

Preventing Severe and Fatal Child Maltreatment: Making the Case for the Expanded Use and Integration of Data

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In this article we examine risk factors for severe and fatal child maltreatment. These factors emerge from studies based on different data sources, including official child maltreatment data, emergency department and hospitalization data, death certificates, and data from child death review teams. The empirical literature reflects a growing effort to overcome the measurement uncertainties of any one individual data system. After review and reflection upon what is known, we consider how integrating this information can advance efforts to protect children, providing examples where the use and linkage of multiple sources of data may enhance surveillance, improve front-end decisionmaking, and support cost-effective research and evaluation.

In 2011, an estimated 1,570 children in the United States died as a result of abuse or neglect (U.S. Department of Health and Human Services [DHHS], 2012). An additional 6.2 million children were referred to child protective services (CPS) as alleged victims of abuse or neglect. Among referred children, 3 million were included in a CPS investigation and roughly 681,000 were determined to have been maltreated. More than three quarters of maltreated children were neglected, 17.6% were physically abused, and 9.1% were sexually abused. Many children experienced multiple forms of maltreatment (DHHS, 2012).

These estimates were derived from the National Child Abuse and Neglect Data System (NCANDS), the official U.S. source of child maltreatment data. The annual NCANDS report provides information about cases of child maltreatment reported to and investigated by CPS; yet estimates from this data system almost certainly understate the public health burden and number of children affected by abuse and neglect (Gilbert, et al., 2009; Sedlak et al., 2010). For example, NCANDS data indicated 2.1 maltreatment deaths occurred per 100,000 children (DHHS, 2012), yet half of states only reported data on maltreatment fatalities for children who were already known to CPS agencies prior to their death (U.S. Government Accountability Office, 2011). In Pennsylvania, one of 51 states and territories that contribute data to NCANDS, a maltreatment fatality (or any other abuse) can only be substantiated if there is a clearly identified perpetrator. Therefore, in Pennsylvania a child can be fatally maltreated or seriously injured from abuse, but if the perpetrator is unknown, the case is not substantiated or reported to NCANDS (Joint State Government Commission, 2012).

The under-ascertainment of nonfatal and fatal child maltreatment is not unique to NCANDS; emergency department and hospitalization records have also been shown to capture only a fraction of all medical encounters arising from maltreatment. Even among children who receive medical attention as a result of maltreatment—a small subset of all abused children—failure of medical professionals to recognize and diagnose abuse, as well as failure of coders to assign appropriate

diagnosis codes have contributed to the undercounting of abuse in medical data (Hoofft, Ronda, Schaeffer, Asnes, & Leventhal, 2013; Jenny, Hymel, Ritzen, Reinert, & Hay, 1999; Schnitzer, Slusher, Kruse, & Tarleton, 2011; Scott, Tonmyr, Fraser, Walker & McKenzie, 2009; Somji, Plint, McGahern, Al-Saleh, & Boutis, 2011).

Death certificates, the official record of death in the United States, have also been shown to dramatically underestimate fatalities from maltreatment, as more than 50% of deaths from abuse and neglect may be miscoded on death records (Crume, DiGuseppi, Byers, Sirotnak, & Garrett, 2002; Ewigman, Kivlahan, & Land, 1993; Herman-Giddens et al., 1999; McClain, Sacks, Froehlke, & Ewigman, 1993). Even child death review teams (CDRTs)—multi-agency entities charged with systematically compiling data about child deaths—have been found to underestimate the number of deaths attributable to maltreatment (Palusci, Wirtz, & Covington, 2010; Schnitzer et al., 2008).

Why does accurately identifying and counting severe and fatal cases of maltreatment matter? It is a classic axiom that one must be able to measure what one ultimately hopes to understand, manage, and change. Local variations in perspectives regarding parental behaviors that fall along a spectrum of culturally, economically, and historically determined severity, adequacy, and appropriateness may influence whether or not a case involving minimal physical harm to the child is considered maltreatment or not. Severe and fatal maltreatment offer tragic yet concrete instances of child harm that are less likely to fall within the spectrum of parenting behavior perceived as acceptable by any sector of society. Yet as the literature demonstrates, even here we are hindered by measurement issues.

Maltreatment injuries requiring medical intervention—fractures, burns, brain injury, malnutrition—or maltreatment that results in death, represent a minority of all maltreatment cases. Yet, the incidence of these events may provide the most objective measure of a community's broader success in protecting children (Gilbert et al., 2012; Putnam-Hornstein, 2012). Although our capacity to adequately enumerate the occurrence of maltreatment is currently

limited, developing standard definitions and more complete measurement are attainable goals (Slep & Heyman, 2006). And, if the risk factors for these more tangible forms of severe harm are the same as those for less visible victimization, improvements in the ascertainment of these severe forms of abuse and a better understanding of their antecedent risk factors may advance control and prevention of a broader range of maltreatment.

In this article, we provide a brief overview of risk factors for severe and fatal maltreatment identified from studies based on official maltreatment data, emergency department and hospitalization records, death certificates, and CDRT findings. This body of research reflects a growing effort to reduce the measurement uncertainties of relying solely on CPS data through the use of alternative and sometimes integrated sources of information for population-based maltreatment surveillance. Although the risk factors that emerge across sources are strikingly consistent, these factors are also based on a body of literature dominated by retrospective studies. As such, knowledge of etiological factors and their relative significance is still developing. With these limitations in mind, we reflect upon what is known and the need for additional research. Our recommendations center on what we consider to be “low-hanging fruit”—opportunities we believe hold the greatest potential for understanding antecedent risk factors, improving front-end decisionmaking, and targeting services—thereby reducing the incidence of severe and fatal maltreatment.

Risk Factors for Severe and Fatal Child Maltreatment

Given their physical vulnerability, young children face the greatest risk of severe and fatal maltreatment (DHHS, 2012). Studies indicate that 80% to 90% of maltreatment fatality victims are younger than 4 years of age (Crume et al., 2002; McClain et al., 1993; DHHS, 2012). As with child fatalities, the youngest children—those under age 4—comprise the largest share (34%) of substantiated cases of maltreatment (DHSS, 2012). The risk of severe and fatal injuries is particularly acute during the first year of life; children under 1 year

of age have the highest rate of substantiated maltreatment (21.2 per 1,000 children) and account for 12.5% of all victims of child abuse (DHHS, 2012).

Several other child characteristics have emerged as significant risk factors. In general, male children are overrepresented among victims of severe and fatal maltreatment (Leventhal, Thomas, Rosenfield, & Markowitz, 1993; Ross, Abel, & Radisch, 2009). Compromised child health—frequently operationalized in the maltreatment literature as low birth weight, disability, premature birth, or other known medical risk—has also emerged as a risk factor for both severe and fatal maltreatment (Brenner, Overpeck, Trumble, DerSimonian, & Berendes, 1999; Jonson-Reid, Chance, & Drake, 2007).

The socioeconomic conditions of both family and community have been strongly linked to risk of severe and fatal maltreatment. Poverty has consistently been identified as a risk factor for severe and fatal maltreatment (Leventhal, Martin, & Gaither, 2012; Putnam-Hornstein, 2011), although it is unknown whether poverty directly increases a child's risk or is merely symptomatic of other conditions associated with heightened rates of maltreatment (e.g., parental substance abuse or mental illness). Changes in broader macroeconomic conditions have also emerged as possible correlates of hospitalizations for child abuse (Berger et al., 2011; Wood et al., 2012). Race/ethnicity has been closely tied to both socioeconomic status and child maltreatment risk. Just as Black and Native American children are overrepresented among children officially reported for nonfatal maltreatment, these children also face an increased risk of severe and fatal maltreatment (Brenner et al., 1999; Herman-Giddens et al., 1999; Leventhal & Gaither, 2012; Overpeck, Brenner, Trumble, Trifiletti, & Berendes, 1998).

Young maternal age has also emerged as a risk factor (Brenner et al., 1999; Overpeck et al., 1998). One study found that the risk of fatal maltreatment among infants born to mothers younger than 19 with less than 12 years of education was 6.8 times the risk among infants whose mothers had at least 16 years of education (Overpeck et al., 1998). The risk of abuse has also been documented as higher

among second and subsequent children relative to firstborns (Parrish & Gessner, 2010; Putnam-Hornstein, 2011).

Finally, children of single or unmarried mothers have been consistently overrepresented among victims of severe and fatal maltreatment (Overpeck et al., 1998; Parrish & Gessner, 2010; Schnitzer & Ewigman, 2005). Research, however, indicates that it may not be the mother's single parent status that heightens a child's risk, but rather that her single status increases the likelihood that an unrelated adult male resides in the home (Stiffman, Schnitzer, Adam, Kruse, & Ewigman, 2002). One study found that young children living in a home with an unrelated male were nearly 50 times more likely to die from abuse than children living with two biological parents (Schnitzer & Ewigman, 2005).

The Potential for Using and Integrating Multiple Sources of Data

Although every incident of child maltreatment is tragic and consequential, there is no more visible and attention-generating manifestation of harm than when that maltreatment proves fatal. Public outcry is typically quick, intense, and especially reactive when the victim had been previously referred to CPS. The perception in these cases is that the system responsible for responding to child abuse and neglect was informed that the child was at risk but failed to protect the child from harm. Yet, CPS is rarely the only responsible party, a reality that emerges only after information is assembled across agencies.

Recent estimates suggest that roughly one of every three severe or fatal maltreatment victims had been previously referred to CPS (Damashek & Bonner, 2010; Krous et al., 2006; McKenzie & Scott, 2012; Putnam-Hornstein, 2011), meaning a majority of victims had no previous contact with CPS. A limitation of these estimates is that they do not take into account the fact that in many cases, there were previous referrals to CPS for children in the same family as the child who was severely or fatally maltreated (Putnam-Hornstein, 2011). And while the majority of children who are victims of severe or fatal

abuse may not have been known to CPS, these children and their families almost certainly interacted with health care providers at and shortly after birth—the developmental period in which rates of severe and fatal maltreatment are highest, and during which interactions with nonmedical mandated reporters (e.g. schools) are limited. This highlights why surveillance and prevention efforts must be broader than one system and should more effectively incorporate health care systems. To this end, we believe there is tremendous unrealized potential in the use and integration of existing data systems, including health care data, to improve the protection of children.

During the last two decades, technological advances have greatly expanded the availability and quality of data, as well as the ease with which records can be integrated across systems. This progress allows us to outline how administrative data can be used to generate information toward better understanding and greater prevention of nonfatal and fatal child maltreatment through: (1) enhanced surveillance, (2) improved decisionmaking, and (3) cost-effective prospective research and evaluation.

Enhanced surveillance. Investment in the expanded use and integration of administrative data across multiple systems will significantly enhance capacity for the surveillance of nonfatal and fatal maltreatment. Surveillance is defined as the ongoing collection, analysis, and interpretation of data for use in the planning, implementation, and interpretation of population health (Thacker & Berkelman, 1988). Because there is no complete single source of data that documents how many children are victims of abuse or neglect, the integration of multiple sources of data is needed. In the context of child maltreatment, improved surveillance provides more accurate incidence and prevalence estimates, supporting the identification of high-risk population subgroups. By recognizing and tracking changes in factors associated with increased rates of child abuse and neglect, we can identify groups of individuals, as well as communities, with heightened risk of child abuse. This knowledge can be used to develop better prevention programs and allocate resources in a way that is more responsive to the needs of vulnerable groups.

The strength of relying on multiple data sources to overcome underascertainment of maltreatment and improve surveillance has emerged in several recent analyses. In one multisite study, hospitalization data were used by Berger and colleagues (2011) to evaluate trends in the rate of abusive head trauma; they found that during the most recent economic recession, there was an increase in the rate of abusive head trauma across 74 counties. Wood and colleagues (2012) identified a similar relationship between the rate of hospital admissions for child physical abuse and macroeconomic conditions during the recent recession, specifically local mortgage foreclosure activities. The rate of substantiated physical abuse reported by NCANDS during this same period, however, decreased significantly (DHHS, 2009), demonstrating the marked variations among data sources.

There are a number of reasons for these differences between official maltreatment data (i.e., NCANDS) and hospitalization data. Medical diagnoses of physical abuse differ from CPS definitions of abuse. More severe types of abuse leading to hospitalizations may align with macroeconomic conditions, whereas less severe types of abuse may correlate more closely with other risk factors. Trends in one or both data sources may be artifacts of definitional changes or improved ascertainment. CPS may have lacked the workforce to investigate and substantiate what may have been a real increase in physical abuse. Yet, if official maltreatment data and hospitalization data capture different maltreatment dynamics, a more complete understanding will be achieved when multiple sources of data are used to measure child safety.

Improved decisionmaking. The integration of CPS data with medical records and data from other social service sectors also has the potential to improve the consistency and accuracy of CPS decisionmaking. Although the role of CPS is commonly conceptualized as that of a social service provider, its primary function is decisionmaking (Morton & Holder, 1997). CPS agencies embody a decisionmaking continuum (Baumann, Dalglish, Fluke, & Kern, 2011; Fluke, Baumann, Dalglish, & Kern, 2013) that filters children and families by: (1) deciding whether a report is consistent with the conditions that

constitute maltreatment and requires investigation or assessment; (2) determining whether services are needed or required; and (3) assessing what type of service is needed or required, including possible out-of-home placement.

Evidence suggests that CPS decisionmaking is a highly imperfect science, falling in a class referred to as “decisionmaking under uncertainty,” where complex conditions prevent decisionmakers from fully understanding the likely consequences of their determinations. Errors in decisionmaking can be either in the form of *taking action when actions are not needed* (false positives) or *not taking action when action is needed* (false negatives). While false positives are likely more common, an error of not taking action or a false negative (e.g., not removing a child who is at risk) is what undoubtedly receives much more public reaction as the consequences are often clearly visible and significant. Unfortunately, not only are both types of errors unavoidable given the incomplete state of our understanding of risk and severity of harm, but in the context of relatively low base rate events such as severe or fatal maltreatment, it is likely that there would need to be many false positives (e.g., children removed from a home in which they would not have been re-abused) in order to significantly decrease the false negatives.

For CPS, as with other systems in which service decisions are made, decisionmaking consists of an assessment component (i.e., determining the level of concern) and an action component (i.e., determining what to do about that concern) (Dalglish, 1988). Determination of the level of concern is generally tied to factors associated with the child and family (e.g., risks), whereas the action component is a function of decisionmaker action thresholds influenced by decisionmaker experience, organizational factors, and factors external to the service delivery system, collectively referred to as the Decisionmaking Ecology (Baumann et al., 2011). Correctly assessing the likelihood that a given child will be the victim of abuse or neglect at some future time—and creating tools that allow for a more sophisticated discrimination of risk—would enable scarce resources to be more strategically targeted. It would mean that evidence-based programs of varying intensity could

be offered to families (Pecora et al., 2012), more efficiently matching service levels to maltreatment risk.

What might such a tool look like? New Zealand is exploring the adoption of a computerized algorithm for stratifying children based on likelihood of future maltreatment (Vaithianathan, Maloney, Putnam-Hornstein, & Jiang, in press). The New Zealand model is based on integrated public benefit and child maltreatment data. These data have allowed researchers to draw from more than 200 data elements concerning children, siblings, and adults in the home to develop a model that generates a risk score capturing a child's future probability of being maltreated. This approach is unique because: (1) the model has been built from data gathered from multiple data systems; (2) if implemented, the tool would be automated rather than operator driven (i.e., computer-generated risk scores), reducing both the burden on workers and subjectivity bias; (3) this approach would allow new risk scores to be generated for children as new information is entered into the integrated system, with the model run on a weekly or even daily basis to allow more dynamic assessments of risk; and (4) risk scores would be used to identify children at high risk of maltreatment prior to any alleged abuse or neglect or CPS involvement. In other words, this model would be used to match the highest-risk children to maltreatment prevention services. Although implementation has yet to occur, findings indicate that available data capture more than 83% of children prior to a report of maltreatment, and 48% of children in the highest risk decile (as scored by the risk model) are maltreated by age 5 (Vaithianathan et al., in press).

Cost-effective prospective research and evaluation. The integration of data sources also supports cost-effective research agendas that allow for a prospective examination of risk factors and evaluations of prevention and intervention programs. Each year, government and private service delivery systems invest significant resources in early intervention and maltreatment prevention activities, including the collection of data. These efforts have recently increased as illustrated by the expansion of resources under the Patient Protection and Affordable Care Act to provide home visiting programs, a primary

prevention strategy. Yet, in most cases, the data collected by these agencies to assess the effectiveness of their interventions reflect the reach of a single agency, even though children and families are frequently served by multiple agencies and investments by one agency may be realized by a second. For example, the U.S. Department of Health and Human Services (1999) estimated that between one third and two thirds of child maltreatment victims are affected by parental substance abuse. Nevertheless, in most states, CPS and substance-abuse treatment data are maintained in separate data systems, preventing even basic point prevalence estimates of dually involved clients.

Fortunately, integrated data can be used to conduct relatively low-cost, prospective (and often population-based) maltreatment research and evaluation. For example, birth, CPS, and death records have been linked in California and used to track more than 4.3 million children over time (Putnam-Hornstein, Webster, Needell, & Magruder, 2011; Putnam-Hornstein, 2011). By linking these data sources, entire birth cohorts of children have been prospectively followed, allowing an identification of risk factors present at birth, the subgroup of children referred to CPS for nonfatal maltreatment, and deaths occurring over time. While generating a study in which millions of children are followed and actively tracked over time would be costly and inefficient, integrated data systems can leverage essential information available in existing data sources.

Findings from use of integrated data sources have: (1) helped document the public health burden of child maltreatment; (2) highlighted the potential for using universally collected data at birth to target high-risk populations for services; and (3) allowed for population-based examinations of child fatalities following involvement with CPS. In terms of public health, these linked data document that annual estimates of the number of children reported for maltreatment, substantiated as victims, or entering foster care underestimate the number of children who will experience these events over the course of childhood. For example, in California less than 5% of children are referred to CPS as victims of maltreatment annually, although nearly three times that number (15%) have been referred

for possible maltreatment by age 5. Point-in-time (or cross-sectional) estimates give the impression that only a small share of children are maltreated or in the foster care system, whereas population-based and longitudinal data document the cumulative risk of CPS involvement over the course of childhood and provide a better measure of the resulting public health burden.

Integrated data also demonstrate that data which is already collected on the birth certificate can be used to identify children at greatest risk of maltreatment. It is possible to identify roughly 50% of children who will be reported to CPS before the age of five from a relatively small subset of all births (15%) (Putnam-Hornstein & Needell, 2011). These data suggest that it is possible to move strategically upstream in our prevention efforts, creating services and supports that are tailored and targeted to those families at greatest risk of child maltreatment during the peak period of a child's developmental and physical vulnerability, when child maltreatment fatalities are highest.

Perhaps most importantly, population-based data indicate that a report to CPS for maltreatment is not a random event and is not simply a function of poverty or the result of racial/ethnic surveillance bias. After adjusting for other risk factors including maternal age, race/ethnicity, paternity establishment, children's health risks, gender, birth order, and birth payment method, children reported for maltreatment were observed to die from abuse at a rate 5.9 times greater than children who had not been reported (Putnam-Hornstein, 2011). In fact, a previous allegation of maltreatment was the single strongest predictor of death due to child abuse and was a much stronger risk factor than poverty or any other variables examined. While the National Incidence Studies (NIS) (Sedlak et al., 2010) and other sources of surveillance data suggest that the CPS system has contact with only a subset of maltreated children, the heightened rate of abuse deaths among children previously referred to CPS leave little doubt that those children who are known to CPS do, in fact, face threats that run far deeper than poverty or sociodemographic factors alone would indicate.

Concluding Thoughts

Evidence suggests a widespread under-ascertainment of both nonfatal and fatal child maltreatment in any one data system, largely due to limitations in the scope of information collected, as well as variations in data source criteria, coding, and diagnostics. Advances in technology, however, now allow the application and integration of multiple data sources to the study and prevention of child maltreatment. In this paper, we discuss and provide examples of how the use of multiple sources of data has the potential to: improve surveillance, support enhanced CPS decisionmaking and the strategic targeting of services, and increase cost-effective and rigorous research and evaluation.

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