



OYA Feeder System Technical Report:
Predicting Adult Felony Conviction from contacts with Child Protective
Services, Foster Care, Mental Health, and Alcohol and Drug Services

Prepared by
Oregon Youth Authority
Research & Evaluation
June 2019

Contact:
Kristina Racer, Ph.D.
kristi.racer@oya.state.or.us
(503) 779-3926



Introduction

This report is one in a series examining where, when, and how youth at high risk for a future adult felony conviction¹ can be identified within other state-funded programs. Previous reports have documented the prevalence of prior social service contacts among Oregon adults with felony convictions (Racer, 2015a) and have identified which agency contacts are most predictive of future adult felony convictions (Racer, 2015b). The present report examines whether first-time adult felony convictions can be predicted from agency-specific service details (i.e., administrative records) within each of four programs: Child Protective Services (CPS), Foster Care (FC), Mental Health (MH) and Alcohol and Drug Services (AD). Such predictions would enable agencies to estimate the risk of future adult felony conviction among the populations they serve and provide an opportunity to target additional services and resources to high-risk individuals to reduce that risk. The present report also takes a preliminary look at the value added by cross-agency information when predicting first-time adult felony convictions. It is presumed that the prediction of a first-time adult felony conviction will be improved by the coordination of information across agencies, so that individual-level characteristics (e.g., demographics), agency contacts (e.g., yes/no per agency), and a range of details regarding services received within each agency (e.g., number of contacts, types of services, length of service) can be combined to estimate an individual's risk of a future adult felony conviction at a given point in time. Although we are currently unable to include cross-agency service details in the models, the present report provides an initial look at the added value of including cross-agency contacts by comparing the predictive accuracy of models using (a) demographics alone, (b) demographics and within-agency service details, and (c) demographics, within-agency service details, and cross-agency contact information (i.e., yes/no per agency).

General Methods

Sample

The analyses within this report use the previously described “Feeder System” dataset (e.g., Braun, 2014; Racer, 2015b). The primary dataset includes individual-level administrative data from Self-Sufficiency (SS), Medical Assistance (DMAP), Mental Health (MH), Alcohol and Drug Services (AD), Child Protective Services (CPS), Foster Care (FC), the Oregon Youth Authority (OYA), and the Oregon Department of Corrections, including Community Corrections (DOC). Administrative data from DOC and OYA represent an agency; data from SS, DMAP, MH, AD, CPS, and FC represent programs within the Department of Human Services (DHS) and the Oregon Health Authority (OHA). However, for this report, programs within an agency are also referred to as an agency.

The source data spans a 14-year period from 2000 to 2013 (1998 to 2010 for CPS and FC). The full dataset includes individuals of all ages (from 0 to 100+); the current sample was restricted to individuals who were between the ages of 8 and 12 years in 2000 (years of birth (YOB) = 1988-1992; see Racer, 2015b for further detail). This restricted age range ensures that every individual had the opportunity for DHS, OHA, and OYA service records from at least age 12 forward (age 10 for CPS and FC), as well as at least 4 years of eligibility for adult convictions (i.e., age 21 or older) by the end of 2013. Adult convictions that occurred after 2013 (ages 21-25) will not be detected in the present analyses. This limitation is partially mitigated by the fact that a large proportion of adults receiving first-time felony

¹ Note: “adult felony conviction” was referred to as “DOC involvement” in prior reports. The terminology has been updated for clarity; both terms are meant to refer to any adult felony conviction.

convictions (nearly 40%) are age 25 or younger (see Racer, 2015a).

The present report examines whether future adult felony conviction can be accurately predicted within the populations served by Mental Health, Alcohol and Drug Services, Child Protective Services, and Foster Care. For each of these agencies, the sample consisted of individuals who (a) received services from that agency within the time frame of the available data (1998-2010 or 2000-2013) and (b) had valid gender and race/ethnicity information, and (c) were between the ages of 8 and 12 years of age in the year 2000. In addition, individuals whose first contact with an agency occurred less than 90 days before their first adult felony conviction were excluded. Adult felony convictions were identified using the administrative records from DOC. Sample sizes and adult felony conviction rates for each agency are presented in Table 1.

Table 1. Total sample size and rates of future adult felony conviction by agency

Agency	Total N	Number with future adult felony conviction	% with future adult felony conviction
Child Protective Services (CPS)	18,238	1,901	10.4%
Foster Care (FC)	8,038	1,254	15.6%
Mental Health (MH)	45,803	5,207	11.4%
Alcohol and Drug Services (AD)	30,162	5,285	17.5%

Data Reduction and Coding

Data transformation. First, the available within-agency administrative data fields were reviewed. Many of the administrative variables were categorical (e.g., specifying which type of service was provided). Categorical variables were expanded into a range of indicator variables (e.g., if the original variable was “program type” and included Programs A, B, and C, three new variables were created as ProgramA_Yes/No, ProgramB_Yes/No, and ProgramC_Yes/No). Indicator variables were only created for categories that were found in at least 5% of the population served. In some cases, two or more related categories were combined in order to meet the 5% threshold (for example, within Alcohol and Drug Services, heroin use was combined with other opiate use to create a single category of “heroin and other opiates”). For variables reflecting counts (e.g., the number of times a service was received), the range was truncated at the highest value that captured at least 5% of the population; counts higher than that value were recoded as equal to that value (e.g., if the full range of scores was 1 thru 6, but less than 5% of the sample had scores of 4, 5, or 6, the variable was transformed into scores 1, 2, and “3 and higher”).

Data reduction. Among the administrative data for each agency, variables were excluded if (a) they were present in < 5% of cases or (b) they were redundant with other predictors in the model. Variables excluded due to redundancy are listed underneath the regression results table for each program in Appendix A. Full lists of all available administrative variables for each agency are available upon request.

Other agency contacts. Yes/No indicators of agency contacts were available for the four target agencies (Child Protective Services, Foster Care, Mental Health, and Alcohol and Drug Services) as well as for Self-Sufficiency (SS), Medical Assistance (DMAP), and the Oregon Youth Authority (OYA). Contacts with each agency were coded as “Yes” if they occurred at least 3 months before the first contact with the target agency. For the purpose of the analyses, “Yes” was coded as ‘1’ and “No” was coded as ‘0’. Indicators of prior contact with each agency were included in the analyses for every program, even in cases where less than 5% of the program sample had contact with a given agency. See Appendix B for rates of prior program contacts by agency.

Adult felony conviction. For all analyses, the outcome of interest was a first-time adult felony conviction as indicated by DOC administrative records. Approximately 85% of first-time felony convictions resulted in probation and approximately 11% resulted in incarceration.

Methods

A separate set of analyses was conducted for each of the four target agencies (CPS, FC, MH, and AD), using the approach described below.

Outcome measure. A first-time adult felony conviction between the ages of 18 and 25.

Analytic Approach. Hierarchical stepwise logistic regression was used to identify which variables within a given agency were most predictive of future adult felony conviction, and to compare the relative contributions of demographic information (Step 1), agency-specific information (Step 2), and cross-agency contacts (Step 3). Models were built using a randomly-selected 80% of the sample (“development sample”) and verified using the remaining 20% of the sample (“validation sample”). Variables that significantly contributed to the prediction of future adult felony conviction were identified using backwards elimination via the Wald statistic. Separate logistic regressions were run for each of the four agencies examined: Child Protective Services, Foster Care, Mental Health, and Alcohol and Drug Services.

Evaluating predictors. Odds ratios are used to quantify the relative contributions of individual predictors within the final models. For binary (e.g., yes/no) variables, odds ratios reflect the multiplication of risk associated with a “yes” versus “no” response. For example, an odds ratio of 2.0 indicates that the risk for individuals with a “yes” response on that predictor variable is two times higher than the risk for individuals with a “no” response on that variable. Odds ratios less than 1.0 indicate protective factors, with “yes” responses reducing risk compared to “no” responses; for example, an odds ratio of 0.5 indicates that the that the risk for individuals with a “yes” response on that predictor is two times lower ($1/0.5 = 2.0$) than the risk for individuals with a “no” response on that predictor. For variables with more than two categories (e.g., age in whole years), the odds ratio reflects the multiplication of risk between each level of the category (e.g., each 1-year increase in age).

Evaluating model accuracy. The overall ability of each model to accurately predict first-time adult felony conviction was evaluated using the area under the curve (AUC) statistic. The AUC indicates how often the model would produce a higher risk score for an individual who actually received an adult felony conviction versus an individual who did not receive an adult felony conviction. In other words, if pairs of individuals were randomly selected from the DOC and non-DOC groups, the AUC indicates how often

the model produces a higher risk score for the person from the DOC group. AUC can range from 0.50 to 1.00, with 1.00 indicating a perfect fit (the model always assigns higher risk scores to those in the DOC group versus the non-DOC group) and 0.50 indicating that the model does not improve predictions beyond what would be achieved by chance (“coin-toss” predictions). In social sciences, an AUC of .70 is often considered to be the minimum threshold for acceptable models.

Evaluating model stability. The available cases from each agency were divided randomly into a development sample (80% of cases) used to create the initial model and a validation sample (20% of cases) used to evaluate the stability of the model when applied to a new sample. Two validation approaches were used: first, the development model was applied to the validation sample to evaluate the stability of the AUC across samples; second, a new regression model was run on the validation sample using only those variables that were significant in the development model. The second method was used to evaluate the stability of the individual predictors (i.e., odds ratios and significance levels) across different samples. As reported below, the overall accuracy of each model was consistent across the development and validation samples. However, some predictors that were significant for the development sample were not significant for the validation sample. In theory, those non-significant predictors could be “trimmed” from the model without substantially reducing model accuracy. However, because one goal of this report is to provide an overview of potentially-relevant predictors within each agency, we present the development sample results for each predictor and use footnotes to identify predictors that did not reach significance in the validation sample.

Results

Predicting Adult Felony Convictions

Table 2 summarizes the variables within each agency that were found to be significant predictors of a future adult felony conviction, using the methods described above. The extent to which the administrative variables were able to accurately estimate adult felony outcomes varied across agencies, with CPS data producing the weakest model (AUC^a = .68) and AD data producing the strongest model (AUC = .75). All models were statistically significant, indicating a better-than-chance ability to predict adult felony convictions. Furthermore, all of the models created using the development samples retained comparable accuracy when applied to the validation samples, indicating that the models can be applied to new samples without losing predictive accuracy. See Appendix for additional model statistics and details.

Child Protective Services. Models predicting adult felony conviction from CPS contacts achieved modest accuracy, ranging from 66% accurate using demographics alone to 68% using demographics, CPS administrative data, and information on contacts with the other 6 agencies. Odds ratios (ORs) indicated that the strongest risk factors for future adult felony conviction were male gender (OR=3.25), prior Alcohol and Drug Service contacts (OR=2.93) and prior contact with the Oregon Youth Authority (OR=3.31).

Foster Care. Statistical models predicting future adult felony conviction from Foster Care contacts achieved moderate predictive accuracy, ranging from 68% with demographics alone to 72% with demographics, FC records, and information on contacts with the other 6 agencies. Overall model accuracy was similar with and without the inclusion of other-agency contacts. However, when other-agency contacts were included, prior contacts with OYA and AD emerged as two of the strongest risk

factors for future adult felony convictions (odds ratios of 2.34 and 3.80, respectively). Other strong risk factors were male gender (OR=3.58) and removals due to child drug use (OR=2.12). The strongest protective factor was having a foster care episode that resulted in adoption (odds ratio of 0.33).

Mental Health Services. Statistical models predicting future adult felony conviction from Mental Health Services contacts were among the strongest of the four models developed, with an overall accuracy of almost 75% using demographics, MH service records, and information about contacts with the 6 other agencies. The strongest risk factors were male gender (OR=3.04), being referred to MH by criminal justice (OR=2.28), living in a residential or institutional setting at the time of MH services (OR=2.07), and having prior contacts with Alcohol and Drug Services (OR=2.31). The strongest protective factor was receiving adult outpatient MH services (OR=0.59).

Alcohol and Drug Services. Statistical models predicting future adult felony conviction from Alcohol and Drug Services contacts achieved 75% accuracy when demographics, AD service data, and contacts with the other 6 agencies were included. The strongest risk factors were male gender (OR=2.69) and prior contacts with the Oregon Youth Authority (OR=2.00). The strongest protective factors were having alcohol as the primary substance of abuse (OR=0.74) and receiving DUII education (OR=0.79). Other protective factors were being referred to AD services by the client's personal support system (OR=0.88), having marijuana as the primary substance of abuse (0.86), and successfully completing any AD episodes (OR=0.88). Age at first known AD services, and age at earliest reported use of any substance also had small protective effects (OR=0.89 and 0.98, respectively), with older age corresponding to less risk of future adult felony conviction.

Table 2 provides an overview of the data elements that were significant predictors of future adult felony conviction for individuals receiving services from each of the four target agencies (Child Protective Services, Foster Care, Mental Health, and Alcohol and Drug Services). The statistics presented in Table 2 are from the models developed on 80% of the total sample for each agency; overall model fit was comparable when each model was applied to the remaining 20% of the sample, indicating that the models generalize to new samples without losing predictive accuracy.

Table 2. Overview of Significant Predictors (see Appendix for full analyses)

Significant Predictors of Adult Felony Conviction, by Agency			Odds Ratio
Child Protective Services			
		Male	3.25
	N = 14,626	Non-White Race/Ethnicity	1.21
	(1,549 entered DOC)	Age at First CPS Referral in Records	1.04
	AUC = .681	Total Number of CPS Referrals in Records (1, 2, 3+)	1.33
		Any CPS Referral for Physical Abuse	1.30
		Any CPS Referral for Neglect	1.13
		MH Services Received prior to First CPS Referral in Records	1.48
		AD Services received prior to first CPS referral in records	2.93
		FC placement prior to first CPS referral in records	1.47
		OYA commitment prior to first CPS referral in records	3.31
Foster Care			
		Male	3.58
	N = 6,439	Total Number of FC Episodes	1.56
	(992 entered DOC)	Any FC Episode ended in Reunification	0.73
	AUC = .722	Any FC Episode ended in Adoption	0.33
		Any FC Episode ended in Emancipation	0.74
		Any Non-Relative FC Placements	0.56
		Any Relative FC Placements	0.61
		Any Removals for Sexual Abuse	0.78
		Any Removals for Child Drug Use	2.12
		Any Removals for Child Disability	0.81
		Any Removals for Child Behavior	1.58
		MH Services Received prior to First FC Placement in Records	1.17
		AD Services Received prior to First FC Placement in Records	2.34
		OYA Commitment prior to First FC Placement in Records	3.80
Mental Health			
		Male	3.04
	N = 36,729	Non-White Race/Ethnicity	1.20
	(4,170 entered DOC)	Total Number of Mental Health Episodes (1, 2, 3+)	1.14
	AUC = .747	Ever Referred to MH by Criminal Justice	2.28
		Ever Referred to MH by a Local or State Agency	1.09
		Ever Received Adult Outpatient Services	0.59
		Ever Received Crisis Services	1.15
		Ever Eligible via Severe and Persistent Mental Illness	0.83
		Ever Eligible via Priority 3	0.90
		Ever Living Arrangement = Alone or with Friends or Partner	0.87
		Ever Living Arrangement = Homeless	1.35
		Ever Living Arrangement = Residential Institution	2.07
		Ever Incomplete due to Administrative reasons	1.19
		Ever Incomplete due to Client Reasons	1.26
		Ever Funded by Medicaid	1.09
		SS received prior to first MH service episode	1.23
		DMAP Received prior to First MH Service Episode	1.15
		AD Services Received prior to First MH Service Episode	2.31
		FC placement prior to first MH service episode	1.24

Table 2. Overview of Significant Predictors (see Appendix for full analyses)

Significant Predictors of Adult Felony Conviction, by Agency			Odds Ratio
Alcohol and Drug			
		Male	2.69
	N = 24,174	Age at First Known Alcohol and Drug Services	0.89
	(4,141 entered DOC)	Ever Referred by Criminal Justice	1.17
	AUC = .750	Ever Referred by Personal Support System	0.88
		Ever Received DUII Education Services	0.79
		Ever Received Detoxification Services	1.61
		More than One Substance of Abuse at Any Service Episode	1.24
		Ever Primary Substance = Alcohol	0.74
		Ever Primary Substance = Marijuana	0.86
		Ever Primary Substance = Heroin or Opiates	1.35
		Ever Primary Substance = Amphetamine, Meth, or Cocaine	1.56
		Age at Earliest Reported Use of Any Substance	0.98
		IV Drug Use Ever	1.36
		Polysubstance abuse ever	1.18
		Positive UA during any AD service episode	1.27
		Arrest in the 5 years preceding any AD Service Episode	1.38
		MIP received during any AD Service Episode	1.25
		Ever Successfully Completed AD service episode	0.88
		Ever Incomplete for Administrative Reasons	1.26
		Ever Incomplete for Client Reasons	1.66
		SS received prior to first AD service episode	1.16
		DMAP Received prior to First AD Service Episode	1.51
		FC Placement prior to First AD Service Episode	1.18
		MH Services Received prior to First AD Service Episode	1.18
		OYA Commitment prior to First AD Service Episode	2.00

^aAUC = Area Under the Curve Statistic; AUC estimates the overall accuracy of the model at distinguishing between individuals who do and do not enter DOC. AUCs can range from 0.50 (chance) to 1.00 (perfect prediction).

Relative Contributions of Within-Agency and Cross-Agency Information

For all agencies other than Child Protective Services, information obtained from within-agency administrative service records (including demographics) was sufficient to achieve greater than 70% accuracy in predicting future adult felony convictions. Adding information on contacts with other state-funded agencies (SS, DMAP, MH, AD, CPS, FC, or OYA) improved accuracy by about 1 percentage point (see Table 3).

Table 3. Contribution of Demographics, Agency Data, and Other Agency Contracts to the Prediction of Future Adult Felony Conviction.

Table 3. Contribution of Demographics, Within-Agency Information, and Cross-Agency Information to the Prediction of Future Adult Felony Conviction			
Agency	Overall Accuracy¹ of Models Using:		
	Demographics Only	Demographics plus Within-Agency Data	Demographics, Agency Data, plus Contacts with Other Agencies
Child Protective Services	66%	67%	68%
Foster Care	67%	72%	72%
Mental Health	66%	74%	75%
Alcohol and Drug Services	67%	74%	75%

¹Overall Accuracy = Area Under the Curve Statistic (AUC). AUC indicates how often the model correctly discriminates between higher-risk and lower-risk cases.

For all agencies, demographics alone (age, gender, and race/ethnicity) had only a modest ability to differentiate between individuals at higher vs lower risk for future adult felony conviction (Model accuracy ranged from 66% - 67%). Within-agency information (administrative data) produced substantial gains in model accuracy for Foster Care, Mental Health, and Alcohol and Drug Services. For each of these agencies, including service details improved model accuracy by 5 - 8 percentage points over demographics alone. For Child Protective Services, the model was only slightly improved by the addition of within-agency and across-agency information. For all agencies besides Foster Care, information about contacts with other agencies improved model accuracy by about 1 percentage point. Information about other agency contacts did not improve the accuracy of the Foster Care model.

General Summary and Conclusions

Predicting future adult felony conviction. The primary goal of this report was to demonstrate the feasibility of predicting future adult felony conviction among youth and young adults served by Child Protective Services, Foster Care, Mental Health, and Alcohol and Drug Services. For each of these four agencies it was possible to predict first-time adult felony convictions with better-than-chance accuracy. For Foster Care, Mental Health, and Alcohol and Drug Services, the models were able to predict future adult felony convictions with a respectable 72-75% accuracy.

Examination of the models reveals some consistent themes. First, male gender is a consistent predictor of adult felony conviction. Second, many of the other strong predictors are directly or indirectly tied to antisocial behavior, such as contacts with AD or OYA, being referred by criminal justice, and using illicit substances. This is not surprising, but it also suggests that one limitation of the current models may be that they are identifying individuals who are already known to be at high risk for criminal involvement. One might have hoped that the present analyses would suggest opportunities to identify high-risk individuals before any overt antisocial behaviors were evident. On the other hand, the predictors identified may not always be evident to service providers. A next step for this work is begin a conversation with providers about when and how the risk scores from the models may enhance case management and prevention services.

Relative importance of cross-agency information. The second goal of this report was to begin to explore whether the availability of cross-agency information improves predictive accuracy. In the present case we used only dichotomous yes/no variables indicating whether an individual had accessed each of 6 agencies (SS, DMAP, AD, MH, CPS, FC, OYA) prior to their first contact with the primary agency of interest (AD, MH, CPS, or FC). The simple yes/no indicators of prior contact were the only variables available to us at the time of this report, and it is likely that they underestimate the potential value of cross-agency information. For example, knowing which types of services were accessed within an agency may contribute more predictive value than simply knowing that services were received. Nevertheless, the present report demonstrates small but consistent accuracy gains from including indicators of prior contacts with other agencies, suggesting that cross-agency data sharing would improve predictions of client outcomes.

Limitations. Important limitations include the limited time window for detecting both prior service contacts and adult felony convictions, as well as the inability to include details of prior service contacts (e.g., the extent and type of involvement) as predictors in the model. Due to these limitations, the reported rates of both prior service contacts and young-adult felony convictions are underestimates, and the contribution of cross-agency information to models predicting future adult felonies may have been underestimated as well.

Future Directions. Future reports will examine whether first-time adult felony convictions can be predicted within the populations served by county juvenile departments and the Oregon Youth Authority. Future work may also explore the extent to which additional cross-agency service details add to the predictive strength of the models. At the same time, it should be noted that relatively good predictive accuracy was obtained using only within-agency data. Thus, agencies should be encouraged that they can accurately predict important long-term client outcomes even if they are only working within their own administrative datasets.

References

Braun, M.J.F. (2014). Prevalence of DHS and OHA Program Access Prior to First OYA Commitment: An Exploratory Analysis. Salem, OR: *Oregon Youth Authority*.

Racer, K. (2015a). Prevalence and Timing of DHR, OHA, and OYA Services Prior to First DOC Commitment. Salem, OR: *Oregon Youth Authority*.

Racer, K. (2015b). Predicting First DOC Commitment from Prior Social Service Involvement. Salem, OR: *Oregon Youth Authority*.

Appendix A: Final Hierarchical Logistic Regression Models by Agency

Table 4. Child Protective Services (CPS): Hierarchical Logistic Regression									
Development Sample N=14,626 (1,549 DOC)	β	SE	Wald	Odds Ratio	p- value	Chi- Square	R ²	Δ R2	AUC
Step 1 : Demographics Only					.000	456.12	.063	n/a	.658
Male	1.18	.06	400.36	3.25	.000				
Non-White Race/Ethnicity*	.19	.06	8.93	1.21	.003				
Age at first substantiated CPS referral	.04	.01	12.93	1.04	.000				
Step 2: Demographics plus CPS data					.000	526.04	.072	.009	.673
Total Number of Known CPS Referrals (1, 2, or 3+)	.29	.05	38.92	1.33	.000				
Any Referrals for:									
Mental Injury	<i>Not significant</i>								
Neglect*	.12	.06	3.81	1.13	.051				
Physical Abuse	.27	.07	15.27	1.30	.000				
Sexual Abuse	<i>Not significant</i>								
Threat of Harm	<i>Not significant</i>								
Step 3: Demographics, CPS data, plus Contacts with Other Agencies					.000	608.53	.083	.011	.681
Prior Contact with:									
Self Sufficiency	<i>Not significant</i>								
Medical Assistance	<i>Not significant</i>								
Mental Health Services	.39	.08	21.58	1.48	.000				
Alcohol and Drug Services	1.07	.20	29.93	2.93	.000				
Foster Care*	.38	.18	4.63	1.47	.031				
Oregon Youth Authority*	1.20	.43	7.74	3.31	.005				
Constant	-3.76	.15	661.51	.02	.000				
Model applied to validation sample (N=3612)									.668

*Validation Sample: Race/Ethnicity, neglect, prior Foster Care, and prior OYA involvement were not significant predictors in the validation model

CPS variables that were excluded from analyses: Referrals for fatality; Foster Care services (due to redundancy with cross-agency Foster Care indicator entered in Step 3).

Table 5. Foster Care (FC): Hierarchical Logistic Regression

Development Sample				Odds		Chi-			
N=6,439 (992 DOC)	β	SE	Wald	Ratio	p-value	Square	R ²	ΔR^2	AUC
Step 1: Demographics only					.000	320.64	.084	n/a	.667
Male	1.28	.08	256.06	3.58	.000				
Non-White Race/Ethnicity	<i>Not significant</i>								
Age at first known FC placement	<i>Not significant</i>								
Step 2: Demographics plus FC services data					.000	497.42	.129	.045	.716
Total FC Episodes (1, 2, 3+)	.44	.10	19.53	1.56	.000				
Any FC Placements that Resulted in:									
Reunification*	-.32	.09	12.63	.73	.000				
Adoption*	-1.10	.20	29.08	.33	.000				
Guardianship	<i>Not significant</i>								
Emancipation*	-.30	.13	5.35	.74	.021				
Any Non-Relative Foster Care Placements (Y/N)	-.59	.11	27.74	.56	.000				
Any Relative Foster Care Placements (Y/N)*	-.49	.16	9.50	.61	.002				
Any Voluntary Foster Care Placements (Y/N)	<i>Not significant</i>								
Child designated as Emotionally Disturbed	<i>Not significant</i>								
Any Removals due to:									
Physical Abuse	<i>Not significant</i>								
Sexual Abuse*	-.25	.12	4.28	.78	.039				
Neglect	<i>Not significant</i>								
Parent Drug Use	<i>Not significant</i>								
Child Drug Use*	.75	.16	22.00	2.12	.000				
Child Disability*	-.21	.11	3.70	.81	.055				
Child Behavior	.46	.09	27.92	1.58	.000				
Inability to Cope	<i>Not significant</i>								
Inadequate Housing	<i>Not significant</i>								
Step 3: Demographics, FC data, plus Contact with Other Agencies						537.85	.139	.01	.722
Prior Contact with:									
Self Sufficiency	<i>Not significant</i>								
Medical Assistance	<i>Not significant</i>								
Child Protective Services	<i>Not significant</i>								
Mental Health Services*	.16	.09	3.12	1.17	.078				
Alcohol and Drug Services	.85	.19	20.01	2.34	.000				
Oregon Youth Authority*	1.34	.44	9.11	3.80	.003				
Constant	-3.02	.19	247.10	.05	.000				
Model applied to validation sample (N=1,599)									.717

***Validation Sample:** In the validation sample, the only statistically significant predictors ($p < .05$) were: gender, total episodes, non-relative Foster Care, removal for child behavior, and prior Alcohol and Drug services.

Foster Care variables that were excluded from analyses: Removals due to Special Problem (redundant with Removals due to Child Disability).

Table 6. Mental Health Services (MH): Hierarchical Logistic Regression

Development Sample N=36,729 (4,170 DOC)	β	SE	Wald	Odds Ratio	p- value	Chi- Square	R ²	Δ R2	AUC
Step 1: Demographics only					.000	1335.84	.07	n/a	.661
Male	1.11	.04	802.63	3.04	.000				
Non-White Race/Ethnicity	.18	.04	19.54	1.20	.000				
Age at first known MH Services	.01	.01	1.19	1.01	.276				
Step 2: Demographics plus MH services data					.000	2920.47	.15	.08	.735
Total Number of Mental Health Service Episodes (1, 2, 3+)	.13	.03	19.87	1.14	.000				
Ever Referred to MH by:									
Criminal Justice	.83	.05	339.29	2.28	.000				
Health Provider	<i>Not significant</i>								
Local or State Agency	.09	.04	4.74	1.09	.029				
Personal Support System	<i>Not significant</i>								
Ever Received:									
Adult Outpatient	-.54	.06	91.91	0.59	.000				
Child/Adolescent Outpatient	<i>Not significant</i>								
Crisis Services*	.14	.05	9.13	1.15	.003				
Residential Services	<i>Not significant</i>								
Eligibility Level:									
Severe and Persistent Mental Illness, or Severe Emotional Disturbance	-.19	.06	12.52	.83	.000				
Priority 1	<i>Not significant</i>								
Priority 2	<i>Not significant</i>								
Priority 3*	-.11	.04	6.89	.90	.009				
Living Arrangement at Start of Service:									
Home	<i>Not significant</i>								
Non-Relative Foster Care	<i>Not significant</i>								
Alone or with Friends or Significant Other	-.14	.05	6.60	.87	.010				
Homeless*	.30	.08	13.49	1.35	.000				
Residential or Institution	.73	.05	209.51	2.07	.000				
Completion Status:									
Complete	<i>Not significant</i>								
Incomplete for Administrative Reasons*	.18	.04	16.00	1.19	.000				
Incomplete for Client Reasons	.23	.04	30.70	1.26	.000				
Evaluation Only	<i>Not significant</i>								
Funding Source:									
Private	<i>Not significant</i>								
Medicaid*	.08	.05	2.74	1.09	.100				

Table 6. Mental Health Services (MH): Hierarchical Logistic Regression

Development Sample N=36,729 (4,170 DOC)	β	SE	Wald	Odds Ratio	p- value	Chi- Square	R ²	Δ R ²	AUC
Indigent	<i>Not significant</i>								
Other	<i>Not significant</i>								
Step 3: Demographics, MH data, plus Contacts with Other Agencies					.000	3158.91	.16	.01	.747
Prior Contact with:									
Self Sufficiency*	.21	.05	20.09	1.23	.000				
Medical Assistance	.14	.05	8.19	1.15	.004				
Alcohol and Drug	.84	.07	150.23	2.31	.000				
Child Protective Services	<i>Not significant</i>								
Foster Care*	.21	.07	8.67	1.24	.003				
Oregon Youth Authority	<i>Not significant</i>								
Constant	-3.83	.12	1078.52	.02	.000				
Model applied to validation sample (n=9,074)									.750

***Validation Sample:** Crisis services, Priority 3 eligibility, homelessness, incomplete for administrative reasons, Medicaid payor, prior Self-Sufficiency, and prior Foster Care were not significant predictors in the validation model.

Mental Health variables that were excluded from analyses: Completion Status = Crisis/Short-Term Services (Redundant with Service Type = Crisis Services)

Table 7. Alcohol and Drug Services: (AD) Hierarchical Logistic Regression

Development Sample N=24,174 (4,141 DOC)	β	SE	Wald	Odds Ratio	p- value	Chi- Square	R ²	Δ R2	AUC
Step 1: Demographics only					.000	1144.66	.077	n/a	.666
Male	0.99	.05	484.87	2.69	.000				
Non-White	<i>Not significant</i>								
Age at First Known Alcohol and Drug Services	-0.11	.01	147.90	0.89	.000				
Step 2: Demographics plus AD services data					.000	2505.25	.164	.087	.736
Ever Referred By:									
Criminal Justice*	0.16	.05	9.75	1.17	.002				
Health Provider	<i>Not significant</i>								
Local or State Agency	<i>Not significant</i>								
Personal Support System	-0.13	.06	5.11	0.88	.024				
Ever Received:									
Outpatient Drug Treatment	<i>Not significant</i>								
Outpatient Alcohol Treatment	<i>Not significant</i>								
Residential Treatment	<i>Not significant</i>								
DUII Education	-0.24	.06	15.35	0.79	.000				
Detoxification	0.48	.10	20.78	1.61	.000				
Primary Substance was Ever:									
Alcohol	-0.30	.06	29.08	0.74	.000				
Marijuana*	-0.15	.06	6.45	0.86	.011				
Heroin or Opiates	0.30	.09	11.08	1.35	.001				
Amphetamine, Methamphetamines, or Cocaine	0.45	.07	45.60	1.56	.000				
Age at Earliest Reported Use of Any Substance*	-0.02	.01	8.99	0.98	.003				
IV Drug Use Ever *	0.31	.09	12.65	1.36	.000				
Polysubstance Abuse Ever	0.16	.05	11.43	1.18	.001				
Positive Urinalysis during any AD Service Episode *	0.24	.04	34.91	1.27	.000				
Arrest in the 5 years preceding any AD Service Episode	0.33	.05	45.91	1.38	.000				
MIP in the 2 years preceding any AD Service Episode	<i>Not significant</i>								
MIP received during any AD Service Episode	0.22	.06	12.04	1.25	.001				
Completion Status was Ever:									
Complete	-0.13	.04	7.96	0.88	.005				
Incomplete for Administrative Reasons	0.23	.05	26.92	1.26	.000				
Incomplete for Client Reasons	0.51	.05	122.72	1.66	.000				
Step 3: Demographics, AD data, plus Other Agency Contacts					.000	2846.33	.185	.021	.750
Prior Contact with:									
Self Sufficiency*	0.15	.05	8.02	1.16	.005				

Table 7. Alcohol and Drug Services: (AD) Hierarchical Logistic Regression

Development Sample N=24,174 (4,141 DOC)	β	SE	Wald	Odds Ratio	p- value	Chi- Square	R ²	Δ R2	AUC
Medical Assistance	0.41	.06	56.23	1.51	.000				
Mental Health	0.17	.05	12.99	1.18	.000				
Child Protective Services	<i>Not significant</i>								
Foster Care	0.16	.07	5.25	1.18	.022				
Oregon Youth Authority	0.69	.11	41.49	2.00	.000				
Constant	-1.02	.19	28.59	0.36	.000				
Model applied to validation sample (n=5,988)									.758

***Validation Sample:** Referred by criminal justice, primary substance was marijuana (ever), minimum age at first use, IV drug use (ever), positive urinalysis during any service episode, and prior Self-Sufficiency services were not significant predictors in the validation model.

Note: The categories within AD Services Received, Primary Substance of Abuse, and Completion Status include some roll-up combinations of the original categories. The roll-ups were used to combine some conceptually similar but low-frequency categories into a single category that met the 5% prevalence criterion (e.g., all detoxification services were combined). Details are available upon request.

Alcohol and Drug Services variables that were excluded from analyses: No AD variables were excluded due to redundancy. A large number of administrative variables were obtained from AD, many of which were excluded from the present analyses due to low frequency and/or low theoretical relevance to the question of interest. A full list of all AD administrative variables is available upon request.

Appendix B: Rates of Other Program Contacts per Agency

Table 8. Percentage of agency populations who had prior contacts with other agencies				
	Agency Cohorts			
	Child Protective Services (N=18,238)	Foster Care (N=8,038)	Mental Health Services (N=45,803)	Alcohol and Drug Services (N=30,162)
% who had prior contact with:				
Self-Sufficiency	39.7%	52.6%	56.6%	51.6%
Medical Assistance	40.6%	56.0%	60.7%	48.6%
Child Protective Services	n/a	22.8%	12.4%	10.6%
Foster Care	1.7%	n/a	5.2%	5.9%
Mental Health	10.7%	22.5%	n/a	22.3%
Alcohol and Drug Services	1.1%	2.7%	4.4%	n/a
Oregon Youth Authority	0.2%	0.3%	0.7%	1.8%