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Original Articles

Medicaid Expenditures on Psychotropic Medications for Children in the Child Welfare System

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Abstract

Objective: Children in the child welfare system are the most expensive child population to insure for their mental health needs. The objective of this article is to estimate the amount of Medicaid expenditures incurred from the purchase of psychotropic drugs – the primary drivers of mental health expenditures – for these children.

Methods: We linked a subsample of children interviewed in the first nationally representative survey of children coming into contact with U.S. child welfare agencies, the National Survey of Child and Adolescent Well-Being (NSCAW), to their Medicaid claims files obtained from the Medicaid Analytic Extract. Our data consist of children living in 14 states, and Medicaid claims for 4 years, adjusted to 2010 dollars. We compared expenditures on psychotropic medications in the NSCAW sample to a propensity score-matched comparison sample obtained from Medicaid files.

Results: Children surveyed in NSCAW had over thrice the odds of any psychotropic drug use than the comparison sample. Each maltreated child increased Medicaid expenditures by between $237 and $840 per year, relative to comparison children also receiving medications. Increased expenditures on antidepressants and amphetamine-like stimulants were the primary drivers of these increased expenditures. On average, an African American child in NSCAW received $399 less expenditure than a white child, controlling for behavioral problems and other child and regional characteristics. Children scoring in the clinical range of the Child Behavior Checklist received, on average, $853 increased expenditure on psychotropic drugs.

Conclusion: Each child with child welfare involvement is likely to incur upwards of $1482 in psychotropic medication expenditures throughout his or her enrollment in Medicaid. Medicaid agencies should focus their cost-containment strategies on antidepressants and amphetamine-type stimulants, and expand use of instruments such as the Child Behavior Checklist to identify high-cost children. Both of these strategies can assist Medicaid agencies to better predict and plan for these expenditures.

Introduction

Child abuse and neglect are major public health challenges in the United States today. This is because their health and mental health sequelae are manifest not only during childhood (Gilbert et al. 2009) but also persist long into adulthood, being associated with a range of adverse adult health outcomes (Felitti et al. 1998). Child abuse and neglect are also numerically significant problems; in federal fiscal year 2009, ~6,000,000 children were reported to child welfare/child protection agencies (hereafter, *child welfare*) nationwide for suspected child maltreatment (U.S. Department of Health and Human Services et al. 2010), of whom almost half have clinically significant emotional or behavioral problems (Burns et al. 2004; Hurlburt et al. 2004). Medicaid is the dominant insurer of children in child welfare settings (Raghavan and Leibowitz 2007). Quantifying and identifying the drivers of such expenditures is of critical importance to Medicaid agencies, especially at a time when the recession has expanded

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Medicaid enrollment nationwide and has increased pressure upon the program (U.S. Department of Health and Human Services and Centers for Medicare and Medicaid Services 2011), and when state budgets are highly constrained.

Prescription drugs used for the treatment of mental disorders (psychotropic drugs) are the principal drivers of the increase in mental health spending, accounting for 51% of per capita spending on mental health services (Frank et al. 2009). The implications of this are particularly salient for Medicaid agencies, which pay for psychotropic drugs for children in child welfare. For a variety of reasons including the emotional and behavioral consequences of maltreatment, and differences in access to psychosocial interventions, children in child welfare receive psychotropic medications at a rate between two and three times that of comparable children in the community (Raghavan et al. 2005). Approximately one in seven children in foster care receives a psychotropic drug at a given point in time (Zima et al. 1999, 2000), a rate that rises to nearly one in four when children in child welfare are followed up over time (Leslie et al. 2010). Not only do these children receive more drugs, they also receive more drugs concomitantly (Raghavan and McMillen 2008; Zito et al. 2008). Cumulatively, children in the child welfare system are the largest consumers of psychotropic drugs of all child populations in the United States today.

From a Medicaid perspective, this pattern of psychotropic drug use among child welfare populations has serious fiscal consequences. Direct and indirect mental health costs can reach $16,848/month for maltreated children (Conrad 2006), and total behavioral health expenditures incurred by each child in foster care are more than eight times higher than expenditures on non-foster children (Becker et al. 2006). What is not well known is the extent to which psychotropic medications are responsible for these expenditures, and the particular classes of drugs most likely to contribute to them. Identifying specific drugs (either by indication or pharmaceutical class) has direct policy implications. If expenditures are being driven by drugs used to treat a particular condition, Medicaid agencies can construct disease management programs that target such conditions. Also, if expenditures are driven by particular drug classes, Medicaid agencies can expand their use of regulatory mechanisms such as prior authorization (Tilly and Elam 2003) in order to ensure cost containment.

In addition to identifying specific drugs, it is also important to identify child characteristics that might increase the risk of Medicaid spending on these drugs. Currently, child-serving agencies use a range of psychological instruments to assess the behavioral needs of the child; Missouri's Medicaid agency, for example, is about to deploy an instrument called the Child Behavior Check List (CBCL; described subsequently) (Achenbach 1991,1992) for all of its child beneficiaries. The fiscal utility of such instruments is as yet unknown. If increased scores on the CBCL are associated with increased expenditures, for example, then this is valuable information that Medicaid agencies can use to better predict their drug expenditures, a technique called risk adjustment (Iezzoni 2003; Blumenthal et al. 2005). This lack of data has been identified as one of the principal challenges facing Medicaid agencies in their attempts to contain costs of care for their child welfare beneficiaries (Raghavan 2010).

This study was the first to link data from a national panel survey of children and adolescents coming into contact with child welfare agencies to their Medicaid claims. We quantified Medicaid expenditures on psychotropic medications among these children, and compared them to a propensity score-matched comparison sample of child Medicaid beneficiaries without any Medicaid codes for eligibility based upon foster care status. We modeled expenditures for both of these groups to identify differential drivers of expenditures, and ended by modeling expenditures among a sample of child welfare-involved children. Through such analyses, we provide Medicaid agencies with information designed to help them anticipate, better predict, and deliberately plan for mental health expenditures for their child welfare-involved beneficiaries.

Methods

Data sources and creation of analytic data set

The National Survey of Child and Adolescent Well-Being (NSCAW) is the first nationally representative, panel study of children and adolescents coming into contact with child welfare agencies. This probability sample contains data on 5501 youth investigated by Child Protective Services for possible abuse and neglect in 92 primary sampling units in 97 counties throughout the United States. These data were obtained after interviews with caregivers, caseworkers, teachers, and the youth themselves. NSCAW's baseline wave was conducted over a 15-month period beginning October 1999 (NSCAW Research Group 2002; Dowd et al. 2006), and these data were used for information on child and caregiver characteristics. NSCAW contains information not only on children placed in foster care ($\sim$11% of the sample), but also on children who receive services while living in their birth homes. NSCAW data, therefore, are designed to be representative of all children who present to child protection agencies for suspected maltreatment.

We obtained Medicaid claims files (Medicaid Analytic Extract or ''MAX'' [Research Data Assistance Center 2011]) for years 2000 through 2003; enrollment files contained Social Security Numbers (SSNs) and residence data of beneficiaries. These years were chosen to parallel the time frame of NSCAW administration. We obtained data on 14 states (Texas, Ohio, Florida, California, Pennsylvania, New York, and eight others; our confidentiality agreements preclude our identifying these states). These states were chosen to maximize the number of NSCAW participants within that state, the ''yield'' of SSNs within NSCAW, and the rate of managed care penetration within that state. We also took into account the availability of encounter data for Medicaid plans compensated under a non-fee-for-service (FFS) payment methodology in each of these states (''shadow claims'').

We first used SSNs to link NSCAW children to their MAX personal summary file, which contains limited sociodemographic information for beneficiaries; we were able to link 1557 NSCAW youth to their Medicaid enrollment files. An additional 1259 NSCAW youth were linked after finding all unique date of birth, sex, and ZIP code combinations that matched between NSCAW and Medicaid enrollment files. Combinations with multiple matches are excluded from this study. The total linked NSCAW-MAX sample was 2816 children. Other children in NSCAW could not be linked either because their caregivers did not permit data linkage, or because these children did not possess Medicaid personal summary files. Linked and non-linked children were not statistically different by age, gender, or placement category. More Hispanics (19.9% vs. 15.2%, $p < 0.001$) were found in the linked sample, and correspondingly fewer white, non-Hispanics (38.8% vs. 43.9%, $p < 0.001$).

We linked these personal summary files to drug claims files (RX file) across 4 years using unique research identifiers and aggregated individual claims by beneficiary so that all claims within a single calendar year captured all Medicaid expenditures on medications

that year for a given NSCAW youth. We deleted from our sample all children < 2 years of age at wave 1, because the version of the CBCL (Achenbach 1991, 1992), the measure of need for mental health services used in NSCAW, is not normed for that age group. Except where otherwise noted, all NSCAW variables were obtained from a caregiver report on the child. Children who were not enrolled in an FFS or primary care case management (PCCM) plan for a full year were also deleted, as we observe only enrollment, not claims or services, for children in Medicaid managed care.

We generated a comparison sample of putatively non-child welfare-involved Medicaid beneficiaries using propensity score matching, with replacement, to the nearest neighbor (Guo and Fraser 2010). We identified a cohort of Medicaid beneficiaries without any Medicaid codes for eligibility based upon foster care status, and then matched them to NSCAW children using their age, gender, race/ethnicity, year of data, Medicaid plan type (FFS, PCCM, or both in a calendar year), and ZIP code of residence. We conducted sensitivity analyses using 1:1 and 1:10 matches, but the increase in precision was negligible, and we present results from the 1:1 matched comparison sample. Eligibility codes were distributed proportionately between the NSCAW and matched samples for most categories, except for foster care (exclusively NSCAW by design) and State Children's Health Insurance Program (SCHIP) (46% matched vs. 29% NSCAW). Deletion of children < 2 years of age was conducted after matching, so the final sample is slightly unbalanced: 2831 NSCAW and 2821 matched child observations, for a total of 5652 child observations over 4 years for both NSCAW and the matched samples.

Medicaid expenditures on psychotropic medications

Because each Medicaid drug claim contains information on a particular formulation and packaging of a particular drug, we aggregated these data for ease of understanding using two approaches. First, we used codes from Medicaid RX (MRX) (Gilmer et al. 2001), the most widely used Medicaid pharmacy risk adjustment model, to aggregate drugs by indications for attention-deficit disorder, depression/anxiety, psychotic illness/bipolar, and seizure disorder (which contains anticonvulsants that are sometimes used in the treatment of psychiatric illnesses). Second, we used drug categories from the Red Book (Thompson Reuters 2011) in order to present information on drug classes of relevance to psychiatric practice. Red Book is an industry-standard reference that contains details on, among other things, drug (pharmaceutical) classes. Taken together, these approaches allow examination of the types of medications used, and the indications for which they are used. We purposively selected mental health-relevant MRX and Red Book categories; therefore, results from these two approaches are not expected to be equivalent. Outcomes for both groupings were measured as annual utilization, defined as any non-zero Medicaid expenditures in a calendar year, and mean total annual Medicaid expenditure per child. Out of pocket expenditures and other payers are not available in MAX data.

Covariates

Child-level covariates included child age, gender, and race/ethnicity, all as coded in the NSCAW data. Identification of behavioral problems was based on the identification of a probable behavioral disorder if the child scored in the clinical range (*t* score ≥ 64) on the internalizing or externalizing scales of the CBCL (Achenbach 1991, 1992), a caregiver-elicited questionnaire that is a well-established measure of mental health need among child welfare populations (Raghavan et al. 2005, 2010a, b). Maltreatment history was obtained from the child's child welfare caseworker and was based on a modified Maltreatment Classification Scale (Manly et al. 1994). Categories of physical abuse, sexual abuse, neglect, and abandonment were dichotomized such that a child could have more than one type of abuse coded. We also used a binary indicator variable representing ''fair'' or ''poor'' physical health, with ''excellent, ''very good,'' or ''good'' as a referent, reported by the child's caregiver; these questions have been used by the National Health Interview Survey since 1982 (Adams et al. 1999).

Each child's placement status was grouped into two mutually exclusive categories of in-home (i.e., living with their permanent primary caregiver, usually their birth parent), or out-of-home (in family foster care – either with a relative or nonrelative – or in congregate care, such as a group home or residential treatment center). Information on whether the child lived in an urban or rural area was obtained from NSCAW data as a control for the availability of healthcare resources in the child's community. We also included dummy variables for insurance type (FFS, PCCM, or both types) from the Medicaid enrollment files. All covariates were measured at baseline, except insurance type, which was measured at the child observation (i.e., calendar year) level for an individual child.

Analyses

We first obtained an aggregate expenditure figure per child per year, for both NSCAW and comparison samples, and adjusted all expenditures to 2010 dollars following guidelines from the Agency for Healthcare Research and Quality (U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality 2011) and Centers for Medicare and Medicaid Services (U.S. Department of Health and Human Services et al. 2008) (details available from the authors upon request). Bivariate analyses showing mean differences in rates of annual use of, and expenditures on, psychotropic medications between NSCAW and comparison group children were performed using a two-sample *t* test, after summing use and expenditures over all years.

Differences in psychotropic medication expenditures between NSCAW and comparison group children were then examined using a two-part (Duan et al. 1984) generalized linear model (GLM) that used expenditures per child per year as its outcome. In the first part we used logistic regression to estimate the annual probability of having any medication expenditures, and in the second part we used a generalized linear model with a log link and a γ distribution (essentially a regression model of log annual expenditures among children with non-zero expenditures), as suggested by Manning and colleagues for expenditure data (Manning et al. 2003, 2005). These models used 5652 child observations. We then focused only on NSCAW children and estimated similar models on this sample (2096 child observations after some missing values) to examine the association between NSCAW's rich set of explanatory variables and expenditures. We developed predictive margins (Graubard and Korn 1999) for significant coefficients from the second part of our models in an attempt to increase their interpretability; predictive margins of expenditures for an African American race/ethnicity coefficient, for example, is the average difference in expenditures between African American children and whites, controlling for the other variables in the model.

Although the NSCAW data come with a set of survey weights, we report unweighted expenditure data for two reasons. First, a full complement of survey weights comparable to NSCAW is not available for our comparison sample, which is obtained from MAX

files alone. Second, our outcome variable is an annualized expenditure derived from Medicaid claims (not NSCAW), and hence NSCAW weights cannot be applied to these exogenous data. In an attempt to reduce bias and the risk of a type 1 error, however, all models include corrections for the clustering of multiple years' worth of expenditure observations per child. Confidence intervals for all expenditure estimates were bootstrapped using a bias-corrected empirical model with 1000 replications. We also include state fixed effects to control for unobserved state-level variables that might affect expenditures for all children within a given state, and year-fixed effects to control for secular trends (not shown in tables).

All analyses were performed in Stata version 12.0 (StataCorp 2010).

Results

Among the NSCAW youth, 1350 (47.7%) were male. At NSCAW's baseline wave, 997 (35.2%) were aged between 2 and 5 years, 990 (35.0%) between 6 and 11 years, 305 (10.8%) between 12 and 13 years, and 539 (19.0%) > 14 years. Most children (1491, 52.7%) were of non-Hispanic white race/ethnicity, others were African American (941, 33.2%), and the remainder were of unknown race/ethnicity (135, 4.8%).

Table 1 shows bivariate analyses of the mean differences in utilization of, and annual expenditures on, psychotropic medications between NSCAW and comparison group children. Prescriptions in the MRX classifications shown were used by 26% (735 child observations) of the NSCAW sample versus 11% (306 child observations) of the comparison sample ($p < 0.001$). Among those who received these medications, mean drug expenditures for NSCAW children were significantly higher ($1482) than those of children in the comparison group ($993; $p < 0.001$). NSCAW children had significantly higher use and expenditures for drugs used to treat attention-deficit, and depression/anxiety disorders than did children in the comparison group ($p = 0.002$ and $p = 0.003$), as well as increased utilization of drugs used to treat psychotic/bipolar disorders ($p < 0.001$) whereas other categories were not significantly different.

Results of differences in pharmaceutical class (Red Book classifications) were similar, with rates of 28% and 14% for differences in use, and expenditure differences of $1368 and $784, for NSCAW compared to non-NSCAW children respectively ($p < 0.001$ for both). Expenditure differences were observed on antidepressants ($551 for NSCAW versus $395 for non-NSCAW; $p = 0.007$), amphetamine-type stimulants ($593 versus $494; $p = 0.02$), and miscellaneous central nervous system agents – a grouping that includes drugs such as clonidine ($518 versus $218; $p = 0.04$).

Differences in cumulative drug expenditures between NSCAW and comparison group children are reported in Table 2. Odds ratios (OR) from Part 1 of the model indicate the likelihood of annual

Table 1. Utilization Rate and Mean Expenditures Among Individuals Using Each Type of Medication (nT = 5652 Child Observations)

	NSCAW sample		*Comparison sample*	
Drug	*Utilization nT = 2831 (%)*	*Expenditure ($)*	*Utilization nT = 2821 (%)*	*Expenditure ($)*
MRX classification				
Attention-deficit disorder	16.32***	626**	7.05	492
Depression/anxiety	12.89***	550**	4.29	379
Psychotic illness/bipolar disorder	8.72***	1790	18.08	1783
Seizure disorders	6.64***	838	2.38	1033
Total for any of these	25.96***	1482***	10.85	993
Red Book classification				
Sedatives/hypnotics, barbiturates	0.49	103	0.25	87
Sedatives/hypnotics, benzodiazepines	0.60	78	0.78	252
Anticholinergic/antimuscarinic/antispasmodic	0.81	136	0.92	46
Anticholinergic/antiparkinsonian agent	0.60***	85	0.07	28
Anticholinergic, not elsewhere classified	0.28	125	0.24	76
Anticonvulsants, hydantoin derivative	0*	–	0.14	229
Anticonvulsants, oxazolidinediones	0	–	0	–
Anticonvulsants, succinimides	0	–	0.04	792
Anticonvulsants, benzodiazepines	0.39	186	0.14	151
Anticonvulsants, miscellaneous	6.39***	862	2.20	1,002
Antimanic agents, not elsewhere classified	0.71**	234	0.14	300
Anxiolytics/sedatives/hypnotics not elsewhere classified	4.13*	91	3.08	49
Central nervous system agents, miscellaneous	1.41***	518*	0.39	218
Opiate antagonists, not elsewhere classified	0.04	894	0	–
Antidepressants	12.22***	551**	3.86	395
Antipsychotics	8.51***	1815	1.81	1759
Stimulants, amphetamine type	16.00***	593*	6.91	494
Stimulants, non-amphetamine	0	–	0.04	360
Total for any of these	28.44***	1368***	14.04	784

*Significant at < 0.05, **significant at < 0.01, ***significant at < 0.001.

MRX = Medicaid Rx, NSCAW = National Survey of Child and Adolescent Well-Being; nT = child-year observations.

Note: Utilization is the row mean and is non-exclusive; therefore, the sum may exceed the MRX or Red Book total. Expenditures reflect means for observations of children who are using a particular type of medication. Zeros are not included in the means.

Table 2. Two-Part Regression Model of Cumulative Drug Expenditures (MRX Classification), NSCAW Versus Comparison Sample (nT = 5652 Child Observations)

	Part I: Odds ratio (95% CI) for any expenditure	*Part II: GLM coefficients (95% CI) for expenditure if > $0*	*Predictive margin (Part II) for expenditure if > $0 ($)*
NSCAW sample	3.40 (2.78, 4.15)***	0.40 (0.19, 0.61)***	538.73 (236.98, 840.48)
Male	1.65 (1.33, 2.03)***	0.32 (0.11, 0.54)**	431.23 (131.15, 731.31)
Age			
3–5	(omitted)	(omitted)	
6–11	7.81 (5.75, 10.59)***	0.71 (0.30, 1.11)**	943.55 (387.91, 1499.20)
12–13	10.58 (7.46, 15.01)***	0.96 (0.53, 1.39)***	1283.02 (674.03, 1892.00)
≥ 14	11.49 (8.24, 16.03)***	0.95 (0.54, 1.37)***	1274.69 (685.80, 1863.58)
Race/ethnicity			
White	(omitted)	(omitted)	
Black	0.56 (0.44, 0.71)***	−0.30 (−0.60, −0.00)*	−399.09 (−795.97, −2.22)
Hispanic	0.63 (0.38, 1.07)	0.11 (−0.33, 0.55)	147.55 (−445.83, 740.94)
Other/unknown	1.40 (0.88, 2.24)	0.06 (−0.24, 0.37)	86.33 (−320.04, 492.69)
Insurance			
Fee-for-service (FFS) only	(omitted)	(omitted)	
Primary care case management (PCCM) only	0.71 (0.53, 0.95)*	−0.43 (−0.76, −0.10)***	−576.87 (−1028.11, −125.64)
Switches between FFS & PCCM	0.80 (0.62, 1.04)	−0.46 (−0.75, −0.16)	−612.57 (−1019.25, −205.89)

*Significant at ≤ 0.05, **significant at < 0.01, ***significant at < 0.001.
MRX = Medicaid Rx, NSCAW = National Survey of Child and Adolescent Well-Being, CI = Confidence Interval, GLM = Generalized Linear Model
Note: Predictive margins reflect the mean effect for child observations with drug expenditures in any of the MRX categories in Table 1. They are the marginal effect for Part II of the model.

utilization of any of the MRX categories in Table 1 and, consequently, the odds of having any expenditures on any psychotropic medications. (In an attempt to avoid redundancy, we do not show expenditure differences for the Red Book classifications.) Controlling for demographic and insurance characteristics, an NSCAW child had over thrice the odds of incurring an expenditure on any psychotropic drug than did a non-NSCAW child (OR: 3.4; 95% confidence interval [CI]: 2.8, 4.2; $p < 0.001$). Across both groups, older children and males had significantly higher odds of incurring any expenditures, whereas children in Medicaid plans that used PCCM as a reimbursement modality had ~ 30% lower odds of any expenditure than did children in Medicaid plans that paid using FFS. When compared with white children, children of African American race/ethnicity had approximately half the odds of incurring expenditures on any medications (OR: 0.6; 95% CI: 0.4, 0.7; $p < 0.001$).

Table 2 also displays coefficients of the GLM model (Part 2) showing predictors of expenditure among children with any (non-zero) expenditures on psychotropic drugs. The direction of these predictors parallels that of Part 1 of the model. Among only those with positive expenditure in these MRX categories, the GLM coefficients imply that African American children have a mean difference of $399 (95% CI: $2, $796; $p = 0.05$) less expenditure than white children. Being Hispanic or other/unknown race/ethnicity was not significantly associated with utilization or expenditure. A child whose Medicaid program reimbursed providers on a PCCM basis incurred $577 less in expenditures (among those with positive expenditure) than did a child whose Medicaid program paid its providers on an FFS basis (CI: $125, $1028, $p = 0.01$).

Table 3 displays results that are from a two-part model of differences in psychotropic medication expenditures conducted on a stratified sample of NSCAW-only children. As seen in the table, males and older children had significantly higher odds of use and expenditures of any psychotropic medication than did girls and younger children. Furthermore, NSCAW children in out-of-home placement (compared with children maintained in-home), those in fair or poor health, those with externalizing CBCL in the clinical range, and those with a physical abuse history all had higher odds of incurring any expenditure for drugs in the MRX categories. However, as seen in Part 2 of this model, only a clinically significant externalizing CBCL score was a significant predictor of expenditures for children with non-zero expenditures. A CBCL t score ≥ 64 was associated with an $853 increase in psychotropic medication expenditures among children with non-zero expenditures (CI: 366, 1340, $p = 0.001$). An African-American child in NSCAW incurred $760 lower expenditures than did a white child, controlling for the other variables in the model (CI: 239, 1281; $p = 0.004$).

Discussion

In this study, we examine Medicaid expenditures on psychotropic drugs among a sample of child respondents to the NSCAW, in 14 states. NSCAW children had three times the odds of using medications, and incurred between 50% and 75% higher expenditures on medications (Table 1) than did Medicaid child enrollees without apparent child welfare involvement. Each maltreated child enrolled into Medicaid increased the program's expenditures on psychotropic medications by between $489 (differences between Medicaid RX estimates) and $584 (Red Book estimates) per year, relative to non-maltreated children also receiving these medications. These estimates provide greater precision than did prior attempts to identify the magnitude of incurred expenditures on this population, and allow state Medicaid policy makers to calculate provisional budgets on a per-child per-year basis that can adequately resource their medication use needs, or to set capitation rates for medication management contracts.

Medicaid agencies not only need to budget for these expenditures annually, but also to take into account cumulative expenditures incurred by these children during their stay within the child welfare system over time. Children in foster care who are

Table 3. Two-Part Regression Model of Cumulative Drug Expenditures (MRX Classification), NSCAW Only (nT = 2096 Child Observations)

	Part I: Odds ratio (95% CI) for any expenditure	*Part II: GLM coefficients (95% CI) for expenditure if > $0*	*Predictive margin (Part II) for expenditure if > $0*
Male	2.01 (1.44, 2.81)***	0.37 (0.08, 0.65)*	572.13 (114.35, 1029.91)
Age			
3–5	(omitted)	(omitted)	
6–11	5.28 (3.07, 9.06)***	0.45 (−0.03, 0.93)	699.07 (−56.95, 1455.09)
12–13	6.62 (3.63, 12.08)***	0.54 (0.02, 1.05)*	834.73 (23.05, 1646.40)
≥14	6.13 (3.35, 11.20)***	0.59 (0.07, 1.10)*	910.64 (98.90, 1722.39)
Race/ethnicity			
White	(omitted)	(omitted)	
Black	0.54 (0.36, 0.83)**	−0.49 (−0.81, −0.17)**	−760.37 (−1281.26, −239.47)
Hispanic	0.76 (0.35, 1.62)	0.18 (−0.36, 0.71)	278.37 (−556.92, 1113.67)
Other/unknown	0.99 (0.48, 2.04)	−0.11 (−0.61, 0.40)	−163.29 (−948.37, 621.80)
Insurance			
Fee-for-service (FFS) only	(omitted)	(omitted)	
Primary care case management (PCCM) only	0.70 (0.44, 1.11)	−0.16 (−0.54, 0.23)	−243.29 (−842.47, 355.88)
Switches between FFS & PCCM	0.90 (0.60, 1.33)	−0.14 (−0.47, 0.19)	−217.68 (−725.08, 289.72)
Out-of-home care vs. in-home care	1.94 (1.34, 2.81)***	0.17 (−0.12, 0.47)	269.85 (−182.15, 721.85)
Fair or poor health vs. excellent or good health	1.70 (1.05, 2.73)*	0.25 (−0.17, 0.66)	382.06 (−271.37, 1035.48)
Rural vs. urban	1.02 (0.69, 1.50)	−0.26 (−0.59, 0.07)	−401.28 (−922.38, 119.83)
CBCL Score			
Externalizing *t* score ≥ 64 vs. *t* score < 64	4.32 (3.02, 6.19)***	0.55 (0.27, 0.83)***	853.05 (366.16, 1339.93)
Internalizing *t* score ≥ 64 vs. *t* score < 64	1.32 (0.92, 1.91)	0.15 (−0.11, 0.41)	230.31 (−170.63, 631.25)
Maltreatment history			
Physical abuse	1.44 (1.02, 2.03)*	0.01 (−0.3, 0.32)	18.07 (−460.07, 496.20)
Sexual abuse	1.46 (0.91, 2.33)	0.09 (−0.31, 0.48)	133.99 (−479.42, 747.39)
Neglect	0.82 (0.5, 1.35)	−0.29 (−0.67, 0.08)	−456.53 (−1048.84, 135.78)
Abandonment	1.28 (0.73, 2.23)	0.24 (−0.14, 0.61)	365.20 (−209.94, 940.34)

*Significant at < 0.05, **significant at < 0.01, ***significant at < 0.001

MRX = Medicaid Rx, NSCAW = National Survey of Child and Adolescent Well-Being, CI = Confidence Interval, GLM = Generalized Linear Model, CBCL = Child Behavior Check List

Note: Predictive margins reflect the mean effect for child observations with drug expenditures in any of the MRX categories in Table 1. They are the marginal effect for Part II of the model.

ultimately reunited with their families stay a median of a year in the child welfare system; however, children who are ultimately adopted stay a median of 35 months (Wildfire et al. 2007). Even after departure from foster care, children maintain Medicaid eligibility for a mean of 3 months (Raghavan et al. 2009). Consequently, cumulative median Medicaid expenditures on medications can approximate $1482 at a lower bound, with a large proportion of children costing Medicaid agencies several thousand dollars throughout their stay in the child welfare system.

Our findings also suggest that cost containment for pharmaceuticals can be achieved by focusing on particular drug classes. The principal cost drivers in our study were amphetamine-type stimulants and antidepressants, both of which may be suitable targets for a focused cost-containment policy. One such policy that Medicaid agencies have deployed to monitor medication spending is prior authorization, which requires additional patient-level information prior to approval of reimbursement for certain pharmaceutical products (Tilly and Elam 2003). These findings suggest that instead of a global medication use prior authorization policy regime, Medicaid's efforts may be better served by focusing narrowly on these two drug classes. Such a narrowing of regulation may reduce unintended consequences of prior authorization programs on access to needed services (West et al. 2009), and is in keeping with reviews suggesting that prior authorization is least associated with undesirable clinical outcomes when it is carefully targeted at medications for which generics or alternatives are easily available (Green et al. 2010). There is a risk that such a policy may result in inappropriate underutilization of amphetamine-type stimulants and antidepressants for children who need them; any such policy design will, therefore, have to carefully monitor outcomes for all children subject to such a policy regime.

Also, children in PCCM plans incurred average medication expenditures that were $577 less than those of children in FFS plans. This finding is perhaps a financial endorsement of the medical home models developing within Medicaid programs, which share several key characteristics in common with PCCM plans. Medicaid agencies should consider accelerating movement of child welfare-involved children into medical home models. Coordinating care for such high-use children within medical homes is not only likely to improve the quality of their care, but also to reduce the overall costs of their care, at least regarding psychotropic medication expenditures.

Finally, a child with an externalizing CBCL score in the clinical range costs Medicaid an additional $853 in psychotropic drugs annually relative to a child with medication use who has a low externalizing score. Compared with other instruments available within NSCAW (not shown), this instrument is perhaps the single strongest predictor of Medicaid expenditures. Extending the use of the CBCL as a screening tool to all child welfare Medicaid beneficiaries may give Medicaid agencies greater predictability on

identifying and resourcing high-use children. The California Evidence-Based Clearinghouse for Child Welfare, a group that disseminates evidence-based practices to child welfare agencies, gives the CBCL its highest rating of A (California Evidence-Based Clearinghouse for Child Welfare 2010), and our findings offer Medicaid agencies a financial reason for its adoption as a population-level screening instrument.

Our study is subject to a few limitations. The design of our data linkage and our inability to use weights means that our results cannot be generalized to a nationally representative sample of children in child welfare – our data are convenience samples of children in 14 states. Second, we used Medicaid eligibility codes to identify a comparison sample of child Medicaid beneficiaries without foster care involvement. We do not have definitive information on child welfare involvement for these children. It is possible, therefore, that some of these children may have been maltreated, in which case our estimates of the magnitude of expenditure differences between NSCAW children and comparison children is conservatively biased. On the other hand, our comparison group has a higher proportion of SCHIP-eligible children. These may have a lower average rate of medication use. Hence, our comparative estimates must be approached with caution. Third, in some states in our sample, such as California, increased managed care penetration and lack of availability of shadow claims precluded our ability to fully capture expenditures. Hence, our data are only reflective of children in non-managed Medicaid systems, which form the largest type of payment systems for children in child welfare (Raghavan and Leibowitz 2007), and were the dominant plan types for child welfare children in our sample. Fourth, concerns in the literature with the validity of diagnoses in Medicaid claims data led us to focus on validated instruments instead of particular diagnostic categories (Crystal et al. 2007). Finally, our data only reflect Medicaid expenditures generated by a paid claim; our results are not reflective of the true societal costs of psychotropic drugs for these children.

Conclusion

Despite these limitations, this first-ever linkage between survey data and Medicaid claims data at a national level provides many new insights to Medicaid policymakers on better predicting psychotropic medication expenditures among a highly vulnerable population. Planning for these expenditures, and ensuring that the needs of the most emotionally disturbed children are adequately resourced, is of critical important to Medicaid agencies as they attempt to resource care for children in the child welfare system within an increasingly unstable and uncertain fiscal climate.

Clinical Significance

This first-ever linkage between a national survey and Medicaid claims provides new estimates on the magnitude of expenditures incurred on psychotropic medications for the care of maltreated children. It provides new information on the types of medications that are the primary drivers of these increased expenditures, and provides Medicaid policymakers with information on ways to undertake cost containment, especially as health reform efforts get underway.

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