Using Predictive Modeling to Improve Child Welfare Decision Making in Allegheny County, PA

April 11, 2017
Optimizing Government Workshop Presentation

Source: Erin Dalton, Allegheny County, Department of Human Services
What is an IDS?
AISP Network of Integrated Data Systems

Existing Sites + Developing Sites

44% of the U.S. Population
Using Predictive Modeling to Improve Child Welfare Decision Making

The Problem: Ineffective Screening

• 4 in 5 children in Allegheny County who died (or nearly died) as a result of abuse were reported but not screened in for investigation.
The Proposed Solution: Risk Scoring

• Use predictive modeling to generate risk scores
• Call center would use risk score to inform investigation decision
Using Predictive Analytics to Prevent Child Abuse

- Issued an RFP
- 16 organizations responded
- Many multidisciplinary teams
- Awarded—Auckland University
  - Experience
  - Concern with ethical issues
  - Implementation support

Key Partners

Research Team
- Rhema Vailthianathan, Auckland University of Technology
- Emily Putnam-Hornstein, USC
- Irene de Haan, University of Auckland
- Marianne Bitler, UC Irvine
- Tim Maloney, Auckland University of Technology
- Nan Jiang, Auckland University of Technology

Ethics
- Tim Dare, University of Auckland
- Eileen Gambrill, UC Berkeley

Allegheny County Dept of Human Services

Evaluators
- Process
  - Hornby-Zellar Associates
- Impact
  - Stanford University

Technology Implementation
- Deloitte
What data go into the model?

Child & Family History

- Mental Health
- County Prison
- Drug & Alcohol
- Juvenile Justice
- Probation
- Public Welfare
- Parent History
- Community Indicators
How the Score is Generated

KIDS Application

Call Screening Module

- Call Info (Caller into client info)
- Client MCI Clearance/Creation
- Allegations
- Relationships (incl. mandatory, but also non-mandatory screens)
- Collaterals, other non-mandatory screens

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

Automatically run Algorithm, per MCI ID, after Clearance and after Relationships

Return risk score per MCI, Run ID, Run date/time, Algorithm version # to DB only

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.

Algorithm Configuration Application

Algorithm Configuration Settings
- Version: [14]
- Eff Begin D: 8/1/15
- Eff End D:

Pulls current: Algorithm Configuration settings

Var 1 | Active? | Weight
Var 2 | Active? | Weight
Var 3 | Active? | Weight
...

User Defined Variables

Per all known MCI IDs, active flags (per 180D, 360D, 540D) across ACJ, DMPL, IPQ, RH Prgm Areas

KIDS Staged Data

Determine based upon KIDS SQL/Extracts sent to NZ item

KIDS Data

Determine based upon KIDS SQL/Extracts sent to NZ item

History of Risk Score Run Data

Columns: MCI ID, Run ID, Run date/time, Algorithm Configuration version #, data

Image Source: Allegheny County DHS
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.
Testing the Screening Model

- Tested model’s accuracy using thousand of historical maltreatment calls
- Followed the children in subsequent referrals to see how often the model was correct...
Results: Predicting Re-referrals

**Risk Score of 1**

1 in 10 re-referred within 2 years of a call

**Risk Score of 20**

9 in 10 re-referred within 2 years of a call
Results: Predicting Out-of-Home Placement

• 1 in 100 children who received a score of 1 were placed in out-of-home care within 2 years of the call

• 1 in 2 children who received a risk score of 20 were placed in out-of-home care within 2 years of the call
Without the predictive model...

- 27% of the highest risk cases were screened out
- 48% of lowest risk cases were screened in
Model Validation — Preliminary Results

- Used Children’s Hospital injury data
- Of all children referred to child welfare between 2010-2016, 21% had a hospital admission between 2002-2015
  - 5% of those kids had a Children’s Hospital code for external injury
- Risk score of 20: 45% of those kids had a hospitalization & 16% had an external injury code
- Risk score of 1: 9% are hospitalized, 2% had an external injury code
Addressing Ethical Issues

• Multiple community meetings
• Independent ethical review
• Scores never generated based only on demographic information. Child and parent must have positive MCI ID.
“There is a real worry that not using this technology is unethical...It’s giving us information to make a difference in kids’ lives.

Tim Dare, Professor of Philosophy, University of Auckland

Pennsylvania County Leads in Use of Big Data to Stem Child Abuse, Probes Ethics First

by Journalism for Social Change  May 26, 2016
Operationalizing Results

• Calls are now assessed using the risk score and information gathered from the caller

• All cases that score a **16 or higher** are automatically referred to investigation. Otherwise, the score is supplemental information.
Final Thoughts & Next Steps

• Existence of the IDS and 20+ years of successful IDS use made this an easier implementation in Allegheny County.
• Multiple jurisdictions are planning to replicate.
• Allegheny County now working on using predictive modeling to address other child welfare issues.
• Will soon release methodology paper & ethical analysis results.
Attribution Statement

• The Allegheny Family Screening Tool is a predictive risk modelling tool designed to improve child welfare call screening decisions. The Allegheny County Department of Human Services worked with an international research team to develop and implement the tool. The research team is led by Professor Rhema Vaithianathan from Auckland University of Technology, New Zealand and includes Associate Professor Emily Putnam-Hornstein from the University of Southern California.

• For detailed information about the project, find it on www.alleghenycountyanalytics.us