RESEARCH BRIEF

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.

Probability of Commitment to the Oregon Youth Authority among Young People Receiving Alcohol and Drug Treatment Services

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Introduction

The report below is the final installment in a series of three brief reports covering recent findings from the Oregon Youth Authority's (OYA) ongoing juvenile justice feeder system research (e.g., Braun 2014, 2015a, 2015b, 2015c). OYA's feeder system work utilizes individual and family-level data gathered from collaborating social service agencies to identify youth who are at risk of becoming involved with the juvenile justice system. The first feeder system analysis (Braun, 2014) revealed that the potential to deter youth from becoming involved with OYA in the future may exist within social services they receive during early childhood. Specifically, 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 an average of 6 years before commitment; suggesting that at-risk youth could be identified and provided prevention services via early contacts with DHS and OHA. The second feeder system study identified agencies serving large concentrations of future OYA youth (i.e., Child Welfare, Mental Health Treatment Services, and Alcohol and Drug Treatment Services). The current series of studies focuses on identifying the individual and/or 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.

The first research brief in this series reported on the probability of OYA commitment among children and youth involved with the Oregon Child Welfare system (Braun, 2015b). The second in this series presented an analysis of future OYA risk among children and youth involved with OHA's Mental Health Treatment Services (Braun, 2015c). This final report focuses on young people served by OHA's Alcohol and Drug Treatment Services and their risk of future OYA commitment.

Alcohol and Drug Treatment Services Involvement among OYA Youth

Preliminary feeder system research showed that 40% of youth committed to OYA felony probation or close custody for the first time between 2000 and 2013 had histories of involvement with OHA's Alcohol and Drug Treatment Services (Braun, 2014). The majority of these youth were primarily involved with outpatient drug and alcohol treatment, but some also experienced more intensive services including detox and residential drug and alcohol treatment. The sample of OYA youth who accessed Alcohol and Drug Treatment Services prior to commitment were on average 15 years old at the time of their first treatment episode, and this first episode was initiated about 12 months before entering OYA care and custody. Youth committed to OYA for felony probation were slightly more likely to have histories of involvement with alcohol and drug treatment compared to youth committed to close custody as juveniles. Youth committed to close custody on an adult sentence were significantly less likely to have prior involvement with Alcohol and Drug Treatment Services. Female youth were more likely than male youth to have been involved with alcohol and drug treatment prior to first arriving at OYA; and Native American youth were more likely than youth in all other racial/ethnic categories to have experienced alcohol and drug treatment prior to OYA commitment, although the effect was small. Finally, findings indicated that involvement with Alcohol and Drug Treatment Services is significantly associated with youths' risk of general recidivism and risk of recidivism for a violent offense. Indeed, the correlation between prior alcohol and drug treatment and recidivism risk was the strongest of all the relationships tested among recidivism risk and selected DHS/OHA social service programs.

Follow-up feeder system analyses compared a selection of OYA youth from the first study with a group of similarly-aged youth randomly selected from historical DHS/OHA client records (Braun, 2015a). Social service histories were compared between the two groups to identify program areas serving large populations of youth who were eventually committed to OYA. Findings indicated that OYA youth were significantly more likely to have histories of involvement with Alcohol and Drug Treatment Services, Child Welfare, and Mental Health Treatment Services relative to non-OYA youth. Specifically, 43% of youth committed to OYA had histories of involvement with Alcohol and Drug Treatment Services relative to only 8% of the comparison group. Moreover, out of all tested DHS/OHA social services (i.e., Alcohol and Drug Treatment Services, Mental Health Treatment Services, Child Welfare, Self-Sufficiency, and Medical Assistance), results showed that a history of involvement with Alcohol and Drug Treatment Services was the strongest predictor of future OYA commitment. Youth in the sample whose records indicated one or more contacts with alcohol and drug treatment before the study end date were nearly eight times more likely to be committed to OYA relative to youth with no history of alcohol and drug treatment. OYA youths' substantial histories of alcohol and drug treatment certainly suggest they are likely to suffer from issues with substance abuse and potentially severe or chronic addiction.

Current Study

Findings from early OYA feeder system work demonstrated the significant prevalence of involvement with Alcohol and Drug Treatment Services and assessed the impact of alcohol and drug treatment need on the probability of OYA commitment. Results indicate that OHA's Alcohol and Drug Treatment Services program supports a concentrated population of youth who eventually become involved with OYA. Given this knowledge, the current analysis focuses on examining the specific individual and/or family characteristics and service utilization patterns that may influence

the probability of OYA commitment among those involved with Alcohol and Drug Treatment Services.

Data

Approximately 13 years of alcohol and drug treatment records were collected from OHA's Alcohol and Drug Treatment Services' Client Process Monitoring System[1] and matched with OYA commitment records from 2000 to 2013. Client records from other DHS and OHA program areas serving children and youth between 2000 and 2010 were also matched including Mental Health Treatment Services, Child Welfare, Self-Sufficiency, and Medical Assistance.

The initial dataset contained over 750,000 alcohol and drug treatment episodes experienced by nearly 400,000 individuals in Oregon. The goal of the current study is to assess the probability of OYA commitment among Alcohol and Drug Treatment Services clients—some of whom experienced later involvement with OYA and some who did not. Therefore, similar to previous work (Braun, 2015a, 2015b, 2015c) the initial dataset was first limited to include only Alcohol and Drug Treatment Services clients who could have possibly been committed to OYA within the same time period covered by OYA youth records (i.e., January, 2000 through July, 2013). In order to be "eligible" for possible commitment to OYA, a youth must be between the age of 12 and 19 years old at the time of adjudication. Therefore, individuals in the dataset were limited to those who were born between January, 1981 and July, 2001 and whose records did not indicate they passed away before the age of 12 (when available).[2] Data were further restricted to include only alcohol and drug treatment episodes where the client was age 19 or younger when the episode began. A single alcohol and drug treatment episode was then chosen randomly for each client to assure balance of the predictive model across the alcohol and drug treatment continuum. Elimination of records based on this criteria resulted in a final sample of 54,333 Alcohol and Drug Treatment Services clients and treatment episodes.

Administrative records of involvement with Mental Health Treatment Services, Child Welfare (i.e., foster care and substantiated maltreatment claims), Self-Sufficiency, and Medical Assistance were summarized up to each client's study end date (i.e., date of OYA commitment for clients who became involved with OYA and date of 19th birthday for clients who did not). Summarized records were matched at the individual level with alcohol and drug treatment and OYA data. The dataset reflected each client's involvement with these program areas up to their study end date.

Sample

The final sample included 54,333 individuals born between 1981 and 2001 who were clients of OHA's Alcohol and Drug Treatment Services in Oregon between 2000 and 2013. Slightly more than 7% (n=3,965) of the sample were committed for the first time to OYA probation or close custody

[1] Individuals enrolled in the Client Process Monitoring System (CPMS) include those whose alcohol and drug treatment is paid for with public funds (e.g., federal, state, or county grants/contracts, direct contracts from OHA, Oregon Health Plan dollars, etc.). In addition, clients receiving DUII treatment or synthetic opiate/methadone maintenance treatment are enrolled in CPMS regardless of funding.

[2] 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 is Fatality).

Table 1. Demographic information for the full cohort of children and youth in Alcohol and Drug Treatment Services (n=54,333).

	N	%	Mean	*SD*	Range
Sex					
Female	18,462	34%			
Male	35,871	66%			
Race/Ethnicity					
Caucasian	41,107	75.7%			
Hispanic/Latino	7,260	13.4%			
Native American	2,669	4.9%			
African American	1,950	3.6%			
Other/Unknown	778	1.4%			
Asian	569	1%			
Age at first known Alcohol and Drug Treatment Services episode			15.8 yrs	1.5	3-19 yrs
10 years or under	22	<1%			
11-13 years	3,761	6.9%			
14-16 years	30,022	55.2%			
17 years or older	20,528	37.8%			
Current Alcohol and Drug Treatment Services episode number			1.3	0.7	1-10
First episode	42,275	83.3%			
Second episode	6,386	11.8%			
Third or higher episode	5,672	4.9%			

between 2000 and 2013. Table 1 shows demographic information for the full sample. Exactly 66% of the sample is male and 34% is female. Youth identifying as Caucasian are the most common in the sample (75.7%) followed by Hispanic/Latino (13.4%), Native American (4.9%), African American (3.6%), Other/Unknown (1.4%), and Asian (1%). On average, individuals in the sample were 15.8 years old (*SD* = 1.5) at the time of their first contact with Alcohol and Drug Treatment Services; and the vast majority (83%) of treatment episodes were the clients' first.

Analysis

The sample was divided randomly into a training set (80%) used to develop the predictive model and a testing set (20%) used to evaluate model accuracy. Following procedures recommended by Homer, Lemeshow, and Sturdivant (2013), relationships among variables of interest were examined through correlation analyses conducted with the training set and selected for modeling based on their associations with the outcome (i.e., future OYA commitment yes or no) and each other (i.e., not highly intercorrelated).

Results

Similar to previous work (e.g., Braun, 2015b, 2015c), variables were entered into the predictive model so that the effects of gender and race/ethnicity on OYA commitment could be statistically controlled. After controlling for these factors, constructs representing individual characteristics and service utilization patterns were entered into a backward stepwise logistic regression model predicting OYA commitment within the training set. The predictive model was then applied to the testing set to assess model accuracy, sensitivity (i.e., rate of detecting true positives), and specificity (i.e., rate of detecting true negatives).

Results of the final model developed in the training set are displayed in Table 2. In addition to gender and race/ethnicity, nine variables remained in the model at its final step. All together gender, race/ethnicity, number of arrests over the preceding 5 years, involvement with Mental Health Treatment Services, record of incomplete alcohol and drug treatment episodes, earliest age at first use

Table 2. Final step of the backward stepwise logistic regression model predicting OYA commitment among the training sample of Alcohol and Drug Treatment Services clients in Oregon (n=43,466).[a]

	β	S.E.	Wald	df	Sig.	Odds ratio
Constant	-4.37	0.12	1197.55	1	.000	0.01
Child gender (Male)	0.68	0.04	199.29	1	.000	1.98
Race/Ethnicity: Hispanic/Latino	0.42	0.05	60.56	1	.000	1.53
Race/Ethnicity: African American	0.53	0.08	44.29	1	.000	1.70
Race/Ethnicity: Native American	-0.31	0.09	10.34	1	.001	0.72
Race/Ethnicity: Other/Unknown	-0.23	0.19	1.37	1	.240	0.79
Race/Ethnicity: Asian	-0.22	0.23	0.90	1	.340	0.79
Number of times client was arrested during 5 years preceding current treatment episode	0.40	0.01	946.90	1	.000	1.50
Mental Health Treatment Services involvement (Yes/No)	1.17	0.04	710.11	1	.000	3.22
Client has never successfully completed an alcohol and drug treatment episode (Completed none = 1; Completed at least some = 0)	0.77	0.04	333.40	1	.000	2.16
Earliest reported age at first use of any substance (including nicotine)	-0.09	0.01	251.35	1	.000	0.91
Involvement with residential drug treatment (Yes/No)	0.61	0.05	139.21	1	.000	1.85
Number of alcohol and drug treatment referrals made by client's personal support system (including self-referral)	-0.48	0.06	59.01	1	.000	0.61
Self-reported use of marijuana (Yes/No)	0.62	0.08	53.46	1	.000	1.87
Foster Care involvement (Yes/No)	0.31	0.05	34.94	1	.000	1.37

[a] AUC = .825.

of any substance (including nicotine), number of treatment referrals made by oneself or one's personal support system, involvement with residential drug treatment, marijuana use, and experience with foster care significantly predicted OYA commitment (-2LL = 18,422.24; $\chi^2[14]$= 4,290.58 p < .0001).

Model effects indicate that both gender and race/ethnicity significantly predict future OYA commitment within the Alcohol and Drug Treatment Services client population. Gender is significant (β = 0.68, *p* < .0001) in that the odds of OYA commitment for male clients is nearly twice that of female clients (Odds ratio $[OR]_{Gender}$ = 1.98). Race/ethnicity is also significant in that Hispanic/Latino clients are just over 1.5 times more likely to experience future OYA commitment relative to Caucasian clients (β = 0.42, *p* < .0001; $OR_{Hispanic/Latino}$ = 1.53). African American clients are also more likely to become involved with OYA (β = 0.53, *p* < .0001). Compared to Caucasian clients, African American clients are 1.7 times more likely to experience OYA commitment ($OR_{AfricanAmerican}$ = 1.70). Clients of Native American race/ethnicity are significantly less likely to experience OYA commitment compared to Caucasians (β = -0.31, *p* < .01; $OR_{NativeAmerican}$= 0.72). The number of times a client reported being arrested during the 5 years preceding the current alcohol and drug treatment episode also significantly predicts OYA commitment (β = 0.40, *p* < .0001). For every arrest, the probability of future OYA commitment increases by 50% ($OR_{Arrests}$ = 1.50). Alcohol and Drug Treatment Services clients who are also involved with Mental Health Treatment Services are just over three times more likely experience OYA commitment relative to those with no known history of mental health treatment (β = 1.17, *p* < .0001; $OR_{MentalHealthTreatment}$ = 3.22). Enrolling in but not completing alcohol or drug treatment also increases the probability of future OYA commitment. Regardless of the reason for incompletion, clients whose records indicate they never successfully completed an alcohol or drug treatment episode are over two times more likely to experience OYA involvement compared to clients who complete all treatment episodes (β = 0.77, *p* < .0001; $OR_{Incompleters}$ = 2.16). Earliest reported age at first use of any substance (including nicotine) also significantly predicts OYA involvement (β = -0.09, *p* < .0001). For every year younger in reported age at first use, the probability of OYA commitment increases by about 9% ($OR_{AgeFirstUse}$ = 0.91). History of involvement with residential drug treatment significantly increases the likelihood of OYA commitment (β = 0.61, *p* < .0001). The probability of OYA commitment for clients who participated in residential drug treatment is 85% higher compared to those who participated in other types of alcohol or drug treatment (e.g., outpatient treatment; $OR_{ResidentialDrugTx}$ = 1.85). The number of times a client is self-referred to alcohol and drug treatment or referred by an individual from their personal support system significantly decreases the probability of future OYA commitment (β = -0.48; *p* < .0001). Each additional treatment referral initiated by the client or a parent, friend, or other support person corresponds with a 39% decrease in the likelihood of OYA commitment ($OR_{PersonalReferrals}$ = 0.61). Reported marijuana use increases the probability of OYA commitment significantly as well (β = 0.62, *p* < .0001). Clients who report a history of marijuana use are 87% more likely to eventually become involved with OYA compared to clients who never reported using marijuana ($OR_{Marijuana}$ = 1.87). Finally, alcohol and drug treatment clients who also experienced foster care are significantly more likely to be committed to OYA (β = 0.31, *p* < .0001). Individuals whose service records indicate one or more foster care episodes prior to the study end date are 1.37 times more likely to become involved with OYA in the future ($OR_{FosterCare}$ = 1.37).

Accuracy and ability to detect true positives (i.e., sensitivity) and true negatives (i.e., specificity) were evaluated by applying the model developed in the training set to individuals in the testing set (n = 10,867). The model's ability to accurately predict future OYA commitment among Alcohol and Drug Treatment Services clients was assessed by examining the area under the receiver operating characteristic curve (AUC). AUC analyses conducted with the testing set produced a value of .813, indicating the model developed in the training set accurately predicts OYA commitment among youth in the testing set about 81% of the time. Sensitivity and specificity were evaluated by comparing the probability of OYA commitment estimated by the model to the actual OYA commitment status of youth in the sample. The cutoff value that maximized both sensitivity and specificity was 0.075 or larger—that is any sampled youth with a model-estimated probability of at least 0.075 would be classified as a future OYA youth. With this cutoff value, Table 3 shows that sensitivity reached 74.4% (590 of 793 OYA youth were correctly classified) and specificity was 75.3% (7,589 of 10,074 non-OYA youth were correctly classified). The AUC estimate remained at .813 despite the adjusted cutoff level.

Table 3. Classification table showing the final model's ability to correctly predict future OYA commitment and no future OYA commitment in the testing sample of Alcohol and Drug Treatment Services clients (n = 10,867).

	Predicted		Percentage correct
Observed	OYA Commitment - No	OYA Commitment - Yes	
OYA Commitment - No	7,589[a]	2,485	75.3%
OYA Commitment - Yes	203	590[b]	74.4%
Overall percentage			**74.8%**

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

Model Performance within Certain Groups

As in previous work (Braun, 2015b, 2015c), we assessed model performance within certain subpopulations in addition to the overall group of Alcohol and Drug Treatment Services clients. All evaluations of model performance within subpopulations were conducted using the testing sample.

Gender. Similar to the results from our analyses predicting OYA commitment among Oregon Child Welfare children (Braun, 2015b) and Mental Health Treatment Services clients (Braun, 2015c), the current analysis suggests model performance is not equal between male and female Alcohol and Drug Treatment Services clients. The AUC decreases slightly to .809 when the model is applied to males alone, but overall classification accuracy remains relatively steady at 74.4%. Among males the model is more adept at detecting true positives (i.e., 79.1%) compared to true negatives (i.e., 69.8%). When applied to females, the AUC drops a bit more to .765 and overall classification accuracy falls to 69%. Similar to the model predicting OYA involvement among Child Welfare children, the female alcohol and drug treatment model detects true negatives very well (i.e., 85.1%) but detects true positives poorly (i.e., 52.8%).

Race/Ethnicity. Caucasian clients make up the overwhelming majority of the Alcohol and Drug Treatment Services client sample, therefore model performance among individuals in this racial/ethnic group alone is similar to that of the entire sample (i.e., AUC = .812, overall classification accuracy = 74.5%). The model is less accurate among Hispanic/Latino clients, with both AUC and classification accuracy dropping slightly to .797 and 73.8%, respectively. The model predicts true positives among Hispanic/Latino clients very accurately (i.e., 80.9%) but has poor ability to detect true negatives within this racial/ethnic group (i.e., 66.7%). Similar patterns emerge when the model is applied to African American clients alone, with AUC dropping further to .749 and overall classification accuracy reaching only 66.4%. Among African American clients the model does well at detecting true positives (i.e., 91.3%) but quite poorly detecting true negatives (i.e., 41.6%). Model AUC is slightly higher among Native American clients (i.e., .795), however the rate of detecting true positives drops to 61.7%. The model does a better job detecting true negatives among Native Americans (i.e., 78.6%) compared to both African American and Hispanic/Latino clients.

Age. Unlike previous analyses predicting OYA commitment among populations served by Child Welfare (Braun, 2015b) and Mental Health Treatment Services (Braun, 2015c), current findings suggest that model performance does not vary dramatically across the different ages of Alcohol and Drug Treatment Services clients. Among clients who were 12 or younger at the time of their first known Alcohol and Drug Treatment Services episode, the model predicts true negatives at a rate of 65.7% and true positives at a rate of 91.3%, for an overall classification rate of 78.5%. AUC for this age group is good at .787. Model performance is similar but not quite as good among clients who were 13 years old at first alcohol or drug treatment, detecting true negatives 68.5% of the time, true positives 72.5% of the time (overall classification accuracy of 70.5%), and an AUC of .751. When applied to 14 year olds, AUC increases to .793 and both true positives and true negatives are detected slightly better than the model for 13 year olds (i.e., 70.4% and 75.1%, respectively, with an overall classification rate of 72.7%). For 15 year old clients, the model AUC reaches .776 and true negatives are detected slightly better (71.3%) than true positives (70.4%). Among 16 year olds the model reaches a higher AUC (i.e., .809) and displays a more balanced ability to detect true positives (i.e., 76.5%) and true negatives (i.e., 74.8%). The model still performs well among clients aged 17 and older but is less balanced compared to 16 year olds. The AUC for clients 17 and older climbs to .843, but true negatives are detected at a better rate than true positives (80% vs. 76%).

Discussion

OHA's Alcohol and Drug Treatment Services program serves a large proportion of individuals who eventually become involved with OYA. Previous analyses (Braun, 2014) have demonstrated that as many as 40% of OYA youth engage with Alcohol and Drug Treatment Services at some point before becoming involved with OYA. Youth whose service records indicate participation in alcohol and drug treatment due to substance abuse or addiction are nearly eight times more likely to experience OYA commitment (Braun, 2015a). The current work expands on these findings by

examining the individual characteristics and service utilization patterns of Alcohol and Drug Treatment Services clients that contribute to the probability of OYA commitment.

Findings reveal that 7.3% of Alcohol and Drug Treatment Services clients born between 1981 and 2001 experienced commitment to either OYA probation or close custody between January, 2000 and July, 2013. The proportion of young Alcohol and Drug Treatment Services clients who eventually become involved with OYA is larger than that of the Oregon Child Welfare and Mental Health Treatment Services service populations (6% and 4%, respectively, Braun, 2015b, 2015c). Even so, the 7.3% figure suggests that the majority of young people involved with Alcohol and Drug Treatment Services do not experience OYA commitment in the future. However, consider that only about 0.0015% of the entire Oregon youth population aged 10-19 was committed to OYA between 2000 and 2013 (Braun, 2015b). If this is compared to the 7.3% commitment rate among Alcohol and Drug Treatment Services clients, it becomes clear that this program area serves a large proportion of children and youth who are likely to be committed to OYA in the future. As with the Child Welfare and Mental Health Treatment Services populations (Braun, 2015b, 2015c) if Alcohol and Drug Treatment Services clients can be assessed for risk of OYA commitment, enhanced intervention may divert some from proceeding down the path toward OYA. Moreover, the fact that less than 10% of young Alcohol and Drug Treatment Services clients may be at risk for OYA commitment suggests that additional intervention services need only be targeted toward a relatively small part of this population.

As with the Child Welfare (Braun, 2015b) and Mental Health Treatment Services (Braun, 2015c) client populations, results indicate that identifying at-risk Alcohol and Drug Treatment Services clients will require screening for a combination of certain factors. These include gender, race/ethnicity, arrest history, involvement with mental health treatment and foster care, previous success and/or failure in alcohol or drug treatment, age at first substance use, type of alcohol or drug treatment received, type of referral to treatment, and type of substance(s) used. The current model suggests that Alcohol and Drug Treatment Services clients at highest risk of future OYA commitment are typically male, Hispanic/Latino or African American, have been arrested multiple times in the past 5 years, are also involved with treatment for mental health issues, have failed to complete previous alcohol or drug treatment, began using substances (including nicotine) around 10 years old, have not been referred to treatment by a friend, parent, or other support person, have participated in residential drug treatment, have used marijuana, and have also been involved with foster care.

Variations in model performance based on client gender, race/ethnicity, and age indicate that caution should be used when applying the model in practice to certain subpopulations. Specifically, the model tends to perform better among male Alcohol and Drug Treatment Services clients compared to female clients, suggesting that separate gender-based models might be considered. The model performs relatively well overall across different racial/ethnic categories, however the detection of true negatives and true positives is somewhat unbalanced within certain groups. Findings suggest that the model may be the most accurate and potentially useful among 16 year olds, however the average age of commitment for sampled youth who became involved with OYA

is just under 16 years (i.e., 15.9). Accuracy and balance in classification is still relatively good among younger subpopulations, therefore practitioners may choose to target higher risk youth within younger age groups in order to offer diversion services in plenty of time. As with all statistical models, the model should be applied with care in practice and data should supplement—not replace—professional discretion.

Next Steps

Feeder system research will now focus on youths' K-12 education histories with the goal of identifying school-related patterns, risks, and protective factors that contribute to the probability of OYA commitment. Next steps also involve combining Child Welfare, mental health, alcohol and drug treatment, and education records to explore a more comprehensive feeder system model that incorporates all key service areas and risk factors identified in previous work.

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