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Rates of Psychotropic Medication Use over Time among Youth in Child Welfare/Child Protective Services

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Abstract

Objective: The aim of this study was to examine rates of psychotropic medication use over time among a national probability sample of youths involved with child welfare/child protective services (CW/CPS) in the National Survey of Child and Adolescent Well-Being (NSCAW).

Methods: Growth mixture modeling was used to classify 2,521 youths into groups based on individual medication use trajectories. Determinants associated with groupings were examined using logistic regression.

Results: Overall, 22% of youths used medications over 3 years. Three groups were identified: (1) Low medication use (85%, $n = 2,057$), where medication was used rarely or never; (2) increasing medication use, where medication was commonly started after investigation (4%, $n = 148$); and (3) high medication use, where medication use was endorsed over multiple study waves (12%, $n = 316$). On multivariate modeling, physical abuse predicted membership in the increasing-use group (reference group, low use); Caucasian (versus African American) and need predicted membership in the high-use group (reference group, low use). Male gender was associated with membership in both the increasing-use and high-use groups (reference group, low use). Age and abuse type (physical abuse, neglect) demonstrated complex relationships with group membership.

Conclusions: Psychotropic medication use trajectories for children in child welfare vary and are best understood when disaggregated into distinct subpopulations.

Introduction

YOUTHS INVOLVED WITH THE CHILD welfare/child protective services system (CW/CPS) represent a uniquely vulnerable subpopulation of U.S. youths. Their numbers are staggering: In 2006, caregivers of approximately 6.0 million youths were reported for abuse or neglect and roughly 510,000 youths were living in out-of-home care on any given day (U.S. Department of Health and Human Services, Administration for Children, Youth and Families 2008a; U.S. Department of Health and Human Services, Administration for Children, Youth and Families 2008b). These youths share histories characterized by abuse, neglect, domestic violence, poverty, and *in utero* and environmental drug exposure. Research has confirmed the negative impact of these risk factors; high rates of behavioral problems have consistently been documented among youths investigated by CW/CPS, whether or not they are removed from their home and placed into out-of-home care or remain in the care of their parents (Simms and Halfon 1994; Pilowsky 1995; Clausen et al. 1998; Landsverk et al. 2002; Burns et al. 2004).

A relatively large body of research now exists describing outpatient mental health services use by youths investigated by CW/CPS. Most of the recent data come from the National Study of Child and Adolescent Well-Being (NSCAW), a longitudinal, national probability cohort of over 5,500 youths undergoing investigation for alleged abuse and/or neglect (Dowd et al. 2004). These data indicate that outpatient mental health services use among youths in CW/CPS reflect the presence of clinically significant behavioral problems as well as moderating factors, such as age, race/ethnicity, and maltreatment history (Burns et al. 2004).

In contrast to the numbers of studies describing service use, there is a relative dearth of data regarding psychotropic medication use. The few regional studies available show rates of medication use ranging from 13% to 37%, (Zima et al. 1999a; Zima et al. 1999b; Breland-Noble et al. 2004; McMillen et al. 2004; Raghavan et al. 2005; Ferguson et al. 2006; Zito et al. 2008) compared with approximately 4% in youths in the general population (Olfson et al. 2002). One national study, using data from NSCAW, estimated that approximately 14% of youths were using psychotropic medications

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approximately 12 months following investigation. Age, gender, Caucasian race/ethnicity, history of physical abuse, public insurance, and borderline/clinical cutoff scores on the Child Behavior Checklist were associated with higher proportions of medication use (Raghavan et al. 2005). All of these studies to date have been cross sectional in nature and have not examined rates of psychotropic medication use over time.

It is important to increase our knowledge regarding rates of longitudinal medication use given the responsibility placed on child welfare agencies and Medicaid to provide ongoing oversight and coordination of mental health services, including medication, for children removed from their homes under recently passed federal legislation, "Fostering Connections to Success and Increasing Adoptions Act" (P.L. 110-351) (United States 110th Congress 2008). Previous research using NSCAW indicates that outpatient mental health service use varies over time, with a rapid increase in outpatient use documented for all youths following investigation, but particularly for youths placed in out-of-home care, even when controlling for behavior problems (Leslie et al. 2005). If outpatient services vary in relation to a CW/CPS investigation, it is possible that rates of psychotropic medication use show a similar pattern and increase substantively following investigation.

On the basis of these previous findings, we hypothesized that a significant proportion of youths would show an increase in medication use following investigation. Growth mixture modeling (GMM) uses sophisticated statistical techniques to identify unobserved subpopulations within a larger population group, taking into account the nesting of time observations within individuals (Muthén and Muthén 2000; Muthén 2002). Thus, in this research, we analyzed data from the NSCAW sample with the following aims: (1) To identify distinct, heterogeneous groups of youths based on individual longitudinal trajectories of psychotropic medication use, and (2) to determine the impact of the child's sociodemography, maltreatment history, and behavioral problems on membership within these groups.

Methods

Overview

The NSCAW study tracked a cohort of 5,501 U.S. children, aged birth to 16 years at enumeration. The study was funded by the Federal Administration on Children and Families, and data collection was completed by the Research Triangle Institute (RTI). RTI employed a two-stage, stratified-sample design. First, RTI selected primary sampling units (PSUs) defined as geographic areas that encompassed the population served by a single CW/CPS agency and tended to represent single counties. Of the 100 selected PSUs, seven were small and were combined with adjacent counties, and eight had legislation in place limiting their participation. The final sample comprised 92 PSUs, representing 97 counties. The second-stage sampling identified 5,504 index children from lists of children undergoing investigation from October, 1999, through December, 2000, in PSUs. The framework oversampled for certain subsets within CW/CPS, such as infants, sexually abused children, and children receiving CW/CPS services. Approval for this study was given by the U.S. Office of Management and Budget and the Institutional Review Boards (IRB) of RTI, University of North Carolina, Rady Children's Hospital-San Diego, Tufts Medical Center, and state or county IRBs representing communities involved with the study. Face-to-face informed consent was obtained by trained field representatives. For these analyses, we selected a subsample of children ages 2 years and greater at wave 1.

Procedure

Interviews were conducted with youths (where age appropriate), their caregivers, and their CW/CPS workers at wave 1 (baseline) and at three follow-up intervals (12-month, 18-month, and 36-month waves). Wave 1 interviews with child welfare workers were completed on average 5.2 months after investigation (standard deviation [SD] = 2.8 months) and with caregivers 5.6 months after (SD = 2.8 months). Wave 2, 3, and 4 follow-up interviews with caregivers were conducted on average at 13.9 (SD = 2.9), 21.0 (SD = 3.0), and 36.9 (SD = 2.9) months, respectively. At each wave, respondents were asked whether the index child was currently using medications for emotional, behavioral, learning, attentional, or substance abuse problems as well as using general medical, outpatient specialty mental health services, and services in restrictive settings (e.g., day treatment, residential care, inpatient setting) for these types of problems. Attrition was limited; 71% of cases were missing zero to one interviews across all child, caregiver, and caseworker interviews.

Measures

Table 1 describes all variables and pertinent references. Child demographics examined included youth age, gender, and race/ethnicity. We also included maltreatment history at baseline as a series of indicator variables, given the overlap in types of maltreatment experienced by youths. Youths were considered in need of mental health services if they scored in the clinical range (64 or above) on the internalizing, externalizing, or total problem subscales of the Parent Version of the Child Behavior Checklist (CBCL) and/or the Youth Self-Report (YSR) for youths ≥ 11 years of age (Achenbach 1991; Achenbach 1992; Achenbach 1997). The clinical cutoff point, rather than the borderline range, was used to avoid inflating our estimate of need. The use of the CBCL as a proxy for need for clinical services has been employed in multiple mental health services research studies in the past (McIntyre and Keesler 1986; Clausen et al. 1998; James et al. 2004). We included insurance status as a control variable, given this may act to either facilitate or hinder medication use. Finally, we included three control variables (use of general medical services, use of outpatient mental health services, and use of restrictive care [e.g., group home, residential] services) to control for access to services and allow us to better understand the impact of the primary variables in the model. This approach has been previously used by other researchers examining mental health service use (Zima et al. 1999a; Raghavan et al. 2006; Horwitz et al., in press). Our primary outcome measure was groups of children derived using GMM based on medication use patterns over the four study waves (Wang and Bodner 2007).

Data analysis

We employed GMM to identify distinct, heterogeneous groups of children with varied medication use trajectories over time using M-Plus, (Muthén and Muthén 2007), a statistical software package well equipped to handle the complex issues that arise when analyzing growth curves. Missing data patterns were evaluated and treated with full information maximum likelihood estimation for missing values, capitalizing on all available data. After deriving the groups, we employed chi-squared analyses and multivariate logistic regression, using SUDAAN version 10 (Research Triangle Institute 2008), to estimate the associations between independent variables and group membership. Both logistic and polychotomous

TABLE 1. OUTCOME AND INDEPENDENT VARIABLES IN THE NSCAW STUDY USED IN THIS RESEARCH

<i>Variables</i>	<i>Description</i>	<i>Measure if applicable</i>	<i>Wave</i>	<i>Source</i>
Outcomes				
Medication use	Categorical variable measured at each wave regarding medication use for emotional/behavioral/learning/attentional or substance use problems.	NA	1, 2, 3, 4	Caregiver
Medication use group	Variable derived regarding medication use patterns (low use, high use; increasing use).	NA	NA	Derived for this study
Independent variables				
Child placement	Placement in out-of-home care at wave 1 (i.e., kinship care, non-relative foster care, group home, residential care, other unspecified) versus in-home	NA	1	Case records
Demographics	Child's age, gender, race/ethnicity	NA	1	Case records
Maltreatment history	Indicator variables for the presence or absence of four different types of abuse: (1) Physical abuse, (2) sexual abuse, (3) physical or supervisory neglect, (4) abandonment.	Modified Maltreatment Classification Scale	1	Case records
Emotional and behavior problems	Dichotomous variable indicative of a Externalizing, Internalizing, or Total Problem score on the CBCL or the YSR at or above the clinical cut point of T = 64; available for ages 2+ in NSCAW. Two forms of the CBCL were used: One for children aged 2–3 years and another for children aged 4–18 years.	Child Behavior Checklist (CBCL) Youth Self report (YSR)	1	Caregiver report; youth report ages ≥11 years
Child's insurance status	Categorical variable: (1) Medicaid, (2) private/Champus, (3) uninsured.	NA	1	Caregiver report
General medical use	Any general medical service for an emotional, behavioral, learning, attentional, or substance use problem. Referent time period was over the 3 years of the study for temporary caregivers and lifetime for permanent caregivers.	Child and Adolescent Services Assessment (Ascher et al. 1996)	1, 2, 3, 4	Caregiver report
Outpatient mental health service use	Any outpatient mental health subspecialist service (i.e., mental health center, psychologist, psychiatrist, social worker, or psychiatric nurse) for an emotional, behavioral, learning, attentional, or substance use problem. Referent time period was over the 3 years of the study for temporary caregivers and lifetime for permanent caregivers.	Child and Adolescent Services Assessment (Ascher et al. 1996)	1, 2, 3, 4	Caregiver report
Restrictive care use	Any service in a restrictive setting (i.e., therapeutic nursery, day treatment, group home, residential care, inpatient). Referent time period was over the 3 years of the study for temporary caregivers and lifetime for permanent caregivers.	Child and Adolescent Services Assessment (Ascher et al. 1996)	1, 2, 3, 4	Caregiver report

Abbreviations: NSCAW = National Survey of Child and Adolescent Well-Being; NA = not applicable; CBCL = Child Behavior Checklist; YSR = Youth Self-Report.

regressions were run and demonstrated similar results; for this research, we chose to display the regression models using separate logistic regressions for ease of interpretation by the reader. Because medication use group demonstrated a nonlinear relationship with age, we chose to transform age into a categorical variable, with three groupings: Children ages 2–5, ages 6–11, and ages 12 and older. Because the models were tolerant of the inclusion of the three service use variables included as control variables, these variables were maintained in the model. Note that numbers and percentages

reported in all tables do not total 100% because the reported percentages are weighted to account for the sampling design.

Results

Sample characteristics

Characteristics of the sample are shown in Table 2. Approximately 10% of youths were in out-of-home care at wave 1; the other 90% were living with a parent or informally with kin. About half

TABLE 2. CHARACTERISTICS OF YOUTHS AGED 2 OR MORE IN THE NSCAW STUDY BY MEDICATION-USE GROUP^{a,b}: AGE ≥ 2 (N = 2,521)

Independent variables	Increasing medication use n = 148		High medication use n = 316		Low medication use n = 2,057		Total N = 2,521	
	n	% (se)	n	% (se)	n	% (se)	n	(%)
Child's placement at wave 1**								
In home	82	77.7 (7.1)	197	82.6 (3.3)	1615	91.3 (1.0)	1894	89.7
Out of home	66	22.3 (7.1)	119	17.4 (3.3)	442	8.7 (1.0)	627	10.3
Child's age***								
2–5	36	19.8 (7.4)	17	8.9 (2.9)	721	34.6 (2.0)	774	31.0
6–11	82	62.2 (7.5)	184	57.0 (6.2)	902	46.5 (2.3)	1168	48.4
12+	30	18.0 (4.9)	115	34.1 (5.4)	434	18.9 (1.6)	579	20.6
Child's gender***								
Male	97	75.1 (7.0)	198	67.2 (4.4)	880	43.2 (2.2)	1175	47.3
Female	51	24.9 (7.0)	118	32.8 (4.4)	1177	56.8 (2.2)	1346	52.7
Child's race/ethnicity***								
African American	39	16.5 (5.0)	70	14.3 (3.4)	636	31.0 (3.0)	745	28.5
Caucasian	72	66.6 (7.0)	196	67.0 (5.8)	916	43.3 (4.1)	1184	47.0
Hispanic	28	11.0 (3.8)	35	16.2 (5.2)	356	19.2 (3.7)	419	18.6
Other	9	5.9 (2.7)	15	2.6 (1.1)	146	6.5 (1.0)	170	6.0
Maltreatment history								
Physical abuse*								
Yes	53	51.9 (8.1)	117	48.0 (4.9)	593	32.7 (2.0)	763	35.2
No	89	48.1 (8.1)	173	52.0 (4.9)	1338	67.3 (2.0)	1600	64.8
Sexual abuse								
Yes	25	8.5 (3.0)	56	13.2 (3.2)	356	13.7 (2.0)	437	13.5
No	117	91.5 (3.0)	234	86.8 (3.2)	1575	86.3 (2.0)	1926	86.5
Neglect*								
Yes	90	58.6 (8.4)	144	39.5 (5.2)	1141	56.9 (2.4)	1375	55.0
No	52	41.4 (8.4)	146	60.5 (5.2)	790	43.1 (2.4)	988	45.0
Abandonment								
Yes	10	3.2 (1.2)	14	4.2 (2.3)	80	2.2 (0.7)	104	2.4
No	132	96.8 (1.2)	276	95.8 (2.3)	1851	97.8 (0.7)	2259	97.6
CBCL/YSR total/externalizing/internalizing score at wave 1***								
<64	44	26.7 (7.2)	57	19.4 (4.8)	1241	62.4 (2.1)	1342	56.0 (2.2)
≥ 64	104	73.3 (7.2)	259	80.6 (4.8)	814	37.6 (2.1)	1177	44.0 (2.0)
Child's insurance status at wave 1*								
Medicaid	116	72.2 (7.8)	255	70.0 (5.6)	1369	61.5 (2.5)	1740	62.9
Private/Champus	20	22.2 (7.9)	51	25.7 (5.0)	471	27.1 (2.0)	542	26.7
No insurance	12	5.6 (2.6)	10	4.3 (2.2)	207	11.4 (1.5)	229	10.4
Any restrictive care***								
Yes	80	54.3 (8.0)	188	48.5 (5.3)	216	7.7 (0.8)	484	14.2
No	68	(45.7) (8.0)	128	51.5 (5.3)	1841	92.3 (0.8)	2037	85.8
Any outpatient specialty mental health service***								
Yes	135	89.9 (4.1)	294	91.3 (2.9)	841	33.1 (2.7)	1270	42.1
No	13	10.1 (4.1)	22	8.7 (2.9)	1216	66.9 (2.7)	1251	57.9
Any general medical services***								
Yes	111	84.1 (4.1)	257	82.5 (4.1)	357	17.0 (1.5)	725	27.2
No	37	15.9 (4.7)	59	17.5 (4.1)	1700	83.0 (1.5)	1796	72.8
National estimates (n, mean [se])	52519	3.9 (0.6)	156747	11.6 (1.2)	1142905	84.5 (0.3)	1352170	

^aSee Table 1 for complete description of each variable.

^bNote all percents are weighted to account for the study sampling plan.

*Significant at $p < 0.05$. **Significant at $p < 0.01$. ***Significant at $p < 0.001$.

Abbreviations: NSCAW = National Survey of Child and Adolescent Well-Being; se = standard error; CBCL = Child Behavior Checklist; YSR = Youth Self-Report.

(48%) of the sample were aged 6–11 years, with one third 2–5 years of age (31%) and the rest 12 years or greater (21%). The proportion of males and females was equivalent. Almost half (47%) of the sample was Caucasian. Over half (55%) reported a history of neglect, and more than one third (35%) reported physical abuse. About 44% of youths had Total, Internalizing, or Externalizing scores on the CBCL or YSR ≥ 64 . About two thirds (63%) endorsed having Medicaid insurance coverage. About one quarter (27%)

reported seeing a general medical provider physician, 42% had seen an outpatient mental health specialist, and 14% had spent time in restrictive care.

At wave 1, 13% of children had used a medication for emotional, behavioral, learning, attentional, or substance abuse problems; this increased to 16% by wave 4. Overall, 22% reported using medication at one or more of the four study waves (data not shown).

Three groups derived by latent class analysis

As is recommended, we tested multiple solutions including two-, three-, and four-group models. Indicators of good model fit in GMM include a lower relative sample size-adjusted Bayesian information criterion (SBIC) and a higher relative Entropy (values greater than 0.90), a summary number reflecting the quality of classification of individuals into groups based on their posterior probabilities of group membership for each group. We also considered utility of the classification solution in practice (e.g., lack of overlap among groups, large enough proportion of individuals within groups).

The three-group solution demonstrated the best fit based on the criteria noted above (SBIC = 7345.883; Entropy = 0.97), and the groups were identified as: (1) Low users, those who reported limited or no medication use over time; (2) increasing users, those who initiate medication use over time following an investigation; and (3) high users, those who enter the system using medications or start within a close time frame to the initial CW/CPS investigation and consistently report use over time. The majority of youths (85%, $n = 2057$) were in the low-use group, 4% ($n = 148$) were in the increasing-use group, and 12% ($n = 316$) were in the high-use group and endorsed medication use across most and/or all of the 3 years of the study (see Fig. 1).

Characteristics of medication use groups

Table 2 demonstrates bivariate relationships between independent variables and the three identified groups. Placement in out-of-home care at wave 1 was more commonly seen in the increasing-use group ($\chi^2 = 5.13$, degrees of freedom [df] = 2, $n = 2,521$, $p = 0.0079$). Males were more likely than females to be in the high- or increasing-use groups ($\chi^2 = 1,445$, $df = 2$, $n = 2,521$, $p = 0.0000$). Caucasians were more likely to be increasing- or high-use group members; conversely, African Americans were more likely to be in the low-use group ($\chi^2 = 5.48$, $df = 6$, $n = 2,518$, $p = 0.0001$). The majority of 2 to 5 year olds were in the low-use group. Preschoolers tended to be in the low and increasing-use

group, and youths 12 and up more likely to be in the high-use group ($\chi^2 = 13.50$, $df = 4$, $n = 2,521$, $p = 0.0000$). Youths with a history of physical abuse were more likely to be in the increasing- or high-use groups ($\chi^2 = 4.19$, $df = 2$, $n = 2,363$, $p = 0.0185$). Youths with a history of neglect were more likely to be in the increasing- or low-use groups ($\chi^2 = 3.93$, $df = 2$, $n = 2,363$, $p = 0.0234$). Children without insurance were more likely to be low users ($\chi^2 = 2.60$, $df = 4$, $n = 2,511$, $p = 0.042$). Children with any general medical ($\chi^2 = 42.41$, $df = 2$, $n = 2,521$, $p = 0.0000$), outpatient mental health specialist use ($\chi^2 = 40.36$, $df = 2$, $n = 2,521$, $p = 0.0000$), or restrictive care ($\chi^2 = 17.24$, $df = 2$, $n = 2,521$, $p = 0.0000$) were more likely to be in the increasing- or high-use groups.

Predictors of group membership

Table 3 represents the logistic regression models delineating the odds ratio for medication use by group for each independent variable examined in the model, controlling for all other variables. The referent group for both logistic regression models was the low-use group.

In the multivariate logistic regression model comparing the increasing- and low-use groups (see Table 3), several variables did differentiate the two groups. Specifically, males were 4.16 times as likely as females to be in the increasing-use group (95% confidence interval [CI], 2.16, 8.00). Age was significant for the overall comparison ($p = 0.02$), but this was only apparent in the odds ratios and confidence intervals when the age range 6–11 was used as the reference group. Specifically, youths ages 12 and older were 0.35 times as likely to be in the increasing-use compared to youths ages 6–11 years (data not shown in table; 95% CI, 0.16, 0.76); no relationship was noted in comparison to the preschool age group. Youths with a history of physical abuse were 2.82 times as likely as youths without a history of physical abuse to be in the increasing-use group (95% CI, 1.37, 5.79). Use of general medical services (odds ratio [OR], 6.93; 95% CI, 2.81, 17.06), outpatient specialty

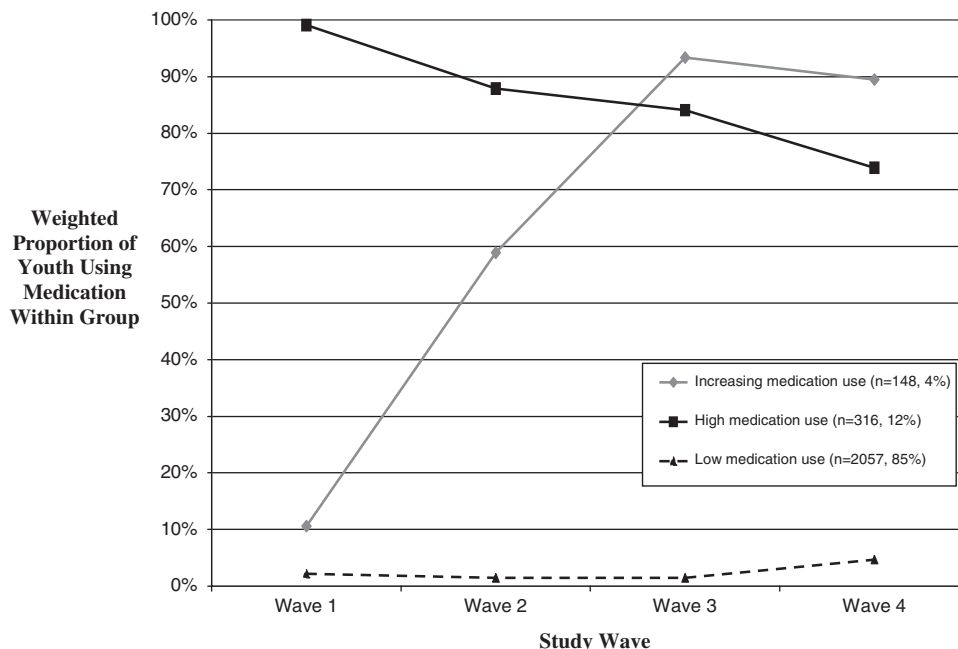


FIG. 1. Weighted proportion of youths using medication in latent medication groups at each study wave ($n = 2,521$).

TABLE 3. LOGISTIC REGRESSION ANALYSIS: INCREASING MEDICATION-USE GROUP COMPARED TO LOW-USE GROUP ($N = 2,060$)

<i>Independent variables</i>	<i>Increasing medication use OR (95% CI)</i>
Child's placement in out-of-home care at wave 1 (in-home = reference)	1.56 (0.75, 3.27)
Child's age (years)*	
2–5	1.00
6–11	2.10 (0.89, 4.95)
12+	0.72 (0.26, 2.01)
Child's gender-male (female = reference)***	4.16 (2.16, 8.00)
Child's race/ethnicity	
African American	0.54 (0.23, 1.28)
Hispanic	0.46 (0.17, 1.25)
Other	0.75 (0.14, 4.21)
Maltreatment history (no = reference for each type of maltreatment)	
Physical abuse**	2.82 (1.37, 5.79)
Sexual abuse	1.18 (0.42, 3.28)
Neglect	1.61 (0.77, 3.38)
Abandonment	0.60 (0.18, 2.03)
CBCL/YSR total/externalizing/internalizing score at wave 1 ≥ 64 (< 64 = reference)	2.01 (0.92, 4.38)
Child's insurance	
Medicaid	0.92 (0.20, 4.22)
Private/Champus	0.78 (0.17, 3.67)
No insurance	1.00
Any general medical services (no = reference)***	6.93 (2.81, 17.06)
Any outpatient specialty mental health (no = reference)***	4.16 (1.44, 12.04)
Any restrictive care (no = reference)***	6.12 (2.71, 13.82)

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

***Significant at $p < 0.001$.

Abbreviations: OR = Odds ratio; CI = confidence interval; CBCL = Child Behavior Checklist; YSR = Youth Self-Report.

mental health services (OR, 4.16; 95% CI, 1.44, 12.04), and restricted care (OR, 6.12; 95% CI, 2.71, 13.82) were also strongly associated with psychotropic medication use.

In the multivariate logistic regression model comparing the high- and low-use groups (see Table 4), males were more likely to be in the high-use group compared to females (OR, 2.86; 95% CI, 1.54, 5.30). Age also was associated with group membership; youths ages 6–11 years and ages 12+ years were more likely to be in the high-use group compared to youths ages 2–5 years (OR, 4.22; 95% CI, 1.72, 10.32; and OR, 3.10; 95% CI, 1.17, 8.19, respectively). Unlike the previous model, race/ethnicity was associated with group membership; African-American youths were 0.30 times as likely to be in the high-use group compared to Caucasians (95% CI, 0.14, 0.64). Behavioral status, as measured by a Total, Internalizing, or Externalizing Score ≥ 64 on the CBCL and/or YSR, was also associated with being in the high-use group (OR, 2.70, 1.27, 5.75). Use of general medical services (OR, 8.33; 95% CI, 4.33, 16.04), outpatient specialty mental health services (OR, 7.20; 95% CI, 2.34, 22.14), and restricted care (OR, 3.54; 95% CI, 1.84, 6.82) were also positively associated with membership in the high-use group compared to the low-use group.

Last, we compared the increasing-use group to the high-use group (see Table 5). On multivariate logistic regression modeling, only three variables were significant. Youths with a history of physical abuse were more likely to be in the increasing-use group compared to the high-use group (OR, 2.86; 95% CI, 1.15, 7.10), and those with a history of neglect were similarly more likely to be in the increasing-use group (OR, 4.48; 95% CI, 1.70, 11.78). Youths who had used any restrictive care were also more likely to be represented in the increasing-use group (OR, 2.62; 94% CI, 1.22,

5.61). Although age as an overall variable was marginally associated with group membership ($p = 0.08$), youths ages 12 years and older were less likely than youths ages 2–5 years (OR, 0.16; 95% CI, 0.03, 0.81) to be in the increasing-use group.

Discussion

In this paper, we describe for the first time longitudinal patterns of rates of psychotropic medication use among a nationally representative sample of youths involved with CW/CPS. Reported rates of medication use were 22% across the 3-year period, suggesting that one fifth of all youths aged 2–16 years undergoing an investigation report are likely to be taking psychotropic medications at some time within 3 years of an investigation. We found three distinct medication use groups: (1) Low users, those who reported limited or no medication use over time; (2) increasing users, those who initiate medication use over time following an investigation; and (3) high users, those who enter the system using medications or start within a close time frame to the initial CW/CPS investigation and consistently report use over time. The majority of youths were in the low-use group; contrary to our hypotheses, only a small proportion of youths (4%) were in the increasing-use group. This suggests that only a limited proportion of children begin medications following investigation. When weighted back to the entire U.S. population of children undergoing an investigation over a 15-month period from October, 1999, to December, 2000, 1,142,905 children would most likely be classified as low users, 156,747 children as high users, and 52,519 children as increasing users over the 3-year follow-up period (see Table 2).

TABLE 4. LOGISTIC REGRESSION ANALYSIS: HIGH-MEDICATION-USE GROUP COMPARED TO LOW-USE GROUP (N=2,208)

<i>Independent variables</i>	<i>High medication use OR (95 % CI)</i>
Child's placement in out-of-home care at wave 1 (in-home = reference)	1.42 (0.68,2.58)
Child's age (years)**	
2-5	1.00
6-11**	4.22 (1.72, 10.32)
12+*	3.10 (1.17, 8.19)
Child's gender-male (female = reference)**	2.86 (1.54, 5.30)
Child's race/ethnicity (Caucasian = reference)*	
African American**	0.30 (0.14, 0.64)
Hispanic	0.99 (0.30, 3.27)
Other	0.46 (0.14, 1.50)
Maltreatment history (no = reference for each type of maltreatment)	
Physical abuse	1.32 (0.68, 2.57)
Sexual abuse	0.77 (0.31, 1.89)
Neglect	0.67 (0.34, 1.33)
Abandonment	3.33 (0.34, 32.80)
CBCL/YSR total/externalizing/internalizing score at wave 1 ≥64 (<64 = reference)*	2.70 (1.27, 5.75)
Child's insurance (no = reference)	
Medicaid	2.59 (0.78, 8.57)
Private/Champus	2.89 (0.80, 10.36)
Any general medical services (no = reference)***	8.33 (4.33, 16.04)
Any outpatient specialty mental health (no = reference)***	7.20 (2.34, 22.14)
Any restrictive care (no = reference)***	3.54 (1.84, 6.82)

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

***Significant at $p < 0.001$.

Abbreviations: OR = Odds ratio; CI = confidence interval; CBCL = Child Behavior Checklist; YSR = Youth Self-Report.

Our results indicate that there is considerable heterogeneity in medication use trajectories following entry into child welfare, even among youths demonstrating behavioral symptoms as measured on the CBCL/YSR. Only a limited number of youths start medication after entry; a larger proportion of youths enter CW/CPS with a history of medication use and generally maintain that use over time. However, the majority of youths report limited to no use of medication. Whether these rates of use reflect under use, appropriate use, or over use of medications cannot be determined using the NSCAW data. It is striking, though, that only one quarter (27%) reported seeing a general medical provider physician and less than half had seen an outpatient mental health specialist (42%). This suggests that youths undergoing investigation are not well connected to health and mental health service systems despite the fact that 44% had rates of need in the clinical range on the CBCL, a high cut point indicating serious emotional needs.

We next examined variables associated with group membership in a multivariate model. Male gender was positively associated with the increasing- and high-use groups in comparison to the low-use group, but not in the comparison between the increasing-use and high-use groups. Age displayed a complex relationship with group membership. Youths ages 6-11 years and 12 years and greater were more likely to be in the high-use group compared to youths ages 2-5 years (reference group, low use). Youths ages 12 years and greater were less likely to be in the increasing-use group compared to youths ages 6-11 years (reference group, low use) and to preschool-age youths (reference group, high use). The use of psychotropic medication among preschool and latency age children in the increasing-use group is particularly worrisome, given growing concerns regarding the trend in off-label use of psycho-

tropic medications among young children in the general population (Vitiello 2001). Abuse similarly showed a complex relationship with group membership. For youths in the increasing-use group, a history of physical abuse but not behavioral problems was associated with group membership, when compared to low users. Conversely, behavioral status but not physical abuse was found to be associated with high users compared to low users. Abuse type (physical and neglect) differentiated between the increasing-use and high-use groups. In addition, African-American youths were less likely to be in the high-use group compared to the low-use group. Placement, as defined as out-of-home versus in-home at wave 1, was not associated with medication use group but time spent in restrictive care was associated with both the increasing-use and high-use groups.

Many of these variables have previously been linked to medication use, specifically older age (Zima et al. 1999b; dosReis et al. 2005; Raghavan et al. 2005; Ferguson et al. 2006), male gender (dosReis et al. 2005; Raghavan et al. 2005; Ferguson et al. 2006), Caucasian race/ethnicity (Zima et al. 1999b; McMillen et al. 2004; Raghavan et al. 2005; Ferguson et al. 2006), a history of physical abuse (Raghavan et al. 2005), public insurance (Raghavan et al. 2005), foster care placement (dosReis et al. 2005), and placement in group homes (Zima et al. 1999b; Breland-Noble et al. 2004). African-American and Latino ethnicities, as well as history of neglect, have been associated with decreased medication use in previous analyses of the NSCAW data examining use at wave 2 (Raghavan et al. 2005). The variation in the factors influencing medication use among the three groups, even when controlling for behavioral status, reiterates findings from previous studies—that medication use among children in CW/CPS is not solely driven by clinical symptomatology, at least as measured by the CBCL and YSR.

TABLE 5. LOGISTIC REGRESSION ANALYSIS: INCREASING MEDICATION USE GROUP COMPARED TO HIGH-USE GROUP (N=432)

<i>Independent variables</i>	<i>Increasing medication use OR (95% CI)</i>
Child's placement in out-of-home care at wave 1 (in-home = reference)	0.89 (0.43, 1.86)
Child's age (years)	
2–5	1.00
6–11	0.24 (0.06, 1.03)
12+*	0.16 (0.03, 0.81)
Child's gender-male (female = reference)	1.69 (0.71, 4.00)
Child's race/ethnicity	
African American	1.67 (0.64, 4.36)
Hispanic	0.58 (0.16, 2.11)
Other	4.42 (0.87, 22.37)
Maltreatment history (no = reference for each type of maltreatment)	
Physical abuse*	2.86 (1.15, 7.10)
Sexual abuse	1.70 (0.46, 6.19)
Neglect**	4.48 (1.70, 11.78)
Abandonment	0.45 (0.10, 2.05)
CBCL/YSR total/externalizing/internalizing score at wave 1 ≥ 64 (<64 = reference)	0.46 (0.18, 1.19)
Child's insurance	
Medicaid	0.32 (0.07, 1.56)
Private/Champus	0.25 (0.05, 1.31)
No insurance	1.00
Any general medical services (no = reference)	0.75 (0.25, 2.23)
Any outpatient specialty mental health (no = reference)	0.83 (0.24, 2.87)
Any restrictive care (no = reference)*	2.62 (1.22, 5.61)

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

Abbreviations: OR = Odds ratio; CI = confidence interval; CBCL = Child Behavior Checklist; YSR = Youth Self-Report.

However, the novel findings in this research suggest that youths vary in their trajectories of use and that these trajectories appear to be associated with different independent variables. This research suggests a number of future research questions to further disentangle medication use patterns among youths in child welfare, including: (1) The interplay between age, race/ethnicity, abuse history, and behavioral status in predicting medication use, and (2) medication use and its temporal relation to episode(s) of restricted care. Last, these different patterns of medication use suggest social workers, medical, and mental health clinicians are using some mechanisms for classifying the mental health needs of youths as they enter the child welfare system. How these decisions are made and what modalities (i.e., psychotherapeutic as well as pharmacological) are recommended and then used deserves further exploration.

Limitations

Some limitations of this study should be noted. Specifically, NSCAW does not contain data to examine numbers or types of medication used or patterns of episodic versus continuous use between waves. In addition, NSCAW did not garner clinical diagnoses, either through a diagnostic interview or clinician-generated administrative data, and thus we cannot comment on the quality of care received. The proportion of children in out-of-home care compared to in-home limited our ability to examine medication use among children in different types of out-of-home care at wave 1. Also, the different referent time periods for general medical and subspecialty services for temporary and nonpermanent caregivers makes comparisons across groups for these services incomplete. Last, whether these rates of use reflect overutilization of psychotropic medications cannot be determined using this large data

survey set and will require more complete measures of clinical need as well as controlling for receipt and intensity of psychotherapeutic modalities.

Conclusions

This study is the first to examine trajectories of medication use longitudinally in a nationally representative probability sample of youths in CW/CPS, thus avoiding sampling biases inherent in cross-sectional and regional studies. The findings suggest that the majority of youths undergoing an investigation have limited to no use of psychotropic medication over time. However, there is a unique subpopulation of youths who are consistently on medication as well as a smaller group of youths who begin medication following investigation. Understanding how clinical need, race/ethnicity, gender, age, maltreatment history, and service use drive variations in medication use over time will be critical for developing interventions to counter both under- and overprescribing of medications to youths in CW/CPS and to assure quality mental health care for these vulnerable youths.

Disclosures

Drs. Leslie, Raghavan, and Aarons and Mr. Zhang have no conflicts of interest or financial ties to report.

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