Child Maltreatment

Child Welfare System-Level Factors Associated with All-Cause Mortality Among Children in Foster Care in the United States, 2009-2018

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FACTORS ASSOCIATED WITH FOSTER CARE MORTALITY

Abstract

Little is known about the impact of child welfare system-level factors on child mortality as an outcome within foster care. Using data from the Adoption and Foster Care Analysis and Reporting System, 2009-2018, we examined the associations between county-level sociodemographic, foster care performance, and judicial reform characteristics with all-cause mortality rates. Results of random effects negative binomial regression analyses showed that higher proportions of younger children (<1 year: IRR=1.06, 95% CI [1.02, 1.11]; 5-9 years: IRR=1.05, 95% CI [1.01, 1.09]); children of color (i.e., non-Hispanic Asian: IRR=1.07, 95% CI [1.01, 1.13]; Multiracial: IRR=1.03, 95% CI [1.01, 1.04]; non-Hispanic Black: IRR=1.02, 95% CI [1.01, 1.02]; Hispanic: IRR=1.01, 95% CI [1.01, 1.02]); and male children (IRR=1.10, 95% CI [1.05, 1.15]) were associated with higher mortality risks at the county level. Current class action lawsuits (IRR=0.79, 95% CI [0.63, 0.99]) and active consent decrees (IRR=0.77, 95% CI [0.63, 0.94]) were associated with lower mortality risks. None of the foster care performance characteristics (e.g., foster care entry, placement stability, permanency) were associated with mortality risks. These findings have implications for addressing health disparities and reforming foster care systems through programmatic and policy efforts.

Keywords: Foster care systems; all-cause mortality; Adoption and Foster Care Analysis and Reporting System; risk and protective factors

Most recently available data show that the U.S. foster care system served approximately 391,000 children during the 2021 fiscal year between October 1, 2020, and September 30, 2021 (U.S. Department of Health and Human Services [USDHHS], 2022). In the last decade between fiscal years 2012 and 2021, approximately 252,000 children entered the U.S. foster care system each year (USDHHS, 2017, 2022). Foster care is defined as "24- hour substitute care for children placed away from their parents or guardians and for whom the Title IV-E agency has placement and care responsibility. This includes, but is not limited to, placement in foster family homes, foster homes with relatives, group homes, emergency shelters, residential facilities, childcare institutions, and pre-adoptive homes" (45 CFR § 1355.20, 2022). Although all foster care systems are responsible for complying with federal and state requirements, they vary in how they are organized, operate, and deliver services, as well as the populations they serve (USDHHS, 2018). For example, some states have centralized administrative systems at the state level, including Alabama, Florida, Maryland, Michigan, South Carolina, and Texas. In contrast, others have county-administered systems (e.g., California, New York, Pennsylvania) or "hybrid" systems in which the state and counties share administration (e.g., Nevada, Wisconsin; U.S. Department of Health and Human Services, 2018). The state-to-state variation goes beyond administrative systems to include differences in foster care populations and how well foster care systems comply with system objectives (Russell & Macgill, 2015).

Varied organization and operations of foster care systems across states and counties have implications for child outcomes. For example, variation in budgets might affect the extent to which child welfare agencies are able to recruit and train foster parents or implement evidence-based programs to serve children's needs, ultimately yielding differential outcomes for children

in care (Goldhaber-Fiebert et al., 2014). Prior research suggests that overburdened and under-resourced foster care systems are likely to have higher incidences of adverse child outcomes (Herz et al., 2019; Wulczyn, 2020). Such overburdened and resource-strained systems may also see higher rates of child deaths, given the large proportion of children (approximately 33%) in foster care with chronic illnesses (Lindley & Slayter, 2018, 2019). The same overburdened systems may also experience difficulties with placing high-risk children who might then remain in dangerous situations or place such children in sub-standard settings that fail to protect them from future harm—all of which may additionally contribute to child deaths in foster care.

Yet, no studies, to our knowledge have investigated child deaths as an adverse child outcome and factors that might be associated with child deaths across different foster care systems. The focus on child deaths is important, given that on average 330 children died in foster care each year between 2005 and 2015, with the mean age of children being 6 years, and the highest proportion of children dying as infants (Lindley & Slayter, 2019). To prevent such child deaths, policy reform along with research informing intervention efforts are urgently needed. To address these knowledge gaps, this study examined system-level factors associated with all-cause mortality among children in foster care, using national child welfare data from 2009 to 2018. A greater understanding of system-level risk and protective factors associated with mortality for children in foster care may inform prevention efforts, guide reforms in the child welfare system, and promote child wellbeing.

Factors Associated with All-Cause Mortality in Foster Care

Children in foster care have high rates of physical, mental, and developmental health problems and unmet health care needs (Turney & Wildeman, 2016). They also are at higher risk for death compared to the general U.S. population (Chaiyachati et al., 2020). Each year hundreds

of children die while in foster care due, in part, to health problems, sudden infant death syndrome, suicide, homicide, and accidents (Barth & Blackwell, 1998; Haeberle, 2022; Lindley & Slayter, 2019). For example, between 2005 and 2015, nationally there was a total of 3,653 children who died in foster care, with the number of deaths ranging between 251 deaths (in 2012) and 436 deaths (in 2006) (Lindley & Slayter, 2019). Causes of mortality within foster care are not captured in national child welfare datasets and thus other sources of data, mostly local, provide a glimpse of why children may be dying while in state care. For example, in Ohio, 128 children have died in foster care since 2015, and 20 deaths occurred while children were in the care of Franklin County Children's Services, one of the largest public child welfare agencies in Ohio. Ten out of 20 of the deaths were reported to be due to gun violence (Haeberle, 2022). A study with California data showed that children in the Californian foster care systems were more likely to die of diseases and disorders compared to children in the general state population (death rates of 46 versus 19 deaths per 100,000 children) (Barth & Blackwell, 1998). Despite such evidence and societal obligations to abate excess mortality while children are in state care, little is known about factors associated with mortality for children in foster care. In the following sections, we describe sociodemographic population, foster care performance measures, and judicial reform characteristics that may be associated with mortality of children in foster care.

Sociodemographic Characteristics of the Foster Care Population

Risk of mortality is not evenly distributed across childhood when assessed by several typically considered sociodemographic factors. When foster care populations are compared, differential representation of demographically defined risk groups may be reflected in different mortality at the system level.

Race and Ethnicity of Children

In the general population, race and ethnicity are associated with differential mortality risks such that children of color have higher rates of mortality compared to White children (CDC, 2022a). Since children enter foster care from the general population, similar mortality trends may be expected in the foster care population and even amplified given the disproportionate and unmet needs of children of color who come in contact with the child welfare system (Drake et al., 2021). Relatedly, systemic factors such as racially biased decision-making and lack of resources to address the needs of children of color after entrance to foster care have been noted as contributors to such racial and ethnic disproportionalities and disparities (Dettlaff & Boyd, 2020). Collectively, these point to differences in child mortality risks depending on the proportion of children of color systems have in their care when compared between foster care populations, such as at county level.

Age of Children

Regarding children's ages, the first year of life has much higher mortality than later years, accounting for the majority of pediatric deaths (Institute of Medicine Committee on Palliative and End-of-Life Care for Children and Their Families, 2003). Previous work has also demonstrated higher mortality in younger years for children in foster care, with a mean age of 6 for foster care decedents (Chaiyachati et al., 2020; Lindley & Slayter, 2019). Thus, similar to differential representation of racial groups affecting measured risk of mortality, child mortality within foster care likely reflects risk conveyed by the proportions of infants and younger children foster care systems serve.

Sex of Children

Another sociodemographic factor to consider is the proportion of male versus female children. Within child welfare, male children are more likely to die than female children. This is

similarly true in the general population (Lindley & Slayter, 2019; Xu et al., 2021). Moreover, given the elevated risk for mortality in youths with history of delinquency (Ruch et al., 2021), another point that may be relevant is that some studies have documented higher risks of delinquent behaviors and other behavioral problems among boys than girls in foster care (Gypen et al., 2017; Rosenthal & Curiel, 2006). Thus, observation of differences in mortality risks based on the proportion of male children in the foster care system may then reflect general population trends, as well as systems with increased needs to address delinquent and externalizing behaviors of male children.

Physical Disability Status of Children

In general, children with high morbidity, such as physical disability, will be at higher risk for mortality (Decouflé & Autry, 2002). The proportions of children with physical disabilities in foster care range from 1% to 13% depending on the data source (Seltzer et al., 2017). Prior research using national child welfare data has shown that, compared to children without disabilities, children with disabilities in foster care are more likely to die (Slayter, 2016). Lack of coordination and communication between disability systems and child welfare systems has also been documented, which may result in child welfare caseworkers being insufficiently trained in disability competence and ways to successfully access or advocate for disability services on behalf of children on their caseloads (Slayter, 2016). Generally, these challenges raise questions about whether the complex needs of children with disabilities are being sufficiently met in foster care. Then, at the system level, differences in child mortality risks based on the proportion of children with physical disabilities in foster care may be mirroring existing trends, along with limited capacity of foster care systems to care for the needs of children with physical disabilities.

Foster Care Performance Measures

Foster care performance measures, such as those outlined in the Child and Family Services Review (CFSR) (e.g., placement stability, permanency goal), may be reflective of the extent to which systems serve high risk populations, as well as how well or poorly systems are functioning (USDHHS, 2021a). As part of the 1994 Amendment of the Social Security Act, the USDHHS was authorized to review state child and family service programs, and the Children's Bureau within the Department has been tasked with administering CFSRs to assess whether states substantially conform to federal requirements for child welfare services, including foster care, as outlined in Title IV-B and IV-E of the Social Security Act (Children's Bureau, n.d.). In terms of system-level risk factors, for example, higher foster care entry rates (Russell & Macgill, 2015) and higher proportions of long-term foster care cases (Ringeisen et al., 2013) may imply system burden and challenges with meeting timely permanency objectives. Higher proportions of children in congregate care (especially younger children; Harden, 2002; USDHHS, 2015), children placed out of state (Sankaran, 2006), and children who experience placement instabilities (Konijn et al., 2019) may also indicate system failures related to ensuring that children have permanency and stability in their living situations and continuity in family relationships (USDHHS, 2021a).

Protective factors include systems' higher proportions of (a) children who reunite with their families of origin within 18 months of foster care entry, which aligns with permanency timelines outlined in state family codes and the Adoption and Safe Families Act (ASFA; Font et al., 2018; Golden & Macomber, 2009); (b) children who retain a case goal of reunification even after 18 months have elapsed, suggesting that the system is still putting efforts toward reunification on behalf of the child (Radel & Madden, 2021); and (c) cases receiving foster care payments, which may reflect systems' resources to support the needs of children in their care

(Duncan & Argys, 2007). There is some evidence that foster care improves children's safety and educational outcomes (Gross & Baron, 2022; Schneiderman et al., 2021). Further research is needed to examine the association between foster care performance measures and childhood mortality for youth in foster care.

Judicial Reform Characteristics

Judicial reform attempts, such as class action lawsuits and consent decrees pertaining to child welfare, may also impact system performance. Class action lawsuits brought about by children's rights watchdog agencies have focused on addressing a lack of coherence across state and federal laws, as well as cases where children's safety is violated (Font & Gershoff, 2020). Proponents of judicial reform often view these as final attempts to reform child welfare systems that, in their current state, do not protect children (Lee et al., 2019). Consent decrees are often used in judicial reform of systems. Consent decrees are settlements that resolve legal conflict between two parties without entering trial and lead to federal court monitoring the defendants' (e.g., child welfare systems) course of actions to resolve the initially identified problems. Current knowledge investigating the impact of consent decrees is generally mixed, and proof of any direct, positive impact on the health and wellbeing of children in the foster care system is challenging to quantify (Lee et al., 2019). That said, some evidence from research—especially with states (e.g., Alabama, Kansas, Tennessee, Utah) that have had a history of being under consent decrees and successfully exited them by using non-adversarial means and replying on outside expert support—suggests that potential system level benefits may exist. For these states, judicial reform has led to improved performance measure outcomes, including caseload standards that enhance child welfare workers' abilities to support children and families within the foster care system (Center for the Study of Social Policy, 2012; Lee, 2021). For example, for

class action lawsuits, which occur as part of a pre-decree phase, concerns about system functioning, distress of being sued, and fear of legal and financial consequences could promote foster care systems' corrective action. At the consent decree phase, however, it may be that additional funds and resources (e.g., support from outside experts) are made toward reform, allowing systems to improve their performances that ultimately benefit children in foster care.

The Current Study

This study examined the associations between system-level factors and all-cause mortality rates for children in the U.S. foster care system. To the best of our knowledge, our study is the first to do so. Based on prior research, we hypothesized that, at the system level, higher proportions of children of color, younger children, children with disabilities, and male children would be associated with higher mortality risks (H1). We also hypothesized that child welfare systems' higher foster care entry rates, higher proportions of children in congregate care, long-term cases, children placed out of state, and children experiencing placement instability would be associated with higher risks of mortality; whereas higher proportions of reunification within 18 months, cases that retain a goal of reunification even after 18 months, and cases receiving foster care payments would be associated with lower risks of mortality (H2). Finally, we hypothesized that having class action lawsuits and currently being under consent decrees would be associated with lower risks of mortality (H3).

Methods

Study Design and Data Sources

We used data from the 2009-2018 Adoption and Foster Care Analysis and Reporting System (AFCARS) (National Data Archive on Child Abuse and Neglect [NDACAN], 2022a). AFCARS, a federally mandated data collection system, gathers case-level information on every

child served by state or tribal Title IV-E agencies that provide adoption or foster care services across all 50 states in the United States, the District of Columbia, and Puerto Rico. The data include information on child demographics, foster care entry, placement, discharge, and service goals. Data are deidentified and publicly available through the National Data Archive on Child Abuse and Neglect (NDACAN, 2022a).

To gather data on judicial and legislative reforms, we reviewed related literature documenting each state's or county's consent decree and class action lawsuit history and status (e.g., Font & Gershoff, 2020). Next, additional searches were conducted, accessing and looking up databases of child advocacy groups such as Children's Rights (Children's Rights, n.d.) in January of 2022, to confirm or update each child welfare system's most recent consent decree and class action status. The *name of the institution masked for review* Institutional Review Board approved the current study as secondary analysis of AFCARS.

Unit of Analysis

The unit of analysis for this study consisted of 85 counties in the United States, the District of Columbia, and Puerto Rico from calendar years 2009 to 2018. To select these counties, we first converted the AFCARS data from federal fiscal years into calendar years because of a lag in the availability of data within a given federal fiscal year (NDACAN, 2022a). Because counties with fewer than 1,000 records each year are deidentified by NDACAN for confidentiality reasons (NDACAN, 2022a), we focused only on those counties that could be identified (n = 153). Of these, we retained only those counties that had all 10 years of calendar year data from 2009 to 2018; this resulted in excluding 68 counties without such data. The final sample was N = 85 counties, all of which were in urban areas. We converted individual-level AFCARS data from each of the included counties into county-level data, as described in the

measures section below. Prior to county-level conversion, our sample included nearly a third (32.4%) of all youth in foster care and just over a third (35.1%) of all youth who died in foster care during the study time period.

Measures

Dependent Variable

All-cause mortality rates served as our dependent variable. Deaths were identified from the foster care discharge reason variable in AFCARS and coded as 1 if death occurred within the calendar year and 0 otherwise. The total number of deaths was summed for each county-year. All-cause mortality rates were then calculated by dividing the number of deaths in a county by the months of placement in that county and thus converted to deaths per 100,000 county-months in foster care.

Independent Variables

Sociodemographic Characteristics of the Foster Care Population

Race and ethnicity were measured with the following seven distinct binary variables: Non-Hispanic White, non-Hispanic Black, non-Hispanic American Indian or Native Alaskan, non-Hispanic Native Hawaiian or Other Pacific Islander, non-Hispanic Asian, Hispanic, and Multiracial. *Age* was grouped into five categories, all of which were binary variables: <1 year, 1-4 years, 5-9 years, 10-14 years, 15-17 years. *Sex* was captured as a binary measure for males. All sociodemographic variables were summed for each county-year and divided by the counties' total foster care populations to obtain percentages of each category at the county-level.

Physical disability status was operationalized in AFCARS as a child having a physical condition (e.g., cerebral palsy, spina bifida, multiple sclerosis, orthopedic impairments, other physical disabilities) that adversely affects their day-to-day motor functioning (NDACAN,

2022b). Children identified with physical disabilities were summed for each county-year and divided by the counties' total foster care populations to obtain the percentages of children with physical disabilities.

Foster Care Performance Measures

Placement instability was operationalized as the total number of placement moves per 1,000 placement days amongst children who entered foster care within each calendar year. To obtain the rate of placement instability, we summed the total number of placement moves for each county-year, divided by the total number of placement days for the county-year, and multiplied that by 1,000 placement-days.

Two measures were used to capture permanency. The first measure, *reunification within 18 months of foster care entry*, was derived from the discharge reason and discharge date variables in AFCARS to assess the number of children discharged to reunification with their parents or primary caregivers within 18 months of foster care entry. The percentage of reunifications within 18 months of foster care entry was calculated for each county-year by summing the number of reunifications within 18 months and dividing that by the total number of reunifications (irrespective of current length of stay in foster care). The second measure, *reunification as a case goal after 18 months*, was derived from the case goal variable and the current length of stay variable to assess the number of children who have been in foster care equal to or longer than 18 months but still retained a case goal of reunification with their parents or caregivers. The percentage was then calculated by summing all cases with reunification as a case goal after 18 months of entry for each county-year and dividing by the total number of cases with reunification as the case goal.

Long-term foster care was captured by the number of children who had been in foster care for three or more years since birth. To calculate the percentage, we summed the number of long-term cases for each county-year and divided by each county's total foster care population.

Two congregate care (e.g., group home or residential treatment facility) measures were created: *young children (<12 years) in congregate care* and *older children (≥12 years) in congregate care*. Both variables were converted to percentages for each county-year by summing the total number of children in congregate care who were under 12 years or 12 years and older, and then dividing by all foster care children within the corresponding age group in the county.

Kinship care captured whether the child's current foster care placement setting was with a relative. The total number of children in kinship care was summed for each county-year and divided by the total foster care population in each county to obtain the percentages.

Foster care payment captured whether Title IV-E maintenance payments were paid on behalf of children in foster care. The total number of children who received foster care payments was then summed for each county-year and divided by the total foster care population in each county to obtain the percentages.

Out-of-state placement captured a child's current placement setting as outside the state of the child welfare agency. Percentages were calculated by summing all out-of-state placements for each county-year and dividing by the total foster care population for each county.

Foster care entry rate was created based on the latest removal date recorded in AFCARS. Children removed during the calendar year were summed across each county-year and divided by each county's child population count to obtain rates of foster care entry per 100 children for each county-year.

Judicial Reform Characteristics

Consent decree status of each county and state child welfare system represented their past and current history of being under a consent decree or federal court monitoring per judicial child welfare reform efforts. Consent decree status was coded using a 4-point scale: 0 = *No active consent decree in the past three years*, 1 = *Consent decree that has been closed in the last three years*, 2 = *Currently has class action lawsuit only*, and 3 = *Actively under court monitoring via a consent decree.*

Impending class action lawsuit status of each county and state child welfare system represented whether a class action lawsuit was filed within subsequent years. To be consistent with the consent decree timeframe, we created a binary impending consent decree status variable coded as: 0 = *No class action lawsuit was filed within the next three years*, and 1 = *Class action lawsuit was filed within the next three years.*

Statistical Analysis

Summary statistics of county-level variables were examined with means and standard deviations. Trend tests were used to examine changes over time. Random effects negative binomial regression models were used to examine the associations between county-level sociodemographic, foster care performance measure, and judicial reform characteristics with all-cause mortality rates. The log of the population at risk, county-months in foster care, was used as an offset variable allowing for interpretation as rates (Osgood, 2000). We treated each coded age and race/ethnicity category as a continuous variable, given that they represented percentages (e.g., percentage of infants, percentage of Non-Hispanic Blacks) at the county level. That said, to allow for comparisons, we treated the oldest age group (15 to 17) and the Non-Hispanic White percentages as reference categories and left out of the regression models. All other continuous variables were grand mean centered, allowing these variables to be interpreted as the average

foster care system when set to 0. Sensitivity analyses included dividing the sample into two groups, one for infants (<1 year) and another for ages 1 and 17 years. The same negative binomial analyses were performed on the separate groups to determine if infant mortality, which is higher in general (Matthews et al., 2015), was primarily influencing the results. We used SAS version 9.4 (SAS Institute Inc, 2013) to conduct all our analyses.

Results

Descriptive Statistics

Table 1 provides descriptive statistics of county-level characteristics by calendar years. In 2009, the all-cause mortality rate was 8.68 deaths per 100,000 county-months in foster care and decreased to 6.96 deaths per 100,000 county-months in foster care in 2018 (p = .44). All-cause mortality rates in foster care for each of the 85 counties across 2009 and 2018 can be found in Supplemental Material 1. In general, counties varied in their mortality rates across the years.

In terms of the sociodemographic characteristics of the foster care population, several trends emerged. For child race and ethnicity variables, the percentage of Multiracial children gradually increased during the study period (from 6.27% in 2009 to 8.65% in 2018, p = .002), whereas the proportion of Non-Hispanic Black children in foster care decreased over the years (from 37.01% in 2009 to 32.08% in 2018, p = .03). For child age, there were significant patterns of increase in the proportions of younger age groups, including <1 year (from 11.50% in 2009 to 13.91% in 2018, p <.001), 1-4 years (from 24.12% in 2009 to 27.41% in 2018, p <.001), and 5-9 years (from 20.29% in 2009 to 23.64% in 2018, p <.001), while there were significant patterns of decrease in the proportions of older age groups, including 10-14 years (from 22.48% in 2009 to 20.41% in 2018, p <.001) and 15-17 years (from 21.61% in 2009 to 14.62% in 2018, p <.001). Although the proportion of males in the foster care system did not change dramatically over

time, the decrease was statistically significant (from 52.41% in 2009 to 51.57% in 2018, p <.001). All other sociodemographic characteristics showed no significant changes.

Among foster care performance measures, only three variables showed significant changes during the study period. The proportion of younger children (i.e., below 12 years) in congregate care and children in long-term care both decreased during this time (from 4.32% in 2009 to 2.98% in 2018, p < .001 and from 26.11% in 2009 to 18.57% in 2018, p <.001, respectively). The proportion of children in kinship care increased during this time (from 24.23% in 2009 to 30.60% in 2018, p <.001). For judicial reform characteristics, the categories of no consent decree and closed consent decree in the past three years both declined during the study period (from 68.24% in 2009 to 38.82% in 2018, p = .001 and from 10.59% in 2009 to 0% in 2018, p <.001, respectively), while the categories of current class action and active consent decree both increased (from 3.53% in 2009 to 23.53% in 2018, p = .02 and from 17.65% in 2009 to 37.65% in 2018, p <.001, respectively).

System-Level Factors Associated with All-Cause Mortality of Children in Foster Care

Table 2 presents results from the random effects negative binomial regression analysis, examining the associations between county-level factors and all-cause mortality among children in foster care. Results showed that overall mortality decreased by 3% per year during the study period (IRR: 0.97, 95% CI [0.94, 1.00], p = .023). Compared to the percentage of children between the ages of 15-17 years, the percentage of infants less than one year was associated with a 6% higher risk of mortality (IRR: 1.06, 95% CI [1.02, 1.11], p = .008). That is, for each percentage increase of infants less than one year in the foster care population, there was a 6% increased risk of mortality at the county level. Higher mortality at the county level was similarly seen for counties with higher proportions of children aged 5-9 years (IRR: 1.05, 95% CI [1.01,

1.09], p = .020). With regard to race and ethnicity groups in foster care, increased representation of several groups relative to non-Hispanic White children was associated with higher mortality at the county level; specifically: Non-Hispanic Asian (7% risk, IRR: 1.07, 95% CI [1.01, 1.13], p = .021), non-Hispanic Black (2% risk, IRR: 1.02, 95% CI [1.01, 1.02], p < .001), Multiracial (3% risk, IRR: 1.03, 95% CI [1.01, 1.04], p = .006), and Hispanic (1% risk, IRR: 1.01, 95% CI [1.01, 1.02], p = .001). Furthermore, compared to the percentage of female children, the percentage of male children was associated with a 10% higher risk of mortality (IRR: 1.10, 95% CI [1.05, 1.15], p < .001).

None of the foster care performance measures were associated with all-cause mortality. With regard to judicial reform related characteristics, compared to not having a consent decree in the past three years, currently having a class action lawsuit and being under a current active consent decree were associated with a 21% lower risk of mortality (IRR: 0.79, 95% CI [0.63, 0.99], p = .042) and 23% lower risk of mortality (IRR: 0.78, 95% CI [0.63, 0.94], p = .012), respectively (for details, see Table 2).

Sensitivity Analysis

Sensitivity analysis results, shown in Supplemental Material 2, demonstrated that for the model with children ages 1-17 years only (i.e., excluding <1-year infants), the findings, for the most part, exhibited similar trends as the main results. Specifically, the percentages of children ages 5-9 and male children were still associated with higher mortality risks. The percentages of non-Hispanic Black children, Hispanic children, and Multiracial children, compared to the percentage of non-Hispanic White children, were also associated with higher mortality risks. The percentage of non-Hispanic Asian children was no longer associated, whereas the percentage of Native Hawaiian or Pacific Islander children was associated with a 8% lower risk of mortality

(IRR: 0.92, 95% CI [0.85, 1.00], p = .055). Concerning foster care performance measures, the percentage of younger children in congregate care, which was modified to be the percentage of children ages 1-12 years for this sensitivity analysis, was associated with a 3% higher risk of mortality (IRR: 1.03, 95% CI [1.00, 1.06], p = .052). Regarding judicial reform characteristics, being under an active consent decree remained associated with lower mortality risk but currently having a class action lawsuit was not. Calendar year was no longer significant. The sensitivity analysis model with child age <1 showed a different pattern, with only the percentage of children retaining a case goal of reunification after 18 months of foster care entry being associated with a 5% lower risk of mortality (IRR: 0.95, 95% CI [0.91, 0.99], p = .014). No other significant associations were found.

We also conducted sensitivity analysis with all 153 identified counties, which included the original 85 counties with all 10 years of calendar year data and 68 counties without such data. The purpose of this sensitivity analysis was to assess whether the addition of counties without all 10 years of calendar year data changes our main results (i.e., does it make a difference that we combine counties without a full decade of data with those with a full decade of data?). Furthermore, the sensitivity analysis allowed for assessing whether analysis using fiscal years yields comparable results as those of analysis using calendar years. As shown in Supplemental Material 3, the results were overall similar to those of the main model with minor differences. Specifically, the percentage of non-Hispanic Asian children and current action lawsuit were no longer significant. However, all other key predictors (i.e., year, percentages of 5-9 years, male, non-Hispanic Black, Multiracial, Hispanic children, and current active consent decree) from the main model remained significant. Percentage of families receiving foster care payment and foster care entry rate emerged as additional predictors, with both being associated with lower risks of

mortality: foster care payment (IRR: 0.99, 95% CI [0.99, 1.00], $p = .011$) and foster care entry rate (IRR: 0.81, 95% CI [0.67, 0.98], $p = .027$).

Discussion

This is the first study to examine system-level factors associated with all-cause mortality for children in foster care. Consistent with prior research, we found that all-cause mortality rates in foster care decreased from 2009 to 2018 (Lindley & Slayter, 2019). In general, our main results showed that sociodemographic and judicial reform characteristics, and not foster care performance measures, were significantly associated with child mortality at the county level. We found support for our first hypothesis related to the sociodemographic characteristics of the foster care population that higher proportions of younger children, children of color, and male children would be associated with higher risks of mortality at the county level (H1).

Our results pertaining to the proportions of infants and children aged 5-9 years are consistent with prior evidence from both the general and child welfare populations, demonstrating that infants and younger children have some of the highest mortality rates (Chaiyachati et al., 2020; Institute of Medicine Committee on Palliative and End-of-Life Care for Children and Their Families, 2003; Lindley & Slayter, 2019; Turney & Wildeman, 2016). Infants in foster care are a particularly vulnerable group and have disproportionately high rates of health problems (e.g., prenatal drug exposure, premature births) that may increase the likelihood of chronic medical conditions, developmental delays, disabilities, and even death (Dicker & Gordon, 2004). One study of mortality in foster care for children in California demonstrated that common causes of mortality among infants included birth defects, sudden infant death syndrome, accidents and injuries related to prenatal drug exposure, and child maltreatment (Barth &

Blackwell, 1998). The primary causes of death for children ages 5-9 years in foster care have shown to include natural causes or chronic medical conditions (Fontanella et al., 2022).

Our findings showing higher mortality at the county level with larger proportions of children of color reflect trends in differential mortality risks by race and ethnicity present within the general population (Dettlaff & Boyd, 2020). Beyond the persistence of disproportionate and unmet health needs of children of color established in the general population, additional barriers, such as limited accessibility to child welfare providers, may exist within foster care for children of color to receive adequate healthcare (Drake et al., 2021; USDHHS, 2021b). Our results have important clinical and policy implications for child welfare systems. Systems should be modified with intentionality to support equity within healthcare access and utilization. For instance, strategies that would address these disparities and reduce mortality for children of color include raising awareness among child welfare professionals and healthcare providers about racial and ethnic disparities in referral decisions and availability and accessibility of culturally sensitive services (USDHHS, 2021b). Additional strategies include educating child welfare personnel and foster families about the health and mental health needs of children in care and systemic barriers for children of color in accessing appropriate care (USDHHS, 2021b).

Our findings concerning the proportion of male children also reflect mortality trends by child sex in the child welfare population, as well as the general population (i.e., male children more likely to die than female children) (Ely & Driscoll, 2021; Lindley & Slayter, 2019; Xu et al., 2021). For example, males in 2019 had an age-adjusted death rate that was 1.4 times the rate of females (Xu et al., 2021). Males are also more prone to both accidental deaths (e.g., unintentional injuries) and non-accidental deaths (e.g., suicide) than females (CDC, 2022b) with multiple behavioral, genetical, and social reasons (e.g., males taking bigger risks, having less

social support, maturing slower than females) contributing to such sex differences (Shmerling, 2020). Specific to foster care, boys are at higher risk for delinquent behaviors and other behavioral issues than girls, increasing their risk for mortality (Gypen et al., 2017; Rosenthal & Curiel, 2006). Foster care systems with higher proportions of male than female children then may be taxed with the additional responsibility of meeting behavioral health needs of male children. That is, higher proportions of males in foster care may be reflecting the general vulnerabilities of males, as well potentially increased system needs to address delinquent and externalizing behaviors of boys. Although additional research is required to disentangle these associations in relation to mortality, our results point to the need for supporting male children, and more broadly, foster care systems serving large proportions of male children as a measure of preventing child mortality.

In contrast to other demographic risk variables, there was no association between the proportion of children with physical disabilities and mortality risk, despite prior evidence showing higher mortality risks amongst children with disabilities (Decouflé & Autry, 2002). One reason may be that most prior research in this area has typically aggregated across different disability measures (e.g., intellectual, learning, physical; Lindley & Slayter, 2018; Seltzer et al., 2017; Slayter, 2016), whereas we focused primarily on physical disability given the potential unreliability of other health measures in AFCARS as noted in the limitations section and documented in prior research (Palmer et al., 2022). In our data, the proportion of children with physical disabilities in foster care were generally low (i.e., less than 1.5% across all years). This is consistent with findings from studies that disaggregate different types of disability (Lightfoot et al., 2011; Seltzer et al., 2017). For example, Seltzer used AFCARS data from 2014 and found that 1% of children in foster care had physical disabilities. Similarly, Lightfoot et al. (2011),

using Minnesota's child welfare administrative data, found that 2.1% of children in foster care had physical disabilities. Low number of cases and lack of variability might have contributed to our null finding, suggesting that a focus on physical disability alone is likely insufficient to capture health status in relation to morality risk.

Surprisingly, we did not find support for our hypothesis concerning foster care performance measures (H2). Markers of foster care system performance (e.g., placement instability, permanency goal, foster care payments) were not associated, at least in our main analyses, with mortality risks. These results are in contrast with prior research showing significant links between foster care performance measures and child wellbeing outcomes. For example, placement instability has been consistently linked with poor developmental outcomes for children in foster care (Konijn et al., 2019). There may be few reasons why we did not find significant associations between foster care system performance and mortality risks. For instance, our results were at the county level and were limited to measures available in AFCARS—factors that could have contributed to our analyses being insensitive to detect hypothesized findings. Further, it could well be that foster care system performance measures are related to some of the sociodemographic and case factors in our study, suggesting more indirect effects, rather than direct effects, of foster care system performance measures on mortality risks via these sociodemographic and case factors included in our model. Additional research is needed to further understand the links between foster care performance and mortality risks.

That said, we did find significant associations between foster care performance variables and mortality risks within our sensitivity analyses. When we removed infants from our sample and examined those in foster care aged 1-17, we found that the percentage of younger children (ages 1-12) in congregate care settings was associated with higher risk of mortality at the county

level. Unfortunately, we are unable to explore this finding in depth due to the limited data available within AFCARS. However, results may suggest that when more young children are placed in congregate care settings, foster care systems may be dealing with children with more medically and behaviorally complex needs and who are thus at increased risk for mortality (USDHHS, 2015). This finding could also suggest that such foster care systems are lacking in family-based foster care settings possibly due to challenges with recruiting, training, and retaining foster parents, which then may be contributing to higher risk of child deaths in foster care (Harden, 2002; USDHHS, 2015). The sensitivity analysis for infants found that higher proportions of children who retain a case goal of reunification after 18 months in foster care was associated with lower mortality risk. This may indicate that foster care systems are putting additional efforts toward reunification beyond the typical permanency timeline (Radel & Madden, 2021) and that such practices may be beneficial for reducing mortality risks, especially for infants under age one.

In our sensitivity analysis with all 153 counties, percentage of families receiving foster care payments was associated with lower risk of mortality, suggesting the potentially protective effect financial support for foster families has against child deaths. The inverse relationship between foster care entry and mortality risk was unexpected and can be understood in a few ways. Specifically, the finding may be pointing to selection bias in the foster care system, as well as death as a rare event. For instance, it is plausible that foster care systems with higher entry rates have lower thresholds for removing children, so they remove healthier children who are less likely to die. Systems that remove very few children ostensibly remove only the most seriously harmed children, who may have mental or physical trauma from their maltreatments that contributes to early mortality, driving up mortality rates within foster care. Also from a

death as a rare event perspective, it may be that deaths within foster care are generally rare that a single death can drastically change the death rates. Importantly, increases in foster care entry point to increases in the population that determines death rates (i.e., denominator in calculating death rates). As such, death rates decrease as the overall number of children in foster care increases.

With respect to our hypothesis concerning judicial reform characteristics, we found support that markers of system accountability and monitoring (i.e., having a class action lawsuit and currently being under a consent decree) were associated with lower risk of mortality (H3). These results suggest that legal efforts to reform foster care as initiated by children's rights watchdogs in the form of class action lawsuits and monitored by federal courts work to improve child wellbeing, in the form of lowered mortality risk in our case. More descriptively, we saw general increases in the proportions of judicial actions occurring over our study period, with close to a quarter and over a third of the counties having class action lawsuits and consent decrees, respectively, by 2018. These results suggest the increased use and popularity of class action lawsuits and consent decrees over time as system reform tools. Relatedly, research documents the ongoing need for and, on balance, the potential effectiveness of class action lawsuits and consent decrees in improving child welfare system performance that ultimately benefit children in foster care (Font & Gershoff, 2020; Lee et al., 2019). Even skeptics of child welfare reform via these legal means have admitted to there being few alternatives, as systemic failures have been around for decades for some foster care systems and that all other options had been exhausted before turning to class action lawsuits and consent decrees as last resorts (Font & Gershoff, 2020).

One mechanism by which legally induced system improvements lead to better child outcome may be through reducing child welfare caseloads that could then be linked with improved outcomes for children in foster care (Lee, 2021). High caseloads are associated with child welfare worker turnover, frequent case transfers, and workers making mistakes that adversely affect children in care (Wilke et al., 2019). In-depth examinations of three states—Michigan, Tennessee, and New Jersey—that were subject to class action lawsuits and were under consent decrees have shown improvements in caseload reductions (e.g., from average caseloads of 40 children before consent decree to 15-20 after consent decree exit for Tennessee) as a result of such federal court monitoring and oversight. Although we did not test specific mechanisms by which judicial reform may be associated with lowered risk of mortality of children in foster care, it may be that when child welfare workers have manageable caseloads, they have the capacities to provide continuity in their case management and quality services (e.g., visiting children in foster homes more regularly, obtaining services for children's health needs; Lee, 2021).

Strengths and Limitations

This study makes several important contributions to the literature, including (1) the use of a national foster care dataset spanning 10 years from 2009-2018; (b) examination of all-cause mortality rates of children in foster care as the main outcome, which has been underexplored by previous research; (c) identification of system-level risk and protective factors associated with mortality rates to inform efforts to promote child wellbeing; and (d) linkage of judicial reform data with child welfare administrative data to understand the role of legal measures in transforming foster care systems in relation to children's risk of mortality.

There are several limitations to this study. Our small sample size of 85 urban counties limits the generalizability of our findings. We are also unable to determine if the counties

included in our study significantly differ from other U.S. counties. That said, given that smaller counties (i.e., those with fewer than 1,000 records) were excluded because of NDACAN masking protocols, we assume, at least in part, that potential differences between included and excluded counties reflect county sizes (e.g., how populous counties are) or urbanicity/rurality. Importantly, our study results cannot be generalized to smaller, less populous, or rural counties in the country. Several measures (e.g., emotional disturbance) available in AFCARS were unusable for our study due to inconsistencies in reporting and missing data documented in prior research (Palmer et al., 2022). Although a robust list of foster care performance measures was included in our models, several key factors could not be included or constructed due to AFCARS data limitations. For example, information related to hidden or informal foster care—an increasing child welfare practice in which agencies induce parents to transfer physical custody of their children to kin caregivers otherwise facing the consequence of their children being placed into foster care (Gupta-Kagan, 2020)—was unavailable.

Further, for mortality rates and some of the predictors such as placement instability, we used time-based rates (e.g., deaths per 100,000 county-months, placement moves per 1,000 county-days). Because AFCARS only provides one record of placement during each reporting period and masks placements that occurred prior to the reported incident in the same period, there may be an undercount of county-days for placement moves. Relatedly, given that an episode involving foster care death could be automatically included in AFCARS without any subsequent episode to overwriting the incident, there may also be overcounts of county-months for deaths. The county codes available in the AFCARS data referred to the location of the child welfare agency rather than a child's placement location, limiting our ability to link AFCARS to external data to examine community resources available to children while in foster care.

Moreover, our analyses did not allow for disentangling pre-existing disparities (by child sex, age, and race and ethnicity) and foster care performance in their relations to mortality risk.

Although we made best efforts to identify and document with accuracy counties' statuses of judicial actions, locating relevant information (i.e., updated status of consent decrees, impending class action lawsuits) proved to be challenging. There was no central database, with class actions being filed by various children's watchdog organizations—some of which made original legal documents available while others did not. Further, most judicial actions were statewide even though we treated them as county-level variables. Overall, we recommend interpreting the judicial reform findings with caution and suggest additional research in this area, including in-depth examination of how state-level judicial actions are implemented and impact foster care system within specific counties. Finally, while overall mortality rates were analyzed, AFCARS did not provide information on specific causes of death (e.g., suicide, homicide, accidental deaths). Further research is needed to examine factors associated with specific types of mortality for youth in foster care.

Conclusion

Among counties assessed, higher proportions of young children, children of color, and males within foster care were associated with higher risk of mortality. Although some system oversight variables, namely current consent decrees and class action lawsuits, were associated with lower risk of mortality, most measures of foster care functioning including entry, stability, and reunification were not associated with risk of mortality. Together, these results indicate that documented mortality in foster care are likely driven by exacerbation of pre-existing risks unrelated to the experiences of foster care. Put another way, foster care does not seem to disrupt patterns of differential mortality risks. This points to the critical need to address health disparities

present even before children enter foster care in addition to providing targeted funding and prevention support for foster care systems with large proportions of these high-risk subpopulations. Importantly, our study is one of few large-scale studies using national child welfare data to demonstrate the potentially helpful roles class action lawsuits and consent decrees play in reducing adverse health outcomes—in our case, child deaths—for children in foster care. Results suggest that oversight mechanisms, such as judicial reform, should continue to be considered a potential tool, in parallel with alternative strategies (e.g., community-based systems rooted in care and not surveillance), to improve the wellbeing of children in foster care.

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Table 1. *Descriptive Statistics of County-Level Characteristics by Calendar Year*

Variable	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Trend Test
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*p*-value
Mortality rate	8.68 (8.71)	7.52 (8.72)	6.62 (7.69)	6.16 (5.99)	7.78 (9.03)	7.23 (7.57)	6.44 (7.62)	7.57 (8.00)	7.32 (8.29)	6.96 (6.28)	0.44
Sociodemographic Characteristics											
% of child age groups:											
<1 year	11.50 (2.57)	11.93 (2.71)	11.80 (2.72)	12.18 (2.98)	12.53 (3.02)	12.92 (2.66)	13.20 (2.31)	13.40 (2.61)	13.81 (2.62)	13.91 (2.67)	<.001
1-4 years	24.12 (5.10)	24.65 (5.09)	25.51 (5.19)	25.76 (5.08)	25.94 (4.60)	26.15 (4.21)	26.39 (3.76)	26.89 (3.76)	27.01 (3.61)	27.41 (3.61)	<.001
5-9 years	20.29 (3.30)	20.14 (3.21)	20.51 (3.52)	21.08 (3.61)	21.97 (3.58)	22.78 (3.55)	23.54 (3.06)	23.72 (2.65)	23.73 (2.36)	23.64 (2.27)	<.001
10-14 years	22.48 (3.23)	21.96 (3.16)	21.72 (3.09)	21.35 (3.04)	20.76 (2.95)	20.41 (2.67)	20.08 (2.31)	20.02 (2.40)	20.18 (2.26)	20.41 (2.27)	<.001
15-17 years	21.61 (7.35)	21.31 (7.43)	20.47 (7.50)	19.63 (7.57)	18.78 (7.24)	17.74 (6.63)	16.78 (5.90)	15.97 (5.54)	15.26 (5.21)	14.62 (4.92)	<.001
% of child race/ethnicity:											
Non-Hispanic Native Hawaiian/Pacific Islander	0.40 (2.04)	0.39 (1.87)	0.41 (1.84)	0.47 (2.18)	0.42 (2.10)	0.41 (1.92)	0.41 (2.07)	0.44 (2.14)	0.47 (2.39)	0.49 (2.45)	.76
Non-Hispanic Asian	1.12 (1.94)	1.19 (1.92)	1.25 (2.03)	1.19 (2.00)	1.17 (1.97)	1.12 (1.76)	1.08 (1.65)	1.10 (1.73)	1.00 (1.56)	1.06 (1.73)	.34
Non-Hispanic American Indian/Native Alaskan	1.03 (1.85)	0.97 (1.75)	0.99 (1.79)	0.99 (1.78)	1.01 (1.85)	1.01 (1.92)	1.05 (1.90)	1.06 (1.97)	1.03 (1.94)	1.03 (2.06)	.79
Non-Hispanic Black	37.01 (23.89)	36.40 (23.56)	35.52 (23.02)	34.61 (22.59)	33.89 (22.36)	33.42 (22.04)	33.12 (21.76)	32.65 (21.65)	32.21 (21.34)	32.08 (21.28)	.03
Non-Hispanic White	31.83 (17.31)	31.54 (17.08)	31.45 (16.86)	31.99 (16.71)	31.92 (16.97)	31.57 (16.60)	31.40 (16.67)	31.19 (16.68)	31.04 (16.33)	31.13 (16.37)	.69
Multiracial	6.27 (8.09)	6.67 (8.13)	7.04 (7.38)	7.29 (7.32)	7.62 (7.52)	7.82 (7.42)	8.24 (7.50)	8.45 (7.71)	8.69 (7.61)	8.65 (7.52)	.002
Hispanic	22.27 (18.87)	22.84 (18.80)	23.33 (18.58)	23.46 (18.44)	23.97 (18.89)	24.65 (19.17)	24.70 (19.01)	25.09 (19.04)	25.56 (18.83)	25.56 (18.77)	.09
% of male	52.41 (2.15)	52.61 (2.13)	52.27 (2.02)	52.38 (2.23)	52.39 (2.12)	52.21 (2.14)	52.18 (1.86)	51.83 (1.64)	51.62 (1.76)	51.57 (1.84)	<.001
% with physical disability	1.15 (1.32)	1.10 (1.14)	1.15 (1.13)	1.10 (1.03)	1.16 (1.01)	1.14 (1.30)	1.11 (1.56)	1.12 (1.64)	0.75 (0.82)	0.94 (1.22)	.06
Foster Care Performance Characteristics											
% of older children (≥ 12 years) in congregate care	30.45 (12.87)	30.68 (13.60)	30.69 (13.77)	32.30 (12.82)	32.43 (12.98)	32.09 (12.30)	31.85 (12.23)	30.85 (11.18)	29.08 (10.99)	27.72 (10.58)	.13
% of younger children (<12 years) in congregate care	4.32 (4.02)	4.12 (4.02)	3.94 (4.12)	3.82 (3.31)	3.28 (2.49)	3.39 (2.46)	3.32 (2.61)	3.26 (2.47)	3.04 (1.96)	2.98 (1.86)	<.001
% in long-term care	26.11 (8.94)	25.07 (9.07)	23.47 (9.84)	21.60 (10.13)	20.35 (10.29)	19.13 (9.86)	18.09 (8.25)	17.92 (7.62)	18.06 (7.25)	18.57 (7.19)	<.001
% of children reunited within 18 months	79.92 (10.62)	79.50 (11.55)	79.54 (13.38)	78.65 (13.31)	79.15 (13.39)	79.91 (12.88)	79.08 (13.36)	78.71 (13.65)	78.06 (12.28)	77.70 (11.58)	.20
% of children with reunification goal after 18 months	21.00 (11.70)	20.04 (10.13)	18.92 (9.84)	19.53 (10.48)	21.19 (12.41)	18.12 (10.53)	18.63 (9.74)	18.80 (9.93)	19.40 (9.63)	20.45 (2.67)	.44

% receiving foster care payments	35.13 (17.05)	35.53 (16.01)	37.97 (10.86)	38.36 (11.19)	38.86 (12.06)	38.52 (13.04)	35.98 (17.15)	35.58 (17.41)	34.28 (15.82)	38.10 (14.00)	.96
% placed out of state	4.84 (7.26)	4.28 (6.94)	3.58 (7.12)	3.40 (6.85)	3.31 (6.27)	3.07 (5.92)	3.26 (5.81)	3.20 (5.56)	3.29 (5.84)	3.47 (5.65)	.08
Placement instability (number of placement moves)	4.03 (1.92)	4.18 (1.77)	4.75 (3.63)	4.52 (2.89)	4.43 (2.36)	4.48 (1.95)	4.55 (1.63)	4.63 (1.78)	4.66 (2.01)	4.68 (2.02)	.16
Foster care entry rate	0.51 (0.838)	0.50 (0.37)	0.47 (0.30)	0.47 (0.28)	0.46 (0.26)	0.47 (0.26)	0.48 (0.26)	0.47 (0.26)	0.46 (0.27)	0.33 (0.19)	.001
% in kinship care	24.23 (12.20)	24.32 (9.84)	24.68 (9.41)	26.87 (9.55)	27.61 (9.46)	28.38 (9.43)	28.93 (9.46)	29.58 (9.43)	30.64 (9.42)	30.60 (9.46)	<.001
Judicial Reform Characteristics											
Consent decree status:											
None in past 3 years, *n* (%)	58 (68.24)	55 (64.71)	41 (48.24)	41 (48.24)	41 (48.24)	41 (48.24)	46 (54.12)	46 (54.12)	43 (50.59)	33 (38.82)	.001
Closed in past 3 years, *n* (%)	9 (10.59)	7 (8.24)	2 (2.35)	1 (1.18)	1 (1.18)	1 (1.18)	0 (0)	0 (0)	0 (0)	0 (0)	<.001
Current class action, *n* (%)	3 (3.53)	8 (9.41)	13 (15.29)	13 (15.29)	13 (15.29)	13 (15.29)	9 (19.59)	8 (9.41)	11 (12.94)	20 (23.53)	.02
Current active consent degree, *n* (%)	15 (17.65)	15 (17.65)	29 (34.12)	30 (35.29)	30 (35.29)	30 (35.29)	30 (35.29)	31 (36.47)	31 (36.47)	32 (37.65)	<.001
Impending class action, *n* (%)	26 (30.59)	19 (22.35)	0 (0)	3 (3.53)	3 (3.53)	15 (17.65)	13 (15.29)	15 (17.65)	12 (14.12)	8 (9.41)	.10

Note. $N = 85$ counties. Mortality rate equates to deaths per 100,000 county-months in foster care.

Table 2. *Negative Binomial Regression Results Predicting Foster Care Mortality Rates*

Variable	IRR	95% CI		*p*-value
Calendar year	**0.97**	**0.94**	**1.00**	**0.023**
Sociodemographic Characteristics				
% of child age groups (ref: 15-17 years)				
<1 year	**1.06**	**1.02**	**1.11**	**0.008**
1-4 years	1.00	0.96	1.04	0.989
5-9 years	**1.05**	**1.01**	**1.09**	**0.020**
10-14 years	1.02	0.96	1.08	0.613
% of child race/ethnicity (ref: Non-Hispanic White)				
Non-Hispanic Native Hawaiian/Pacific Islander	0.95	0.89	1.01	0.092
Non-Hispanic Asian	**1.07**	**1.01**	**1.13**	**0.021**
Non-Hispanic American Indian/Native Alaskan	0.98	0.94	1.03	0.387
Non-Hispanic Black	**1.02**	**1.01**	**1.02**	**<.001**
Multiracial	**1.03**	**1.01**	**1.04**	**0.006**
Hispanic	**1.01**	**1.01**	**1.02**	**0.001**
% of male	**1.10**	**1.05**	**1.15**	**<.001**
% with physical disability	1.04	0.98	1.10	0.161
Foster Care Performance Characteristics				
% of older children (≥12 years) in congregate care	1.00	0.99	1.01	0.947
% of younger children (<12 years) in congregate care	1.01	0.98	1.04	0.585
% in long-term care	0.99	0.98	1.00	0.150
% of children reunited within 18 months	1.00	0.99	1.01	0.640
% of children with reunification case plan goal after 18 months	1.00	0.99	1.01	0.729
% receiving foster care payments	1.00	0.99	1.00	0.236
% placed out of state	0.99	0.97	1.00	0.139
Placement instability (number of placement moves)	1.01	0.98	1.03	0.682
Foster care entry rate	0.85	0.70	1.02	0.081
% in kinship care	1.00	0.99	1.01	0.985
Judicial Reform Characteristics				
Consent decree status (ref: None in the past 3 years)				
Closed in past 3 years	1.15	0.79	1.67	0.466
Current class action lawsuit only	**0.79**	**0.63**	**0.99**	**0.042**
Current active consent decree	**0.77**	**0.63**	**0.94**	**0.012**
Impending class action lawsuit	0.87	0.71	1.07	0.201

Note. IRR = Incident Rate Ratio. CI = Confidence Interval. Bold indicates statistically significant predictors.

Supplemental Material 1

Table 1. *Crude Mortality Rate for Each County-Year*

County	FIPS Code	Mortality Rate by Calendar Year									
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jefferson County, AL	1073	0	16.27	0	9.88	9.79	21.40	0	0	9.89	9.48
Maricopa County, AZ	4013	4.81	6.33	5.68	5.83	8.52	3.71	6.47	6.34	8.33	9.38
Pima County, AZ	4019	0	6.93	3.73	6.53	8.47	5.72	6.16	3.11	3.45	8.06
Alameda County, CA	6001	12.32	0	5.07	5.42	17.58	5.99	12.15	6.59	0	8.43
Contra Costa County, CA	6013	7.31	0	19.80	0	0	16.28	16.91	0	0	10.55
Fresno County, CA	6019	10.74	15.07	13.90	10.15	10.84	0	4.88	14.32	4.83	23.16
Kern County, CA	6029	4.23	13.02	9.47	9.99	11.86	29.47	5.79	0	0	6.8
Los Angeles County, CA	6037	5.56	5.04	6.60	2.85	3.69	3.15	4.50	5.86	6.55	5.99
Orange County, CA	6059	6.24	3.34	0	0	7.71	4.06	0	8.75	4.32	4.21
Riverside County, CA	6065	6.80	2.40	8.87	2.32	2.34	4.31	4.46	4.84	0	14.08
Sacramento County, CA	6067	2.31	0	0	7.96	8.19	18.46	3.76	7.65	4.45	20.07
San Bernardino County, CA	6071	5.03	2.70	4.76	4.74	6.62	4.17	3.65	8.71	6.32	4.56
San Diego County, CA	6073	0	6.84	2.45	2.53	5.45	0	2.97	6.56	7.67	9.10
San Francisco County, CA	6075	11.71	0	21.85	0	38.82	0	33.77	0	12.62	0
San Joaquin County, CA	6077	19.02	13.16	0	0	25.95	6.14	0	6.25	0	7.17
Santa Clara County, CA	6085	11.09	6.92	7.91	8.05	7.54	14.18	14.39	0	0	0
Tulare County, CA	6107	9.85	0	0	0	9.93	0	9.14	9.58	9.28	0
Denver County, CO	8031	30.43	5.73	13.67	8.23	9.10	19.49	0	35.14	0	10.42
El Paso County, CO	8041	34.88	57.87	0	0	12.39	13.03	0	0	11.76	11.65
Hartford County, CT	9003	7.14	0	0	0	0	0	0	20.65	0	0
New Haven County, CT	9009	0	0	0	0	0	0	0	0	7.04	0
District of Columbia	11001	9.74	0	0	0	8.17	9.69	10.41	0	11.87	0
Broward County, FL	12011	36.20	18.43	0	0	18.67	0	7.85	3.70	12.04	0
Duval County, FL	12031	18.62	0	9.91	10.88	41.35	11.86	11.38	21.32	0	10.6
Hillsborough County, FL	12057	4.31	13.86	18.14	26.01	4.95	0	0	8.14	3.63	0
Miami-Dade County, FL	12086	9.34	5.25	31.01	4.93	20.68	16.81	11.81	18.51	9.03	9.36
Orange County, FL	12095	0	0	0	11.09	11.84	0	0	8.81	7.99	7.38
Palm Beach County, FL	12099	7.93	9.37	9.41	18.06	0	7.62	7.24	0	17.04	8.27
Pinellas County, FL	12103	0	0	6.84	6.50	7.05	8.98	0	15.75	20.20	6.32
Polk County, FL	12105	33.22	10.74	9.14	18.72	0	0	0	8.40	7.67	15.10
Honolulu County, HI	15003	0	0	24.66	13.16	0	26.32	0	11.65	0	0
Cook County, IL	17031	0	4.11	11.64	12.28	9.48	14.22	12.33	11.15	9.98	20.13
Perry County, IL	17143	0	0	6.85	7.71	7.56	15.10	7.84	8.41	8.09	7.23
Saint Clair County, IL	17163	0	9.53	0	8.37	0	0	0	0	9.72	0
Winnebago County, IL	17201	0	0	18.48	0	0	14.22	0	0	0	0
Allen County, IN	18003	10.97	0	0	0	0	10.18	8.99	7.86	6.73	6.72
Lake County, IN	18089	5.24	14.73	9.95	0	4.84	0	4.43	0	14.57	6.28
Marion County, IN	18097	13.07	3.42	4.18	3.87	18.12	3.10	4.68	8.18	5.91	4.53
Polk County, IA	19153	0	11.50	0	7.55	0	0	0	9.25	0	0
Sedgwick County, KS	20173	13.57	15.88	0	8.71	0	0	0	33.60	7.83	0
Jefferson County, KY	21111	0	10.34	11.93	0	11.13	0	9.41	18.30	27.35	0
Baltimore City, MD	24510	10.20	0	3.09	11.36	0	16.11	0	12.76	13.08	12.21

Bristol County, MA	25005	0	7.21	0	0	0	0	6.12	0	0	11.67
Essex County, MA	25009	7.69	0	0	10.63	0	0	0	8.57	8.3	18.79
Hampden County, MA	25013	0	0	7.19	0	0	7.69	0	0	0	5.84
Middlesex County, MA	25017	12.16	0	0	0	0	7.79	7.31	0	7.42	7.64
Suffolk County, MA	25025	7.71	0	9.17	18.20	8.69	14.69	0	6.32	6.31	0
Worcester County, MA	25027	0	0	6.02	0	0	0	9.30	4.27	4.24	0
Kent County, MI	26081	0	19.56	0	9.86	0	9.14	0	0	9.68	0
Wayne County, MI	26163	20.98	19.04	9.44	12.79	0	5.50	3.59	17.82	3.07	5.93
Hennepin County, MN	27053	7.22	17.35	8.89	0	26.22	7.98	13.57	0	9.36	4.61
Ramsey County, MN	27123	13.94	16.97	0	13.88	13.17	14.37	22.18	19.77	25.83	16.91
Jackson County, MS	29095	31.04	25.51	0	0	11.11	5.04	5.21	0	5.39	5.42
Saint Louis County, MS	29189	11.87	0	0	12.32	0	0	21.51	0	21.57	0
Douglas County, NE	31055	9.54	4.57	4.59	9.19	0	6.03	0	5.48	0	12.22
Clark County, NV	32003	7.20	9.75	12.35	4.87	2.39	21.61	19.44	5.85	11.34	13.36
Washoe County, NV	32031	19.14	0	0	12.59	10.76	0	0	9.33	0	0
Camden County, NJ	34007	0	0	0	0	0	0	26.52	0	15.35	0
Essex County, NJ	34013	5.25	20.46	16.70	7.35	7.09	0	0	0	0	8.69
Erie County, NY	36029	0	0	21.63	0	0	0	0	0	0	20.47
New York, NY	36061	7.41	8.32	5.69	8.15	1.17	4.30	3.96	4.40	2.73	0.95
Cuyahoga County, OH	39035	9.63	15.84	0	14.88	5.41	15.97	29.36	20.21	0	15.29
Franklin County, OH	39049	8.17	13.60	0	9.44	9.40	4.54	9.02	4.09	14.66	0
Hamilton County, OH	39061	21.77	0	12.91	0	0	0	11.28	9.85	7.91	0
Summit County, OH	39153	0	12.24	0	0	0	0	0	0	27.03	0
Oklahoma County, OK	40109	14.82	3.12	3.47	26.87	3.24	10.42	4.08	22.31	9.87	0
Tulsa County, OK	40143	13.61	15.69	7.85	0	0	19.99	0	11.38	10.34	16.24
Lane County, OR	41039	0	0	0	0	0	25.72	8.59	8.13	0	8.77
Multnomah County, OR	41051	4.26	4.53	9.17	4.77	0	0	0	0	0	0
Allegheny County, PA	42003	3.99	0	0	12.90	6.11	13.14	0	13.38	0	11.20
Philadelphia County, PA	42101	5.16	6.64	5.41	0	10.58	3.80	3.12	6.13	3.04	6.03
Providence County, RI	44007	5.95	0	0	0	34.19	0	7.04	0	0	7.85
Shelby County, TN	47157	11.31	12.14	32.38	9.32	19.69	11.97	12.29	0	53.27	9.73
Bexar County, TX	48029	11.27	13.86	2.45	14.18	4.87	5.00	5.64	8.7	2.44	4.75
Dallas County, TX	48113	9.92	13.14	0	11.09	27.82	6.39	9.20	9.16	6.67	2.88
Harris County, TX	48201	13.93	14.21	10.81	7.06	9.58	8.19	6.83	4.37	6.32	0
Tarrant County, TX	48439	13.33	12.46	6.37	6.24	12.22	19.21	6.87	20.64	6.82	20.15
Travis County, TX	48453	22.91	11.60	18.96	0	17.59	9.13	8.05	10.75	15.49	14.98
Salt Lake County, UT	49035	18.23	0	19.11	10.28	11.72	0	0	0	9.70	0
Clark County, WA	53011	0	15.54	0	0	0	11.69	24.78	9.17	0	11.90
King County, WA	53033	0	10.84	5.71	11.47	5.41	0	0	5.55	4.48	8.53
Pierce County, WA	53053	0	5.56	0	13.34	0	6.26	0	0	15.93	11.08
Snohomish County, WA	53061	0	9.04	0	0	9.29	0	18.45	24.83	0	8.81
Spokane County, WA	53063	15.77	0	19.60	0	16.56	15.41	0	0	0	7.48
Putnam County, WV	55079	10.36	11.42	8.18	8.62	8.40	0	18.84	9.89	8.23	16.12

Notes. N = 850 County-Years. FIPS = Federal Information Processing Standard Publication. Mortality rate equates to deaths per 100,000 county-months in foster care.

Supplemental Material 2

Table 2. *Negative Binomial Regression Results Predicting Foster Care Mortality Rates for Infants and Ages 1-7 Years Separately*

	Children Ages 1 to 17 Years				Infants (<1 Year)			
Variable	IRR	95% CI		*p*-value	IRR	95% CI		*p*-value
Calendar year	0.97	0.93	1.00	0.063	0.97	0.94	1.01	0.136
Percent of child age groups								
1-4 years	0.98	0.94	1.01	0.276	--	--	--	--
5-9 years	**1.06**	**1.01**	**1.10**	**0.009**	--	--	--	--
10-14 years	0.97	0.91	1.03	0.344	--	--	--	--
Percent of child race/ethnicity (ref: Non-Hispanic White)								
Non-Hispanic Hawaiian/Pacific Islander	**0.92**	**0.85**	**1.00**	**0.055**	0.97	0.88	1.07	0.543
Non-Hispanic Asian	1.05	0.98	1.13	0.145	1.04	0.96	1.11	0.354
Non-Hispanic American Indian/Native Alaskan	0.95	0.90	1.01	0.077	1.03	0.98	1.08	0.290
Non-Hispanic Black	**1.02**	**1.01**	**1.03**	**<.001**	1.01	1.00	1.02	0.011
Multiple races	**1.04**	**1.02**	**1.06**	**<.001**	1.01	0.99	1.04	0.336
Hispanic	**1.01**	**1.01**	**1.02**	**0.001**	1.00	0.99	1.01	0.748
Percent of male	**1.10**	**1.04**	**1.16**	**<.001**	1.00	0.97	1.04	0.851
Percent with physical disability	1.06	0.99	1.13	0.092	1.01	0.96	1.06	0.685
Percent of older children (≥12 years) in congregate care	0.99	0.98	1.00	0.168	--			
Percent of younger children (<12 years) in congregate care[a]	**1.03**	**1.00**	**1.06**	**0.052**	1.04	1.00	1.09	0.057
Percent long-term care	0.99	0.97	1.00	0.063	--			
Percent of children reunited within 18 mo	1.00	0.99	1.01	0.976	1.01	0.97	1.06	0.524
Percent of children with reunification case plan goal after 18 mo	1.01	0.99	1.02	0.336	**0.95**	**0.91**	**0.99**	**0.014**
Percent receiving foster care payments	1.00	0.99	1.01	0.817	1.00	0.99	1.00	0.165
Percent placed out of state	0.99	0.97	1.00	0.106	0.99	0.96	1.02	0.504
Placement instability (number of placement moves)	1.01	0.99	1.04	0.291	0.95	0.89	1.02	0.180
Foster care entry rate	0.70	0.55	0.89	0.004	0.97	0.86	1.09	0.584
Percent kinship care	1.00	0.99	1.01	0.736	1.00	0.99	1.01	0.629
Consent decree status (ref: None in the past 3 years)								

Closed in past 3 years	1.22	0.79	1.89	0.368	1.03	0.54	1.99	0.921
Current class action lawsuit only	0.86	0.66	1.13	0.274	0.79	0.56	1.13	0.198
Current active consent decree	**0.73**	**0.58**	**0.93**	**0.008**	0.94	0.70	1.26	0.679
Impending class action lawsuit	0.90	0.70	1.16	0.401	0.88	0.64	1.20	0.415

Notes. [a]Modified for each model such that for the children ages 1-17 years model, the variable is the percentage of children between the ages of 1-12 years in congregate care, and for the infants model, the variable is the percentage of infants in congregate care. IRR = Incident Rate Ratio. CI = Confidence Interval. Bold indicates statistically significant predictors. Dashed lines indicate not applicable.

Supplemental Material 3

Table 3. *Negative Binomial Regression Results Predicting Mortality with All 153 Counties*

Variable	IRR	95% CI		*p*-value
Year	**0.96**	**0.94**	**0.99**	**0.005**
Sociodemographic Characteristics				
% of child age groups (ref: 15-17 years)				
<1 year	1.02	0.99	1.07	0.192
1-4 years	1.01	0.98	1.04	0.643
5-9 years	**1.04**	**1.00**	**1.07**	**0.033**
10-14 years	1.01	0.95	1.06	0.782
% of child race/ethnicity (ref: Non-Hispanic White)				
Non-Hispanic Native Hawaiian/Pacific Islander	0.97	0.92	1.03	0.372
Non-Hispanic Asian	1.02	0.96	1.08	0.620
Non-Hispanic American Indian/Native Alaskan	1.01	1.00	1.03	0.129
Non-Hispanic Black	**1.01**	**1.01**	**1.02**	**<.001**
Multiracial	**1.02**	**1.00**	**1.04**	**0.018**
Hispanic	**1.01**	**1.00**	**1.01**	**0.004**
% of male	**1.05**	**1.00**	**1.09**	**0.019**
% with physical disability	1.03	0.98	1.07	0.269
Foster Care Performance Characteristics				
% of older children (≥12 years) in congregate care	1.00	0.99	1.01	0.692
% of younger children (<12 years) in congregate care	1.00	0.97	1.03	0.921
% in long-term care	1.00	0.98	1.01	0.424
% of children reunited within 18 months	1.00	0.99	1.01	0.852
% of children with reunification case plan goal after 18 months	1.00	0.99	1.01	0.772
% receiving foster care payments	**0.99**	**0.99**	**1.00**	**0.011**
% placed out of state	0.98	0.97	1.00	0.061
Placement instability (number of placement moves)	1.02	0.98	1.04	0.352
Foster care entry rate	**0.81**	**0.67**	**0.98**	**0.027**
% in kinship care	1.00	0.99	1.00	0.367
Judicial Reform Characteristics				
Consent decree status (ref: None in the past 3 years)				
Closed in past 3 years	1.00	0.70	1.44	0.991
Current class action lawsuit only	0.86	0.70	1.07	0.183
Current active consent decree	**0.83**	**0.70**	**1.00**	**0.047**
Impending class action lawsuit	0.89	0.74	1.07	0.220

Note. IRR = Incident Rate Ratio. CI = Confidence Interval. Bold indicates statistically significant predictors.