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## A Longitudinal Analysis of Concerning Psychotropic Medication Regimens Among Adolescents in Foster Care

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### A B S T R A C T

**Purpose:** To provide a population-based examination of psychotropic medication use before and after entry into foster care (FC), with special attention on the use of concerning medication regimens: polypharmacy, stimulants, and antipsychotics.

**Methods:** Using linked administrative Medicaid and child protective service data from Wisconsin, we follow a cohort of early adolescents ages 10–13 years who entered FC between June 2009 and December 2016 (N = 2,998). Descriptive statistics and Kaplan Meyer survival curves illustrate the timing of medication. Cox proportional hazard models identify hazard of outcomes (new medication, polypharmacy, antipsychotic, and stimulant medication) during FC. Separate models were run for adolescents with and without a psychotropic medication claim in the six months before FC.

**Results:** Overall 34% of the cohort entered with a pre-existing psychotropic medication, accounting for 69% of adolescents with any psychotropic medication claim during FC. Similarly, the majority of adolescents with polypharmacy, antipsychotics or stimulants during FC entered with those prescriptions. Among youth with pre-entry medication, rates of polypharmacy (56%), antipsychotic (50%) and stimulants (64%) were high. Among adolescents who entered FC with no prior medication, placement disruptions (30 days before or after) predicted new medication.

**Discussion:** Although a great deal of attention - and policies - have focused on youth in care, there is high reliance on psychotropic medications within the broader population of maltreated adolescents, indicating a need for timely and accurate re-assessment of current and past medications upon entry. Adolescents should also be actively involved in their own health care.

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### IMPLICATIONS AND CONTRIBUTION

The majority of early adolescents in foster care with a psychotropic medication prescription had a prescription prior to entry. Policies focused on reducing the overreliance on psychotropic medication, including polypharmacy, antipsychotics and stimulants, should focus on the larger population of maltreated children.

Over the past two decades, concerns have mounted about perceived overuse of psychotropic medications among children in foster care (FC), leading to federal congressional inquiries [1],

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class action lawsuits, and oversight requirements [2,3]. States continue implementing policies [4,5] that require prescriptions for children in FC to be approved or authorized by another party than the prescriber [6,7], though impacts on prescribing practices are unclear [8].

The extent, source, and nature of overprescribing is contested. Estimated rates of psychotropic medication use among children in FC range from 13%–52% [9] or 2.7–4.2 times higher than Medicaid-insured children not in FC [10]. Yet, psychotropic

medication is an evidence-based treatment for many psychiatric conditions, and children in FC have higher rates of psychiatric conditions [11] and receive more health care services overall [12,13]. Thus, disproportionate psychotropic medication use is not necessarily evidence of biased or inappropriate treatment. Indeed, because behavioral problems are a leading cause of both placement disruptions and placements in group or institutional settings [14,15], effective medication may alleviate symptoms and thereby enable stable family-based FC placements. However, use of psychotropic medication to address escalating symptoms prior to placement disruptions or to stabilize following a placement move is largely unstudied.

Notwithstanding potential benefits, federal investigations raise at least two prominent concerns about the use of psychotropic medications with children in FC. First, normative reactions—both to prior maltreatment and the difficulty of changing environments upon entering FC—may be inappropriately pathologized and medicated in lieu of behavioral treatments or enhanced training and support for foster caregivers [1,16]. Second, when medication is clinically indicated, prescribing practices may not comply with practice guidance [17]. Children in FC may be prescribed multiple psychotropic medications simultaneously [18]—polypharmacy—despite a lack of evidence on the safety and efficacy of such practices. Moreover, one study found that, of children in FC on psychotropic medication, the majority was prescribed stimulants or antipsychotics. We characterize these medication regimens (polypharmacy, antipsychotics, and stimulants) as “higher” risk due to the greater risk of potential side effects and misuse [18] compared to behavioral treatments and first-line or standalone medications. Additionally, these medication regimens have been the subject of federal monitoring and state legislation [19]. Stimulants, though considered a first-line treatment for attention-deficit hyperactivity disorder (ADHD), are of higher-concern due to abuse potential and longstanding concerns that maltreatment-related trauma symptomology is misdiagnosed as ADHD, where stimulants may be ineffective or harmful [20,21]. Conversely, given increased rates of significant mental and behavioral concerns (e.g., delinquency, suicide) among youth in FC, clinicians must weigh the benefits of prescribing such medication against the potential risks of not prescribing it.

This study examines overall psychotropic medication use and “higher-risk” regimens involving polypharmacy, stimulants, and antipsychotics before and during FC. We address two following questions: (1) What proportions of adolescents were prescribed psychotropic medications, including “higher risk” regimens (polypharmacy, stimulants, antipsychotics) before and during FC? and (2) What adolescent and case characteristics predict starting a psychotropic medication regimen during FC?

## Methods

We used data from the Wisconsin Administrative Data Core, a multisystem linked database managed by the Institute for Research on Poverty at the University of Wisconsin-Madison. The study was approved by the University’s internal review board. Primary datasets used were medical assistance (MA; Medicaid/Children’s Health Insurance Program) claims and child welfare system records. The initial cohort was all adolescents ages 10–13 years entering FC via the child welfare system (excluding delinquency or other nonmaltreatment removals) between June 2009 and December 2016, who were not in FC during the six

months preceding their current episode ( $N = 3,762$ ). Adolescents without MA coverage for the full six months prior to FC entry were excluded. The final sample was 2,998 (80% of original sample). For differences between the analyzed cohort and adolescents who were excluded, see [Appendix A](#).

## Psychotropic medication use

Medication measures were derived from the MA pharmacy file, which includes all filled prescriptions billed through MA. We classified psychotropic medications as: psychotherapeutic agents, autonomic drugs (includes many stimulants), central nervous system depressant drugs (e.g., Xanax), and sedative/hypnotics. Prescriptions were excluded if the days of supply were less than seven, indicating trial/emergency use, rather than an ongoing regimen.

Psychotropic medication was classified into four nonmutually exclusive categories: any, antipsychotics, stimulants, and polypharmacy. We used the American Hospital Formulary Service classification system to identify *antipsychotics* (atypical and other). *Stimulant medication* refers to amphetamines or other stimulants listed as Schedule II controlled substances under the Drug Enforcement Agency classification system, which includes drugs that can be legally prescribed but carry a higher risk for abuse (e.g., commonly taken to achieve a ‘high’) or dependency. *Polypharmacy* was measured conservatively, counting only situations where two or more prescriptions were filled on the same day. We did not count as polypharmacy all scenarios in which medications had overlapping supply lengths (e.g., two 30-day prescriptions filled a week apart) because we cannot be certain that concurrent use was intended (e.g., an adolescent may have discontinued the first prescription without using the full supply). For antipsychotics, stimulants, and polypharmacy we created indicators of whether the adolescent had that medication regimen within the six months preceding FC entry and indicators of if/when that regimen began during FC. *Pre-entry medication use* was equal to one if they had a qualifying prescription filled within the six months preceding FC entry. During FC, *new psychotropic medication* indicated each day that a prescription was filled for a medication that the adolescent was not previously prescribed.

## Child social history and demographics

Demographic variables were race/ethnicity, sex, age, year at current FC entry, and receipt of Supplemental Security Income (indicator of disability for children in low-income families) prior to FC entry. For the five-year span preceding the current FC entry, the number and types of Child Protective Services (CPS) investigations that the adolescent experienced were included. Given the small proportion of adolescents without neglect allegations and a high correlation between multiple CPS contacts and multiple types of alleged maltreatment, we coded the following mutually exclusive groups: (1) single or no CPS investigation (any type); (2) 2+ investigations: neglect only; (3) 2+ investigations: physical abuse (alone or in combination with neglect); (4) 2+ investigations: sexual abuse (alone or in combination with neglect); and (5) 2+ investigations: physical and sexual abuse (alone or in combination with neglect). This categorization is consistent with research evidence on the importance of both multiple types [22] and repeated incidents [23] of maltreatment. Psychiatric diagnoses received in the six months

**Table 1**

Demographic and Case Characteristics; Adolescents entering foster care at ages 10–14 years

	Full sample	No pre-entry psychotropic medication	Pre-entry psychotropic medication
	N = 2,998	n = 1,967	n = 1031
	Column pct.	Row pct.	Row pct.
<b>Race and ethnicity</b>			
White (alone)	41.19	57.09	42.91
Black (alone)	26.55	75.13	24.87
American Indian (alone)	3.24	77.32	22.68
Asian or Pacific Islander (alone)	1.00	90.00	10.00
Multiple races non-Hispanic	12.51	62.13	37.87
Hispanic (any race)	15.51	70.75	29.25
<b>Sex</b>			
Female	50.65	72.86	27.14
Male	49.35	58.15	41.85
<b>Age at current removal</b>			
10	27.79	67.47	32.53
11	22.98	68.07	31.93
12	24.78	66.22	33.78
13	24.45	60.57	39.43
<b>Received SSI as child</b>			
No	81.69	71.01	28.99
Yes	18.31	41.53	58.47
<b>Foster care placement at entry</b>			
Nonrelative	38.16	65.38	34.62
Kin	39.36	76.27	23.73
Group home	1.93	46.55	53.45
Residential	4.34	14.62	85.38
Temporary	16.21	56.17	43.83
<b>Maltreatment history in past 5 years</b>			
No or single investigation	23.15	71.18	28.82
Neglect only	20.01	77.17	22.83
Physical abuse	27.32	62.03	37.97
Sexual abuse	8.57	68.87	31.13
Physical and sexual abuse	20.95	51.75	48.25
<b>Prior removal episodes</b>			
No	75.12	68.38	31.62
Yes	24.88	57.24	42.76
<b>Pre-entry internalizing diagnosis</b>			
No	74.15	78.36	21.64
Yes	25.85	29.03	70.97
<b>Pre-entry externalizing diagnosis</b>			
No	68.95	86.84	13.16
Yes	31.05	18.47	81.53

preceding FC entry were categorized as either internalizing or externalizing (see [Appendix B](#)).

Within FC, we measured adolescent's initial placement type (kin, nonrelative, group home, residential, or temporary) and previous FC removals. Time-variant constructs were running counts of FC placements and placement moves within the past or upcoming 30 days. Placement moves were categorized as (1) disruptions—moves suggestive of problems with their preceding placement (e.g., at caregiver request, adolescent behavior problems, need for a more restrictive setting) – and (2) other moves, which may occur for policy-motivated reasons (e.g., to reunite siblings; to a less restrictive environment).

#### Analytic approach

Frequencies and proportions describe adolescents' psychotropic medications before and during FC. Survival analysis is used

to model the timing and predictors of new medication regimens (any new medication, polypharmacy, antipsychotic, and stimulant medication). The time for survival estimates begins when children enter care and ends at the earliest of the following: FC exit date, 18th birthday, or three years postentry, with the exception of the 'new medication outcome' time which ends at the outcome ("failure") event. Different lengths of observation make survival analysis the appropriate method. Kaplan-Meier survival curves illustrate the population that has not yet experienced a new medication regimen but remains in FC over the three-year observation period. We then use Cox proportional hazard models to assess associations between covariates and medication regimen onset. Proportionality assumptions were tested using *estat phtest, detail*. Covariates violating the assumption ( $p < .05$ ) were modeled as time-dependent. Both survival curves and cox models were subgrouped by pre-entry medication status.

#### Results

##### Sample description by prior medication use

**Table 1** shows sample characteristics for the overall cohort and by pre-entry psychotropic medication status. Prior psychotropic medication was more common among White adolescents (43%) than Black (25%), Asian/Pacific Islander (10%), or Hispanic (29%) adolescents and males (42% vs. 27%). Older adolescents were more likely to enter with prior psychotropic medication. Half of adolescents (53%) entering a group home and 85% of adolescents entering a residential facility entered with prior psychotropic medication. Adolescents who entered care with an internalizing or externalizing diagnosis had high rates of pre-removal medications (71% and 82%, respectively).

**Psychotropic medication prior to and during foster care.** **Table 2** depicts the overall rates of psychotropic medication before and during FC. During FC, 42% of adolescents were prescribed any medication, 23% experienced polypharmacy, 21% were prescribed an antipsychotic, and 27% were prescribed a stimulant. Overall, 34% of adolescents had a psychotropic medication claim in the six months before FC entry, accounting for 69% of adolescents on medication during FC. A majority of adolescents who experienced each psychotropic medication regimen in FC had experienced that regimen in the six months preceding FC. The percentage of adolescents starting medication in FC (no incoming medication use) was 13% or 31% of all adolescents on medication during FC. Similarly, overall initiation rates for polypharmacy, antipsychotics, and stimulants in FC were 10%, 7%, and 8%, respectively, or 25%, 17%, and 20% of all adolescents on medication during FC. A majority of higher concern regimens initiated prior to FC continued during FC.

**Survival models.** **Figure 1** depicts Kaplan-Meier survival curves for each outcome, stratified by whether the adolescent was on medication before entry. Graphs for polypharmacy, antipsychotics and stimulants are limited to the subsample of adolescents who were not experiencing that type of medication regimen preceding FC entry. The graphs indicate that, for adolescents entering FC already on/recently prescribed medication, changes to or increased intensity of medication regimens occur at higher rates and more quickly than for adolescents without a pre-FC medication.

**Table 2**

Percentage of full cohort and medication subgroup who had a prescription psychotropic medication before and during foster care episode

	Full cohort (N = 2,998)	Subsample with any psychotropic medication during FC (N = 1,259)
<b>Any psychotropic medication prescription</b>		
Ever during foster care episode	42.0%	100.0%
Before FC entry	34.4%	69.3%
During foster care but not pre-entry	12.9%	30.7%
<b>Polypharmacy</b>		
Ever during foster care episode	23.4%	55.8%
Before FC entry	17.8%	37.6%
During foster care but not pre-entry	10.3%	24.5%
<b>Antipsychotic</b>		
Ever during foster care episode	18.7%	44.4%
Before FC entry	14.7%	31.5%
During foster care but not pre-entry	6.5%	15.5%
<b>Stimulant (Schedule II)</b>		
Ever during foster care episode	26.7%	63.6%
Before FC entry	24.0%	48.1%
During foster care but not pre-entry	8.3%	19.7%

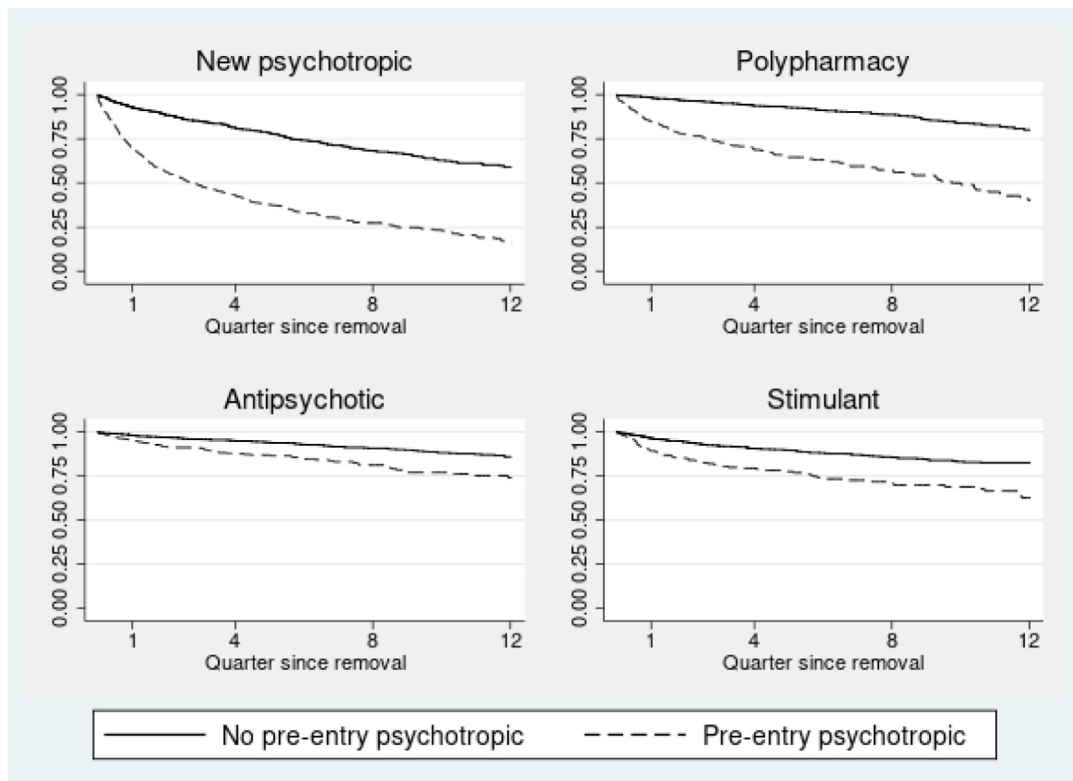
FC = Foster care.

Table 3 presents the results of the Cox proportional hazards models. Coefficients are reported as hazard ratios (HRs) with corresponding 95% confidence intervals (CIs). Among adolescents with no pre-entry psychotropic medication, a history of sexual abuse (HR = 1.17; 95% CI = 1.09, 1.27), initial residential

placement (HR = 3.53; 95% CI = 2.40, 5.20) or temporary care (HR = 1.32; 95% CI = 1.09, 1.61), and a greater number of prior placements (HR = 1.11; 95% CI = 1.08, 1.15) were positively associated with new medication. Adolescents with a past 30 days placement disruption (HR = 1.78; 95% CI = 1.38, 2.31) or upcoming (next 30 days) placement disruption (HR = 1.59; 95% CI = 1.21, 2.10) were also at increased risk of starting medication.

Among adolescents with a pre-entry psychotropic medication, only a pre-entry externalizing diagnosis (HR = 1.20; 95% CI = 1.04, 1.38) and multiple racial identities (HR = 0.81; 95% CI = 0.68, 0.97) were associated with change in medication. There were no differences by initial placement setting, maltreatment history, number of placement changes, or recent placement change.

Table 4 includes results of analytic models for risk of polypharmacy, antipsychotic, and stimulant medication during FC. Among adolescents with no pre-entry psychotropic medication, trends were largely consistent with model 1, with those in residential or temporary placements, adolescents with a history of sexual abuse, and adolescents with a past or next 30 days placement disruption at increased risk of polypharmacy, antipsychotic use and stimulant medications during FC. Risk factors for polypharmacy, antipsychotic, and stimulant medication during FC differed from risks for starting a new medication among adolescents who entered FC with psychotropic medication, adolescents with a history of physical and sexual abuse, those with an externalizing diagnosis, and past and upcoming



**Figure 1.** Kaplan Meier Survival Curves: Onset of Psychotropic Medication Regimens During Foster Care by Pre-Entry Medication Status. Graph 1. Full sample: N = 2,998; 931 failures. Graph 2. Adolescents without past 6 months polypharmacy: n = 2,465; 309 failures. Graph 3. Adolescents without past 6 months antipsychotic med: n = 2,558; 195 failures. Graph 4. Adolescents without past 6 months stimulant med: n = 2,278; 248 failures.

**Table 3**  
Risk of starting a new psychotropic medication during foster care, by pre-entry psychotropic medication history

	Panel A: No pre-entry psychotropic medication		Panel B: Pre-entry psychotropic medication	
	HR	95% CI	HR	95% CI
<b>Demographic</b>				
Race and ethnicity (reference = White alone)				
Black (alone)	0.74**	[0.61-0.89]	0.93	[0.80-1.08]
American Indian (alone)	1.90***	[1.45-2.49]	1.07	[0.76-1.51]
Asian or Pacific Islander (alone)	0.80	[0.43-1.48]	0.44	[0.11-1.77]
Multiple races non-Hispanic	0.84	[0.66-1.08]	0.81*	[0.68-0.97]
Hispanic (any race)	0.88	[0.71-1.10]	0.98	[0.82-1.16]
Sex (reference = female)				
Male	1.24**	[1.07-1.43]	0.98	[0.87-1.11]
Age at current removal	1.19***	[1.11-1.27]	0.99	[0.94-1.04]
Received SSI as child	1.39*	[1.01-1.90]	1.00	[0.88-1.13]
<b>Time invariant covariates</b>				
Foster care placement at entry (reference = nonrelative family)				
Kin	0.76**	[0.64-0.90]	0.91	[0.78-1.06]
Group home	0.81	[0.48-1.37]	1.28	[0.96-1.70]
Residential	3.53***	[2.40-5.20]	1.11	[0.93-1.34]
Temporary	1.32**	[1.09-1.61]	1.04	[0.88-1.22]
CPS history in past 5 years (reference = No or single investigation)				
Neglect only	0.57*	[0.38-0.88]	0.83	[0.65-1.05]
Physical abuse	1.01	[0.72-1.43]	0.97	[0.81-1.16]
Sexual abuse	0.80	[0.51-1.26]	1.14	[0.91-1.44]
Physical and sexual abuse	1.92***	[1.36-2.69]	1.10	[0.92-1.30]
Prior removals				
Pre-entry internalizing diagnosis	0.76**	[0.63-0.92]	0.95	[0.82-1.08]
Pre-entry externalizing diagnosis	1.22	[1.00-1.48]	1.05	[0.92-1.19]
Pre-entry polypharmacy			1.20*	[1.04-1.38]
Pre-entry high abuse potential medication			1.05	[0.92-1.20]
Pre-entry high side effect medication			1.04	[0.91-1.20]
			1.10	[0.95-1.27]
<b>Time varying covariates</b>				
Number of prior placements (running total)	1.11***	[1.08-1.15]	1.01	[0.98-1.04]
Past 30 days other move	1.05	[0.82-1.33]	1.17	[0.96-1.41]
Past 30 days placement disruption	1.78***	[1.38-2.31]	1.26	[0.99-1.60]
Next 30 days placement disruption	1.59***	[1.21-2.10]	1.15	[0.89-1.48]
<b>Interactions with time</b>				
CPS history in past 5 years (reference = No or single investigation)				
Neglect only	1.08	[1.00-1.17]		-
Physical abuse	1.07	[1.00-1.14]		-
Sexual abuse	1.17***	[1.09-1.27]		-
Physical and sexual abuse	1.00	[0.94-1.07]		-
Received SSI as child	0.92**	[0.86-0.97]		-
Children	1,968		1,031	
Failures (multiple per subject)	846		1,324	
Child-day observations	889,824		505,980	

CPS = Child protective services; \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$ .

30-day disruptions were associated with increased risk of a more concerning psychotropic medication regimen.

## Discussion

This study sought to characterize the use of psychotropic medications among adolescents in FC and how it diverges from the medication regimens of adolescents before they entered FC. We also describe how adolescent characteristics and placement experiences are associated with medication changes. We highlight four key findings.

First, although (43%) of adolescents had a psychotropic medication during FC, more than two-thirds were already on medication before entering FC. Similarly, substantial proportions of adolescents entering FC had already been prescribed multiple medications (polypharmacy), antipsychotics, and stimulant medications. Those who entered without prior medication (13%)

and were given a new prescription upon entry were more likely to be on a single, less “risky” medication. Medical professionals appear highly likely to continue medication as a treatment approach for adolescents who enter FC on medication but less likely to initiate new medication. Prior research has also shown that medication use is similar for noninstitutionalized children in FC and children remaining in-home following suspected maltreatment [19]. Yet, federal oversight continues to focus only on children in FC. If reducing the use of “riskier” regimens of psychotropic medication among adolescents in FC is to remain a goal of federal oversight, then policies and best practice guidelines [24] must also address the continued necessity of medications that adolescents were prescribed prior to FC.

Second, although the onset of psychotropic medication use frequently precedes FC placement, overall rates of stimulant and antipsychotic medications are strikingly high. Wisconsin has an unusually high rate of ADHD diagnosis [25] (especially for

**Table 4**  
Risk of polypharmacy, antipsychotic, and stimulant prescription during foster care, by pre-entry psychotropic medication history

	Postentry polypharmacy				Postentry stimulant medication				Postentry antipsychotic medication			
	Panel A. No pre-entry psychotropic medication.		Panel B. Pre-entry psychotropic medication.		Panel A. No pre-entry psychotropic medication.		Panel B. Pre-entry psychotropic medication.		Panel A. No pre-entry psychotropic medication.		Panel B. Pre-entry psychotropic medication.	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
<b>Demographic</b>												
Race and ethnicity (reference = white alone)												
Black (alone)	0.95	[0.61-1.50]	0.49**	[0.30-0.81]	1.11	[0.75-1.65]	1.06	[0.52-2.15]	1.10	[0.66-1.82]	1.01	[0.52-1.97]
American Indian (alone)	1.57	[0.76-3.24]	0.76	[0.26-2.20]	2.26*	[1.18-4.33]	0.91	[0.11-7.34]	1.57	[0.66-3.75]	1.34	[0.44-4.10]
Asian/Pacific Islander (alone)	0.33	[0.04-2.50]	0.00	[0.00-0.00]	0.75	[0.18-3.14]	0	[0.00-0.00]	0.50	[0.07-3.81]	0.00	[0.00-0.00]
Multiple races non-Hispanic	0.89	[0.49-1.61]	0.67	[0.40-1.13]	1.03	[0.60-1.77]	0.75	[0.34-1.65]	0.64	[0.30-1.34]	0.48	[0.22-1.06]
Hispanic (any race)	0.93	[0.53-1.64]	0.74	[0.45-1.21]	0.99	[0.61-1.63]	1.07	[0.49-2.34]	1.16	[0.61-2.20]	0.65	[0.29-1.44]
Sex (reference = female)												
Male	1.50	[0.85-2.63]	0.99	[0.69-1.40]	2.27***	[1.42-3.62]	0.97	[0.56-1.70]	3.28***	[1.77-6.08]	0.99	[0.58-1.68]
Age at current removal												
Received SSI as child	1.14	[0.97-1.33]	1.00	[0.87-1.14]	1.07	[0.93-1.23]	0.99	[0.79-1.24]	1.02	[0.85-1.23]	0.95	[0.77-1.18]
Time invariant covariates												
Foster care placement at entry (reference = nonrelative family)												
Kin	0.87	[0.58-1.32]	0.65	[0.42-1.00]	0.60**	[0.41-0.87]	0.98	[0.45-2.13]	0.75	[0.45-1.23]	0.87	[0.48-1.58]
Group home	0.90	[0.27-3.02]	1.73	[0.51-5.87]	0.22	[0.03-1.59]	0.70	[0.19-2.52]	1.35	[0.39-4.70]	0.67	[0.08-5.71]
Residential	7.67***	[3.32-17.74]	2.73***	[1.54-4.85]	3.25**	[1.47-7.17]	0.98	[0.47-2.05]	7.27***	[3.07-17.18]	2.06	[0.83-5.08]
Temporary	1.78*	[1.13-2.81]	1.50	[0.93-2.41]	1.63*	[1.07-2.46]	0.95	[0.47-1.93]	1.97*	[1.18-3.30]	1.39	[0.71-2.73]
CPS history in past 5 years (reference = no or single investigation)												
Neglect only	0.22*	[0.07-0.78]	1.05	[0.56-1.97]	0.83	[0.38-1.82]	1.42	[0.43-4.70]	0.24*	[0.06-0.93]	0.64	[0.23-1.74]
Physical abuse	1.05	[0.47-2.38]	1.30	[0.76-2.22]	1.34	[0.69-2.60]	0.82	[0.38-1.81]	0.59	[0.25-1.42]	0.97	[0.43-2.19]
Sexual abuse	0.83	[0.28-2.47]	0.93	[0.44-1.99]	1.03	[0.40-2.67]	1.13	[0.42-3.03]	0.71	[0.22-2.27]	2.06	[0.87-4.92]
Physical and sexual abuse	1.92	[0.85-4.33]	1.84*	[1.12-3.04]	2.27*	[1.12-4.60]	1.08	[0.51-2.27]	2.15	[0.95-4.88]	1.39	[0.65-2.99]
Prior removals	1.52	[0.79-2.95]	1.56*	[1.06-2.28]	2.40**	[1.32-4.37]	2.59**	[1.35-4.98]	2.15*	[1.10-4.19]	1.46	[0.80-2.67]
Pre-entry internalizing diagnosis	1.39	[0.89-2.16]	0.89	[0.62-1.30]	1.01	[0.63-1.62]	0.86	[0.46-1.62]	1.39	[0.84-2.30]	1.42	[0.84-2.41]
Pre-entry externalizing diagnosis	1.52	[0.79-2.95]	1.56*	[1.06-2.28]	2.40**	[1.32-4.37]	2.59**	[1.35-4.98]	2.15*	[1.10-4.19]	1.46	[0.80-2.67]
Time varying covariates												
Number of prior placements	1.12**	[1.04-1.21]	1.10	[0.99-1.21]	1.13**	[1.04-1.23]	1.14	[1.00-1.30]	1.17***	[1.07-1.28]	1.06	[0.93-1.21]
Past 30 days other move	1.82*	[1.11-2.99]	1.56	[0.93-2.61]	0.72	[0.41-1.27]	0.92	[0.41-2.07]	1.96*	[1.17-3.26]	1.68	[0.83-3.41]
Past 30 days placement disruption	2.58***	[1.51-4.41]	1.42	[0.70-2.90]	2.42**	[1.42-4.10]	1.65	[0.65-4.16]	3.43***	[1.99-5.89]	2.43*	[1.10-5.40]
Next 30 days placement disruption	1.86*	[1.01-3.42]	2.07*	[1.09-3.92]	1.89*	[1.06-3.38]	1.51	[0.57-3.96]	3.11***	[1.78-5.42]	3.23**	[1.54-6.74]
Interactions with analysis time												
Pre-entry externalizing diagnosis	0.99	[0.96-1.03]	-	-	0.92*	[0.86-0.98]	-	-	0.95	[0.91-1.00]	-	-
CPS history in past 5 years (reference = no or single investigation)												
Neglect only	1.09*	[1.01-1.17]	-	-	1.02	[0.96-1.09]	-	-	1.05	[0.95-1.16]	-	-
Physical abuse	1.03	[0.98-1.10]	-	-	1.02	[0.96-1.08]	-	-	1.06	[0.99-1.14]	-	-
Sexual abuse	1.08*	[1.01-1.15]	-	-	1.03	[0.96-1.11]	-	-	1.09*	[1.01-1.17]	-	-
Physical and sexual abuse	1.03	[0.97-1.09]	-	-	0.98	[0.92-1.04]	-	-	1.00	[0.94-1.08]	-	-
Sex (reference = female)												
Male	0.99	[0.95-1.02]	-	-	1.00	[0.96-1.04]	-	-	0.93**	[0.89-0.97]	-	-
Children	1,967		498		1,967		311		1,967		591	
Failures (single)	151		158		179		69		119		76	
Child-day observations	822,383		164,493		799,474		130,785		831,898		239,819	

CI = confidence intervals; HR = hazard ratio; CPS = Child protective services; \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$ .

adolescents in FC) [26], for which the first-line treatment is stimulant medication. Moreover, ADHD is often treated with stimulants alone—without concurrent behavioral treatments [27]—which is likely inadequate for children who are misdiagnosed with ADHD or have significant trauma-related comorbidities. For children with CPS and FC involvement, medical professionals should carefully assess whether symptoms consistent with ADHD are better explained by trauma or another MH condition [24]. It is noteworthy that nearly one in four adolescents in this cohort were on a Schedule II medication before entering FC and an additional 8% started one during FC. Similarly, 18% of children were prescribed an antipsychotic during FC, which can carry long term physical health consequences such as weight gain and adverse neurological effects, and can leave users fatigued or disoriented [28,29]. High usage of antipsychotics may suggest that children with CPS involvement are less responsive to first-line medications. Indeed, some research suggests lower efficacy of SSRIs in patients with child abuse exposure, potentially indicative of a different biological process underlying symptom expression [30].

Third, for adolescents who were on medication pre-FC entry, changes in medication were common. Adolescents coming into FC on medication are likely to have more significant mental and behavioral health concerns, and given the high rate of medication changes, moves toward polypharmacy, and more intensive medications, their health care providers seem to face difficulty in finding an effective regimen for their symptoms. Despite a wide array of behavioral interventions for adolescents with maltreatment histories [30–32], these may be difficult to implement in the context of residential instability and unsafe or unsupportive caregivers in adolescents' families of origin or foster home environments. Nevertheless, the frequent changes in medication raise questions about the efficacy of common medication regimens for children in FC.

Lastly, medication changes were more common near placement disruptions, suggesting that medication may be introduced or modified to prevent the need for a more restrictive placement or to maintain the current FC placement. Medications may also be changed after a placement disruption in order to stabilize adolescents and avoid additional disruptions. It is also possible that prescribers are reluctant to remove or reduce a previously prescribed medication for fear of continued or escalating externalizing behaviors, which may contribute to the increase in polypharmacy post FC entry. Additionally, youth may feel pressured to agree to medication in such circumstances [33], and foster parents may be unsure how to weigh risks posed by medication in the face of more extreme MH problems, especially self-harm or violence. It is essential that prescribers are aware of these external pressures and ensure that the risks and benefits are fully presented. Further, more intensive outpatient behavioral and cognitive treatments for adolescents, as well as evidence-based behavior management and de-escalation training for foster parents, are difficult to obtain and may serve to encourage reliance on medication to manage behavior.

### Limitations

Claims records are limited in detail and it is not possible to assess the efficacy of medication, ascertain receipt of therapeutic services that could reduce the need, or enhance the effectiveness of medication, or determine if medication prescriptions were an

appropriate response to the presenting symptoms. Additionally, we do not have medical records prior to 2009, and therefore cannot ascertain what proportion of medication was initiated during a previous placement episode. Further, the adolescents in this study were covered by MA. Due to low reimbursement rates and high administrative burden, only 35% of psychiatrists accept MA [34]. Those who do accept MA may have waitlists and be unable to dedicate significant time to understanding the complex needs and experiences of adolescents in (or likely to enter) FC. Thus, the quality of health care received may be adversely affected by the current shortage of qualified child psychiatry providers. Placement moves can cause discontinuity in psychiatric care, whereby a child's medical history—including previous medications or treatments received—is not transferred in a timely manner. Future research is needed to assess the role of provider discontinuity on medication use and effectiveness. Additionally, the findings in this study may not generalize to other states, where medication use varies widely. Further research is needed to determine if Wisconsin considerably varies from the national average. Lastly, 20% of the kids who entered care during this time frame were not consistently using MA in the six months preceding entry. These children tended to be more advantaged (less Supplemental Security Income and less CPS history) but older at entry and less likely to be on medications, which may have led to an overestimation of children entering care on medication.

### Implications

As states continue to examine the use of medication for adolescents in FC, our analyses lead to the following considerations. First, if states seek to reduce psychotropic medication among youth in FC, policies exclusively targeting adolescents who are already in FC may be insufficient given high rates of pre-entry medication use. For example, 27% of adolescents were taking a Schedule II controlled substance—typically stimulants used to treat ADHD—in the six months before entering FC. Studies indicate that ADHD is over- and misdiagnosed in children [35]. Wisconsin, the site of our study, has an especially elevated rate of ADHD diagnoses for children in the general population compared with other states. Children involved with CPS, who are overwhelmingly socially- and economically-disadvantaged, have even higher rates of ADHD diagnoses [36]. However, reactions to acute or chronic stress and environmental deprivation could lead to symptom profiles consistent with ADHD and it is important to assess whether lack of structure, unresolved trauma, or inappropriate parental behavior are contributing to symptoms.

Notwithstanding the limitations of legislation targeting children in FC, some procedural changes may improve the quality of medication management and psychiatric treatment for adolescents in FC. Given high rates of prior psychiatric diagnoses and medication use, the timely and complete acquisition and transfer of medical records when children enter FC is essential, especially if children do not remain with their pre-FC providers [37]. New providers should know whether and how symptoms have changed since the current medication regimen was initiated and what medications and nonpharmaceutical options were tried prior. A child's foster parents may not have this information if the child only recently entered their care and, in many states, have no legal capacity to request these records from providers. Though limited in depth, children's prior medical assistance claims

records can be used to augment incomplete medical histories for children who were enrolled in MA prior to FC entry [38].

Second, child welfare agencies should aim to conduct a prompt assessment of children's mental and behavioral health needs (including formal trauma screening) upon entry in care and periodically thereafter. Such assessments may also be indicated for children who do not enter care but are exposed to abuse or neglect. Although most states have mandatory mental health assessments for children in FC [39] they may not be timely or comprehensive. Federal legislation has been introduced to require initial screening within 30 days and comprehensive assessment within 60 days [40]. Yet, delays in obtaining medical history information may limit the reliability of assessment results. A sizable minority—perhaps 20% – of youth underreport trauma symptoms [41] and information from foster caregivers or caseworkers who have known the child for as little as a month is unlikely to yield valid assessment results. Thus, early assessments may significantly under-identify adolescents in need of mental health care.

Third, adolescents should be actively involved and informed of the benefits and risks of medication overall and relative to alternative treatment options in age-appropriate language, as should their caregivers (biological and foster). The frequent changes in medication regimens among adolescents with any medication use may indicate a lack of understanding about the time frame in which medications take effect, the relative degree of improvement that can be expected from medication alone, and the adverse effects of changing medications (withdrawal effects or initial side effects).

Forth, foster parent training heavily emphasizes the psychological and behavioral effects of trauma on children. This is necessary to prepare foster parents for the range of behavioral challenges they may encounter and to help them reframe and respond to children's behavior with greater empathy. Yet, the desire to attribute challenging behaviors to trauma may also lead to the pathologizing of normative adolescent mood swings or behaviors, particularly for foster parents who have not previously raised teens. Thus, foster parents may benefit from training that more clearly differentiates normative adolescent behavior and behavior that requires mental health intervention or medication.

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### Supplementary Data

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