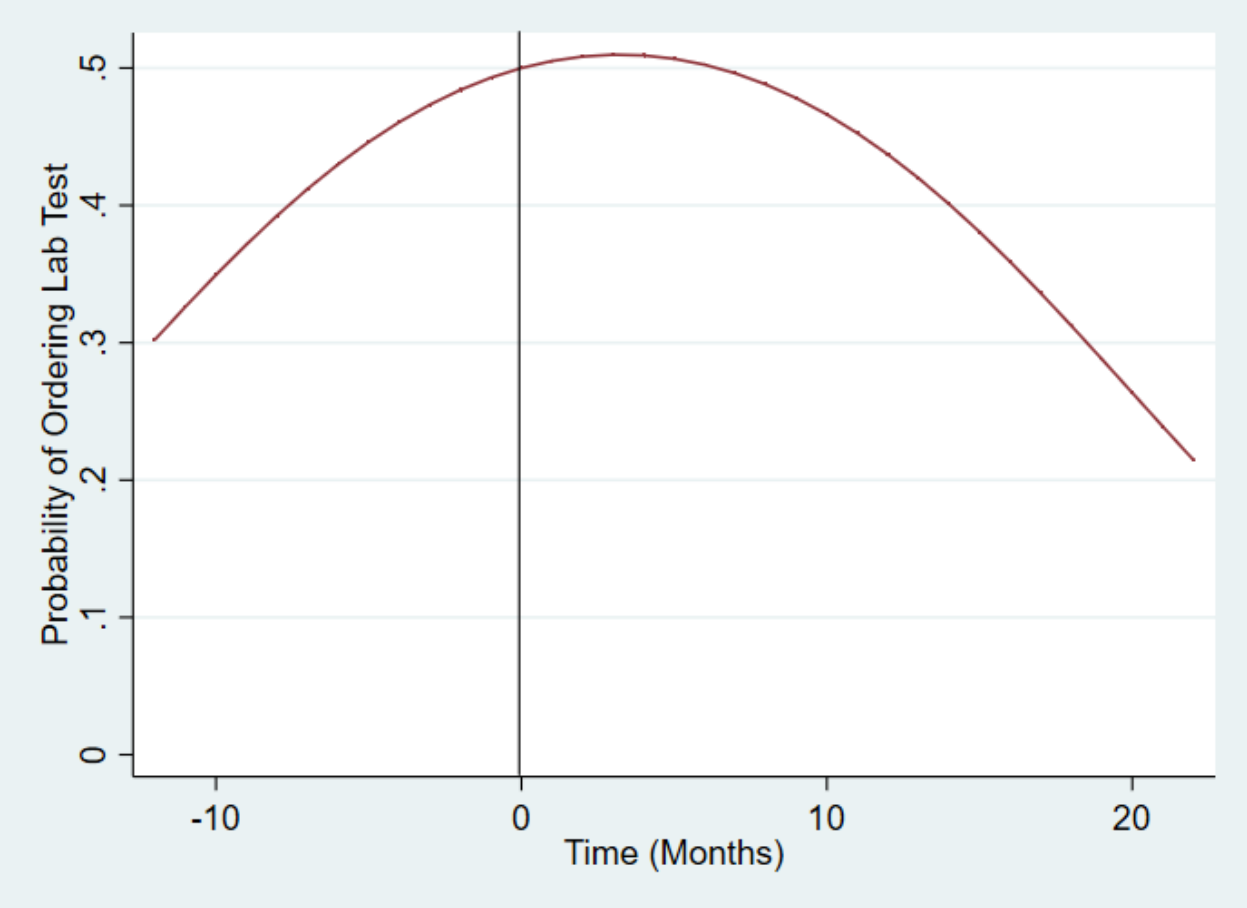
Figure 3. Change over time in predicted probability of having a prescription for a psychotropic medication that is not FDA approved for use in children in the months before and after the medication consultation intervention (p<.001)



Notes: Vertical black line is the point of intervention; p<.0001

Figure 4 presents change over time in the probability that any laboratory tests were ordered for children in the treatment group in a given month. Ordering labs to monitor the physiological effects of psychotropic medications is a behavior targeted for improvement by the consultation program. The probability that any labs were ordered in a given month increased absent any intervention. In the six-month period following the intervention, this probability remained fairly constant at about 0.50. However, the odds of ordering additional labs in the months to follow declined precipitously. It is unclear whether this pattern is a natural function of the timing of required laboratory test monitoring (i.e., normal lab tests may only be required every six months or every year), or whether additional follow up is needed by program staff to encourage appropriate monitoring behavior and to maintain it over a longer period of time.

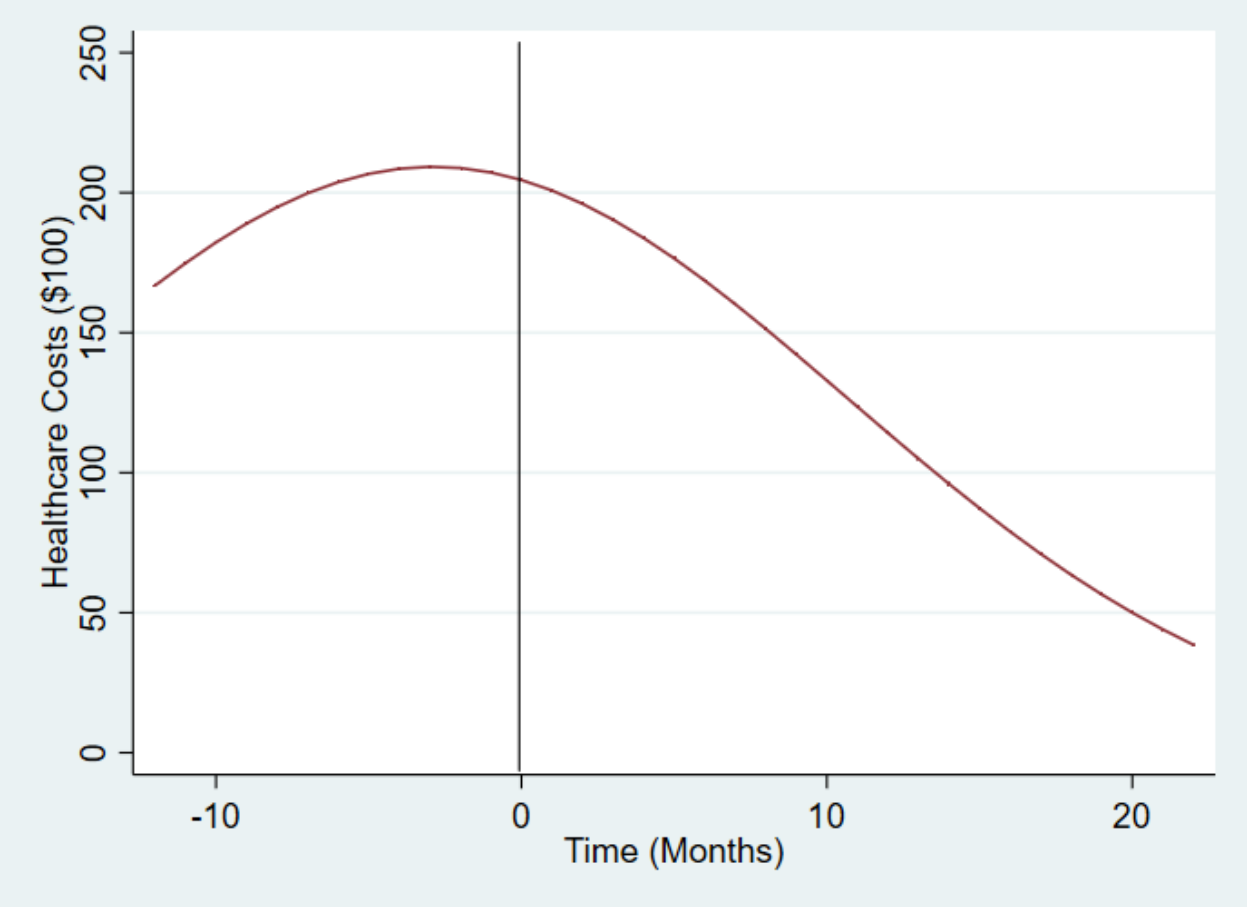
Figure 4. Change over time in predicted probability of laboratory testing in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.0001

Figures 5-7 depict change over time in measures of health services utilization. As shown in **Figure 5**, the predicted total monthly healthcare expenditures increased slightly over time absent any intervention from about $17K to $20K one year later. However, following the intervention, average monthly healthcare expenditures for children in the treatment group dropped substantially to less than $5K by the end of the observation period. There is less than a 0.0001 probability that these patterns occurred due to chance rather than to the intervention. This cost savings is likely due in large part to significant reductions in psychiatric healthcare services following the intervention, including lower medication costs and lower rates of inpatient psychiatric hospitalization.

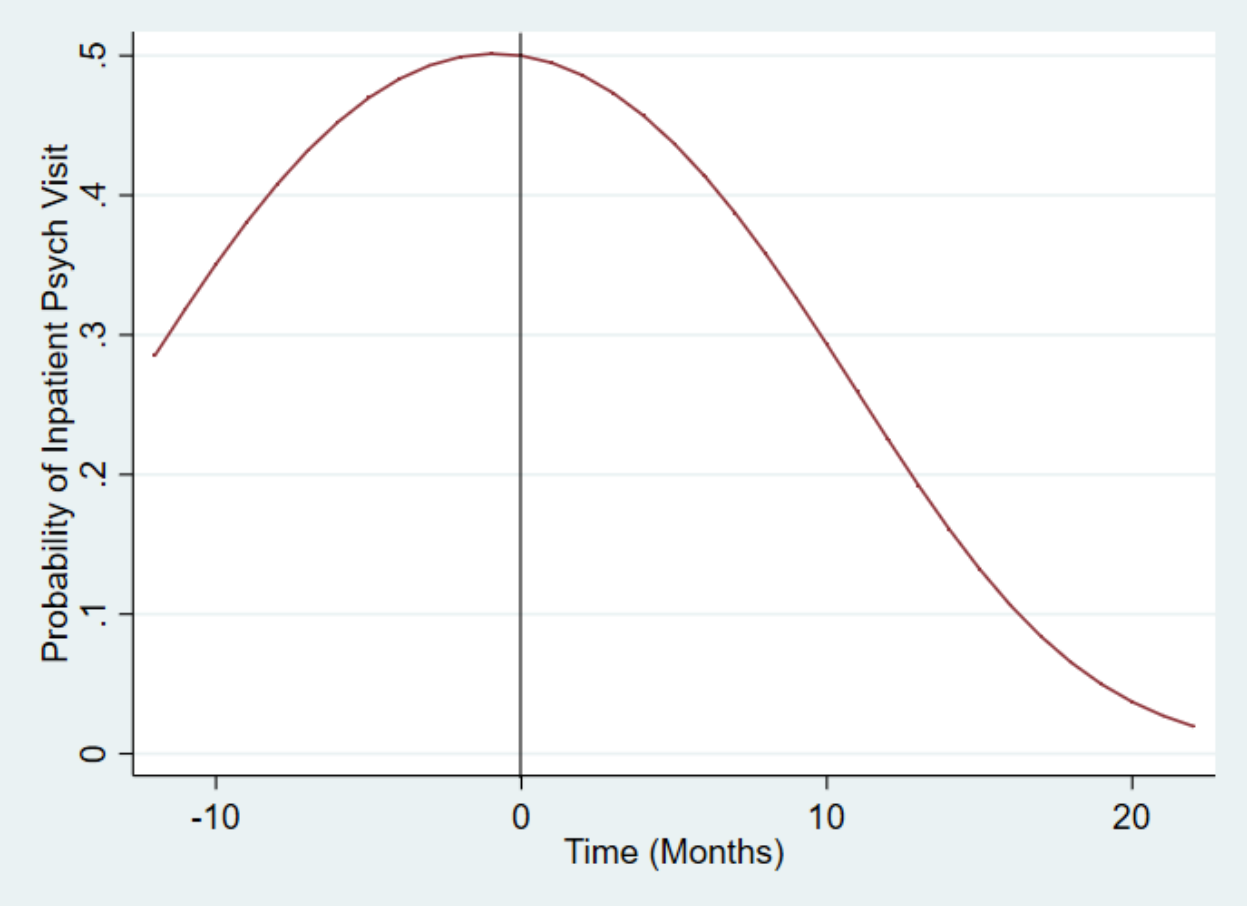
Figure 5. Change over time in predicted total monthly healthcare expenditures (in hundreds of dollars) in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.0001

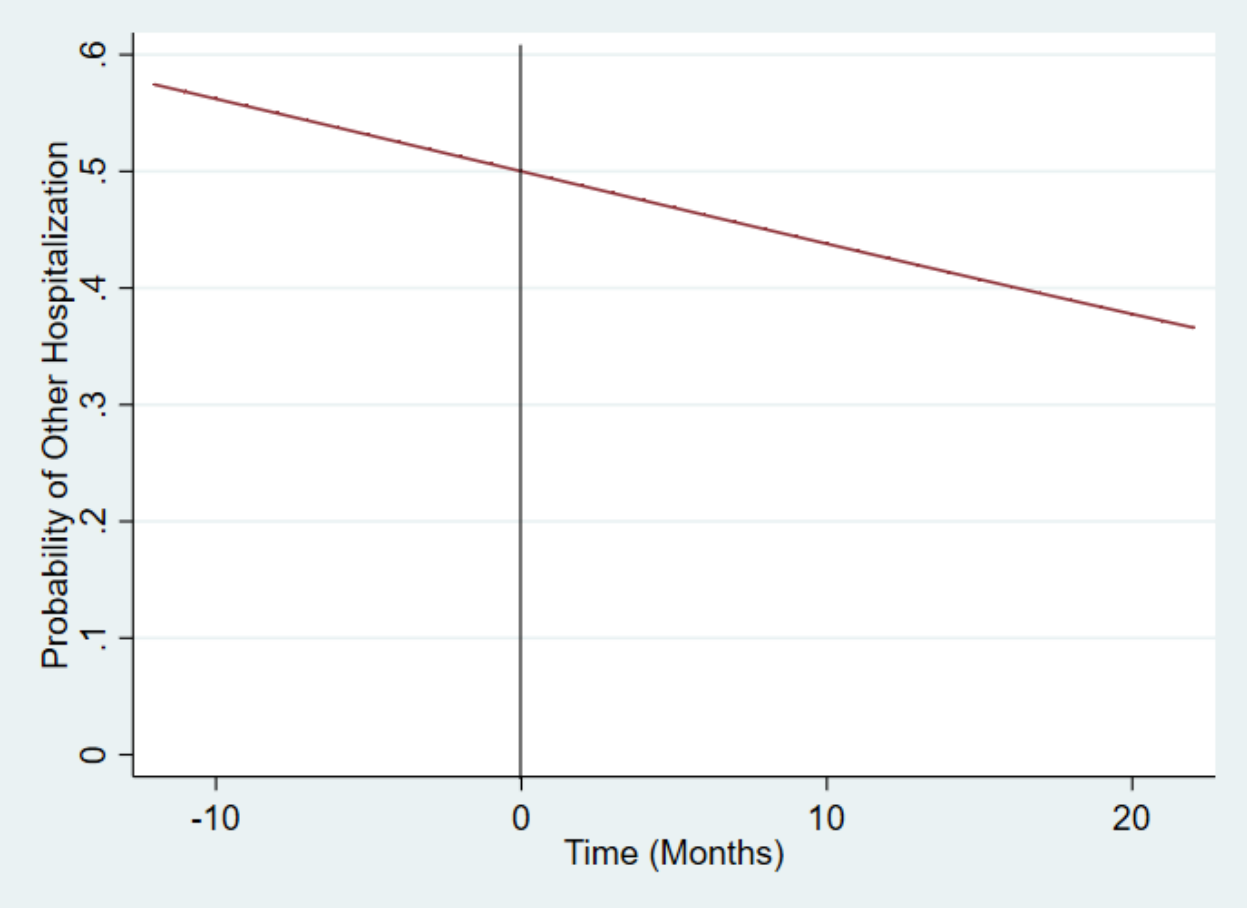
Figure 6 depicts change over time in the probability that a child was admitted to an inpatient psychiatric facility in a given month. Again, these estimates focus on any youth in the treatment group who were ever admitted to such a facility (N=87), and the probabilities are higher than would be expected in the sample as a whole (see Table 5). In this subsample with more severe psychopathology, the probability of being admitted for inpatient treatment increased from 0.30 to 0.50 in the year prior to the intervention. Following the intervention, the probability of being admitted to an inpatient psychiatric facility fell to nearly zero, suggesting that changes in medication regimens may have stabilized psychiatric symptoms and contributed to avoiding hospitalization. This result is a major success of the program. There is less than a 0.0001 probability that these patterns occurred due to chance rather than to the intervention. Additionally, as shown in **Figure 7**, other types of hospitalization (i.e., non-psychiatric) also decreased significantly after peer-to-peer consultation, though this finding is smaller in magnitude.

Figure 6. Change over time in predicted probability of an inpatient psychiatric hospitalization in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.0001

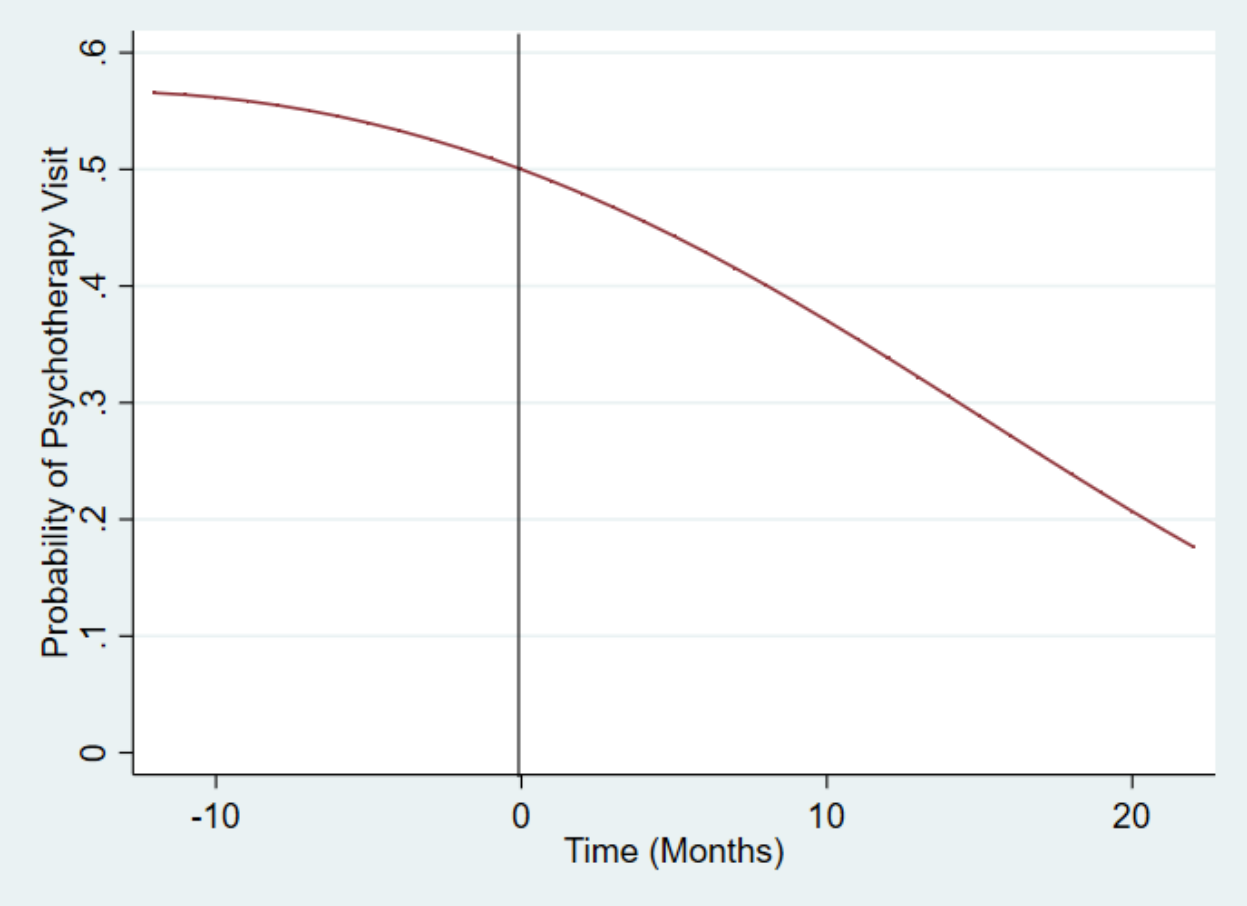
Figure 7. Change over time in predicted probability of any other hospitalization in the months before and after the medication consultation intervention



Notes: Vertical black line is the point of intervention; p<.01

Figure 8 presents change over time in the probability that a child in the treatment group received any psychotherapy or ABA services in a given month prior to and following the intervention. The probability of receiving psychotherapy was relatively stable absent any intervention. However, the probability of receiving psychotherapy declined from 0.50 to only 0.18. There is less than a 0.05 probability that these patterns occurred due to chance. The implications of this trend are unclear. On one hand, the decrease in psychotherapy may be indicative of decreasing need for psychiatric services after the medication problems have been addressed, consistent with the drop in inpatient hospitalizations. On the other hand, insufficient psychotherapy was cited as a concern in 28% of cases reviewed by program staff. A decline in such services may suggest a need to follow up with participating physicians over longer periods of time to ensure that an appropriate level of behavioral interventions is maintained.

Figure 8. Change over time in predicted probability of receiving any psychotherapy or ABA in the months before and after the medication consultation intervention



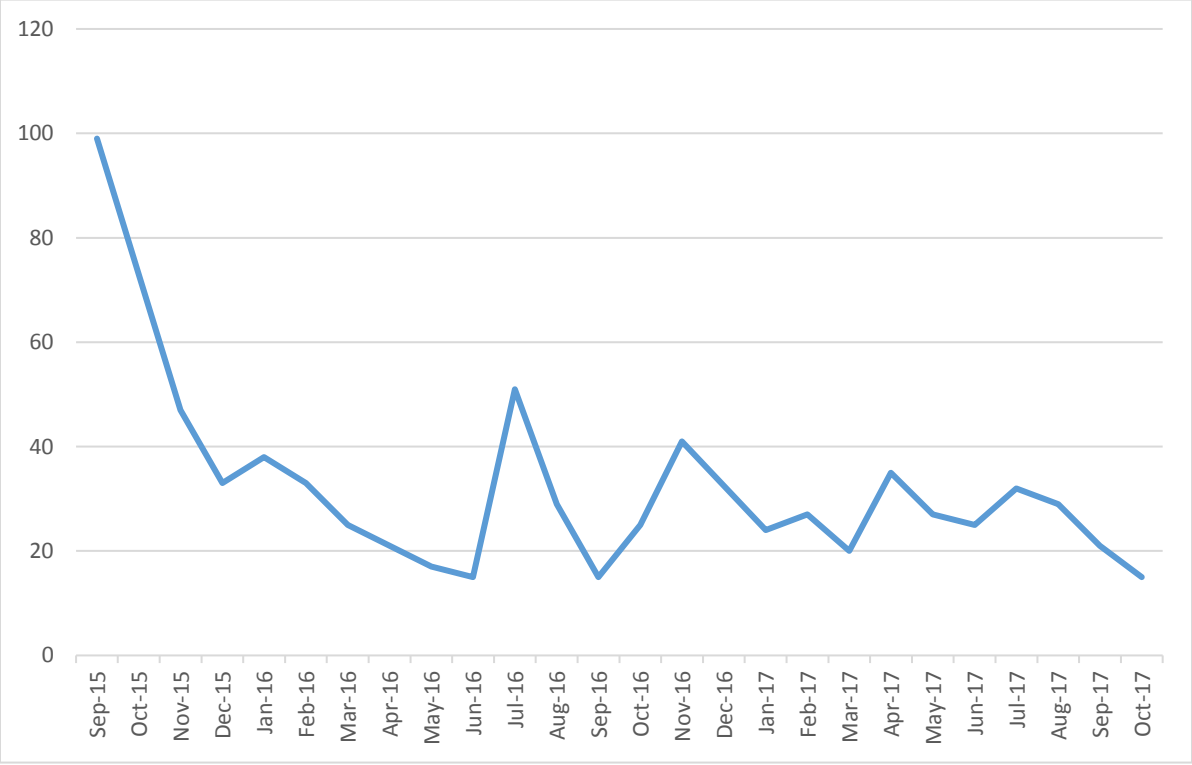
Notes: Vertical black line is the point of intervention; p<.05

Figures for changes in emergency department (ED) visits are not presented because there were no significant patterns observed. There was a small reduction in ED visits following consultation, but the effect was not statistically significant. That is, the intervention did not demonstrably reduce ED visits, perhaps because these can occur for a large variety of reasons unrelated to symptoms of psychopathology or side effects of psychotropic medications.

We do not present regression results for other health outcomes because the numbers of children affected are too small to generate reliable and meaningful estimates. However, the bivariate results (See Table 5) are promising with respect to the impact of the DCS Psychotropic Medication Program.

As a global measure of the impact of the program on youth under the care of DCS, we also tracked the number of individual cases flagged for review over the course of our observation. If participating in a peer-to-peer consultation affects future behavior and extends to patients that were not the subject of the review per se, we would expect to observe smaller numbers of youth being flagged through analysis of Medicaid data over the course of the program. As shown in **Figure 9**, the trend over time is consistent with this observation. Specifically, the number of outlier cases declined from a high of 99 in September of 2015 to a low of 15 in October of 2017. This is consistent with the broad goals of the DCS Psychotropic Consultation Program, suggesting that it may be influencing prescribing practices across physicians' caseloads, improving the safety and effectiveness of psychiatric services for the population of youth under the care of DCS as a whole.

Figure 9. Change over time in the observed number of DCS cases flagged for review



Conclusions

Findings from this independent evaluation of the Department of Child Services Psychotropic Consultation Program suggest that this intervention is highly effective. Though not all problematic prescribing behaviors were resolved following the intervention, we observed statistically and clinically significant declines in the number of medications prescribed, the probability of being prescribed six or more concurrent psychotropic medications, and the probability of being prescribed a medication not FDA-approved for children among those in the treatment group. Moreover, psychiatric health services, including admissions to inpatient psychiatric facilities, dropped meaningfully over the observation period following the intervention, resulting in substantial cost savings. While there is insufficient information at this point to make definitive conclusions about the resolution of physical health problems associated with psychotropic medications, preliminary evidence suggests that outcomes are trending toward improvement. In particular, the small number of cases of dystonia were all resolved following peer-to-peer consultation, and outcomes related to type II diabetes and hypertension were slightly better after the intervention than before, on average. Finally, the substantial reduction in the number of outlier cases flagged for review over the course of the program suggests that the intervention may be influencing prescribing practices more broadly, with benefits extending to other youth under the care of DCS that are in need of psychiatric services.