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The Relationship between Substance Use Indicators and Child Welfare Caseloads

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This brief presents results from a statistical analysis examining the relationship between indicators of substance use prevalence and child welfare caseloads. Top-level findings are as follows:

- Nationally, rates of drug overdose deaths and drug-related hospitalizations have a positive relationship with child welfare caseload rates. After accounting for county socioeconomic and demographic characteristics, counties with higher overdose death and drug hospitalization rates have higher caseload rates.
- These substance use indicators correlate with rates of more complex and severe child welfare cases. Increases in rates of overdose deaths and drug-related hospitalizations are associated with a higher proportion of children entering foster care after reports of child maltreatment.
- Opioid-related hospitalization rates have a relationship with caseload rates comparable to that of other substance types, though alcohol has a stronger relationship than any illicit or prescription substance.

INTRODUCTION

This research brief describes how select indicators associated with substance use prevalence relate to changing trends in child welfare caseloads. It is part of a series describing findings of a mixed methods study undertaken to better understand how parental substance use relates to child welfare caseloads, which began rising in 2012 after years of sustained declines.

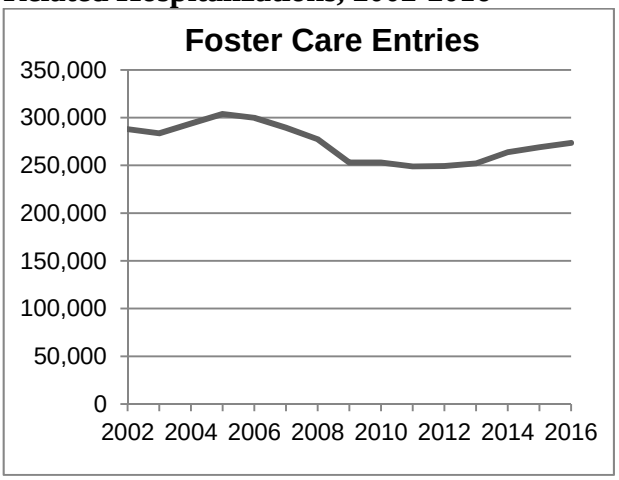
HOW WE CONDUCTED THE STUDY

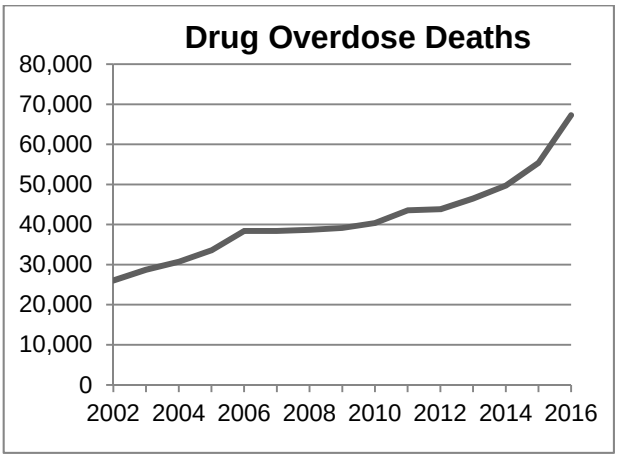
The research team conducted statistical analysis on nationally representative data at the county level. The team also conducted 188 interviews in 11 communities across the U.S. to understand the observations and experiences of child welfare administrators and practitioners, substance use treatment administrators and practitioners, judges and other legal professionals, law enforcement officials, and other service providers at the heart of each community's response to substance use among parents involved with the child welfare system. For an overview of the findings of the study, see the brief *Substance Use, the Opioid Epidemic, and the Child Welfare System: Key Takeaway Messages from a Mixed Methods Study*. For more information about the study's methods, see the brief *Substance Use, the Opioid Epidemic, and the Child Welfare System: Methodological Details from a Mixed Methods Study.*

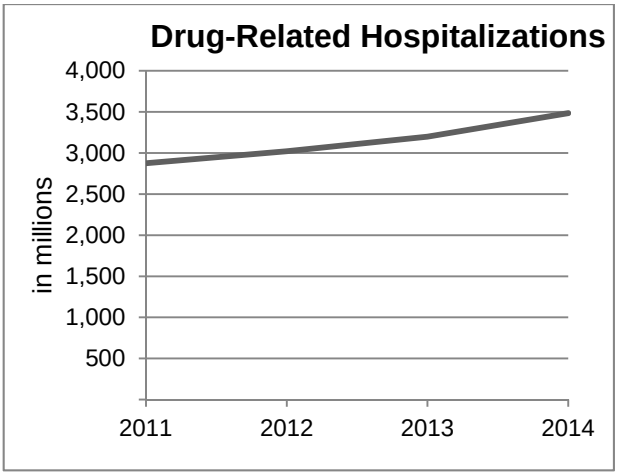
The analysis in this brief uses data on child welfare caseload rates and indicators of substance use prevalence from 2011 through 2016 for most counties in the U.S. Substance use indicators include overdose death rates related to any substance (excluding alcohol and tobacco), and rates of hospital stays and emergency department visits related to any substance (excluding alcohol and tobacco; referred to as "drug-related hospitalizations"). Child welfare measures include rates of reports of child maltreatment to child protective services, substantiated reports, and foster care entries. Substantiated reports include cases in which maltreatment was confirmed following a child protective services investigation or in which an alternative response was initiated. Statistical models were used to identify the relationships, accounting for factors such as county demographics, income, and characteristics of the child welfare system. Though these models identify a strong relationship and the results are supported by evidence from qualitative interviews, they cannot identify causal effects, and these results should not be interpreted that way. More details on

the data and methodology used in this analysis can be found at the end of this brief.

Figure 1. National Trends in Foster Care Entries, Drug Overdose Deaths, and Drug-Related Hospitalizations, 2002-2016







Sources: Foster care entries: Adoption and Foster Care Analysis and Reporting System. Drug overdose deaths: CDC National Vital Statistics System, includes all deaths with drug poisoning as the underlying cause of death. Hospitalizations: AHRQ State Inpatient Databases and State Emergency Department Databases. Includes all hospitalizations and emergency department visits due to any substances, excluding alcohol and tobacco.

NATIONAL AND SUBNATIONAL TRENDS

Nationally, foster care entries have risen recently after years of decline. Over the same period, drug overdose deaths and drug-related hospitalizations have increased at faster paces. While these national trends suggest a relationship between foster care and these substance use indicators, the relationship appears to differ across counties in the U.S. Overdose deaths and drug-related hospitalizations have a stronger relationship with foster care entries in certain areas of the country than in others.

Foster care entries declined from 2005 through 2011, as seen in Figure 1. This decline has generally been attributed to efforts across the country to reduce unnecessary foster care placements and to identify permanent placements for children in foster care, through reunification, guardianship, and adoption. However, starting in 2012, entries into foster care began to increase, causing concern among child welfare practitioners and policymakers.

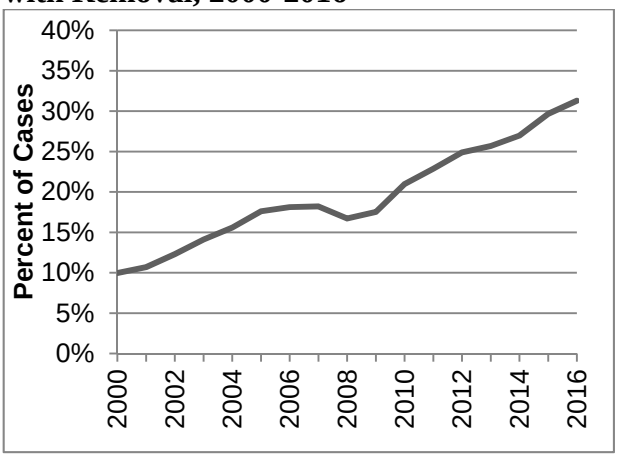
Drug overdose deaths increased nationally from 2002 to 2016. From 2007 through 2012, that increase averaged 2.7 percent per year. From 2013 through 2016, however, deaths increased at a faster rate. The increase in the rate of overdose deaths occurred over roughly the same period as the increase in foster care entries. Drug-related hospitalizations increased steadily from 2011 through 2014 (the latest year for which data are available).

Figure 2 shows the percentage of foster care entries with parental use of any substance identified as a circumstance associated with the removal, as reported by states to the Administration for Children and Families (ACF). This percentage has steadily risen every year since 2000, with the exception of 2007 and 2008. The increase may not entirely be due to increases in parental substance use, however. Historically, counties have had different reporting practices, and caseworkers have not always reliably indicated parental substance use as a reason for removal even when substance use is present. ACF and state agencies have taken steps to

improve reporting reliability, which likely explains a substantial portion of this increase.

As a result of these data quality issues, the trend in Figure 2 does not reliably portray the actual relationship between parental substance use and caseloads. The analysis in this brief uses total caseloads rather than caseloads with substance use listed as a reason for removal, and therefore this limitation does not apply.

Figure 2. Foster Care Entries with Parental Substance Use as a Circumstance Associated with Removal, 2000-2016



Source: Adoption and Foster Care Analysis and Reporting System.

These national trends obscure the substantial variation at the subnational level. When specific counties across the United States are examined, the relationship between substance use indicators and child welfare is more varied. Some areas with a relatively higher prevalence of overdose deaths do not have relatively higher foster care entry rates. Figure 3 divides counties into four classes based on whether they were above or below the national median in 2016 in terms of foster care entry rates and overdose death rates. Counties in red are above the median for both foster care entry rates and overdose death rates. Counties in light blue are below the median on both measures. The dark blue and orange indicate counties where the overdose death rates diverge from their relative foster care entry rates.

In 2016, the areas in red tended to cluster around several key geographic areas: Appalachia, New England, the central part of the Midwest, and parts of the West Coast. These regions saw particularly high rates of foster care entries and overdose death rates for all substances. Other parts of the country showed somewhat diverging trends. Throughout the south, southwest, and mid-Atlantic states, there were a number of counties with high rates of overdose deaths, but relatively low foster care rates (in orange). At the other end of the spectrum, counties with high foster care rates but low overdose death rates (in dark blue) can be found throughout the Midwest from Texas up through North Dakota and Minnesota.

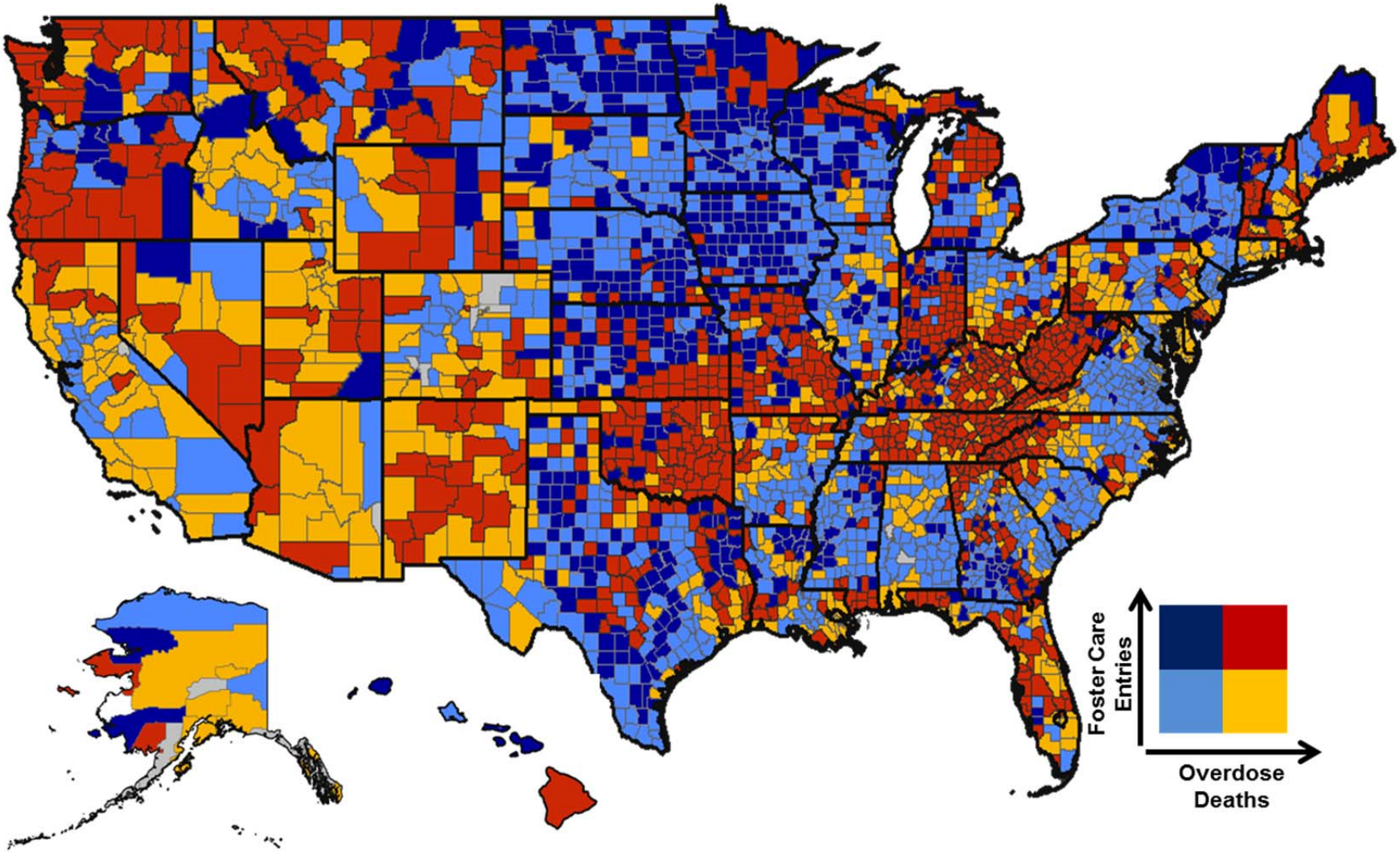
Many factors that differ across counties influence child welfare practices, child maltreatment, and substance use. These factors make it difficult to identify the extent to which substance use and child welfare are related in the average county. For example, poverty is a strong predictor of both child welfare involvement and substance use. Since not every county has the same poverty rate, not taking poverty into account may mask the true relationship between child welfare and substance use prevalence. The next section presents results from statistical models that account for a range of factors to more precisely estimate these relationships.

COUNTIES WITH HIGHER SUBSTANCE USE INDICATORS HAVE HIGHER FOSTER CARE ENTRY RATES

From 2011 through 2016, higher rates of overdose deaths and drug-related hospitalizations correlated with higher rates of entry into foster care. Figure 4 shows the estimated relationship between these two measures of substance use and foster care entry rates, after accounting for a number of socioeconomic, demographic, and other county-level factors. A 10 percent increase in drug overdose death rates correlated with a 4.4 percent increase in foster care entry rates. Similarly, a 10 percent increase in drug-related hospitalizations correlated with a 2.9 percent increase in foster care entry rates.

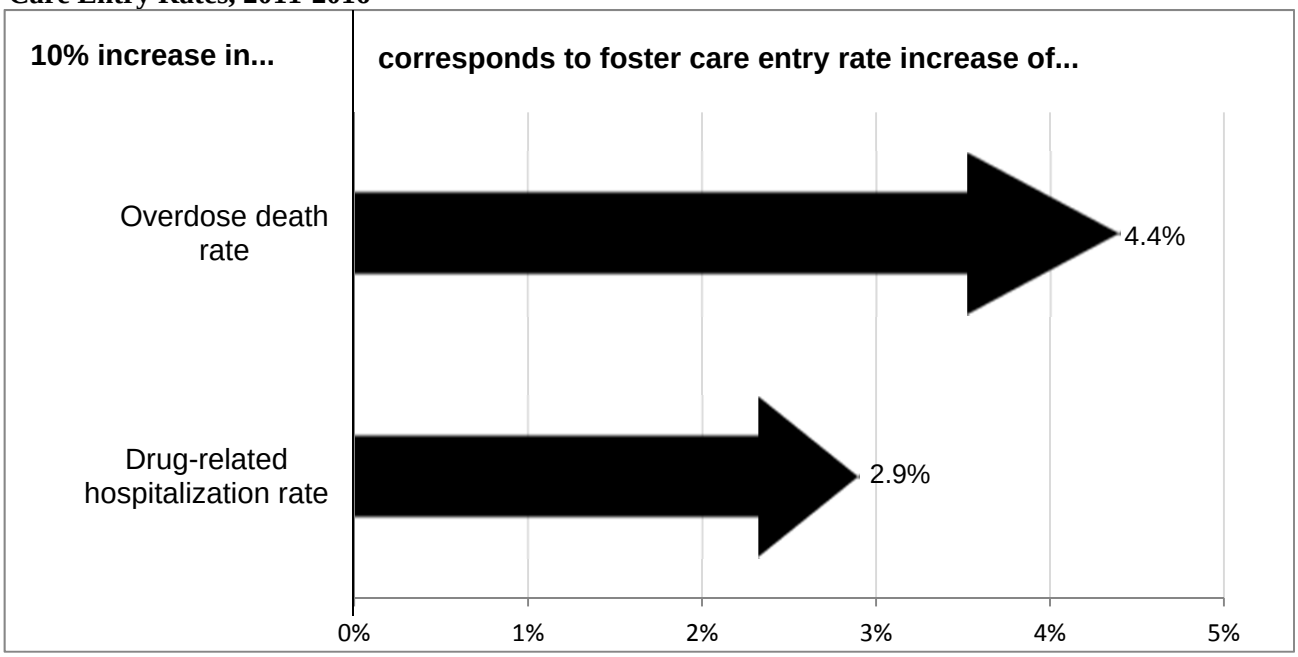
Interviews from the counties we visited corroborated these findings. In every community, caseworkers and court professionals perceived that increases in caseloads were due in large part to parental substance use. While substance use may not be the only factor causing increases, it clearly plays a role nationally.

Figure 3. Foster Care Entry Rates and Drug Overdose Death Rates, 2016



Source: AFCARS and CDC Small Area Estimates of Drug Overdose Death Rates (Age Adjusted). Colors indicate counties above or below the county median age-adjusted overdose death rate (15.4 per 100,000) and foster care entry rate (906 per 100,000 children).

Figure 4. Relationship between Overdose Death and Drug-Related Hospitalization Rates and Foster Care Entry Rates, 2011-2016



Note: Results are statistically significant, $p < 0.01$. $N = 9{,}392$ for hospitalizations and 14,539 for overdose deaths. More detailed model results are shown in Appendix Tables A2 and A3. The analysis for drug-related hospitalizations covers 2011 through 2014.

COUNTIES WITH HIGHER SUBSTANCE USE INDICATORS HAVE MORE COMPLEX CASES

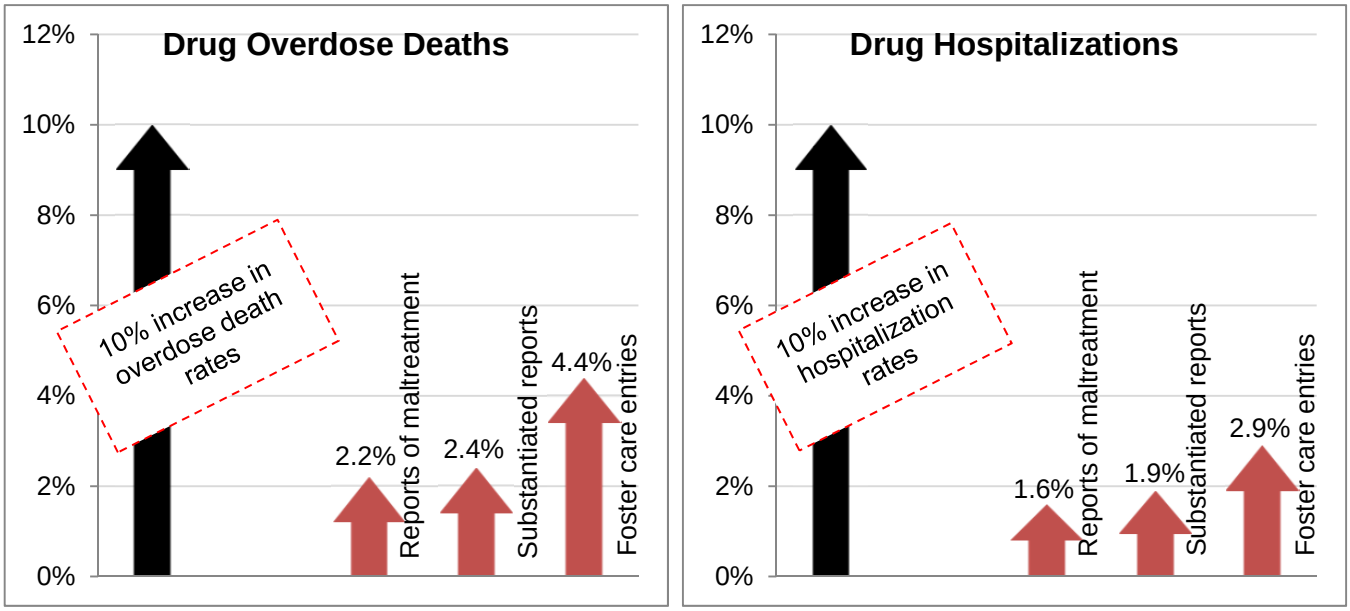
Substance use not only correlates with higher rates of foster care entry but also corresponds with more complex and severe cases of child maltreatment. Figure 5 shows the relationship of overdose death and drug hospitalization rates with three different measures of child welfare caseloads: reports of child maltreatment, substantiated reports, and foster care entry rates.

The two measures of substance use were positively correlated with all child welfare indicators. Furthermore, as cases became more severe—from report to substantiation to placement into foster care—the relationship increased in magnitude. A 10 percent increase in overdose death rates correlated with a 2.2 percent increase in rates of maltreatment reports, a 2.4 percent increase in substantiation rates, and 4.4 percent increase in foster care entry rates. The trend for drug hospitalization rates was comparable, though slightly smaller in scale.

If substance use affected caseloads only by increasing rates of child maltreatment, we would expect the relationship to be the same for all three child welfare measures. That is, more maltreatment should lead to more reports of abuse and neglect, with proportional increases in substantiation and foster care entry. The stronger relationship with foster care entries indicates that something was different about the cases in areas with higher substance use prevalence. In fact, further analysis shows that a 10 percent increase in overdose death rates is associated with a 1.8 percent increase in the proportion of reports resulting in foster care placement (see Appendix Table A2 for detailed results).

For example, caseworkers and courts may handle cases differently, fewer resources may be available to address substance use among parents, or the cases themselves may be more severe or complex. The interviews we conducted found that in many communities, cases involving substance use are frequently more severe and involve particularly complex circumstances in which other supports may not be available to care for children safely. In particular, caseworkers and court professionals discussed higher degrees of child neglect by parents misusing prescription opioids or using heroin or

Figure 5. Relationship between Overdose Deaths, Drug Hospitalizations, and Child Welfare Caseload Rates, 2011-2016



Note: All results are statistically significant, $p < 0.01$. Each estimate comes from a separate model. Sample sizes range from 14,539 to 14,560 for overdose death rates and from 9,392 to 9,397 for hospitalizations, depending on the specific model. "Substantiated reports" include substantiated investigations and alternative response. More detailed results are shown in Appendix Tables A2 and A3.

other illicit opioids. In many communities, caseworkers were finding it increasingly difficult to get parents with substance use disorders to comply with court orders or safety plans for their children. In addition, caseworkers and judges in areas hardest hit by the epidemic described the difficulty of finding family to care for children because in many cases multiple members are misusing opioids. They described this as a substantial shift from recent years, when they would commonly rely on family members. Caseworkers and court professionals also discussed weaker social supports for parents suffering from substance use disorder, increasing the likelihood that children would be removed. The limited availability of family-friendly substance use treatment also may play a role. This treatment modality incorporates family therapy as well as parenting and child development services, and it is structured to allow parents to retain custody of their children while in treatment.

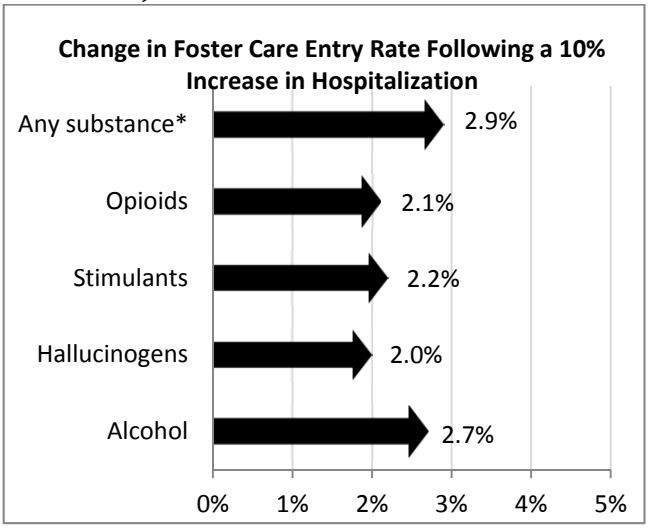
DIFFERENT SUBSTANCE TYPES HAVE COMPARABLE RELATIONSHIPS WITH ENTRY RATES

Use of any substance can put children at risk, and results show that different categories of substance use have comparable relationships with foster care entry rates. Figure 6 shows the relationship of foster care entry rates with hospitalizations related to different classes of substances: opioids (including heroin), stimulants (including cocaine and methamphetamine), hallucinogens, and alcohol. The differences between opioids, stimulants, and hallucinogens are small and not substantively or statistically significant. Alcohol-related hospitalizations have a slightly higher, statistically significant relationship.

These results do not account for use of multiple substances simultaneously. Data on hospitalizations reflect the specific substance hospital workers indicated as the cause of hospitalization, but patients may have been using other substances concurrently. This result may partially account for the similarity in estimates across the different types

of substances. An additional limitation is that models for each substance only included counties where there was at least one hospitalization related to that substance was recorded. As result, the samples are not identical.

Figure 6. Relationship of Foster Care Entry Rates to Hospitalizations due to Different Substances, 2011-2016



* Excludes alcohol. Estimates come from separate models and are statistically significant at the $p < 0.01$ level. *N:* Any substance=9,392, Opioids=7,557, Stimulants=6,891, Hallucinogens=1,193, Alcohol=9,248.

CONCLUSION

Combining evidence from statistical analysis and qualitative research, we find a strong positive relationship between select indicators correlated with substance use and each of the three examined measures of child welfare involvement. From 2011 through 2016, counties with higher rates of drug overdose deaths and drug-related hospitalization had higher rates of child maltreatment reports, substantiated reports, and foster care entries. In addition, higher rates of substance use indicators are correlated with more complex and severe cases of child maltreatment. The increase in overdose death and drug hospitalization rates is correlated with a greater increase in rates of foster care entries, relative to increases in reports of child maltreatment and case substantiation. Interviews in 11 distinct communities across the country corroborated the finding that child welfare cases involving parental substance use can be more difficult to manage and less likely to result in reunification.

While opioids have been a specific focus of concern, we find that hospitalizations related to different substance categories (namely, opioids, stimulants, hallucinogens, and alcohol) have comparable relationships with foster care entry rates.

This study has several important limitations. First, the analysis cannot identify a causal relationship. The positive association between the substance use measures and child welfare caseload rates may be caused by other factors. For example, communities with higher substance use prevalence may have higher degrees of depression, which has been linked to child maltreatment (Conron et al., 2009). While this limitation is valid, the qualitative evidence strongly supports the close connection.

An additional limitation is that the two indicators of substance use do not perfectly measure actual substance use prevalence, particularly among parents. We do not have a good measure of county-level substance use disorder or substance misuse prevalence, and thus we used indicators that have been correlated with substance misuse and use disorder as surrogates.

These findings corroborate what many child welfare practitioners and administrators see on the ground: parental substance use has significant implications for child well-being. Substance use, including opioid misuse, has downstream effects on children's welfare and family stability, and these in turn can place a substantial burden on communities.

ACKNOWLEDGEMENTS

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METHODOLOGICAL APPENDIX

DATA

Our study examines the county-level prevalence of two indicators of substance use and three measures of child welfare caseloads. Case-level data linking parental substance use to child welfare cases do not exist nationally, and indicators of parental substance use within program administrative records from the child welfare system are not reliable. We use county-level data from 2011 through 2016 for models of drug overdose deaths and from 2011 through 2014 for models of drug-related hospitalizations. Counties with fewer than 10 entries into foster care during any year were excluded.

Nationwide child welfare data are derived from two administrative sources, both collected by the Administration for Children and Families. The National Child Abuse and Neglect Data System (NCANDS) is a federally sponsored effort that annually collects case-level data on child maltreatment known to child protective services agencies in all 50 states, the District of Columbia, and Puerto Rico.[1] It is a voluntary reporting system, and agencies report information on the characteristics of the reports of maltreatment, the children involved, and the types of maltreatment, among other data. The Adoption and Foster Care Analysis and Reporting System (AFCARS), also federally sponsored, collects case-level data from title IV-E agencies in all 50 states and the District of Columbia on all children in foster care and those who have been adopted with title IV-E agency involvement. It is a mandatory reporting system and contains information on the characteristics of children and reasons for removal from the home, among other data.[2]

We use three measures for child welfare caseloads that reflect three steps in the child welfare continuum. The first measure is the total number of reports of maltreatment per 100,000 children aged 0 to 18 in a county. The second measure is the total number of substantiated reports for children of any age, per 100,000 children. It includes reports not substantiated but directed for alternative response, an approach taken in many states to provide services on cases that are not deemed serious enough for a full investigation. The third measure is the number of children entering foster care (or, alternatively, the number removed from their home) per 100,000 children. A small percentage of individuals in the foster care system are over 18. Given that the distribution of these individuals is not related to other variables of interest, we do not expect it to affect the results.

Limitations affect the reporting of AFCARS and NCANDS data. First, data are not available for all counties: for example, in 2015, approximately 7 percent of all counties (233) had no AFCARS data reported, and nearly 1 percent of counties (27) had no NCANDS data reported. In addition, child protective services for counties with low populations may be managed by neighboring counties, and AFCARS and NCANDS numbers may be reported accordingly. Finally, when changes in caseload rates are studied, small numeric changes in counties with low caseloads can appear to be relatively large. To account for this limitation, we restrict all modeling to county-year observations with at least 10 cases. This restriction eliminated 891 counties, or 28 percent of all counties, from the analysis for 2015.

We use two indicators associated with substance use prevalence derived from national administrative records. Using both measures helps triangulate substance use prevalence and how it may relate to child welfare caseloads. Each is measured as the rate per 100,000 people. The first measure is age-adjusted drug overdose death rates per 100,000 persons, drawn from small-area estimates from the Centers for Disease Control and Prevention (Rossen et al., 2017).[3] Data are available for all counties and include deaths from any substance, excluding alcohol and tobacco. The second measure is hospital stays related to any type of substance use (excluding alcohol and tobacco). Data are derived from the State Inpatient Databases and State Emergency

[1] Details on NCANDS can be found at https://www.acf.hhs.gov/cb/research-data-technology/reporting-systems/ncands.
[2] Details on AFCARS can be found at https://www.acf.hhs.gov/cb/resource/about-afcars.
[3] See https://www.cdc.gov/nchs/data-visualization/drug-poisoning-mortality/.

Department Databases in the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality. States voluntarily report patient-level hospital stay data to HCUP, following standardized International Classification of Diseases (ICD) codes. Relevant ICD-9 codes, following established practice, were identified based on categories of substances, including opioids (including prescription and illicit opioids and heroin), stimulants (including cocaine and methamphetamine), hallucinogens, and alcohol. Patient records were aggregated to the county level based on patients' county of residence.

Our statistical models account for various demographic and economic characteristics of counties. These county-level characteristics include population size, urbanicity (using USDA's Urban Influence Codes[4]), median income, percentage receiving Medicare disability, uninsured rates, and whether the county is classified as a Health Professional Shortage Area for primary care or mental health (based on definitions established by the Health Resources and Services Administration[5]). We also include state-level characteristics, including state expenditures on child welfare, whether the state had an active prescription drug monitoring program (including whether it was voluntary or mandatory for practitioners to consult it), and whether the state had legislation targeting prescription opioid "pill mills" (Mallatt, 2017). We also include indicators for the year and state, and all year-state interactions. Finally, we include two variables to account for county-level child welfare practice: the proportion of reports referred to alternate or differential response (as reported to NCANDS) and the proportion of all reports ending in foster care placement in 2010. Table A1 reports descriptive statistics for all variables in the models.

METHODS

Separate models were run for each measure of substance use to avoid multicollinearity. The AFCARS and NCANDS measures exhibit substantial positive skew, and their means and variances differ substantially. As a result of these characteristics, negative binomial regression models were used. This statistical modeling method is appropriate for variables measuring counts that exhibit positive skew and are non-negative. Overdispersion of the dependent variables indicated that a negative binomial model was more appropriate than a Poisson model. Models include the number of children aged 0 to 18 as an offset, allowing the coefficients to be interpreted as predicted proportional change in caseloads per children in a county, for a given change in the independent variable. The number of hypotheses being tested across the various models necessitated accounting for multiple testing. To adjust for this risk, we use the false discovery rate (FDR), as defined by Benjamini and Hochberg (1995), where 0.05 set as the FDR threshold. We use cluster-robust standard errors to account for the clustered nature of our data, where years are clustered within counties. All models include state-by-year fixed effects. County fixed effects were not included, in order to preserve cross-county variability, an issue of substantial policy concern.

Models using hospital stays restricted the sample to counties that had at least one hospital stay or emergency department visit related to the specific substance being modeled. Thirty-one percent of all county-year observations with data on hospital stays had no substance-related stays. While it may be that these counties differ in substantive ways from counties that had at least one stay, there are systematic differences in how HCUP data are collected across counties. Statistical models of the number of substance-related stays in counties predicted these counties would have had higher rates of stays, which suggests there may be measurement error in these counties not found in other counties. Our models may be biased to the extent that the actual hospitalization rates in these counties are correlated with child welfare caseloads. This limitation may also affect the comparison of hospitalization rates due to different substances, reported in Figure 6, as the sample sizes differ across these models. To assess the robustness of these differences, we tested the coefficients from the models on their original sample with new models with a more restricted sample. The restricted sample only included county-year observations with at least one hospitalization for all of the substance types. None of the tests found a significant statistical difference. Tables A2 and A3 report the full statistical results for the models shown in Figures 4 and 5.

[4] See https://www.ers.usda.gov/data-products/urban-influence-codes.aspx.
[5] See https://bhw.hrsa.gov/shortage-designation/hpsas.

Table A1. Descriptive Statistics

Variable	Mean	Standard Deviation
Reports of child maltreatment per 100,000 children	5,377.40	4,451.70
Substantiated reports per 100,000 children	1,102.04	1,069.69
Foster care entries per 100,000 children	490.50	441.19
Proportion of reports in foster care	0.12	0.29
Drug overdose deaths per 100,000 residents	13.95	7.41
Drug-related hospitalizations per 100,000 residents	749.88	583.17
Opioid-related hospital stays per 100,000 residents	171.63	204.12
Alcohol-related hospitalizations per 100,000 residents	760.65	577.44
Stimulant-related hospitalizations per 100,000 residents	111.38	148.20
Hallucinogen-related hospitalizations per 100,000 residents	1.11	6.26
Small metropolitan area[a]	0.23	-
Micropolitan area[a]	0.20	-
Rural area[a]	0.42	-
Median income	32,491.37	8,800.83
Population	101,021.30	32,3768.10
Medicare disability (percentage)	3.37	1.62
Uninsured (percentage)	15.25	5.92
Percentage of cases in differential response	0.28	0.36
Prescription drug monitoring program, voluntary[a]	0.88	0.33
Prescription drug monitoring program, mandatory[a]	0.14	0.35
“Pill mill” legislation	0.25	0.43
HPSA, primary care, whole county[a]	0.26	-
HPSA, primary care, part county	0.60	-
HPSA, mental health, whole county[a]	0.68	-
HPSA, mental health, part county[a]	0.23	-
Reports removed in 2010 (percentage)	47.98	32.04
Age over 65 (percentage)	17.28	4.46
White population (percentage)	78.20	19.91
Black population (percentage)	9.36	14.38
State child welfare expenditures (millions)	195.11	345.66

[a] Categorical variable. All continuous variables are presented in levels but are transformed in natural logarithms in models. HPSA = Health Professional Shortage Area.

Table A2. Full Model Results for Drug Overdose Deaths and Child Welfare Caseload Rates

Variable	Child Maltreatment Report Rate	Substantiated Reports	Foster Care Entry Rate	Proportion of Reports Placed in Foster Care
Overdose death rate	1.22***	1.24***	1.44***	1.18***
	(0.03)	(0.03)	(0.06)	(0.04)
Prescription drug monitoring program, mandatory	1.42***	1.27	1.45**	1.08
	(0.14)	(0.17)	(0.20)	(0.13)
Prescription drug monitoring program, voluntary	1.22*	1.25*	1.52***	1.32*
	(0.11)	(0.12)	(0.17)	(0.14)
"Pill mill" legislation	1.53***	1.05	1.33*	0.88
	(0.13)	(0.15)	(0.19)	(0.11)
Small metropolitan area	1.13***	1.12***	1.14***	1.03
	(0.03)	(0.03)	(0.04)	(0.03)
Micropolitan area	1.10***	1.14***	1.13**	0.99
	(0.03)	(0.04)	(0.04)	(0.03)
Rural area	1.06*	1.09*	1.11*	1.03
	(0.03)	(0.04)	(0.05)	(0.03)
HPSA, mental health, partial county	1.04	1.02	1.03	0.97
	(0.02)	(0.03)	(0.04)	(0.03)
HPSA, mental health, total county	1.05	1.02	1.01	0.94
	(0.03)	(0.03)	(0.04)	(0.03)
HPSA, mental health, partial county	1.01	1.01	1.04	1.01
	(0.02)	(0.03)	(0.04)	(0.03)
HPSA, mental health, total county	1.04	1.04	1.05	1.01
	(0.02)	(0.03)	(0.03)	(0.03)
Reports removed in 2010	1.00***	1.00***	1.01***	1.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Percentage in differential response	1.14*	0.31***	0.68***	0.56***
	(0.06)	(0.02)	(0.05)	(0.04)
State child welfare expenditures	0.76***	0.96	0.78**	1.01
	(0.05)	(0.07)	(0.06)	(0.07)
Medicare disability	1.08***	1.10***	1.09***	1.01
	(0.01)	(0.02)	(0.01)	(0.01)

Variable	Child Maltreatment Report Rate	Substantiated Reports	Foster Care Entry Rate	Proportion of Reports Placed in Foster Care
Population	0.96***	0.93***	0.92***	0.95***
	(0.01)	(0.01)	(0.01)	(0.01)
Median income	0.74**	0.76*	0.72*	0.98
	(0.08)	(0.10)	(0.10)	(0.05)
Age over 65	1.00	1.01	1.00	1.00
	(0.01)	(0.01)	(0.01)	(0.01)
White population	1.01*	1.00	1.01	1.00
	(0.00)	(0.00)	(0.00)	(0.00)
Black population	1.00	1.00	1.00	1.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Uninsured	1.00	1.00*	1.00	1.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	1.00	1.01	1.01	1.01**
	(0.00)	(0.01)	(0.01)	(0.00)
Log (alpha)	0.11***	0.18***	0.24***	0.22***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	14,560	14,560	14,539	14,539

Note: Coefficients are incident rate ratios, per 100,000 children aged 0 to 18, with the exception of the "proportion of reports placed in foster care" model ratios, which are per 100,000 reports of maltreatment. Cluster-robust standard errors are in parentheses. State-year fixed effects are not shown. HPSA = Health Professional Shortage Area.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, unadjusted for multiple comparisons. *P* values in the text make such adjustment.

Table A3. Full Model Results for Drug Hospitalizations and Child Welfare Caseload Rates

Variable	Child Maltreatment Report Rate	Substantiated Reports	Foster Care Entry Rate	Proportion of Reports Placed in Foster Care
Drug-related hospitalization rate	1.16***	1.19***	1.29***	1.09***
	(0.02)	(0.03)	(0.04)	(0.02)
Prescription drug monitoring program, mandatory	1.17*	1.50***	1.39***	1.16
	(0.08)	(0.17)	(0.11)	(0.11)
Prescription drug monitoring program, voluntary	1.09	1.35**	1.40***	1.31**
	(0.08)	(0.13)	(0.12)	(0.13)
"Pill mill" legislation	1.76***	1.51	2.17***	1.15
	(0.26)	(0.31)	(0.44)	(0.22)
Small metropolitan area	1.09**	1.07*	1.06	1.00
	(0.03)	(0.04)	(0.04)	(0.03)
Micropolitan area	1.05	1.08	1.03	0.96
	(0.04)	(0.04)	(0.04)	(0.03)
Rural area	1.03	1.05	1.04	1.02
	(0.03)	(0.04)	(0.05)	(0.04)
HPSA, mental health, partial county	1.05	1.04	1.04	0.96
	(0.03)	(0.04)	(0.04)	(0.04)
HPSA, mental health, total county	1.06*	1.04	1.04	0.96
	(0.03)	(0.04)	(0.04)	(0.04)
HPSA, mental health, partial county	1.01	1.00	1.02	0.99
	(0.03)	(0.03)	(0.04)	(0.04)
HPSA, mental health, total county	1.04	1.03	1.03	0.99
	(0.02)	(0.03)	(0.03)	(0.03)
Reports removed in 2010	1.00***	1.00***	1.01***	1.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Percentage in differential response	1.17**	0.30***	0.66***	0.53***
	(0.07)	(0.02)	(0.05)	(0.04)
State child welfare expenditures	0.63*	0.64	0.49**	0.82
	(0.11)	(0.16)	(0.11)	(0.19)
Medicare disability	1.08***	1.09***	1.08***	1.02
	(0.02)	(0.02)	(0.02)	(0.01)
Population	0.96***	0.94***	0.93***	0.96**
	(0.01)	(0.01)	(0.01)	(0.01)
Median income	0.66**	0.67*	0.64*	1.01
	(0.09)	(0.12)	(0.11)	(0.05)
Age over 65	1.00	1.00	1.00	1.00
	(0.01)	(0.01)	(0.01)	(0.01)

Variable	Child Maltreatment Report Rate	Substantiated Reports	Foster Care Entry Rate	Proportion of Reports Placed in Foster Care
White population	1.01**	1.01*	1.01**	1.00
	(0.00)	(0.00)	(0.00)	(0.00)
Black population	1.00	1.00	1.00	1.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Uninsured	1.00	0.99**	0.99***	0.99***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	1.00	1.01	1.01	1.01**
	(0.01)	(0.01)	(0.01)	(0.00)
Log (alpha)	3378.51*	668.65	22663.07*	2.36
	(11682.83)	(3107.18)	(101165.82)	(9.55)
Observations				

Note: Coefficients are incident rate ratios, per 100,000 children aged 0 to 18, with the exception of the "proportion of reports placed in foster care" model ratios, which are per 100,000 reports of maltreatment. Cluster-robust standard errors are in parentheses. State-year fixed effects are not shown. HPSA = Health Professional Shortage Area.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, unadjusted for multiple comparisons. *P* values in the text make such adjustment.