ADVANCED ANALYTICS TO IMPROVE CHILD WELFARE PRACTICE & OUTCOMES

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ANALYTICS IN GOVERNMENT
IT'S THE PRESENT, NOT JUST THE FUTURE

The Role of Data Analytics in Predictive Policing

How Analytics Can Help Governments Crack Down on Disabled Parking Fraud

Big Data, Analytics and a New Era of Efficiency in Government
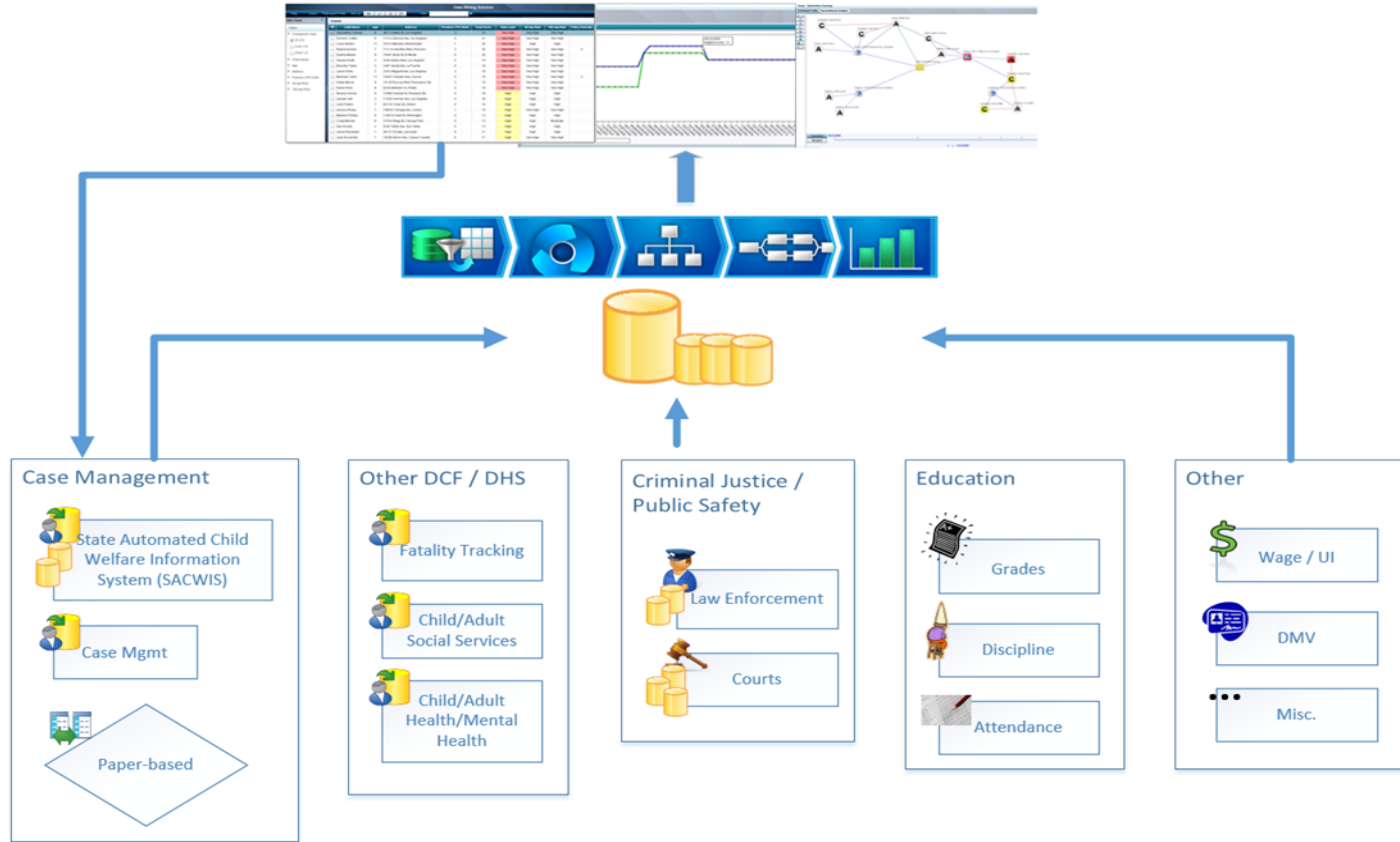
7 Big Data Solutions Try To Reshape Healthcare

Can Data Analytics Reduce Infant Mortality?

Public Agencies Use Business Analytics to Improve Performance and Boost Transparency

States Use Data to Target Identity Thieves

L.A. Weighs Traditional Risk Assessment and Predictive Analytics in Wake of Child Death

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ANALYTIC APPOACH

MALTREATMENT FATALITY RISK MODELING

AURA SCORE THIN FILE PRIMARY CONTRIBUTING FACTORS

Decreasing Importance →

Factor	AURA Score Influence
Client Age	Lower age increases
Number of Months Parents on Probation	More increases
Birth Parent DMH Indicator	Positive increases
Family Law Enforcement Encounter Count	More increases
Alleged/Adopted DMH Parent Service Count	More increases
Number of Alleged/Presumed/Adopted Fathers	Complex relationship
Alleged/Presumed/Adopted Father Age	Complex relationship

Remember: correlation is not the same as causation

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AURA SCORE | PRIMARY CONTRIBUTING FACTORS

Factor	AURA Score Influence
Previous AURA Referral	Maximizes AURA Score
Substantiated Allegation Count	More increases
Client Age	Lower age increases
Narcotic Services Indicator	Substantially Increases (5x)
Substantiated Allegation for Parent on Other Children	Complex relationship
Birth Mother Age	Complex relationship
Child DMH Service Count	More increases
Percent of Children Under 2 in Family	More increases
Parents Were Perpetrator in Previous Substantiated Allegation	Complex relationship
Number of Children in Family	More increases
Parent DHS Inpatient Indicator	Positive Increases
5 Year Total Case Count	More decreases
Inconclusive Allegation Count	More decreases

Decreasing Importance

Remember: correlation is not the same as causation

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RISK FACTORS | VARIABLES CONSIDERED

Factor Name	Description	Primary Data Source
Age in Months	Age of the child	SACWIS
Gender	The gender of the child	SACWIS
Mother's Age	The age of the child's mother	SACWIS
ACCESS Flag	An indication the child or parent listed in the ACCESS data as an aid beneficiary	Public Welfare
Citizenship Flag	An indication of the child's citizenship status	Public Welfare
Sibling Flag	An indication siblings present in the household at the time of a child's birth	SACWIS
Report History Count	The total number of reports known to be received by DCF on individuals connected to the child	SACWIS
Ethnicity	Ethnicity rolled up into the categories Black, White, Hispanic, Other and Unknown	BOTH
Perpetrator as Victim	The number of different individuals listed as a perpetrator for a child or for that child's Level 1 and 2 relationships who were themselves victims of past maltreatment	SACWIS
Historical Maltreatment Mix	The percent of historic allegations classified as: Physical Abuse, Parental Neglect, Substance Abuse, Sexual Maltreatment, Family Violence and Other Maltreatment	SACWIS

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- Early Maltreatment Fatality Model successfully captures more than half of maltreatment fatalities in a relatively small segment of children
- Report History Count vital to the success of this segmentation

- Report History Count depends critically on entity resolution process

- Intergenerational child maltreatment also a critical risk factor

IMPORTANCE OF DATA QUALITY & ENTITY RESOLUTION

ENTITY RESOLUTION | IDENTIFYING UNIQUE PERSONS

Initial inspection of the data revealed unique persons in FSFN assigned to multiple Person IDs. In order to get a complete picture and history of a person, the first analytic task was to consolidate these multiple representations into a single unique person into "Key ID" (KID).

ID_PRSN	Name
100203712	William Smith
100160823	Bill Smythe

KID
12345

LEVELS OF RELATIONSHIPS

To better understand the relationships between a given child and others in th child's event history, the following hierarchy was defined:

Level	Description
0	Previous reports and intakes for the selected child
1	Previous reports and intakes for those in the same cases as the selected child
2	Previous reports and intakes for those linked to the cases of the selected child but not including the selected child

CDR data reported prior counts for victims, perpetrators and several other relations. As an example, a child is listed in CDR to have died in 10/2009. CDR references <u>one victim prior</u> and <u>one perpetrator prior</u> from 10/2007.

OCT07

OCT09
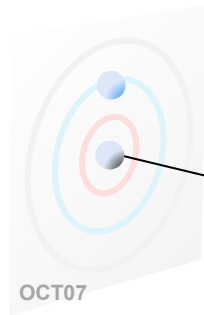
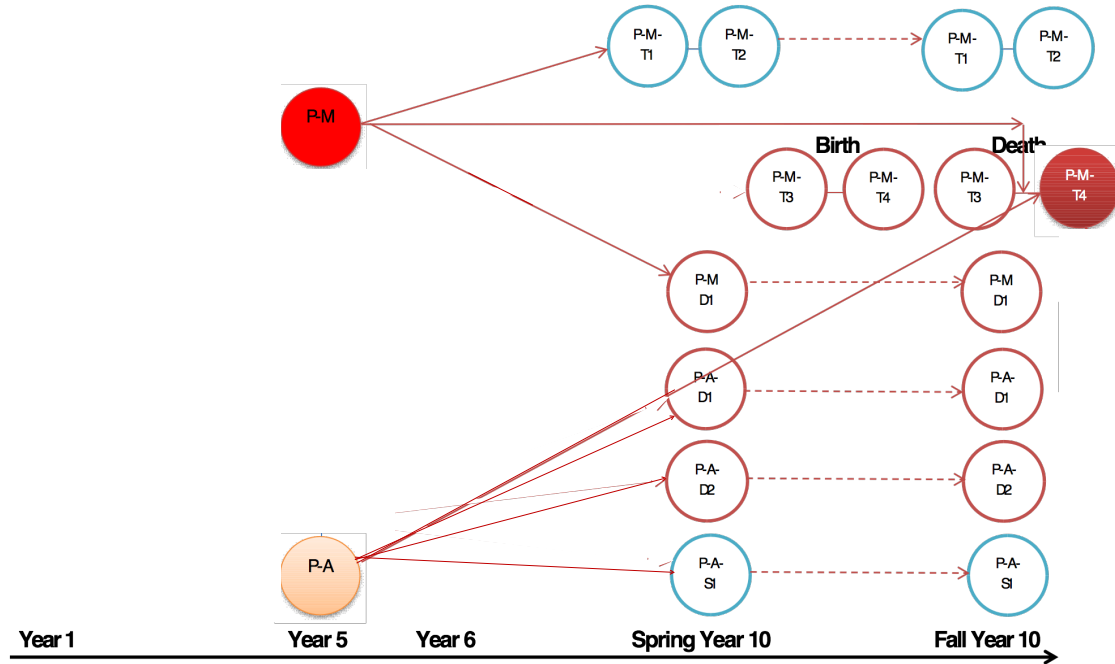This is what the prior event history looks for the child **without** using the linkages established by the Key ID process.
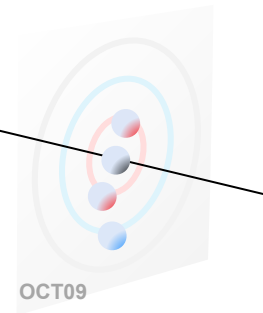
KEY ID EXAMPLE | IMPACT OF ENTITY RESOLUTION ON THE CHILD'S HISTORY

Key ID enables the resolution of relationships vital to building an informative history around the child by leveraging concepts similar to social network analysis.
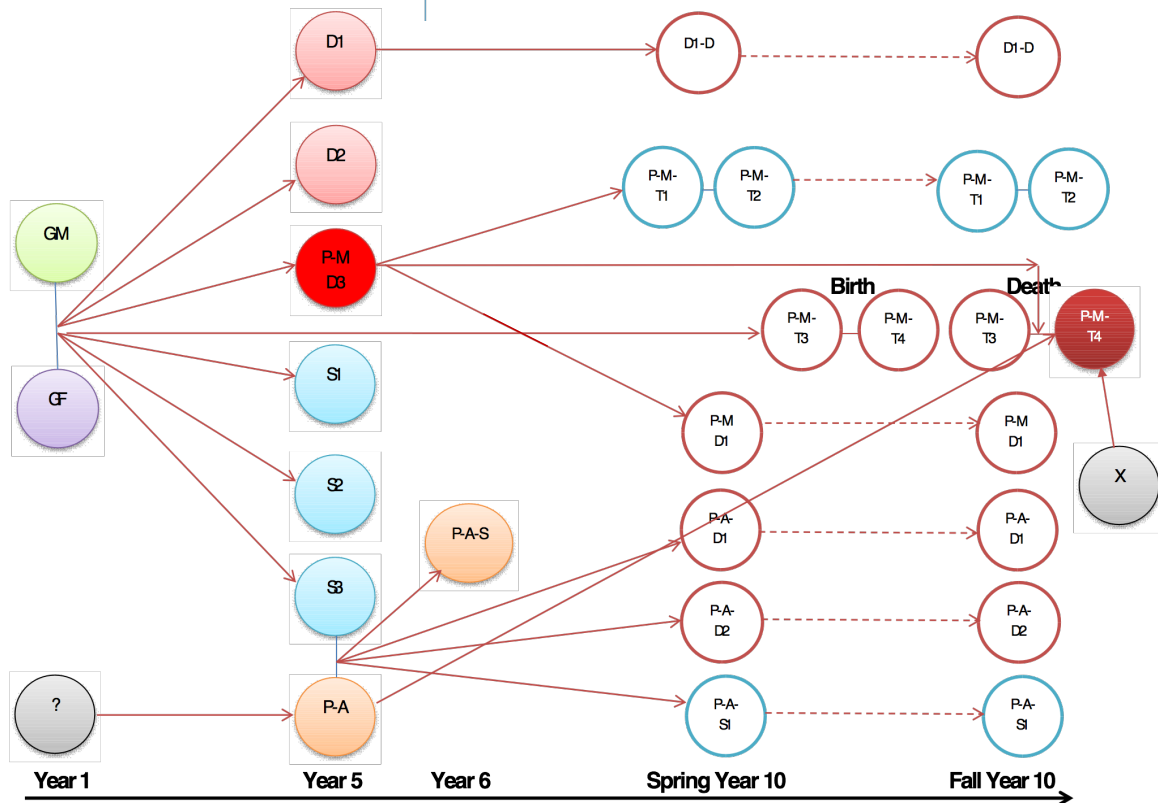
OCT07
NOV07
NOV07
MAR08
DEC08
OCT09
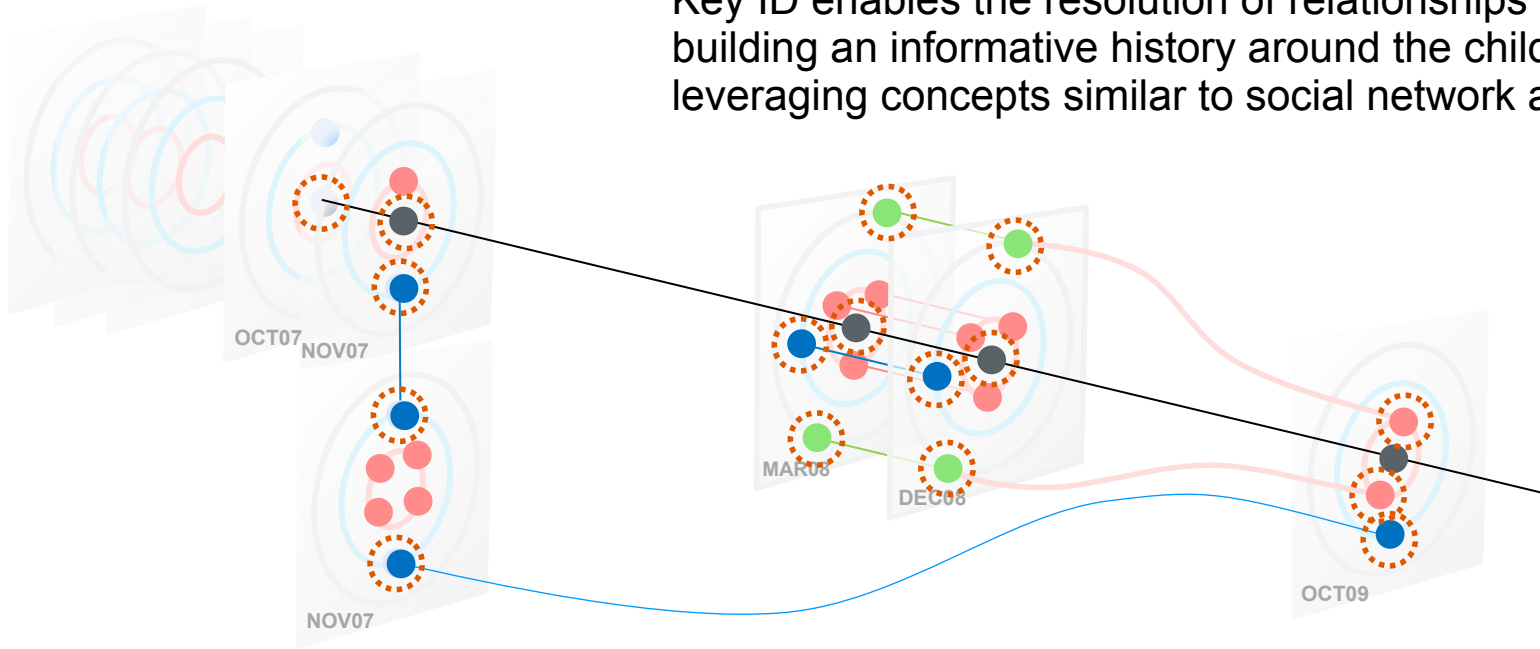
Identified only with improved entity resolution

CASE STUDY 2 | WITH ENTITY RESOLUTION

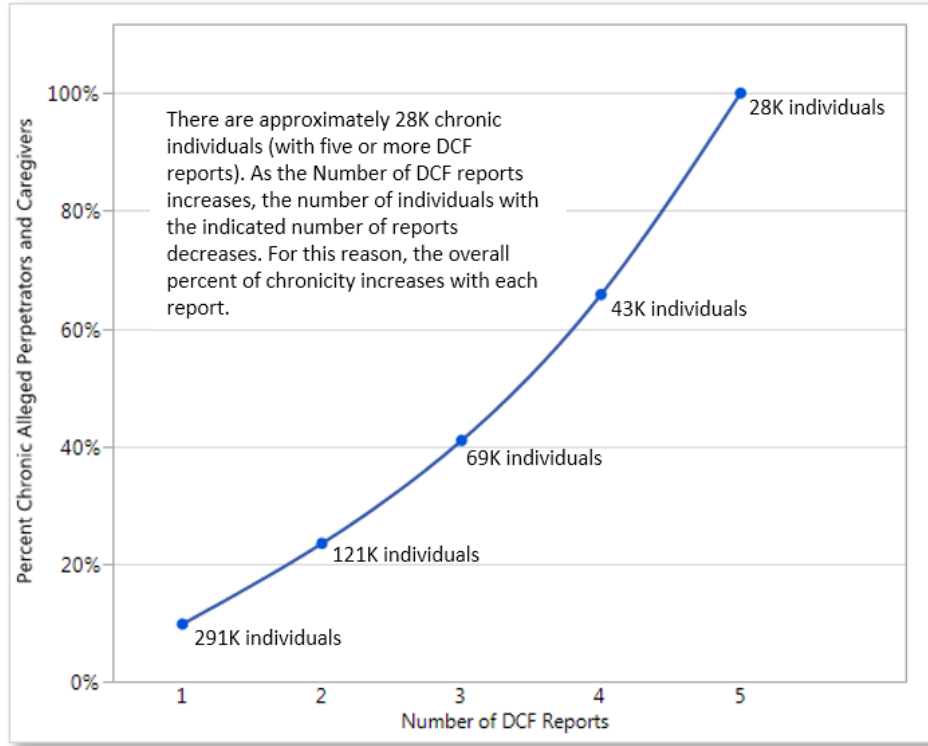|	
GM	Grandmother
GF	Grandfather
D1	Daughter 1
D2	Daughter 2
P-M	Perpetrator Mom
S1	Son 1
S2	Son 2
S3	Son 3
P-A	Perpetrator Aunt
P-A-S	Perpetrator Aunt Sibling
D1-D	Daughter 1 Daughter
P-M-T1	Perpetrator Mom Twin 1
P-M-T2	Perpetrator Mom Twin 2
P-M-T3	Perpetrator Mom Twin 3
P-M-T4	Perpetrator Mom Twin 4
P-M-D1	Perpetrator Mom Daughter 1
P-A-D1	Perpetrator Aunt Daughter 1
P-A-D2	Perpetrator Aunt Daughter 2
P-A-S1	Perpetrator Aunt Son 1

	Without Entity Resolution	With Entity Resolution
Report History Count	44	127
Intergenerational Abuse History	NO	YES
Risk Percentile	82.7	99.6

PERPETRATORS, RE-REPORTING, RE-MALTREATMENT AND CHRONICITY

PATH TO CHRONICITY

There are approximately 28K chronic individuals (with five or more DCF reports). As the Number of DCF reports increases, the number of individuals with the indicated number of reports decreases. For this reason, the overall percent of chronicity increases with each report.
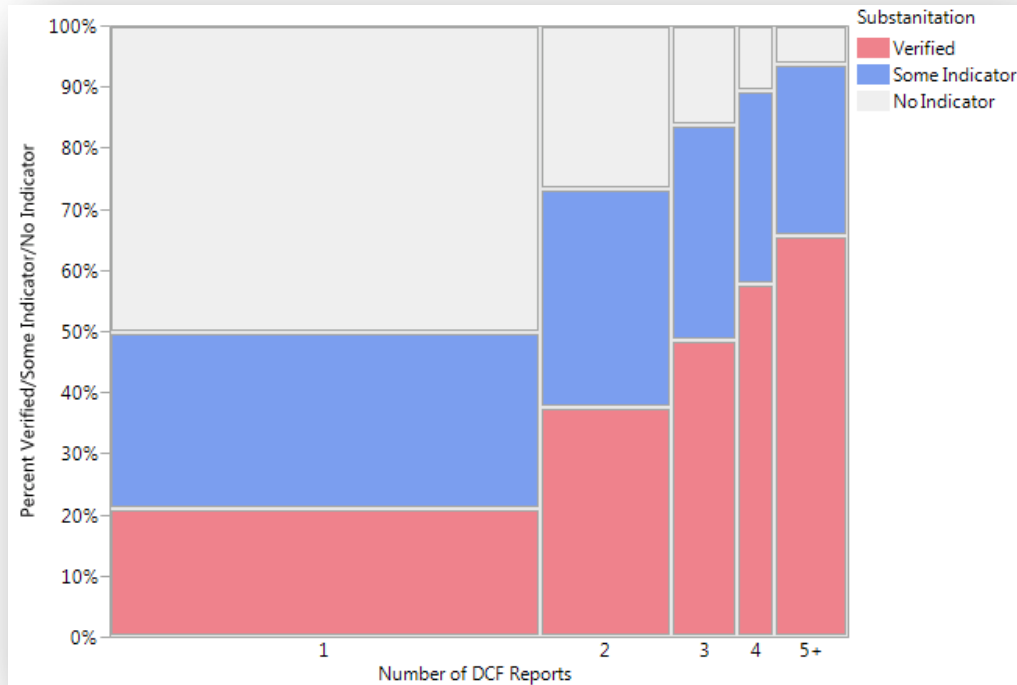
42% (121K) of perpetrators were reported multiple times over the 8 to10 years follow-up period. Roughly, 10% of the study cohort of 291,499 perpetrators had 5 or more reports. After each report the fraction reaching chronicity increased.

CHRONICITY IMPLIES VERIFICATION

By the 5th report, almost 2/3rd of perpetrators were substantiated (verified) at least once and over 9 out of 10 of them had a report with either verified or some evidence ("some indicator") of maltreatment. Even though the type of transition of report disposition from one report to another does not explain the type of next disposition or chronicity, as a perpetrator is re-reported multiple times, the likelihood of substantiation increases substantively over time.

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TIME TO CHRONICITY | UNIFORM RISK OVER TIME
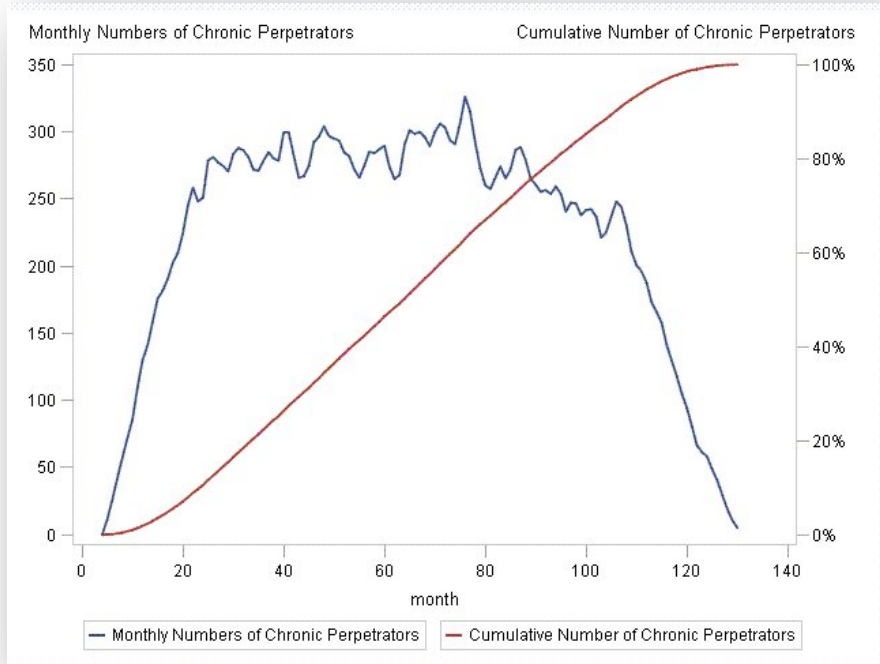
The chronicity of maltreatment is a long-term phenomenon and the median time to chronicity was 64 months suggesting that perpetrators have been abusing their children over a very long time period.

CHRONIC PERPETRATION MODEL | RISK FACTOR CATEGORIES

More than 400 variations of risk factors were considered for development of each chronic perpetration risk model. These were reduced by predictive modeling techniques to about 20 per model.

- Historical report characteristics
- Historical placement characteristics
- Historical maltreatment characteristics
- Historical services characteristics
- Current report characteristics
- Alleged perpetrator of caregiver characteristics
- Intergenerational abuse characteristics
- Historical mental health characteristics
- Physical problem characteristics
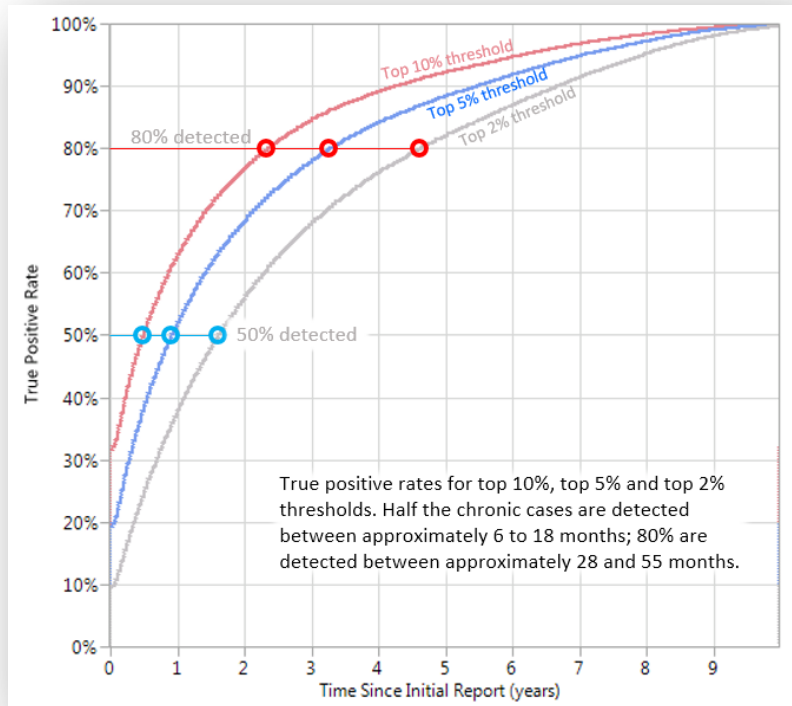- Inter-report characteristics
- Geographic risk factors

RELATIVE RISKS VS DCF REPORT COUNT
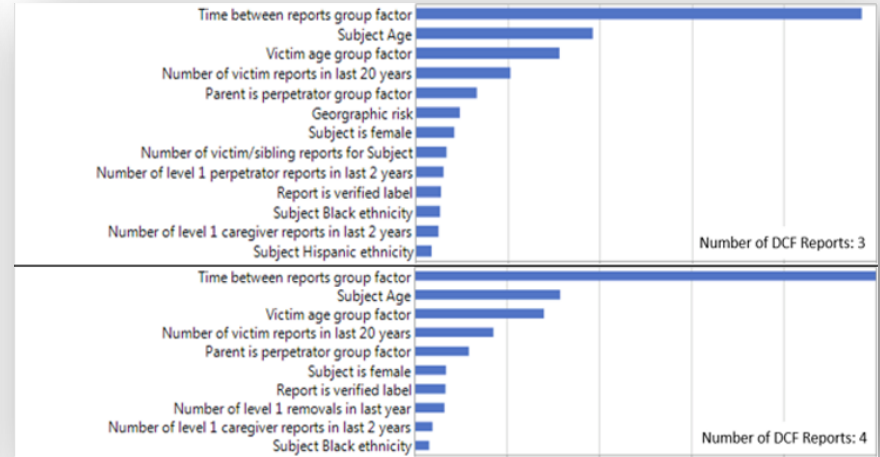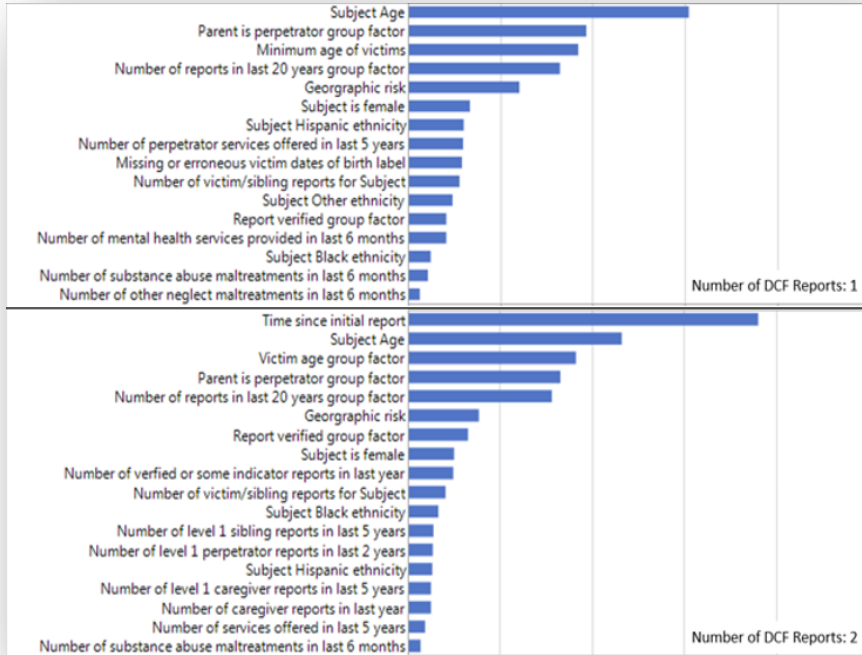
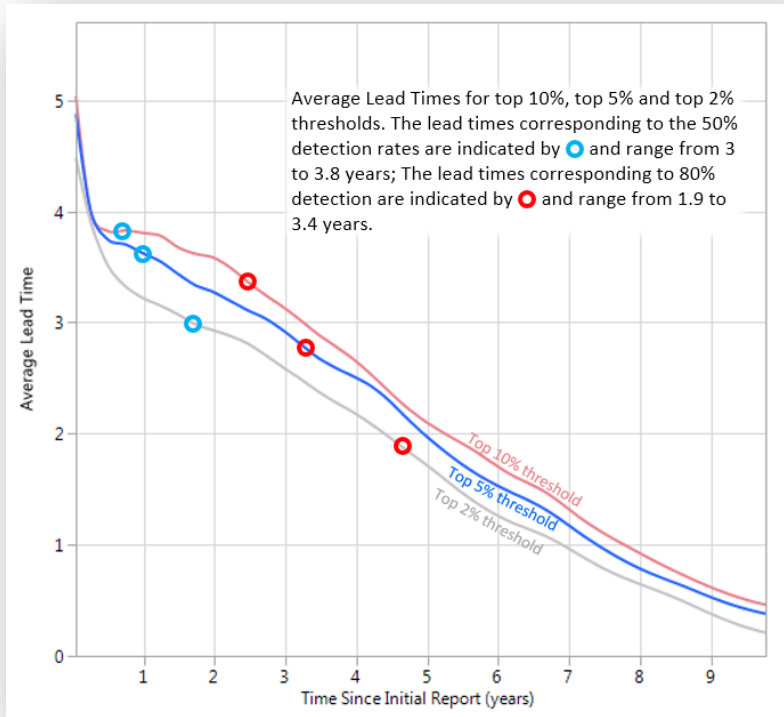Time between reports plays an increasingly important role as the number of DCF reports increases.

True positive rates for top 10%, top 5% and top 2% thresholds. Half the chronic cases are detected between approximately 6 to 18 months; 80% are detected between approximately 28 and 55 months.

The risk models could identify:

- 10% to 33% of chronic subjects on their first DCF report.

- 50% in 6 to 28 months.

- 80% in 28 to 55 months.

Average Lead Times for top 10%, top 5% and top 2% thresholds. The lead times corresponding to the 50% detection rates are indicated by ◯ and range from 3 to 3.8 years; The lead times corresponding to 80% detection are indicated by ◉ and range from 1.9 to 3.4 years.

Lead times (time between detection and the fifth report) varied between:

- 5.4 and 5.7 years for individuals detected on their initial report

- 3.0 to 3.8 years at 50% detection.

- 1.9 to 3.4 years at 80% detection.

HIGH RISK SUBJECTS | DEFINING CHARACTERISTICS

Risk Factor	Cohort Average	High Risk Average	Difference	% Range
Intergenerational report count	0.2	3.8	3.6	60%
Subject is parent of at least one victim	7.2	15.2	8	42%
Number of reports in last 20 years	4.7	7.9	3.3	33%
Minimum age of victims	12	17	5	28%
Subject Age	21.1	26.8	5.7	20%

A key defining characteristic in high chronicity risk was intergenerational maltreatment.

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MALTREATED VS NON-MALTREATED CHILDREN
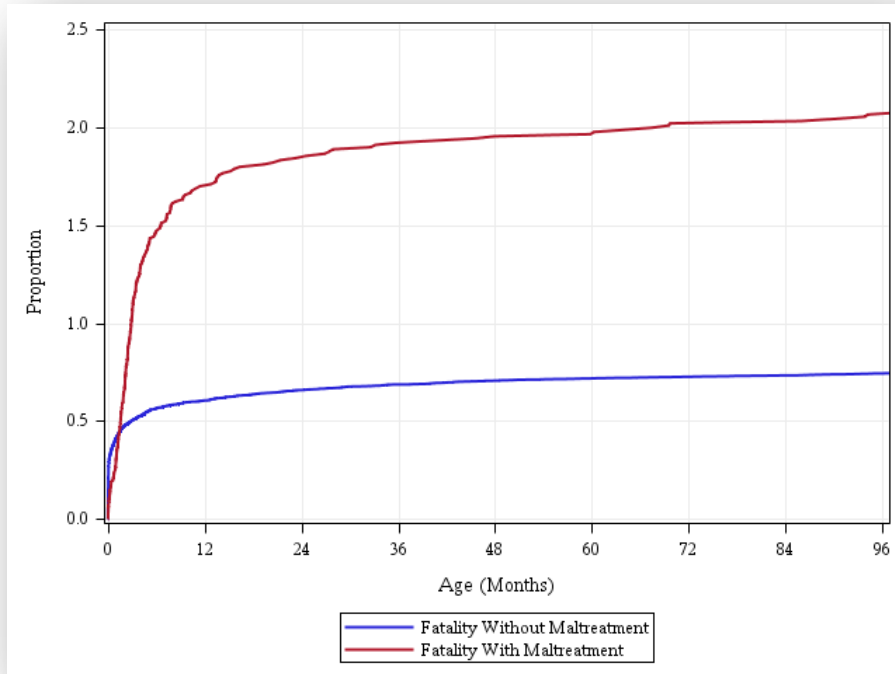
The fatality rate of children with an alleged maltreatment is nearly three times that of non-maltreated children in their first ten years of life and maltreated children have been shown to die sooner and for preventable causes including accidental death and homicide.
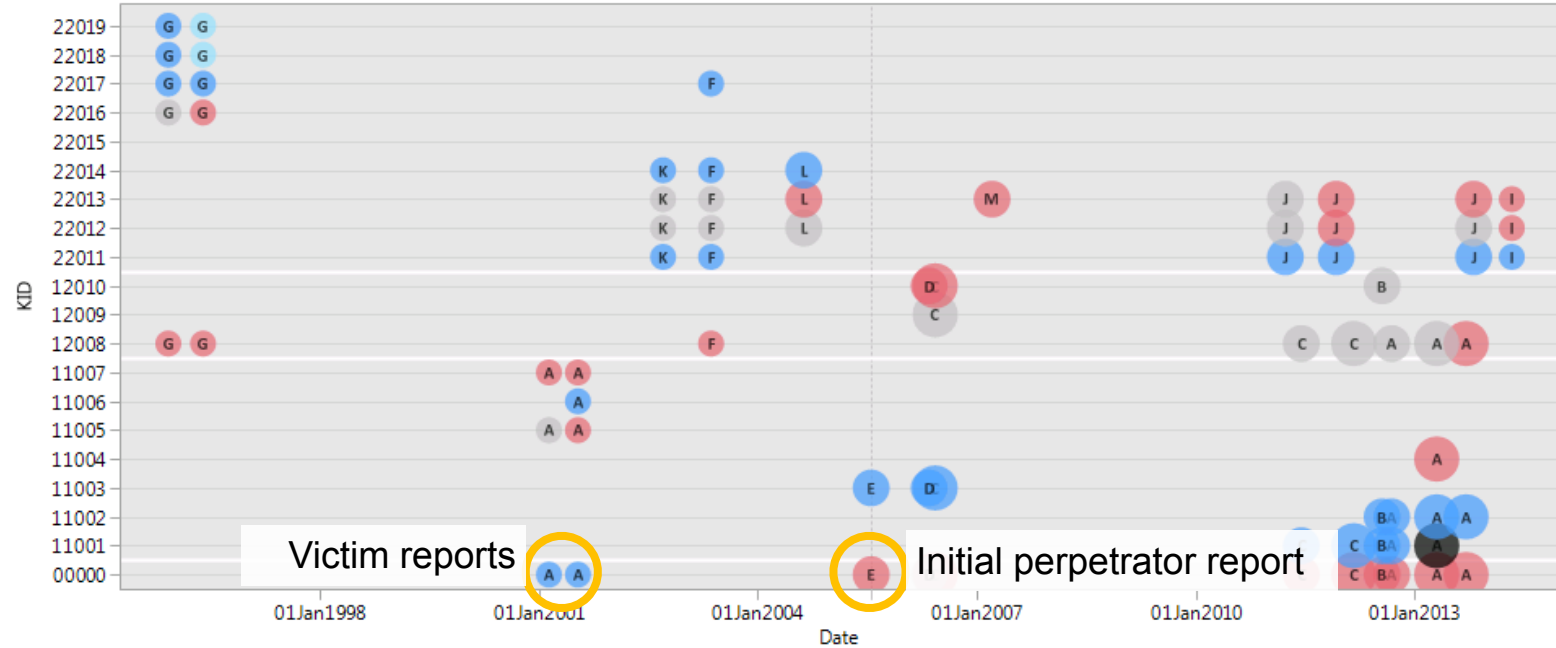
Many of the highest risk perpetrators are young mothers with young children, a history of victimization, and a large number of networked reports in the past.

In the diagram, each marker is a report. Reports on the same row are for the same individual and the position horizontally indicates the time of the report. The marker color indicates role and the size indicates verification status. The letter in the marker groups reports into cases.
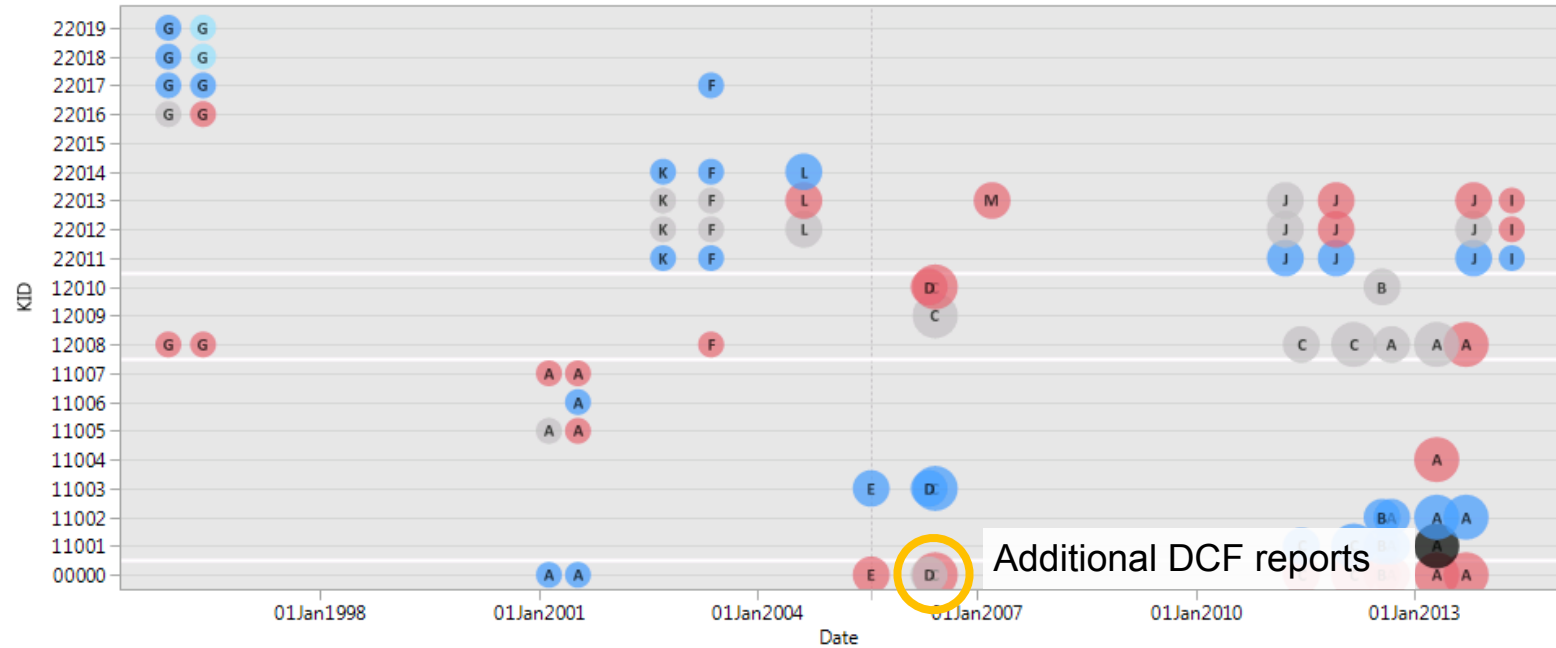
THE TYPOLOGY OF A HIGH CHRONICITY RISK CASE

The individual in question had two (2) victim reports as a child (Case A in 2001) which resulted in a 99.9th percentile initial-report risk score in June 2005 (Case E).

Two additional DCF reports followed within a year. The verified third report resulted in a removal of the victim from the home in mid-2006.
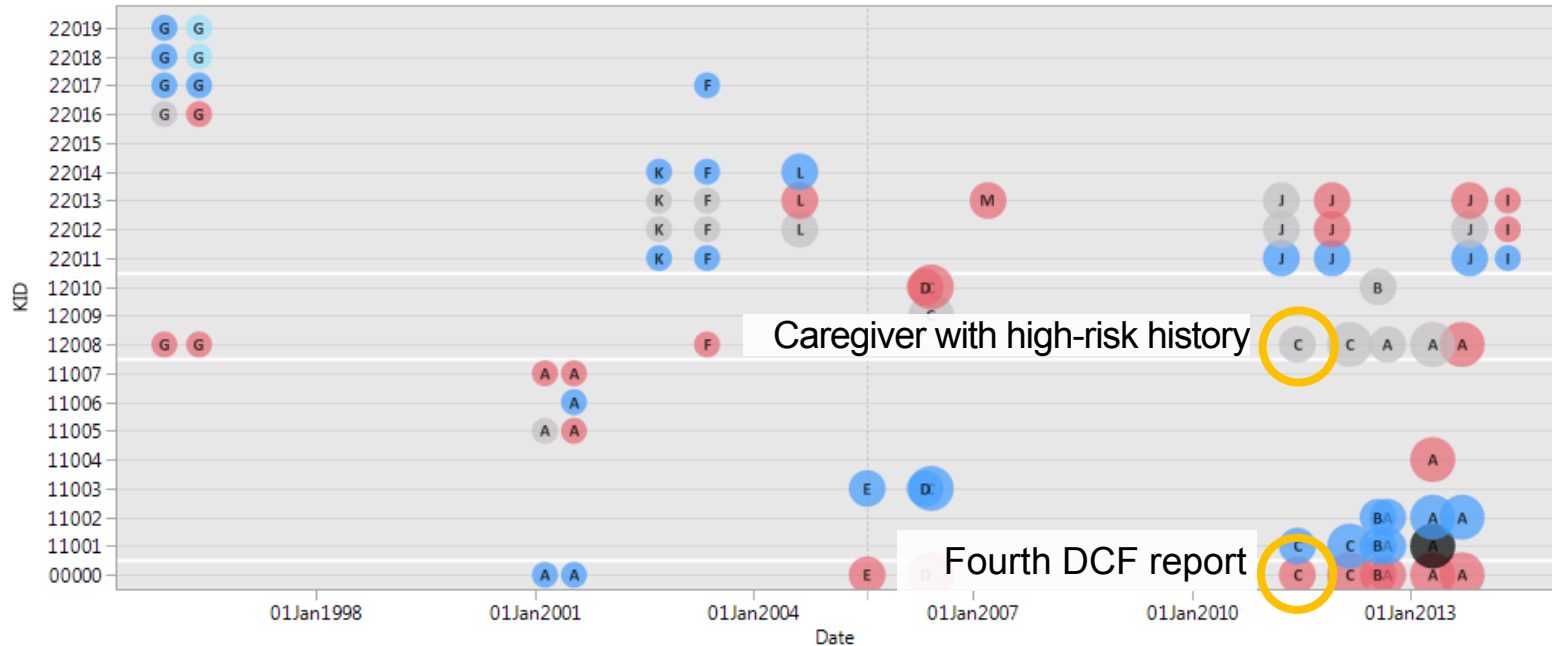
Approximately five years later in 2011, a fourth report came to the child welfare system for the subject for another child (Case C). A caregiver listed in the fourth report had a history of prior perpetration spanning more than a decade (Cases G and F). Due to entity resolution issues, these prior perpetration reports were apparently not known to the case. The chronicity risk for the caregiver at the fourth report exceeded that of the initial report.
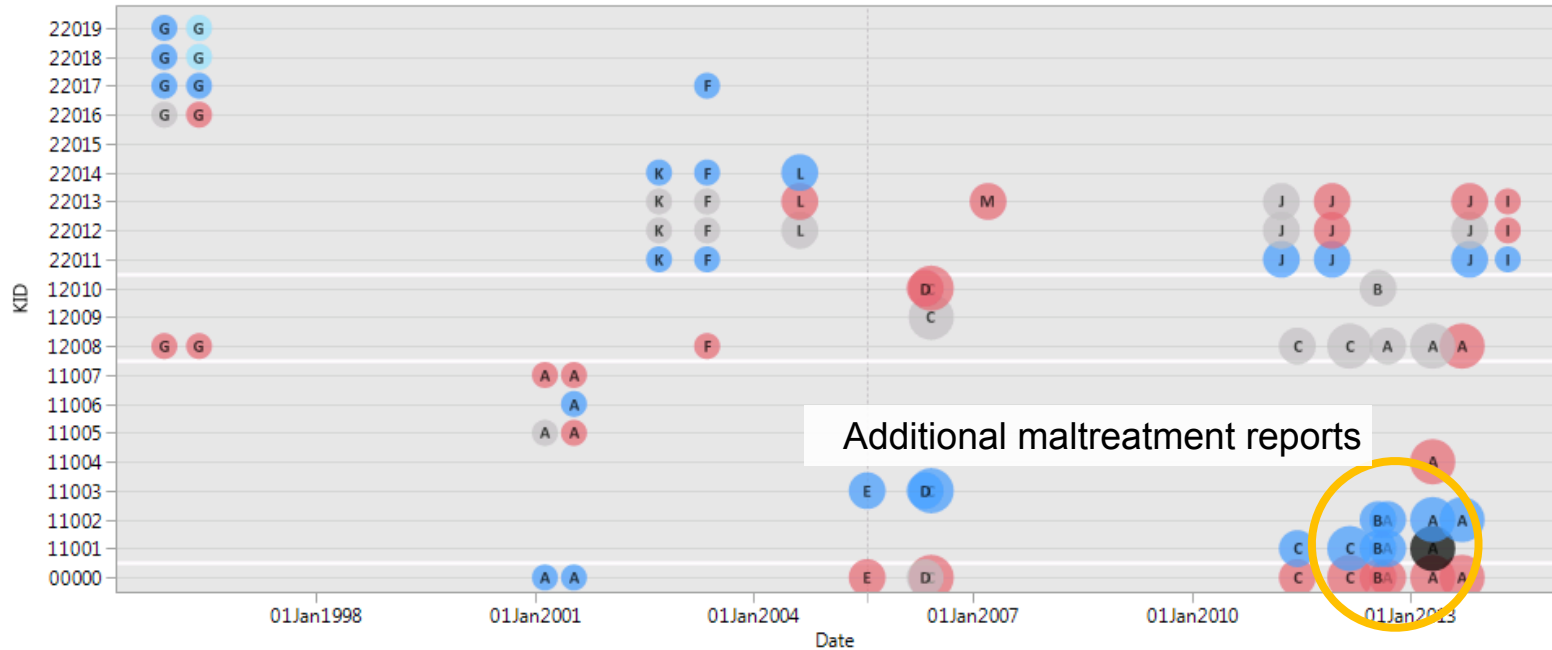
Over the course of the next three years four additional maltreatment reports came to the child welfare system involving the subject, the affiliated caregiver and (eventually) two victims (Cases B, C and A). The last of these, in early 2013, saw the death of one of the victims due substance-abuse related neglect.

THE TYPOLOGY OF A HIGH CHRONICITY RISK CASE

Related maltreatment cases?

Link to fatality-case caregiver
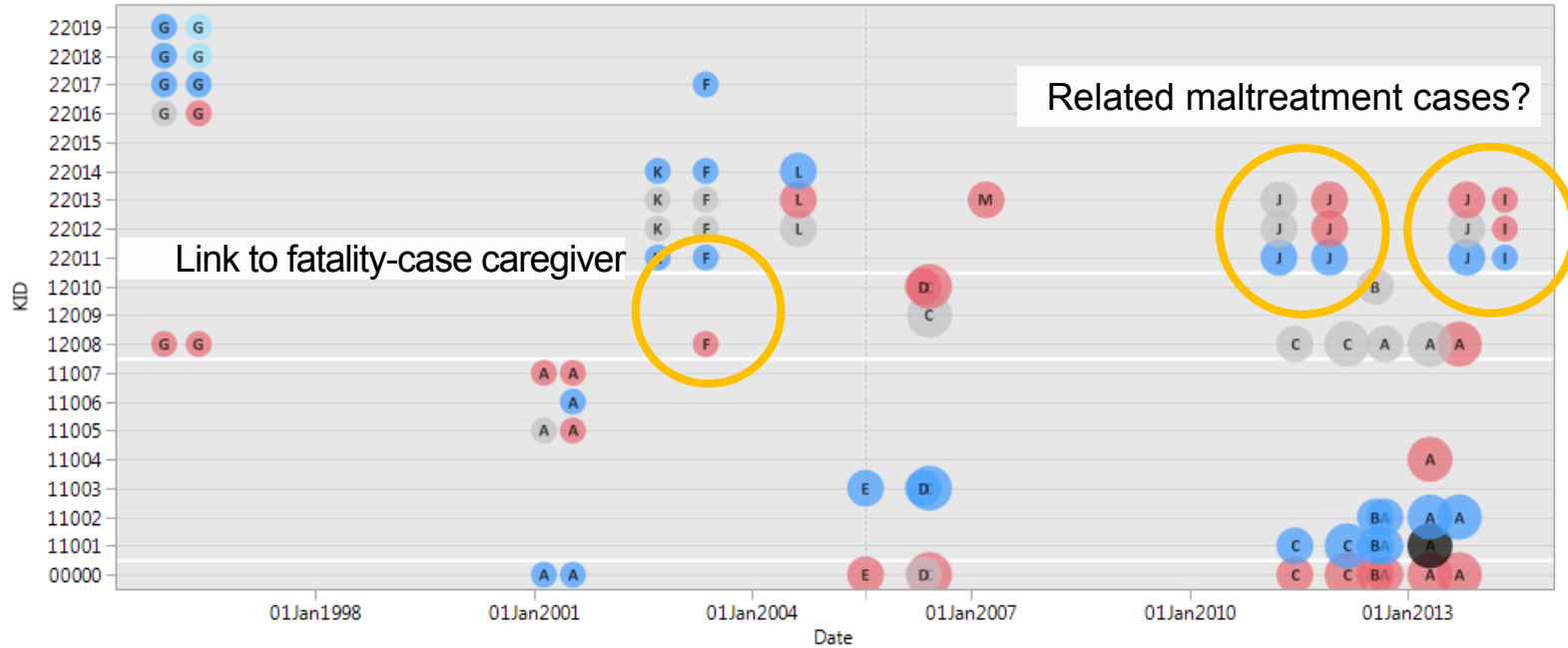
Approximate in time to the second batch of reports to the child welfare system (in 2011), there were reports regarding another family (Case I and J). While not directly related to the subject, one of the recurring victims in these reports was maltreated by the aforementioned caregiver (Case F in 2003). The relationship between Cases A through C with Cases I and J between 2011 and 2014 is not known.

SNAP SHOT OF SOLUTION

Total Risk Score
Child Name
Address
Previous CPS Visits
Risk Level
30 Day Risk
Companion Case

Case Number	Child Name	Age	Address	Previous CPS Visits	Total Risk Score	Risk Level	30 Day Risk	180 Day Risk
1034769191	Samantha Conway	6	8511 S Main St, Los Angeles	2	23	Very High	Very High	High
1518180421	Dominic Oulten	8	11212 Zamora Ave, Los Angeles	0	21	Very High	Very High	Very High
2670001274	Cassie Burton	11	7033 Kittyhawk, Westchester	1	20	Very High	High	High
4234769192	Raymond Saiz	7	1712 S Hamilton Blvd, Pamona	2	20	Very High	Very High	Very High
1205848025	Sophia Manzo	9	1044 Bisby St, El Monte	0	20	Very High	Very High	Very High
1528050358	Saraya Smith	3	4200 Avalon Blvd, Los Angeles	0	19	Very High	Very High	Very High
1609962489	Brandon Taylor	2	1467 Siesta Ave, La Puente	0	19	Very High	Very High	Very High
1912926544	Lania Finley	7	239 S Margaret Ave, Los Angeles	2	19	Very High	Very High	Very High
1306869425	Mashyia Colvin	11	19207 Cliveden Ave, Carson	0	19	Very High	Very High	Very High
1972796837	Hailey Morse	9	14120 Roscoe Blvd, Panorama City	3	19	Very High	Very High	Very High
1598073041	David Hicks	9	6238 Idyllwild Cor, Rialto	2	19	Very High	Very High	Very High
1487859633	Breana Gomez	0	19366 Greyhall St, Los Angeles	0	16	High	High	High
1528043866	Janyah Hall	2	11536 Gorman Ave, Los Angeles	0	16	High	High	High
1073771200	Leah Payton	7	623 W Cedar St, Ontario	0	16	High	High	High
1477529360	Jessica Rojas	1	1908 E Cienega Ave, Covina	1	15	High	Very High	Very High
1659522944	Melanie Phillips	8	1166 W Grant St, Wilmington	0	13	High	High	High
1902087281	Craig Mitchell	6	21024 Stagg St. Canoga Park	0	13	High	High	Moderate
1639164916	Ivan Acosta	2	9160 Telfair Ave, Sun Valley	0	13	High	High	High
1659541340	Jamar Randolph	1	45121 N Date, Lancaster	0	11	High	High	High
1689935926	Juan Escamilla	1	18209 Sierra Hwy, Canyon Country	0	11	High	Very High	Very High

1 - 20 of 20 results

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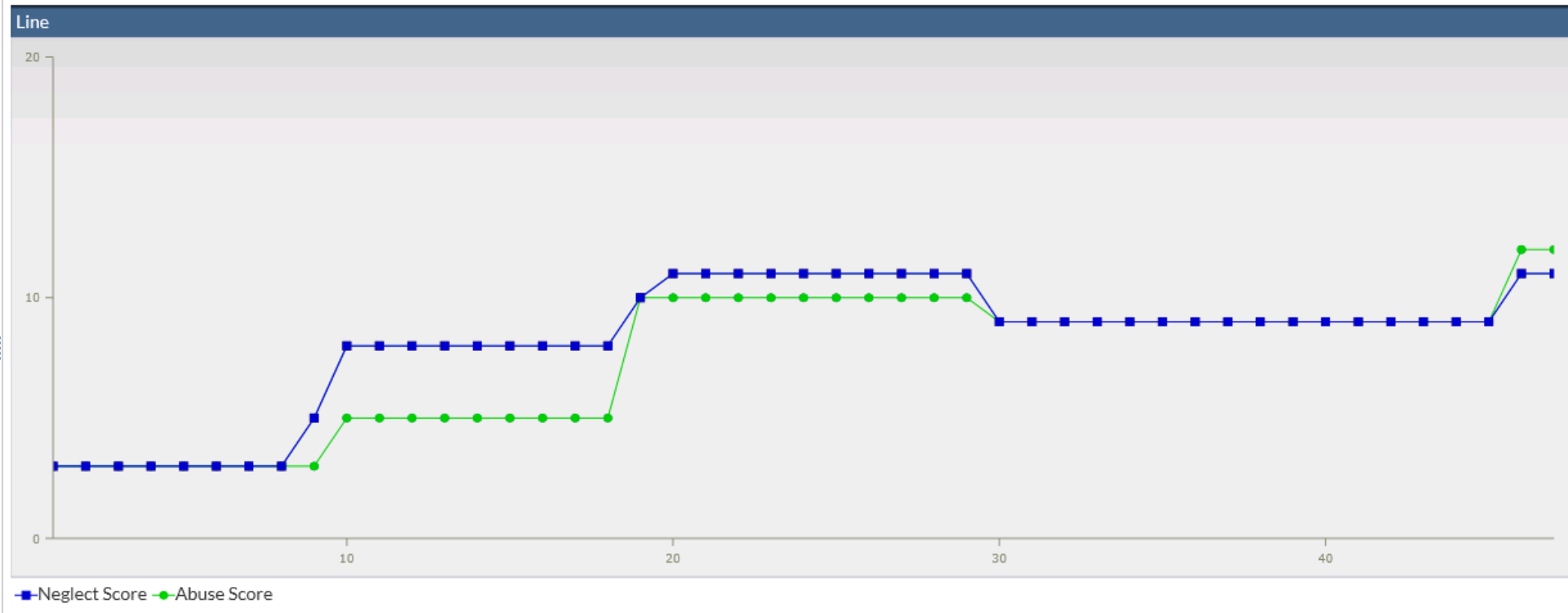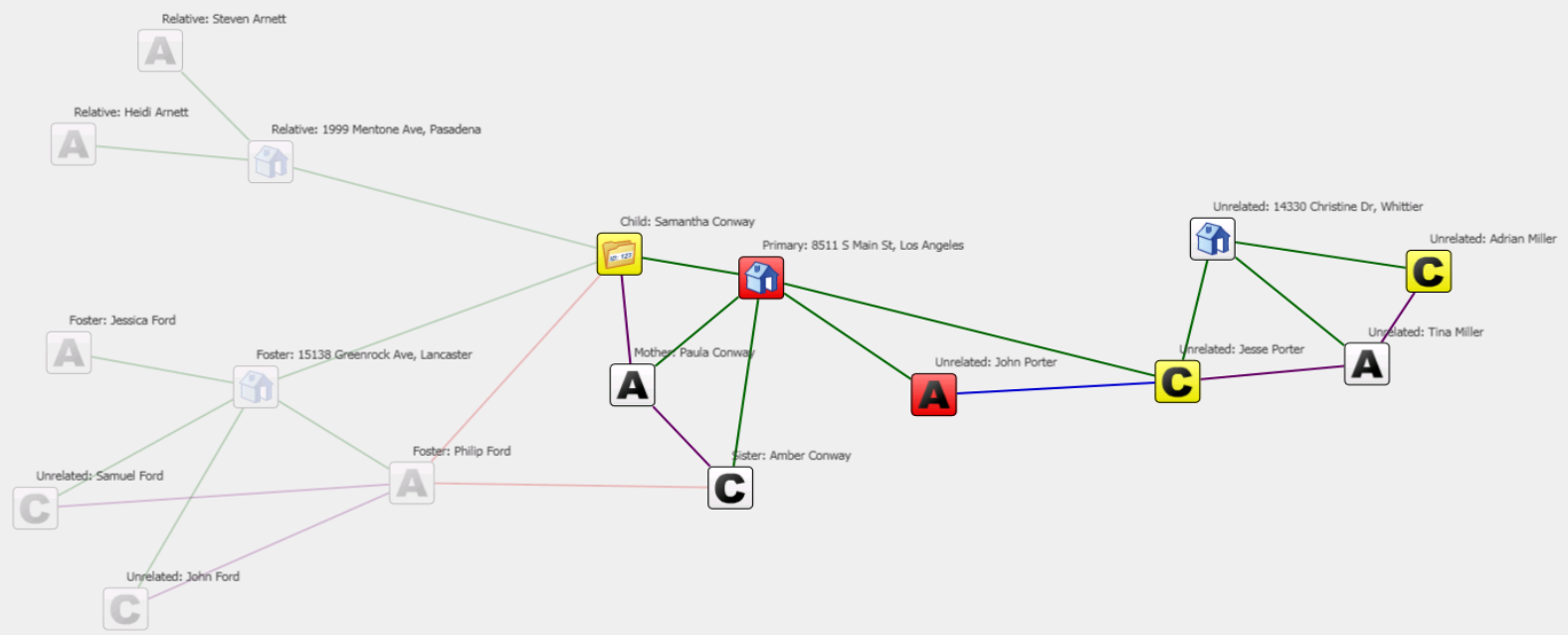
INTEGRATED DATA

Offender info for: JOHN JULIAN PORTER   ✕

No Photo Available **JOHN JULIAN PORTER** 📋   *AWC* OFA SOR FEL GNG CHP 👓   [Lookup] [Report] [Watch] [Merge]

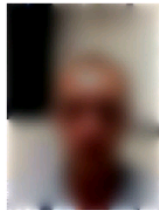SSN: XXX-XX-1111 📋   FBI ID: 122233JB1 📋   SID: NC9988776A 📋   Age: 34   DOC ID: 0327401   DL: NC-16400000 📋

| Summary | Images | Timeline | Court Records | Outstanding | Jail | Prison | DV | ComCorr | SOR | Gangs | Marks | Watchers |

JOHN JULIAN PORTER ▭ *AWC* OFA SOR FEL GNG CHP 👓

Address (03/01/2011): 801 N OAK STREET, DURHAM, NC 27707 ▭

Birth Date:	01/01/1976 📋	FBI ID:	122233JB1
Age:	34	SID:	NC9988776A
Race:	WHITE	SSN:	XXX-XX-1111
Gender:	MALE	DL:	NC-16400000
Height:	5'7"	DOC ID:	0327401
Weight:	219		
Eyes:	BROWN	SRN ID:	34567S1
Hair:	BLACK	Occupation:	

[More...]

Most Recent Update: 03/01/2011

← Jail - NC0320000
11/01/2006

Outstanding Processes	NC Court Records	Jail
Unserved Processes - 0	Pending - 2	Current - No
Felony - 0	Disposed - 64	Previous - Yes
Misdemeanor - 0		Escaped - No
Infraction - 0		
Traffic - 2		

Prison	Community Corrections	Sex Offender Registry
Current - Yes	Current - No	Pending Registration - No
Previous - Yes	Previous - Yes	Active Registration - Yes
Escaped - No	Absconded - No	Prior Registration - Yes

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QUESTIONS?

THANK YOU!

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