Data Construction and Analytic Methods for Large Child Maltreatment Data Sets

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Abstract:
This presentation will describe some of the methodological problems and solutions associated with large multi-jurisdictional and national child maltreatment data sets derived from agency administrative data. The rationale and utility of these data for research will be considered and illustrated by various examples including those published in the peer reviewed literature. The presentation will address data construction methods associated with event structures, data entities, sample data sources, and geographical linkages. The preparation of data for use with certain analytic methods including event history and multi-level modeling will be discussed.

Introduction

Work with complex multi-jurisdictional child maltreatment data sets derived from multiple sources like the Canadian Incidence Study (Trocmé, MacLaurin, Fallon, Daciuk, Billingsley, Tourigny, Mayer, Wright, Barter, Buford, Hornick, Sullivan, McKenzie, 2001) can be a highly productive form of research and analysis. Research of this nature is also challenging since the data are derived from many jurisdictions with a range of policy, practice, and resource differences that must be navigated by the researcher.

A further focus of this paper is an examination of such data as drawn directly from administrative sources. In their raw form, as they reside in various data bases, these data are not organized in a fashion that is conducive for many research purposes and must be constructed to meet various research needs. Before discussing the particular examples of the methods and findings of research using these data it seems appropriate to address some of these concerns up front.

Many criticisms have been raised concerning the use of administrative data for research. One issue is that important or useful data are not collected through administrative data sources and that the researcher is restricted to what is available from the data source. Another common concern expressed by both researchers and practitioners is that the data are in error either because the staff entering the data made mistakes or were not trained adequately. Another complaint is that data are often missing. In justifying the use of administrative data for these sorts of analyses, Barth et. al., (1994) acknowledges weaknesses in the data, but suggests some important benefits for their use. Among the strengths is that the sample sizes are large enough not to distort the estimates of the populations. For certain types of events or conditions these data may be the only

way to obtain a large enough sample. With appropriate safeguards and protections administrative data can be combined with other administrative and non-administrative data by linking various identifiers. In addition, administrative sources may be the only way to obtain continuous data for constructing and analyzing trends over time.

Barth and his colleagues (1994) also point out that the alternative methods for collecting similar data including case record reviews, obtaining desired data directly from workers, or obtaining data from observation is also prone to various errors. These include the potential for bias of the reader, inadequate training of workers, and the difficulties of obtaining sufficiently large samples. The differences between the use of administrative data and more commonly accepted data collection methods is one of degree coupled with the recognition that the purpose of the research, the practicalities of the data collection effort, the attention to concerns regarding the quality of the data, and the nature of the analysis is a more critical determinant of sound research.

Examples of Research Using Multi-Jurisdictional Child Maltreatment Data

Much of the data used in the research presented as examples were drawn from the National Child Abuse and Neglect Data System (NCANDS). The data come in two forms; the Summary Data Component (SDC), and Detailed Case Data Component (DCDC). The NCANDS is a federal data collection program sponsored by Administration on Children Youth and Families, of the US Department of Health and Human Services.

Like the Canadian Incidence Study (CIS), the data are derived from child protective service agencies, and particularly from case workers who conduct CPS

investigations/assessments. The objective of NCANDS is to obtain and analyze data from state child protective service agencies (CPS) agencies on the volume and nature of child maltreatment reporting. All NCANDS data are collected through voluntary participation of state agencies (U.S. Department of Health and Human Services, 2001a).

The data collected in the SDC component of NCANDS is derived from aggregate annual data from all but one or two states each year since 1990. The data are obtained through a survey which includes an extensive validation process with the participating state child protective service agencies.

The DCDC data are derived from state level child protection and child welfare information systems. States submit these data to NCANDS on an annual basis. Prior to data submission, states work with the NCANDS technical team to prepare a mapping of the state's database to the NCANDS DCDC data items, codes, and formats. Upon receipt of the submission, an extensive automated and manual data validation process is conducted to ensure that the submission meets the criteria for inclusion in the DCDC database. Data submissions that fail the validation initially are returned to the state for correction and re-submission.

The basic data submission consists of data records for children who are reported for maltreatment and for whom a disposition decision is made during the calendar year. All child records available to the state are included in the data submissions.   Each child's record contains a unique encrypted identifier, an encrypted report identifier, data regarding the investigation (date of report, disposition, etc.), and child demographics. Data concerning maltreatment, risk factors, services and perpetrators are also collected. A key feature of the database for is that the encrypted unique child ID allows a linkage of

children across report events that occur during the submission period. In addition, most of the participating states use the same encrypted ID across submissions, permitting linkages of children in multiple years.

Beginning with the calendar year 2000 submissions, states submitting the revised DCDC are no longer required to submit the SDC survey as all required data can now be obtained from that source.

The examples are drawn from two articles by the author and his colleagues (Fluke, Yuan & Edwards, 1999; Fluke, Edwards, Bussey, Johnson, & Wells, 2001) and from work appearing in the 1999 annual **Child Maltreatment** report (U.S. Department of Health and Human Services, 2001a) and on-going study of unsubstantiation. In the first study, basic univariate descriptive analyses of survival distributions were used to examine patterns of recurrence, in the second study a multi-state analysis of recurrence was conducted to compare two time periods to determine if differences in recurrence rates could be detected, and for the third study a multivariate cox-regression or proportional hazards approach was used. The last example deals with work that takes a multi-level approach to looking a child maltreatment data from several sources to address CPS decision making.

Since most of the examples are addressing recurrence, some information regarding recurrence and its importance as a measure to CPS may be helpful. Recurrence in these studies is defined as subsequent maltreatment with respect to a child that has already been abused or neglected. There are many views regarding the appropriate definition of recurrence and its interpretation. Regardless of definition, recurrence is increasingly recognized as an important outcome tied to the provision of child protective

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services. The most recent example of this recognition is the use of recurrence as an outcome measure and performance standard by the US Department of Health and Human Services (U.S. Department of Health and Human Services, 2001b).

The use of administrative data to address child maltreatment recurrence is fairly common (Fryer & Miyoshi, 1994; Levy, Markovic, Chaudry, Ahart, & Torres, 1995; DePanfilis & Zuravin,1999; English, Marshall, Brummel & Orme 1999). This may be due to the fact that using administrative data to identify subsequent maltreatment is a highly practical technique as compared to developing and implementing a long term longitudinal data collection process. This is especially so when it is recognized that recurrence has a relatively low base rate among CPS populations. Most studies of recurrence also rely on event history analysis as a preferred methodology.

Example One: Multi-State Recurrence

For the examples described here, a specialized set of analytical data file construction procedures were developed and refined for use with the NCANDS DCDC data. While each study employs a variation on the NCANDS recurrence data construction methods, the basics of the data construction process are relatively constant. As described above NCANDS DCDC data incorporates a unique encrypted child identifier. The basic submission to NCANDS DCDC consists of what is termed a report-child pair, which as its name suggests consists of a child abuse and neglect report tied to a subject child. Thus, a subsequent report child pair can be detected through the process of identifying additional report-pairs with the same child identifier and a later report date. In its simplest terms the data construction activity consists of appending information about a subsequent

report-child pair to the index event. Over the past five years this basic methodology has been refined and tested in a variety ways. For example, there are procedures to unduplicate children, address the "roll-up" effect where multiple reports are made on the same child on the same day, and to test the degree of false negative and positive child identifiers in a state's data.

For the first multi-state example (Fluke, Yuan & Edwards, 1999) the analysis of recurrence is defined as the presence of one or more subsequent maltreatment report-child pair associated with the same child between January 1994 and December 1995. The follow up period between the first and subsequent events in the period ranged from a minimum of less than one month, to a maximum of twenty-four months. Recurrence data was available from ten states and 557,000 report child pairs. Estimated rates of recurrence in 12 months ranged from nearly 5 percent to nearly 30 percent.

For this study the objective was not so much to compare states, but rather to assess the degree to which the state recurrence patterns were consistent across states. Several important patterns emerged as being consistent from state to state.

Initial maltreatment patterns and the likelihood of a subsequent maltreatment are quite consistent from state to state. Children who initially experience neglect are the most likely to recur in nine of ten states. For five states, children who are physically abused are more likely than victims of sexual maltreatment to recur. One state had statistically different and higher rates of recurrence for sexual maltreatment compared to both physical abuse and neglect.

For repeated or chronic recurrences, the pattern of data across states indicates a very clear and also statistically significant difference between children who experience a

single recurrence, a second recurrence and a third recurrence. The likelihood of recurrence increases after each subsequent maltreatment event. For all of the states examined the overall likelihood of a third maltreatment event (second recurrence) was 45% greater compared to the likelihood of a second maltreatment event (first recurrence) and for most states a fourth maltreatment event (third recurrence) was roughly 15% to 20% more likely compared to the third maltreatment event.

For seven states it was possible to compare recurrence rates between those reported children who were opened for post-investigation services and those who were not. For all but one of the seven states, the children who received services were at greater risk of recurrence (Wilcoxon $p < 0.004$[1]). The competing explanations of this effect was that children receiving services were either at greater risk to begin with, or alternatively were subject to increased surveillance by the CPS agency.

Example Two: Multi-State Recurrence Comparing Two Time Periods

This example (Fluke, Edwards, Bussey, Johnson, & Wells, 2001) is derived from an evaluation of a statewide implementation of a child safety assessment protocol by the Illinois Department of Children and Family Services (DCFS). After and extensive developmental and training process the protocol was implemented on December 1, 1995. The evaluation design called for a test comparing short term recurrence (within 60 days) for the year prior to implementation and for the year post implementation. This test was conducted using the DCFS child maltreatment data base directly with a sample of

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[1] This is the highest value obtained for erroneously rejecting the hypothesis that both survival distributions are equal and was derived from data from one state. For the other six states p is less than 0.0001.

187,000 children. A statistically significant difference was found between the two time periods using event history procedures (p < 0.001), where the post implementation recurrence rate was lower.

The point in time implementation of the protocol presented an opportunity to set up and analyze a quasi-experimental condition, however, there were many threats to external validity. Among these was the concern that something might be occurring more broadly in the area of CPS nationally that was impacting 60-day recurrence rates. While on its face this concern may appear to be of little consequence as, in general, conditions that influence CPS data tend to operate at the state level, there is evidence that from time to time broad national trends are operating and observable in the data across states (Jones, Finkelhor, Kopiec, 2001). To address this concern NCANDS DCDC data from six states were tested as follows. Sixty-day recurrence rates were compared using Kaplan-Meier Survival Analysis procedures for the period between December 1994 and November of 1995 with the period from December 1995 to November of 1996. One state showed a statistically significant drop in 60-day recurrence rates during this time period, and a change in policy implementing a diversified response system may have contributed to that drop. In another state a statistically significant increase in short term recurrence was found. No other differences were found among the four other states tested.

The data analysis indicated that there was no strong evidence for a decline in short term recurrence rates nationally. In addition, the absence of statistically significant findings for four of the six states reinforces the identification of a statistically significant difference in Illinois despite the large samples of cases involved in the analyses.

Example Three: Multi-State Cox-Regression of Six Month Recurrence

The last example (U.S. Department of Health and Human Services, 2001a) involves using the six month recurrence rate that is now the basis of the federal safety outcome as mandated under the Adoption and Safe Families Act. Under the act states are reviewed to determine the extent to which they are in compliance with federal standards for six outcome indicators. For recurrence in six months, the standard is set at 6.1 percent so that states at or below the standard are considered in compliance. For most states the standard is obtained from the NCANDS DCDC data. For this analysis the six month recurrence rate is the dependent variable used in the cox-regression.

DCDC data from 15 states and 143,000 children were combined into a single constructed analytic data set. The statistically significant independent variables that were identified consisted of prior victimization, type of maltreatment at the index event, age at the index event, child race/ethnicity, report source, provision of post-investigation services at the time of the index event, and foster care placement at the time of the index event. In addition each a design variable for state was applied as an independent variable to help control for state differences in the analysis and, as expected, the contribution of state was also statistically significant.

To a large extent the results of the analysis were highly consistent with the findings from the first example reviewed here. Children who experienced prior victimization were almost three times more likely to recur in six months. Neglected children were 1.4 times more likely to recur compared to physical abuse, while no statistically significant difference was noted between sexual abuse and physical abuse. Children who received post investigation services and children who were placed were
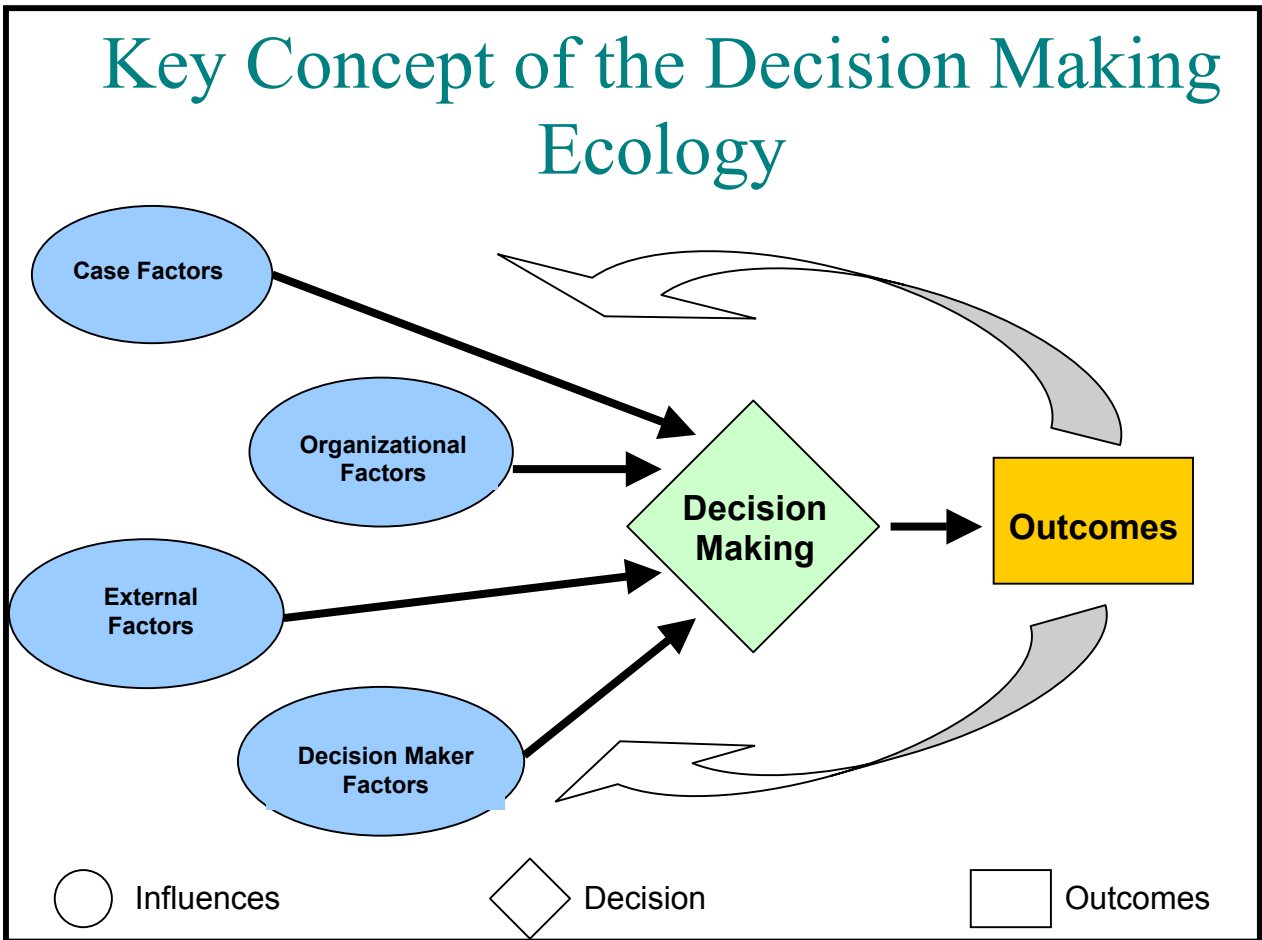
also more likely to recur. In contrast to the first example, a definite trend in lower likelihood of recurrence was noted for each age group. In comparison to white children, African American children, Asian/Pacific Islanders, and children of "other" race/ethnicity were less likely to recur. Finally, compared to social service personnel, reports by law enforcement were less likely to recur, whereas reports by educators and "other" sources including non-professionals were more likely to recur.

As a test, the analysis was also conducted without the state design variable. In the absence of the state design variable, all of the relationships with the exception of prior report were not statistically significant. This points out the need to recognize the importance of state difference to control for variation between states and the utility of viewing and analyzing national data in a multi-level context. The next example addresses this concern more directly.

Example Four: Multi-Level and Multi-Jurisdictional Analysis of Unsubstantiation

This example highlights some of the methodology and findings of a study of CPS decision making which focuses on the decision to unsubstantiate a report (Fluke, Parry, & Baumann, 2001). The theoretical base for the study is described through the concept of the Decision Making Ecology. The CPS Decision Making Ecology (DME) illustrated in the figure below is the theoretical foundation for the present study. As described by Baumann, et. al., (1997) decisions regarding cases are influenced by the presenting factors of the child and family or case factors, the features or characteristics of the child welfare workers or decision makers, the aspects of the work environment or

organizational factors, and the factors that govern the organization including law and

policy or the external factors.

Key Concept of the Decision Making Ecology

Case Factors

Organizational Factors

External Factors

Decision Maker Factors

Decision Making

Outcomes

⭕ Influences   ◇ Decision   ▢ Outcomes

The study was broad based with several components and addressed state law and

policy, worker and supervisory characteristics, and case characteristics. For purposes of

the example, methods and analysis for the aspect of multi-jurisdictional case, worker and

supervisory characteristics will be addressed here. The basic methodology relied on two

sources of data; questionnaires prepared by workers and supervisors, and NCANDS

DCDC data. Data from both sources were made available by three states so that

NCANDS cases could be linked to the questionnaires.

Questionnaires containing the caseworker and supervisor measures were mailed to all Child Protective Services (CPS) caseworkers and supervisors in three states. Three hundred seventy nine caseworkers and 133 supervisors returned the survey resulting in an overall return rate of 26.4%. The two survey instruments, one for workers and one for supervisors, were designed to tap a variety of decision maker and organizational characteristics. Four of the measures used in developing the current survey instrument were slightly modified versions of those developed by the Texas Department of Protective and Regulatory Services through three studies as part of the Worker Improvements to the Structured Decision and Outcome Model (WISDOM) project (Baumann, et. al., 1997b). These were Scale 1 "Caseworker Skills", Scale two "Job Experiences", Scale three "Job Comfort" and Scale four "Caseworker Satisfaction". Two "Definitions of Abuse and Neglect" and "Values" were slightly modified versions of scales used in a sister study conducted by the Office of Child Abuse Research of the Washington State Department of Social and Health Services, and two, "investigation Assessment Decisions" and "unit cohesion", were newly created for this study.

Individual and organizational measures gathered from caseworkers and supervisors were linked to NCANDS data. Each record within these data files represented a particular child within a particular report, or a report-child pair. This resulted in a multi-level sample size of 86,000 report-child pairs, 339 workers and 98 supervisors.

The outcome of primary interest was unsubstantiated decisions. This was operationalized in two ways: as a logit at the worker (or supervisor) level and as a dichotomous case level variable. Both were derived from the DCDC data furnished by participating states.

For this example, three multi-level models were formulated. The hypothesis was that the decision to unsubstantiated is a combination of case or situational characteristics, decision maker factors, organizational factors, and external factors. The design was to obtain a binomial multi-level (Rasbash, Browne, Goldstein, Yang, Plewis, Healy, Woodhouse, Draper, Langford, and Lewis, 2000) analysis. In all three models the level 1 is always the report-child pair, for one model level 2 is the worker, for the second model level 2 is the supervisor and for the three level model the worker is level 2 and the supervisor is level 3. The analyses were conducted using the binomial feature of multilevel modeling package MLwiN.

Binomial Multi-Level Analysis: Summary of Factors Associated with Unsubstantiation		
Variable Category	**Unsubstantiated Reports**	
	Variable	**Direction**
Case Level Variables	Prior Report	Decreased Probability
	Professional Report	Decreased Probability
	Child Age	Increases with Age
Decision Maker Variables	Between Worker	Variable Response
	Between Supervisor	Variable Response
	Between Workers Within Supervisors	Variable Response
Organizational Variables	Worker Views Supervisor as Supportive	Decreased Probability
	Supervisor Overload	Decreased Probability
	Supervisor Views Unit as Cohesive	Increased Probability
	Supervisor Views Self as Supportive	Increased Probability
External Factors	State	Variable Response

From the analysis, much of the variance in the unsubstantiation decision is due to workers or supervisors and to differences in the state where the CPS response took place. However, in the three level model the random term associated with supervisors was non-significant, whereas the random term for workers within supervisors was significant. This may suggest that variability is more closely tied to workers than to supervisors.

The case level factors are quite stable across all three models. In general report-child pairs without prior reports are 21% times less likely to be unsubstantiated. Similarly, those with a professional report are 45% less likely to be unsubstantiated. On the other hand, as children become older they are more likely to be unsubstantiated.

Worker level variables were found to be contributory only in the three level model, where the supervisor support factor (considered an organizational factor) was found to be negatively related to unsubstantiation. The more supervisory support the lower the probability of substantiation.

For the supervisor level 2 model the organizational factor supervisory overload was negatively associated with unsubstantiation. In the three level model, both the supervisors perception regarding the cohesion of the work unit and the degree to which the supervisor supports the workers in the unit are tied to increasing probabilities of unsubstantiation. This may suggest that due to the support of both the supervisor and the other workers in the unit, workers are more comfortable making a decision to unsubstantiate.

In general the analysis supports the operation of the DME in the formation of CPS decisions. The strongest and most consistent factors are the case level factors, but both decision maker, organizational, and external factors contribute to the model.

Conclusion and Ongoing Research Implications for the Canadian Incidence Study

The intent of this paper was to provide a set of examples that illustrate the use of Multi-jurisdictional child maltreatment data sets for addressing a range of research questions. The first example looked at state by state comparison of data that was

constructed and analyzed in the same way to identify broad patterns or trends that could be generalized across states regarding recurrence. The second example also involved a state to state comparison; however, the focus was on a particular time period to determine if a consistent pattern of change could be identified across jurisdictions. The third example looked a how data across jurisdictions could be combined into a single analysis with the objective of describing features associated with recurrence both in the presence of other features as well as jurisdictions. The fourth example, illustrated the use of multi-level modeling to address not only differences across jurisdictions, but across organizational components (workers and supervisors) within these jurisdictions in an effort to identify factors that could be used to flesh out decision making influences.

There are two aspects of both data construction methodology and the analysis that bear further consideration. One is that the research used in these examples is focused on the provision of CPS services. For recurrence, a major emphasis is on the performance of agencies and how the characteristics of the involved children and the service delivery systems impacts recurrence. For decision making the emphasis is on what goes into the key decisions that drive the system. Thus, the domain of research and best use of the data is tied to the subject of the data, child protective services.

The second is that the key to the use of data is an understanding of the complexities of the data system, and how best to organize the data for analysis. This entails knowledge of such things as the structure of the data, an awareness of the data limitations, information regarding the timing of data submission, and the capacity to work with relatively large data sets.

Research that emphasizes a CPS program focus and that addresses similar methodological and analytic concerns appear to be a suitable match for research involving the CIS. For example, the data on prior reports and services could be used to identify patterns that are similar to recurrence as identified using NCANDS data. Even though the CIS prior investigation data are somewhat problematical, and the CIS indicator is not consistent with the prospective methods for defining recurrence described here, it is possible to begin to systematically examine the data and develop more complex multi-variate analyses. As an obvious example, one apparent pattern from the CIS is that a current investigation of neglect, in comparison to physical abuse and sexual abuse appears to be more to likely to be associated with a prior investigation of maltreatment (Trocmé, et. al., 2001, p. 98).

In the area of CPS decision making, the CIS has the potential for some important contributions. The worker information in the CIS including caseload, education, years of experience, training, and team or branch can be coupled with independent variables constructed for screening decisions, disposition decisions, and service decisions related to specific cases. Multi-level modeling at the investigation assessment and worker levels and even at the agency level is feasible. Data problems may prevent a geographically representative analysis and more information regarding the characteristics of workers would be helpful, but even so, the analysis of the data would be very instructive. Given the range of case factors included in the CIS data, a multi-level model could yield a very supportable analysis of case factors that influence the range of CPS decision making in Canada and at least identify the extent to which worker variability is a factor.

Analyses of child maltreatment data sets from administrative sources are a fertile source of information to support research. Despite the challenges associated with utilizing such data, numerous examples exist of the applicability of the data. Good research depends on the nature of the questions that are asked. The appropriate and productive use of multi-jurisdictional child maltreatment data depends on the formulation of research questions that bear on the subject of the child protection system.

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