Using Predictive Modeling to Improve Outcomes

For Children in Allegheny County
• Assistance for older persons with/without disabilities
• Child protective services
• Mental health services (including 24-hour crisis counseling)
• Drug and alcohol services
• Services for individuals with a diagnosis of intellectual disability
• Hunger services
• Emergency shelters and housing for the homeless

• Non-emergency medical transportation
• Job training/placement for older adults and adults on TANF/SNAP.
• Family support
• After school and summer programs for children
• At-risk child development and early education
**Integrated Data Systems**

**Internal Sources**
- Aging
- Child Welfare
- Community Service Block Grant
- Drug & Alcohol
- Early Intervention (partial)
- Family Support Centers
- HeadStart (partial)
- Homeless
- Housing Support
- Mental Health
- Intellectual Disabilities

**External Sources**
- Allegheny County Housing Authority
- Allegheny County Jail
- Birth Records
- Allegheny County Medical Examiner’s Office
- Department of Public Welfare
- Housing Authority City of Pittsburgh
- Physical Health Claims (Medicaid)
- Juvenile Probation
- Pittsburgh Public Schools + 17 additional County School Districts
- Pre-trial Services
- Adult/family court
- 911 Calls for Services

**Potential Data Sources**
- Early Childhood
- Post Secondary Education
- Labor & Industry
Key Partners

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- Deloitte
OPPORTUNITY #1: Improving Child Welfare Decision Making

OPPORTUNITY #2: Rethinking Prevention of Child Abuse & Neglect
Screening Decisions & Outcomes

24,188 Index Referrals

53% (12,894) Screened Out

35% (4,467) Re-referred within a year

65% (8,418) No Re-referrals

47% (11,214) Screened In

24% (2,681) Re-referred within a year

76% (8,533) No Re-referrals
In Allegheny County, rich data are available to case workers to help inform initial maltreatment screening decisions at the child protection hotline, but

- No standardized protocols for using these data to make referral screening decisions
- No method for systematically weighting this information in an equitable manner across all referrals
- No understanding of what information is correlated / predicts future adverse outcomes for children
The system will **harvest data from** the data warehouse.*

At each call, a **screening score** will be produced for each child associated with an allegation of maltreatment.

This screening score is comprised of the **risk of re-referral**, given screen-out and the **risk of placement in foster care**, given screen-in.

More than **100 pieces of information** are included in the screening model.

*Only if an MCI_ID is successfully established*
• The **screening score** is from 1 to 20

• The **higher the score, the higher the chance of the future event** (e.g., abuse, placement, re-referral) according to the data
Researchers built a screening model based on information that we already collect.

They identified more than 100 factors that predict future referral or placement.

To test if the model might improve the accuracy of screening decisions, we scored thousands of historical maltreatment calls and then followed the children in subsequent referrals to see how often the model was correct...
The Results: Re-Referrals

1 in 10 children with a score of 1 were re-referred within two years of the call.

9 in 10 children with a score of 20 were re-referred within two years of the call.
The Results:
Out-of-Home Placements

1 in 100 children who received a score of 1 were placed out-of-home within 2 years of the call.
The Results: Out-of-Home Placements

1 in 2 children who received a score of 20 were placed out-of-home within 2 years of the call
Under current practice:

27% of highest risk cases were screened out — of these, 1 in 3 are re-referred and placed within 2 years of the initial screened out call.

48% of lowest risk cases were screened in — and yet only 1.4% of those are placed within 2 years.
How the Score is Generated

KIDS Application

- Call Screening Module
  - Call Info (Caller Info, Client Info)
  - Client MCI Clearance/Creation
  - Allegations
  - Relationships (not mandatory, but this process requests it)
  - Collaterals, other non-mandatory screens
  - Screening Outcome

- Intake
- Etc...

KIDS DB
- Risk score saved, per run on MCI ID, Run ID, with Algorithm version #

Algorithm

- Includes logic to: pull from DW and KIDS staging data + rules to calculate 289 base algorithm variables + user defined variables
- Per MCI ID, pull staged data from KIDS + DW, and pull real time data from KIDS DB
- For every MCI ID, Risk Score run, archive all of the input data feed into the algorithm

Algorithm Configuration Application

- Algorithm Configuration Settings
  - Version: [x]
  - Efficiency Begin Dt: 8/1/15
  - Efficiency End Dt: ...
- Search Algorithm Configuration
  - Search by Effective Date or Version # to view previous algorithm configurations

Per MCI ID, pull staged data from KIDS + DW, and pull real time data from KIDS DB

User Defined Variables

KIDS Staged Data

- Determine based upon KIDS SID/Entries sent to NZ item

KIDS Data

- Determine based upon KIDS SID/Entries sent to NZ item

DW Staged Data

- Per all known MCI IDs, active flags (per 1504, 3604, 540G) across ACI, DPA, JPO, BH Prim Areas

History of Risk Score Run Data

- Columns: MCI ID, Run ID, Run Date/Time, Algorithm Configuration version #, data
How the Score fits into Current Practice

- Score generated by both Call Screeners and Supervisors prior to final screening decision
- Displayed score represents highest score for any child on the referral, for either placement or re-referral likelihood model
- A subset of high scores that are particularly correlated with possible critical incidents will be mandatorily screened in
- Model will only run if child and parent have past MCI IDs; score will never be generated based upon only demographic information
How the Score will look to Call Screeners

Family Screening Score

The purpose of the Family Screening Score is to use information collected by DHS and other partners to inform screening decisions. The Family Screening Score is calculated by integrating and analyzing hundreds of data elements on each person related to the referral to generate an overall Family Screening Score. The score predicts the long-term likelihood of re-referral, if the referral is screened out without an investigation, or home removal, if the referral is screened in for investigation.

If the Family Screening Score meets the threshold for “mandatory screen-in,” the call must be investigated. In all other circumstances, the Family Screening Score provides additional information to assist the Call Screening Unit in making a call screening decision and should not replace clinical judgement.

The Family Screening Score is only intended to inform call screening decisions and is not intended to be used in making investigative or other child welfare decisions.

Last Run By: Jane McBeth
Last Run Date: 4/7/2016, 10:32 AM
Algorithm Versions Used
Re-referral v43
Placement v22

June 27, 2016 Allegheny County Department of Human Services
Next Steps

• Training
• Go-live August 1, 2016
• Validation with Children’s Hospital data
• Looking at resiliency/positive deviance
• Evaluate
• Build 2.0 model, likely including likelihood of critical incident
• Continue exploring the “preventive model”
OPPORTUNITY #1: Improving Child Welfare Decision Making

OPPORTUNITY #2: Rethinking Prevention of Child Abuse & Neglect
How well do our child serving systems choose the right child at the right time?
Not very well:

4 in 5 children in this county who died (or nearly died) as a result of abuse were never referred to child welfare before the incident.
As soon as the birth is registered we could assign a needs score between 1 and 20

Predicting a child protection case opening by age 3

– Vision would be to prioritize high needs births for upstream early intervention support in the hopes of preventing the need for later child protection involvement
Of those who received a risk score of 20, 40% of them resulted in an open case by age 3.
Opportunities for Prevention

Offer voluntary services at the time of birth

Use needs score to prioritize home visiting services through coordinated intake

Use needs score to provide extra support to families who engage at a family support center

Proactively reach out to high-risk families who live in a catchment area for family support centers

Build needs score into screening at Children’s Hospital
Three Pillars

Executive: Share data, push data to the field aggressively, integrate care, prevention

Judicial/legislative: A concern...we worry that judges and legislators, in an effort to help, will use predictive analytics in ways unintended