

Using Analytics to Predict the Likelihood of Achieving Permanency for Children Available for Adoption

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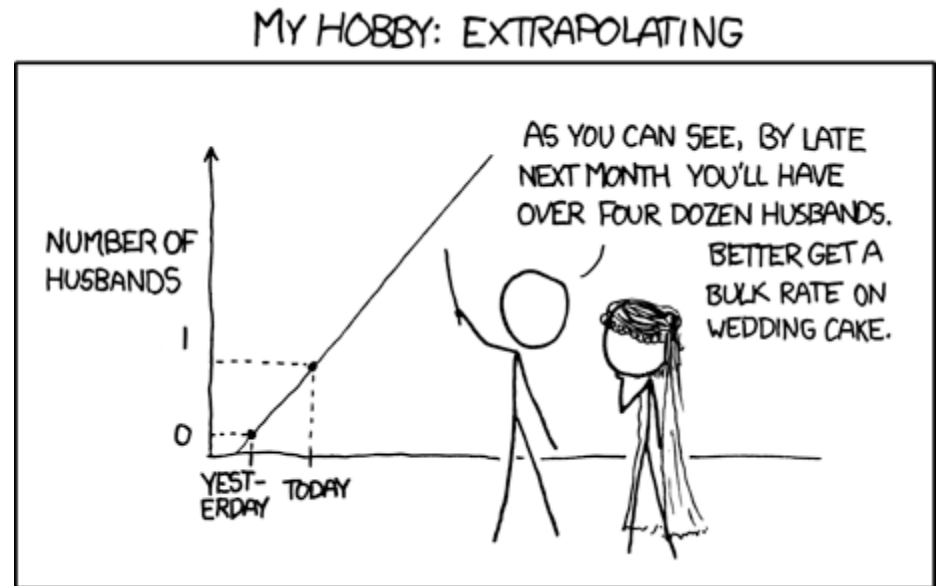


Agenda

- What is Predictive Analytics?
- Using Predictive Analytics in an Applied Setting
 - Children in cases where parental rights have been terminated
 - Developing risk/predictive scores
 - Using a risk to prioritize limited resources
- Next Steps: Division of Child Welfare's Efforts to Increase the Likelihood of Achieving Permanency

Predictive Analytics

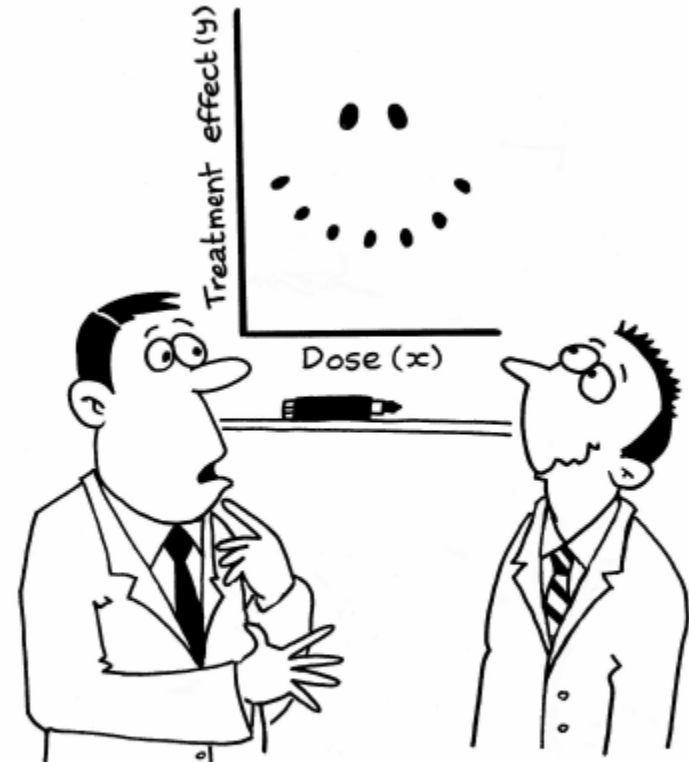
- **Predictive analytics** is the practice of extracting information from existing data sets in order to determine patterns and predict future outcomes and trends.
- **Predictive analytics** does not tell you what *will* happen in the future.



<http://xkcd.org/>

Applications of Predictive Analytics

- **Advertising**
 - Direct marketing
 - Customer retention
- **Health Care**
 - Insurance
 - Treatment decisions
- **Finance**
 - Fraud detection (IRS)
 - Stock Market



"It's a non-linear pattern with outliers.....but for some reason I'm very happy with the data."

Predictive Analytics Methodology



LIBERAL-ARTS MAJORS MAY BE ANNOYING SOMETIMES, BUT THERE'S *NOTHING* MORE OBNOXIOUS THAN A PHYSICIST FIRST ENCOUNTERING A NEW SUBJECT.

- Problem
- Model
- Analyze
- Risk Factors
- Predict

<http://xkcd.org/>

Using Predictive Analytics: Research Design & Findings

Using Predictive Analytics in an Applied Setting

Problem

- Establishing permanent homes (“permanency”) for legally free children & youth has become a top priority in recent decades
 - Federal requirements include (Adoption & Safe Families Act of 1997):
 - Permanent legal connections
 - Reduced time to permanency
 - Fewer emancipations

Using Predictive Analytics in an Applied Setting

Model

Research Question: *What factors affect the likelihood of a legally free child or youth achieving permanency?*

- Previous studies has shown that permanency is correlated with a complex set of factors including:
 - Race
 - Gender
 - Physical & mental disabilities
 - Placement setting
 - Age

Data Collection

- Data collected from Trails, Colorado's State Automated Child Welfare Information System in September, 2014
- Sample: All children & youth that were legally free between 2008 and 2014
 - *Total Sample Size: 5,773*
 - Legally free children & youth divided into 3 distinct age groups:
 - Children who became legally free between birth and 5 ('<1-5 Years')
 - Children who became legally free between 6 and 12 ('6-12 Years')
 - Youth who became legally free between 13 and 17 ('13-17 Years')



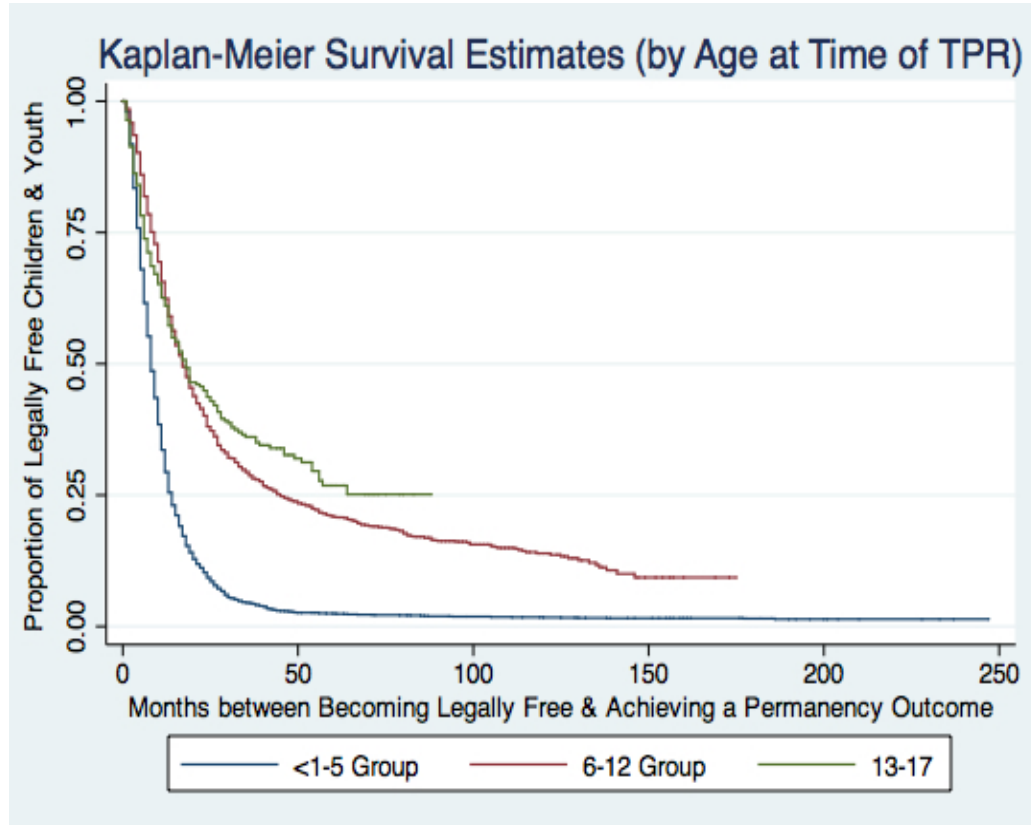
Using Predictive Analytics in an Applied Setting

Method of Analysis: Survival Analysis (also known as Time-to-Event analysis)

- Stratified Cox Regression Models was used for this analysis to examine the factors affecting the likelihood of achieving permanency
 - <1-5 Years
 - 6-12 Years
 - 13-17 Years
 - All Ages
- Calculates the probability that an event will occur (i.e., permanency) at a given period of time for all individuals that have not yet achieved the event
- Methodology allows for the incorporation of right-censored cases (legally free children and youth that are in care and have not yet achieved permanency)

Using Predictive Analytics in an Applied Setting

Outcome Variables



Variable Name
<i>Permanency Achieved</i>
<i>Legally Free Length of Stay</i>

Percentage of Age Group Achieving a Permanency Event (In Months)

% of Age Group	<1-5 Years	6-12 Years	13-17 Years
50%	8	15	15
70%	12	37	36
90%	13	87	57

Using Predictive Analytics in an Applied Setting

Variable Name	Variable Definition
<i>Race</i>	Caucasian, Hispanic, African American, Other Races
<i>Gender</i>	Male or Female
<i>Physical Disability</i>	Formal diagnosis of a physical disability
<i>Mental Disability</i>	Formal diagnosis of a mental disability
<i># of Involvements before Removal</i>	# of involvements with the system prior to becoming legally free
<i>Permanency Goal</i>	The most recent permanency goal
<i># of Placements</i>	# of distinct placements while legally free
<i>Months in Congregate Care</i>	# of months in a congregate care setting
<i>Months in a Family-Like Setting</i>	# of months in a foster care placement or residing with kin

Using Predictive Analytics in an Applied Setting

Risk Factors

	<1-5 Years	6-12 Years	13-17 Years	All Ages
Variable	Hazard Ratio	Hazard Ratio	Hazard Ratio	Hazard Ratio
Race				
<i>African American</i>	0.77*	0.64**	0.40	0.73**
Male	1.00	0.83**	1.32	0.95
# of Involvements before Removal	0.81***	0.91***	0.99	0.88***
Permanency Goal				
<i>OPPLA</i>	0.04	0.03***	0.01***	0.05***
Age at TPR	0.98	0.98	1.30**	0.98**
Number of Placements[^]	1.00	0.94***	0.93***	0.96***
Months in Congregate Care[^]	0.96***	0.98***	1.01	0.98***
Months in Family-Like Setting[^]	0.97***	0.98***	0.99**	0.98***

Emancipation Risk Scores: Identifying Children & Youth at the Highest Risk

Emancipation Risk Scores by Age Group

<1-5 Emancipation Risk Score

$0.23\text{AfricanAmerican} + 0.19\#\text{Involvements} + 0.04\#\text{MonthsCongregate} + 0.03\#\text{MonthsFamilyLike}$

6-12 Emancipation Risk Score

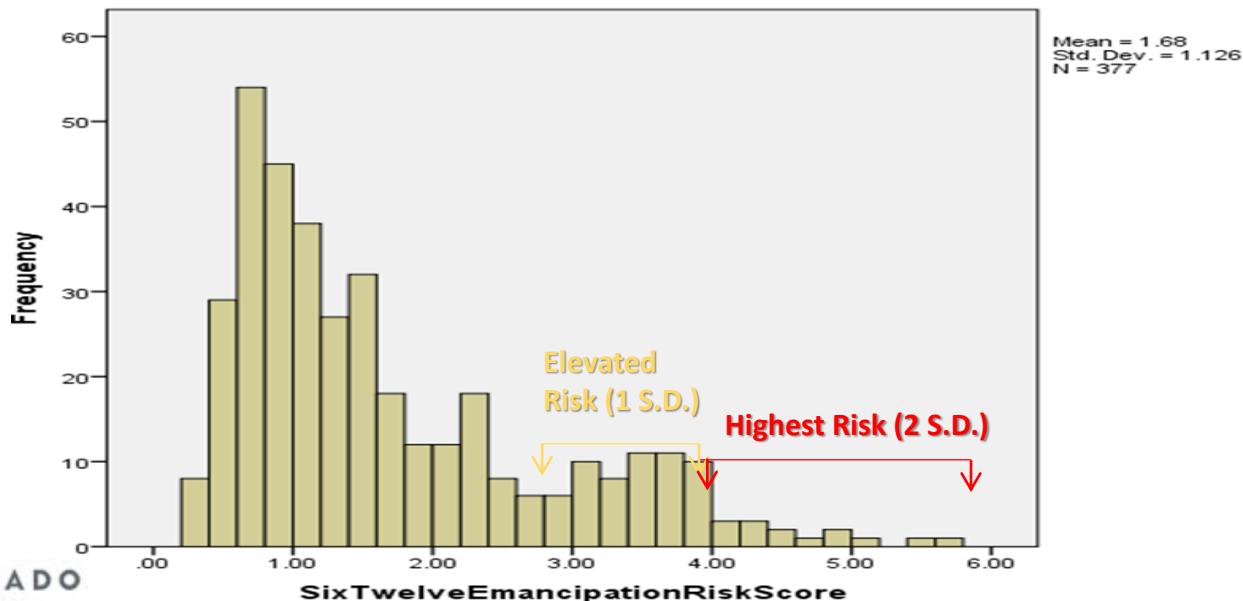
$0.36\text{AfricanAmerican} + 0.17\text{Male} + 0.09\#\text{ofInvolvements} + 0.97\text{OPPLA} + 0.06\#\text{Placements} + 0.02\#\text{MonthsCongregate} + 0.02\#\text{MonthsFamilyLike}$

13-17 Emancipation Risk Score

$0.99\text{OPPLA} + 0.07\#\text{Placements} + 0.01\#\text{MonthsFamilyLike} - 0.30\text{Age}$

Identifying Children & Youth with Elevated Emancipation Risk Scores

- Children with elevated risk of emancipation within each age group were identified via the following process:
 1. Graphing frequency distributions via histograms
 2. Calculating mean and standard deviations (S.D.)
- Those children that are 1 deviation above the mean are considered to have an 'elevated risk' while those children that are 2 deviations above the mean are considered to have the 'highest risk'.



Emancipation Risk Scores for Colorado's Current Population

- The Emancipation Risk Score was calculated for all 966 children & youth currently in the legally free population
 - Children & youth with 'Elevated Risk' and 'Highest Risk' of emancipation were identified for each of the 3 age groups

Group Breakdown	# of Children & Youth	% of Children & Youth
Total Population	966	100.0%
1 S.D. (% of Age Group)	121	12.5%
2 S.D. (% of Age Group)	49	5.1%
<u>0-5 Age Group</u>	<u>500</u>	<u>51.8%</u>
1 S.D. (% of Age Group)	40	8.0%
2 S.D. (% of Age Group)	29	5.8%
<u>6-12 Age Group</u>	<u>377</u>	<u>39.0%</u>
1 S.D. (% of Age Group)	70	18.6%
2 S.D. (% of Age Group)	16	4.2%
<u>13-17 Age Group</u>	<u>89</u>	
1 S.D. (% of Age Group)	11	12.4%
2 S.D. (% of Age Group)	4	4.5%



Next Steps: Division of Child Welfare's Efforts to Increase the Likelihood of Achieving Permanency

Legally Freed Children Discharged to Permanency

Bring back the predictive analytic risk score for each legally freed child in March. How many children are at a significant risk of emancipating?

	# of Children & Youth	% of Children & Youth
Total Population	966	100.0%
Greater risk of emancipation	121	12.5%
Greatest risk of emancipation	49	5.1%

- The Permanency Services, Youth Services and RAD Team have developed a 3-phase plan engaging counties on legally free children and youth with a high risk of emancipation:
 - Phase 1- Highest Risk Group:** Engage county stakeholders on the 49 children and youth with 'Emancipation Risk Scores' that are 2 or more standard deviations from the mean risk score. This 5.1% of the population consists of the children and youth **that are most likely to emancipate.**
 - Phase 2- Elevated Risk Group:** Engage county stakeholders on the 121 children and youth with 'Emancipation Risk Scores' that are 1 or more standard deviations from the mean risk score. This 12.5% of the population consists of the children and youth that are at a greater risk of emancipation.
 - Phase 3- Continuous Monitoring of Emancipation Risk Scores:** Regularly engage county stakeholders on children and youth that have recently become legally free and have an elevated 'Emancipation Risk Scores' that is 1 or more standard deviations from the mean risk score.

Action Item Response



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Legally Freed Children Discharged to Permanency

Provide an update on the children and youth with the highest "Emancipation Risk Scores". What are DCW's next steps to reduce the likelihood of emancipation for these children/youth?

- DCW staff completed a detailed review of the 49 children identified as being at the highest risk for emancipation.
- The results of the review demonstrated that:
 - These children have been in care a long time.
 - The majority have an OPPLA permanency goal.
- The review also provided the population distribution by county.
- DCW's next step is to reach out to the counties individually and share this data with them.

Action Item Response



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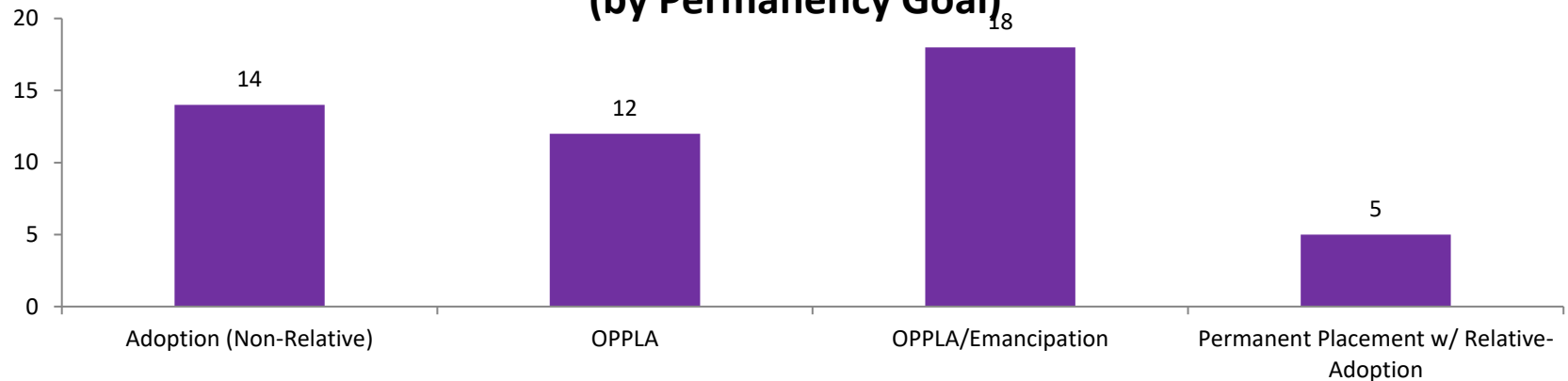
- The majority (59.2%) of the 49 legally-free children and youth with the highest Emancipation Risk Scores became legally free between birth and the age of 5.



Legally Freed Children Discharged to Permanency

Provide an update on the children and youth with the highest "Emancipation Risk Scores". What are DCW's next steps to reduce the likelihood of emancipation for these children/youth?

**# of Legally Free Children & Youth with Highest ERS
(by Permanency Goal)**



- The majority (36.7%) of these 49 children & youth have a current permanency goal of OPPLA/Emancipation.
 - Adoption (Non-Relative) is the second most common permanency goal (28.6%), followed by OPPLA (24.5%), and Permanent Placement with a Relative/Adoption (17.2%).

Action Item Response



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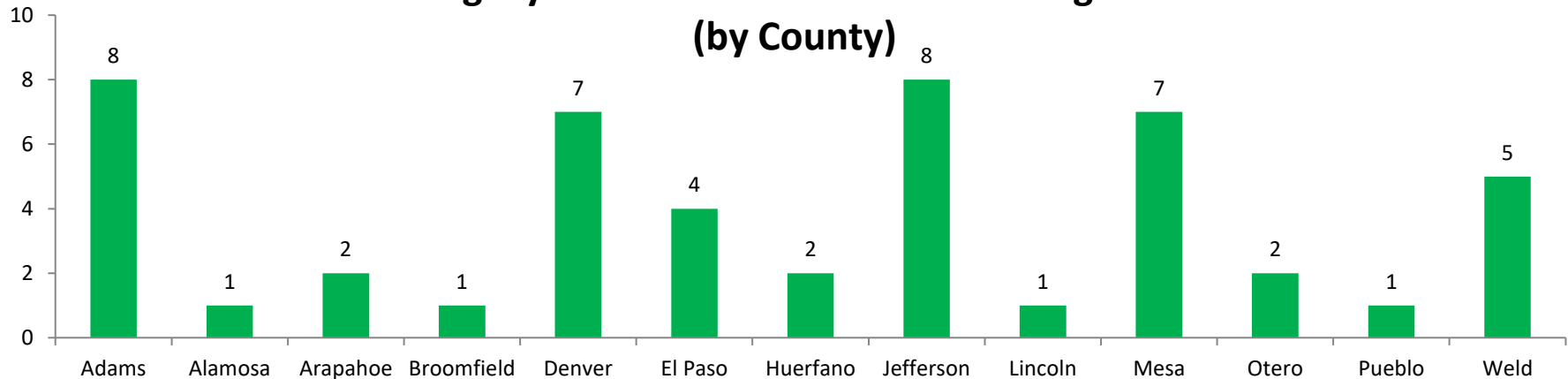
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Legally Freed Children Discharged to Permanency

Provide an update on the children and youth with the highest "Emancipation Risk Scores". What are DCW's next steps to reduce the likelihood of emancipation for these children/youth?

**# of Legally Free Children & Youth with Highest ERS
(by County)**



- The majority of these 49 children & youth reside in the Ten-Large Counties of Adams and Jefferson, followed closely by Denver and Mesa counties.
 - 14.3% of the children reside in BOS counties (including Alamosa, Broomfield, Huerfano, Lincoln, & Otero)

Action Item Response



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