Research and Evaluation

Probability of Oregon Foster Care Children's Future Involvement with the Oregon Youth Authority

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Introduction

The following is the first of three brief reports summarizing recent findings from the Oregon Youth Authority's (OYA) ongoing work concerning the juvenile justice feeder system (e.g., Braun 2014, 2015). OYA's feeder system research is focused on identifying youth at risk of becoming involved with the juvenile justice system using individual and family-level records from collaborating social service agencies. OYA's first feeder system analysis addressed the question of whether opportunities exist to intervene earlier in the lives of children and youth to prevent future OYA involvement. Results showed that 90% of youth committed to OYA between 2000 and 2013 were involved with at least one Department of Human Services (DHS) or Oregon Health Authority (OHA) program as early as 6 years before commitment—demonstrating that opportunities for intervention and diversion exist. The second feeder system study asked whether agencies serving the largest concentrations of high-risk youth could be identified and targeted for enhancement. Findings suggest that the client populations served by Child Welfare, Mental Health Treatment Services, and Alcohol and Drug Treatment Services are most likely to experience future OYA commitment. The current series of studies are focused on identifying the individual/family-level characteristics and service utilization patterns within these client populations that impact the probability of OYA involvement. This information can be used to develop programs intended to divert youth from coming to OYA.

Toward that end, we present an analysis of children and youth involved with the Oregon Child Welfare system and the probability of future OYA commitment. Reports of similar analyses conducted with populations served by Mental Health Treatment Services and Alcohol and Drug Treatment Services are forthcoming.

The mission of the Oregon Youth Authority is to protect the public and reduce crime by holding youth offenders accountable and providing opportunities for reformation in safe environments.

Child Welfare Involvement among OYA Youth

OYA's initial feeder system analysis revealed that 30% of youth committed to felony probation or close custody for the first time between 2000 and 2013 experienced at least one contact with Oregon's Child Welfare system prior to commitment (Braun, 2014). Nineteen percent were placed in foster care on at least one occasion, 21% were a victim of one or more substantiated child maltreatment claims assessed by Child Protective Services (CPS), and 10% had histories of involvement with both program areas prior to OYA commitment. Youth were on average 10 years old at the time of first involvement, and first contact typically occurred approximately 5 to 6 years prior to OYA commitment. Compared with male youth, female youth were significantly more likely to have had contact with both CPS and foster care prior to first arriving at OYA. African American and Native American youth were significantly more likely to have experienced a foster care placement compared to Caucasian, Hispanic/Latino, and Asian youth; Native American youth were more likely than youth in all other ethnic groups to have been the victim of substantiated maltreatment. Sampled youth committed to close custody as juveniles were significantly more likely to have histories of foster care placement and substantiated maltreatment relative to youth committed to OYA probation and youth entering close custody under an adult sentence. In other words, these youth transition directly from Child Welfare to the "deep end" of the state juvenile justice system—passing over other options (e.g., OYA probation) that may have provided enhanced intervention in a less restrictive setting. This suggests that the best time to provide services to divert youth from future OYA commitment is while they are involved with Child Welfare.

The second feeder system analysis compared a selection of OYA youth from the first study with a group of randomly selected non-OYA youth chosen from historical DHS/OHA client records (Braun, 2015). OYA youth and individuals in the comparison group were born between January, 1981 and July, 2013 and had contact with at least one DHS or OHA program prior to the study end date (i.e., OYA commitment for OYA youth and 19th birthdate for the comparison group). Service utilization patterns were compared between the two groups to identify program areas serving the largest concentrations of youth who were later committed to OYA. Findings indicate that OYA youth were significantly more likely to have histories of involvement with both Child Welfare programs (i.e., foster care and CPS) relative to non-OYA youth. Records of substantiated child maltreatment were present for nearly 25% of OYA youth versus 12% of non-OYA youth. Foster care placement was also significantly more prevalent among OYA youth, with 22% experiencing at least one foster care episode versus only 5% of non-OYA youth. Results of the predictive model estimating the likelihood of OYA commitment suggest that youth who experienced foster care were nearly four times more likely to become involved with OYA relative to those with no foster care experience.

Current Study

The first two feeder system analyses demonstrated the significant prevalence of Child Welfare involvement in the histories of OYA youth and estimated its impact on the probability of first OYA commitment. Findings suggest the Oregon Child Welfare system serves a large proportion of children and youth who eventually become involved with juvenile justice. Given this evidence, the analysis now shifts to an examination of the specific child/family characteristics and service utilization patterns that influence the probability of OYA commitment among those involved with Child Welfare.

Data

Administrative records of foster care episodes from a cohort of Oregon children between 1998 and 2011 were matched with substantiated child maltreatment claims from 1993-2010 and OYA commitment records from 2000-2013. Records from DHS and OHA program areas serving children between 2000 and 2010 were also matched and included episodes from Alcohol and Drug Treatment Services, Mental Health Treatment Services, Self-Sufficiency, and Medical Assistance.

A total of 62,727 foster care episodes experienced by 53,105 Oregon children were represented in the initial dataset. The goal of the current study is to estimate the probability of OYA involvement among a cohort of foster care youth—some were committed to OYA after foster care and others were not. Similar to previous work (i.e., Braun, 2015), data were first limited to include only individuals who were "eligible" for OYA services within the same time period covered by available OYA commitment records (i.e., January, 2000 through July, 2013). "Eligibility" for OYA services was determined by examining age, date of birth, and date of death (when available[1]). In general, youth must be a minimum of 12 years old to be eligible for commitment to OYA custody; therefore individuals in the initial dataset were limited to youth born between January, 1981 and July, 2001 and whose records did not indicate a date of death prior to the 12th birthday. Data were further restricted to include only foster care episodes where the child was under 18 years old at the time of removal. From here, a single foster care episode was randomly selected for each child; this is done to assure balance along the foster care continuum. Elimination of records based on this criteria resulted in a final sample of 35,448 foster care children with removal episodes.

Records of involvement with CPS, Self-Sufficiency, Alcohol and Drug Treatment Services, Mental Health Treatment Services, and Medical Assistance were summarized for each child's study end date (i.e., date of OYA commitment for OYA youth and date of 18th birthday for non-OYA youth) and matched in with individual level foster care data. The final dataset reflected involvement in these program areas that occurred prior to each foster care child's OYA commitment date or 18th birthday.

Sample

The final sample included 35,448 Oregon children born between 1981 and 2001 who experienced foster care sometime between 1998 and 2010. Of these children, 1,955 or nearly 6% had a future record of first commitment to OYA probation or close custody between 2000 and 2013. Demographic information for the full sample is displayed in Table 1. The sample is divided almost equally between girls (50.3%) and boys (49.7%). The overwhelming majority are Caucasian (72.9%), followed by Hispanic/Latino (10.1%), African American (6.9%), Native American (5.2%), Other/Unknown (3.9%), and Asian (1%). The average age at first known foster care removal for the sample is 7.8 years (*SD* = 5.1); nearly 82% of the foster care episodes were the child/youth's first placement.

Analysis

To estimate models predicting OYA commitment from child and family characteristics and service utilization patterns, we followed procedures recommended by Hosmer, Lemeshow, and Sturdivant

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[1] Date of death is only available for individuals who were involved with select program areas including Self-Sufficiency, Medical Assistance, and CPS (i.e., in cases where the maltreatment type associated with the claim was Fatality).

Table 1. Demographic information for the full sample of foster care children (n=35,448).

	N	%	Mean	SD	Range
Sex					
Female	17,822	50.3%			
Male	17,626	49.7%			
Race/Ethnicity					
Caucasian	25,831	72.9%			
Hispanic/Latino	3,577	10.1%			
African American	2,438	6.9%			
Native American	1,836	5.2%			
Other/Unknown	1,400	3.9%			
Asian	366	1.0%			
Age at first known foster care removal			7.8 yrs	5.1	0-17 yrs
Newborn-2 years	7,175	20.2%			
3-6 years	8,112	23.0%			
7-10 years	8,007	22.6%			
11-14 years	7,946	22.4%			
15 years and older	4,198	11.8%			
Current foster care episode number			1.3	0.7	1-7
First episode	28,947	81.7%			
Second episode	4,987	14.1%			
Third or higher episode	1,514	4.2%			

(2013). Bivariate correlation analyses were conducted testing the relationships between the outcome variable (i.e., future OYA commitment) and each variable representing child characteristics, family characteristics, and service utilization patterns. Variables that were significantly correlated with OYA commitment (significance level $p > .25$; Hosmer et al., 2013) and not highly correlated with each other were selected for further testing in predictive models (i.e., logistic regression).

To reiterate, only 6% of the current sample of Oregon foster care children experienced future commitment to OYA. Prior literature suggests that some predictive analytic procedures—including logistic regression—can underestimate the likelihood of rare events (King & Zeng, 2001). To counteract this shortcoming, the predictive model was created using a two-step process. In the first step, the model was estimated among the n=1,955 foster care children who experienced future OYA commitment and an equal number of randomly selected foster care children from the sample who did not experience OYA commitment. In the second step, the relative effects of the model developed in step one were applied to the full sample of n=35,448 foster care children.

Results

The order variables were entered into the predictive model was sequenced so that the effects of gender and race/ethnicity on OYA commitment could be statistically controlled. After controlling for these constructs, variables representing child and family characteristics and service utilization patterns were entered into a backward stepwise logistic regression model predicting OYA commitment.

Results of the final model are presented in Table 2. In addition to child gender and race/ethnicity, nine variables remained in the model at its final step. Along with gender and race/ethnicity, variables representing child involvement with Alcohol and Drug Treatment Services, age at first known foster care removal, number of foster care removals to date, child involvement with Mental Health Treatment Services, cumulative time spent in foster care to date, previous foster care removals for child behavior, number of family CPS claims for substantiated threat of harm, and child involvement with Self-Sufficiency significantly predicted OYA commitment (-2LL = 12,720.34; $\chi^2[14]$ = 2,409.72, p < .0001).

Table 2. Final step of the backward stepwise logistic regression model predicting OYA commitment within a sample of Oregon foster care children (n=35,448).[a]

	β	S.E.	Wald	df	Sig.	Odds ratio
Constant	-3.12	0.21	224.76	1	.000	0.04
Child gender (Male)	1.28	0.08	252.95	1	.000	3.58
Race/Ethnicity: African American	0.43	0.14	9.67	1	.002	1.54
Race/Ethnicity: Other	-0.54	0.25	4.50	1	.034	0.59
Race/Ethnicity: Asian	-0.31	0.48	0.42	1	.519	0.74
Race/Ethnicity: Native American	-0.10	0.18	0.32	1	.573	0.91
Race/Ethnicity: Hispanic/Latino	0.01	0.12	0.00	1	.976	1.00
Alcohol & Drug Treatment Services involvement (Yes/No)	1.27	0.09	209.14	1	.000	3.55
Age at first known foster care removal	0.10	0.01	118.96	1	.000	1.11
Number of foster care episodes to date	0.56	0.06	79.45	1	.000	1.76
Mental Health Treatment Services involvement (Yes/No)	0.84	0.10	70.70	1	.000	2.32
Cumulative time spent in foster care to date (Years)	-0.15	0.02	58.70	1	.000	0.86
Previous foster care removals for child behavior (Yes/No)	0.56	0.08	45.78	1	.000	1.75
Number of substantiated CPS claims for threat of harm	-0.35	0.06	33.94	1	.000	0.71
Self-Sufficiency involvement (Yes/No)	-0.41	0.10	18.78	1	.000	0.66

[a] AUC = .815.

Regression effects indicate that gender and race/ethnicity significantly predict future OYA commitment among Oregon foster care children. Gender significantly predicts OYA commitment (β = 1.28; p < .0001) such that male foster care children are over 3.5 times more likely to experience future involvement with OYA (Odds ratio[OR]$_{Gender}$ = 3.58). Certain racial/ethnic groups have significantly different probabilities of OYA commitment compared to Caucasian children. African American children in the sample are 1.5 times more likely than Caucasian children to experience a future OYA commitment (β = 0.43; p < .01; OR$_{AfricanAmerican}$ = 1.54); and the probability of OYA commitment is 41% lower for children whose racial/ethnic background is Other or Unknown (β = -0.54; p < .05; OR$_{Other/Unknown}$ = 0.59). Model effects suggest that the probability of OYA commitment for Asian, Native American, and Hispanic/Latino foster care children is not significantly different than that of Caucasian children.

In addition to race/ethnicity and gender that influence subsequent OYA commitment, contact with alcohol and drug treatment significantly increases the likelihood of OYA involvement (β = 1.27; p < .0001). Individuals with one or more episodes of Alcohol and Drug Treatment Services are about 3.5 times more likely to experience future OYA commitment relative to those with no known record of alcohol and drug treatment (OR$_{A\&DTreatment}$ = 3.55). Age at first known foster care episode significantly influences the probability of OYA commitment (β = 0.10; p < .0001); the older a child is when first placement occurs, the more likely he or she is to experience future OYA commitment. Odds ratios indicate that with each additional year of age, the probability of OYA commitment increases by 11% (OR$_{AgeFirstRemoval}$ = 1.11). The number of foster care episodes a child has experienced also significantly increases the probability of OYA commitment (β = 0.56; p < .0001). Odds ratios suggest that each additional removal increases the probability of OYA commitment by 76% (OR$_{FosterCareEpisodes}$ = 1.76). Mental Health Treatment Services involvement also significantly predicts future OYA commitment (β = 0.84; p < .0001). Odds ratios indicate individuals with mental health treatment are approximately 2.3 times more likely to become involved with OYA (OR$_{MentalHealth}$ = 2.32). The cumulative time in foster care predicts lower likelihood of OYA commitment (β = -0.15; p < .001). Each additional year in foster care decreases the probability of OYA commitment by 14% (OR$_{TimeInFosterCare}$ = 0.86). Previous foster care episodes where the child's behavior is a reason for removal significantly increases the probability of future OYA commitment (β = 0.56; p < .0001). Children with a history of removals for behavior have probabilities of OYA commitment that are 75% greater than children with no known history of these types of removals (OR$_{BehaviorRemovals}$ = 1.75). The number of times a family has been in contact with CPS for substantiated threat of harm is also significantly related to the probability of OYA commitment (β = -0.35; p < .0001). Each additional threat of harm claim decreases the probability of OYA commitment by 29% (OR$_{CPSClaimsTOH}$ = 0.71). Contact with Self-Sufficiency programs also significantly decreases the probability of OYA commitment (β = -0.41; p < .0001) with odds ratios indicating that children involved with Self-Sufficiency are 34% less likely to become involved with OYA (OR$_{Self-Sufficiency}$ = 0.66).

The accuracy of the model in predicting future OYA commitment among Oregon foster care children was assessed by examining the area under the receiver operating characteristic curve (AUC) and classification plots. AUC analyses produced a value of .815—a desirable achievement in the measurement of overall model fit. Furthermore, the classification table in Table 3 indicates the model is well-equipped to detect both true positives (i.e., specificity) and true negatives (i.e., sensitivity)—accurately predicting both about 74% of the time in the current sample. Of the 35,448

Table 3. Classification table showing the final model's ability to correctly predict future OYA commitment and no future OYA commitment.

Observed	Predicted OYA Commitment - No	Predicted OYA Commitment - Yes	Percentage correct
OYA Commitment - No	24,729[a]	8,764	73.8%
OYA Commitment - Yes	496	1,459[b]	74.6%
Overall percentage			**74.2%**

[a] True negatives; [b] True positives.

youth, the model predicted that 10,223 would experience future OYA commitment (nearly 2,000 did in reality). This suggest that if only one third of foster care children are served with enhanced intervention, as many as 2,000 could be diverted from subsequent OYA involvement. Given the high cost of OYA services, this is a reasonable target that has the potential to save a lot of money in the future.

Model Performance within Certain Groups

Although results indicate the predictive model performs well across the entire sample of foster care children, assessing model performance within certain subpopulations is wise. For example, if model accuracy varies among male and female children, children of different races and ethnicities, or children of different ages, it might be practical to adapt the model for certain groups.

Gender. Analyses show the model does not perform equally with boys and girls. When applied to boys alone, the AUC statistic drops to .781 and classification accuracy falls to 71.5%. With boys, the model detects true positives (i.e., children who have a future OYA commitment) at a rate of 84% and true negatives (i.e., children without future OYA commitment) at a rate of only 59%. The opposite appears to be true for the model when it is applied to girls alone. Among girls, the model is considerably better at detecting true negatives (88%) versus true positives (46%). Overall classification accuracy is lower for girls at 67%, however the AUC statistic is slightly higher at .808.

Race/Ethnicity. Given the majority of sampled foster care children are Caucasian, it is not surprising the model performs equally well when applied to Caucasian children alone (AUC = .814; classification accuracy = 74%). The model performs slightly better among Hispanic/Latino children in the sample (AUC = .817; classification accuracy = 75%), however the detection rate for true negatives (78%) is slightly higher than the rate for true positives (72%). Model performance is only slightly diminished when applied to African American children (AUC = .797; classification accuracy = 72%) and is much better at detecting true positives (83%) than true negatives (61%). Because of the small numbers, model performance among children of Asian, Native American, and Other race/ethnicity cannot be adequately estimated.

Age. Analyses indicate that model performance varies based on children's age at first known foster care removal. Among children who were between 0 and 10 years old, the model tends to do a much better job predicting true negatives (89% on average) than true positives (37% on average) with a mean AUC of .764. Among ages 13 through 17 years old, the model detects true

positives (87% on average) considerably better than true negatives (43% on average) and reaches a slightly lower AUC of .731. The most balanced models are found among 11 and 12 year old foster care children. When applied to 11 year olds the model accurately detects true positives 75% of the time and true negatives 67% of the time, with an AUC of .784. True positives are even better detected among 12 year olds (82%) with true negatives still detected 63% of the time. The AUC for the model when applied to 12 year olds is even higher at .802. The fact that the most balanced models are found among older children coincides with evidence from the predictive model, which suggested children who are older when they are first placed in foster care are more likely to experience future OYA commitment.

Discussion

Findings from OYA's first two feeder system analyses reveal the Oregon Child Welfare system serves a large proportion of children and youth who eventually become involved with OYA. The current study expanded upon this work by examining some of the specific child and family characteristics and service utilization patterns that contribute to the probability of OYA commitment among those involved with Child Welfare.

Results indicate that nearly 6% of Oregon children born between 1981 and 2001 who experienced foster care were committed to OYA between January, 2000 and July, 2013. This suggests a majority of Oregon foster care children do not become involved with OYA in the future. However, this figure takes on new meaning when it is compared to the percentage of youth from the entire Oregon population who were committed to OYA between 2000 and 2013. Annual reports estimate that the Oregon population of children and youth ages 10-19 averaged around 500,000 over each of the 13 years.[2] During the same period, the average number of youth committed to OYA for the first time each year was approximately 750.[3] This means only about 0.0015% of the entire youth population in Oregon were committed to OYA. Nearly 6% of Oregon foster care children in the current study who were committed to OYA over the same time period. The Child Welfare system serves many children and youth who are at risk for OYA involvement; if the population can be assessed for risk of OYA commitment, enhanced intervention may divert some from OYA.

The 6% figure suggests that additional services should only be targeted for a relatively small number of high-risk foster care children to prevent their later involvement with the juvenile justice system. With such a small percentage, it is reasonable to hope children at high-risk for future OYA involvement could be identified and targeted with additional services.

The current findings suggest children at risk of becoming involved with OYA can be identified while in foster care by assessing a combination of individual and family characteristics and social service records. Along with child gender and race/ethnicity, certain foster care experiences, family history, and social service records can accurately predict risk of future OYA commitment about 81% of the time. The model recognizes that foster care children with the highest risk of future OYA commitment are typically male, African American, older at first placement in foster care, had multiple foster care episodes, been removed from home for behavioral reasons, and spent less

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[2] Portland State University (2000-2013). *Certified Population Estimates 2000-2013* [Data files]. Retrieved from http://www.pdx.edu/prc/population-reports-estimates.

[3] OYA experienced a sharp decline in the number of youth committed between 2000 and 2013. Because this figure represents the average number per year, it is somewhat skewed relative to commitment trends of the last few years.

than 2 cumulative years in foster care. These children's families are less likely to have histories of contact with CPS for certain types of abuse (i.e., threat of harm) and are less likely to have records of involvement with Self-Sufficiency programs. However, they are considerably more likely to have involvement with both Alcohol and Drug Treatment Services and Mental Health Treatment Services; this suggests both substance abuse and mental health challenges are common among the highest risk foster children/youth.

Variations in predictive accuracy among groups of children based on gender, race/ethnicity, and age suggest that extra care should be used when applying the model in practice. Most notable are the differences in classification accuracy between boys and girls. This suggests the model may be better-suited for boys and separate gender models should be considered. Although differences in accuracy exist among racial/ethnic groups, differences are slight and do not require separate models. The AUC statistic for each group remains sufficiently high suggesting the model accurately predicts risk of OYA commitment across children in all racial/ethnic groups. For different age groups, findings suggest that model best predicts risk of OYA commitment among 11 and 12 year old children in foster care. Such information may be useful among practitioners, who might limit assessment of higher risk youth until they are older.

Next Steps

The same analyses will be performed using data from the remaining two program areas that serve large concentrations of children and youth who later experience OYA commitment—Mental Health Treatment Services and Alcohol and Drug Treatment Services.

References

Braun, M. J. F. (2014). Prevalence of DHS and OHA program access prior to first OYA commitment: An exploratory analysis. Retrieved September 22, 2015: http://www.oregon.gov/oya/docs/YRS_documents/FeederSystemStudy-Report1.pdf

Braun, M. J. F. (2015). Estimating the probability of commitment to OYA from history of social service involvement. Salem, OR: Oregon Youth Authority.

Hosmer, D. W., Jr., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression.* Hoboken, NJ: John Wiley & Sons, Inc.

King, G., & Zeng, L. (2001). Logistic regression in rare events data. *Political Analysis, 9*(2), 137-163.

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