Estimating the Probability of Commitment to OYA from History of Social Service Involvement

(Working title)

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Executive Summary

The Oregon Youth Authority's (OYA) first feeder system analysis indicated that up to 90% of youth committed to OYA have contact with other public agencies in the years preceding juvenile justice contact, suggesting that opportunities for early intervention exist within Oregon's social service system. The following is a report of OYA's second feeder system analysis wherein we attempt to identify specific areas within the social service system that deserve further exploration and where interventions may best be targeted. Analyses were guided by two research questions: 1) how do the histories of social service program involvement among youth committed to OYA compare to those of individuals who are not involved with OYA; and 2) what is the statistical importance of involvement in a given program area relative to the probability of commitment to OYA custody?

The sample (n=18,152) included a cohort of youth committed to OYA between January, 2000 and July, 2013 and a comparison group of non-OYA individuals randomly selected from historical DHS/OHA client records. Sampled OYA youth (n=9,076) and the individuals in the comparison group (n=9,076) were born between January, 1981 and July, 2013 and had contact with at least one DHS/OHA program area prior to the study end date (OYA commitment date for OYA youth, and 19th birthdate for the comparison group). OYA youth records of involvement with Alcohol and Drug Treatment Services, Mental Health Treatment Services, Medical Assistance, Self-Sufficiency, and Child Welfare were considered against those of individuals in the comparison group.

Histories of social service involvement differed significantly between OYA youth and individuals in the comparison group. Findings indicate that the prevalence of contact with Mental Health Treatment Services, Alcohol and Drug Treatment Services, Foster Care, and Child Protective Services was significantly higher among OYA youth relative to the comparison group, suggesting different levels of need in these areas. In contrast, the rate of involvement with Self-Sufficiency programs was significantly higher among individuals in the comparison group relative to OYA youth. Only small differences were found between OYA youth and the comparison group regarding prior contact with Medical Assistance.

Data also indicate that social service involvement is statistically associated with the probability of OYA commitment. Results of the statistical model suggest strong effects for Mental Health Treatment Services, Alcohol and Drug Treatment Services, and Foster Care. Sampled individuals with records showing contact with these program areas were between four and eight times more likely to become involved with OYA. These findings may suggest that youth who become involved with OYA are more likely to be removed from home and to struggle with mental health issues or substance abuse. Contact with Medical Assistance was also related to increased probability of OYA commitment, however this effect is likely due to a significant overlap with Foster Care. Interestingly, participation in Self-Sufficiency was found to decrease in the probability of OYA involvement by approximately 30%.

The next feeder system analysis will rely upon the findings from the current study and concentrate on data from education and program areas that contribute to the probability OYA commitment. Focus will be concentrated on various factors such as type of treatment received, program dose and/or length, program instability (e.g., multiple Foster Care placements), and program participation and completion. Individual and family-level characteristics such as age, individual risk and protective factors, family characteristics, and adverse childhood events will also be examined.

Introduction and Research Questions

The following is a report of the second analysis in a series related to the Oregon Youth Authority's (OYA) work on the juvenile justice feeder system. OYA researchers are attempting to identify youth who are at risk of becoming involved with the juvenile justice system using individual and family-level records of service involvement and program utilization from other state and local agencies. Identifying the child and family characteristics that impact the risk of involvement with OYA represents the first step toward the development of strategies to prevent criminal activity and victimization. OYA is conducting its feeder system work in partnership with the Department of Human Services (DHS), Oregon Health Authority (OHA), Department of Education, Employment Department, State Police, local juvenile departments, and the Department of Corrections.

OYA's first feeder system analysis[1] provided an illustration of the social service (i.e., DHS and OHA) program usage of delinquent youth prior to their first commitment to OYA probation or close custody (i.e., incarceration). Findings suggest that 90% of youth committed to OYA between 2000 and 2013 were involved with at least one DHS or OHA program area in the years preceding commitment. However, this first analysis did not explore the extent to which the service utilization patterns of these youth differ from a comparable group of individuals who were not committed to OYA. Such a comparison would allow researchers to determine the areas in which youth tend to seek assistance prior to juvenile justice involvement and, by extension, approximate their greatest needs. Identifying these areas of need will guide more targeted analyses on the individual and family-level factors that contribute to a youth's risk of involvement in the juvenile justice system.

The current analysis models a comparison between the social service program histories of youth who are involved with OYA and individuals with no OYA involvement. Analyses are focused on the following research questions: 1) How do the histories of social service program involvement among youth committed to OYA compare to those of individuals who are not involved with OYA? 2) What is the statistical importance of involvement in a given program area (signifying a need for service) relative to the probability of commitment to OYA custody (i.e., felony probation or close custody)?

Data

Administrative records of Oregon citizen involvement with DHS, OHA, and OYA over a period of approximately 13 years were compiled into a single dataset. Data from DHS included records from Self-Sufficiency (January, 2000-December, 2013) and its subprograms such as the Supplemental Nutrition Assistance Program (SNAP; i.e., food stamps), Temporary Assistance to Needy Families (TANF), Child Care Services, and assistance programs for domestic violence survivors and their children. Also from DHS, records related to historical contact with Foster Care (January, 1998-December, 2010) and Child Protective Services (i.e., substantiated child maltreatment claims; January, 1993-December, 2010) were included. Data from OHA consisted of records from Medical Assistance (January, 2000-December, 2013) and its subprograms (e.g., Poverty-Level Medical Care, Medicaid, and Foster/Substitute Care Medical), Mental Health Treatment Services (e.g., Child/Adolescent Basic Outpatient and Crisis Services; January, 2000-December, 2013), and Alcohol and Drug Treatment Services (e.g., Outpatient and Residential treatment; January, 2000-December, 2013). Nearly 2.6 million individuals were represented in the initial dataset containing client records from each of the DHS and OHA program areas. Data from OYA included individual records for a cohort of youth

[1] Braun, M. J. F. (2014). Prevalence of DHS and OHA program access prior to first OYA commitment: An exploratory analysis. Retrieved November 14, 2014: http://www.oregon.gov/oya/docs/YRS_documents/FeederSystemStudy-Report1.pdf

(n=10,017) who were committed to either felony probation or close custody for the first time between January, 2000 and July, 2013.

The current analysis compares the historical utilization of social service programs between the cohort of youth committed to OYA and a similar group of individuals with no OYA involvement. To select a comparison group, the initial dataset of 2.6 million individuals was restricted based on several key factors. First, data were limited to those who were "eligible" for OYA services within the same time period covered by data from the OYA cohort (i.e., January 1, 2000 and July 21, 2013). "Eligibility" for OYA services was determined by examining client age, date of birth, and date of death (when available[2]). Pursuant to Oregon law, youth can only be committed to the care and custody of OYA between the ages of 12 and 19; therefore individuals in the initial dataset who were born between January 1, 1981 and July 21, 2001—and who were not deceased before the age of 12[3]—were considered "eligible" for OYA services. Data were further limited only to individuals for whom key demographic information (i.e., gender[4]) was available and consistent across systems and to those whose involvement with social service programs occurred prior to the end of their window of OYA "eligibility." That is, only individuals who accessed one or more program areas before their 19th birthday were considered for inclusion in the comparison group. Elimination of records based on these criteria resulted in a pool of n=632,384 individuals from which the comparison group could be drawn.

Of the cohort of n=10,017 youth committed to OYA custody, a small number (n=941) had no history of social service program involvement according to DHS/OHA records. Conversely, all individuals in the pool for the comparison group accessed at least one DHS or OHA service program prior to their 19th birthday. In order to conduct the most equitable comparison as possible, only youth from the OYA cohort who had at least one point of DHS and/or OHA program contact prior to commitment were included in the analysis. Elimination of these observations reduced the sample of youth committed to OYA to n=9,076. An equal number were randomly selected from the pool of individuals with no OYA involvement to create the comparison group, resulting in a final sample for analysis of n=18,152. Similar to previous analyses,[5] the researcher identified the first record of program involvement that occurred prior to each sampled individuals' "study end date." For those with OYA involvement, the study end date is defined as the date of commitment to either felony probation or close custody. For those with no OYA involvement, the study end date is defined as the person's 19th birthday (i.e., the date when they are no longer "eligible" for OYA services). Dichotomous variables were created to signify involvement/no involvement in all DHS/OHA program areas prior to each sampled individual's study end date.

Data coding strategies to account for overlap in program involvement. In times of difficulty, families or individuals may rely upon government assistance programs to meet basic needs, reestablish independence, and maintain wellbeing. Oftentimes when an individual or family seeks support in a certain area (e.g., nutrition or cash assistance), they find they are eligible for services in other areas as well. For example, because of its basic necessity, families are likely to first seek assistance to buy food (i.e., Self-Sufficiency SNAP services); and when their eligibility for nutrition assistance is determined they may find that they are also eligible for benefits to pay for medical care (i.e., Medical Assistance). Similarly, families or individuals who become involved with a certain program may be automatically enrolled in other services as

[2] Date of death information is only found in records from Self-Sufficiency, Medical Assistance, and Child Protective Services (i.e., where maltreatment claim type is "Fatality").
[3] Data indicate n=188 individuals born between January 1, 1981 and July 21, 2001 were deceased before their 12th birthday.
[4] Approximately n=14,527 (1.6%) records contained inconsistent or missing information on client gender, therefore these cases were eliminated from further consideration in the comparison group.
[5] See Footnote 1.

policy requires. For instance, Oregon Child Welfare policy mandates that children placed in Foster Care receive benefits to pay for both medical care and mental health assessment and/or treatment. In this case, involvement with Foster Care causes enrollment in Medical Assistance and/or Mental Health Treatment Services.

This inherent overlap in program involvement is reflected in the data used for the current analysis. For example, many individuals in the data have the same or very close service start dates between different program areas that typically coincide (as described above; e.g., Foster Care and Medical Assistance); and as a result dichotomous variables denoting program involvement are highly intercorrelated. Most statistical modeling techniques such as logistic regression are sensitive to correlations among variables (i.e., multicollinearity); therefore we approached data coding in a way that reduced multicollinearity without, we believe, jeopardizing the integrity of the data or losing important information. Specifically, service start dates between program areas that are known to overlap (i.e., Foster Care and Medical Assistance, Foster Care and Mental Health Treatment Services, and Self-Sufficiency and Medical Assistance) were examined for proximity within 60 days or less. If start dates for the overlapping program pairs occurred within 60 days of each other, dichotomous variables indicating program involvement were recoded to reflect involvement in only one of the two programs instead of both. To illustrate, if an individual's data reflected Foster Care and Medical Assistance services beginning within 60 days of each other, that individual's data was recoded to indicate Foster Care involvement and not Medical Assistance.[6] Similarly, data indicating Foster Care and Mental Health Treatment Services starting within 60 days of each other were recoded to reflect Foster Care involvement and not Mental Health Treatment Services.[7] Finally, if an individual was involved in both Self-Sufficiency and Medical Assistance beginning within 60 days of each other, that individual's data was recoded to reflect involvement in Self-Sufficiency and not Medical Assistance.[8] Figure 1 provides a more detailed illustration of how the recoding strategy impacts the data in each affected program area.

Sample

The final sample included n=9,076 youth committed to OYA probation or close custody for the first time[9] between January, 2000 and July, 2013; a comparison group of n=9,076 individuals were randomly selected from a pool of DHS/OHA clients who were between the ages of 12 and 19 during the same time period. Sex and race/ethnicity information for both groups is presented in Table 1. Approximately 83% of the sample of OYA youth are male, and the remaining 17% are female. In the comparison group, males and females are distributed evenly (50% male and 50% female).[10] Seventy percent of youth in the OYA group are

[6] Placement in Foster Care automatically initiates Medical Assistance benefits for children who are removed from home. Therefore, the decision to recode Foster Care/Medical Assistance overlap as Foster Care alone is based on the assumption that these individuals' access to Medical Assistance was likely caused by their involvement with Foster Care.

[7] Children placed in Foster Care are required to undergo a mental health assessment within 60 days of removal from home, the results of which may prompt ongoing treatment. Therefore, the decision to recode Foster Care/Mental Health Treatment Services overlap as Foster Care alone is based on the assumption that access to Mental Health Treatment Services was likely prompted by involvement with Foster Care.

[8] Those familiar with the process of accessing government benefits indicate that, because of its basic necessity, the need for food (i.e., SNAP) is often what initially prompts struggling families to seek government assistance. Upon initiating Self-Sufficiency benefits families often discover they are eligible for other benefit programs, the most common of which is Medical Assistance. Therefore, the decision to recode Self-Sufficiency/Medical Assistance overlap as Self-Sufficiency is based on the likely scenario that Medical Assistance benefits are prompted by accessing Self-Sufficiency, and not the other way around.

[9] Youth committed to OYA close custody on a revocation were excluded from the OYA sample.

[10] Selection of individuals for the comparison group was purposely not stratified by sex, race/ethnicity, and age (other than within the window of eligibility) in order to ensure that the group accurately represented the population of DHS/OHA clients. Models were estimated with the current sample and a matched sample stratified on sex, race/ethnicity, and age, and it did not impact the results dramatically.

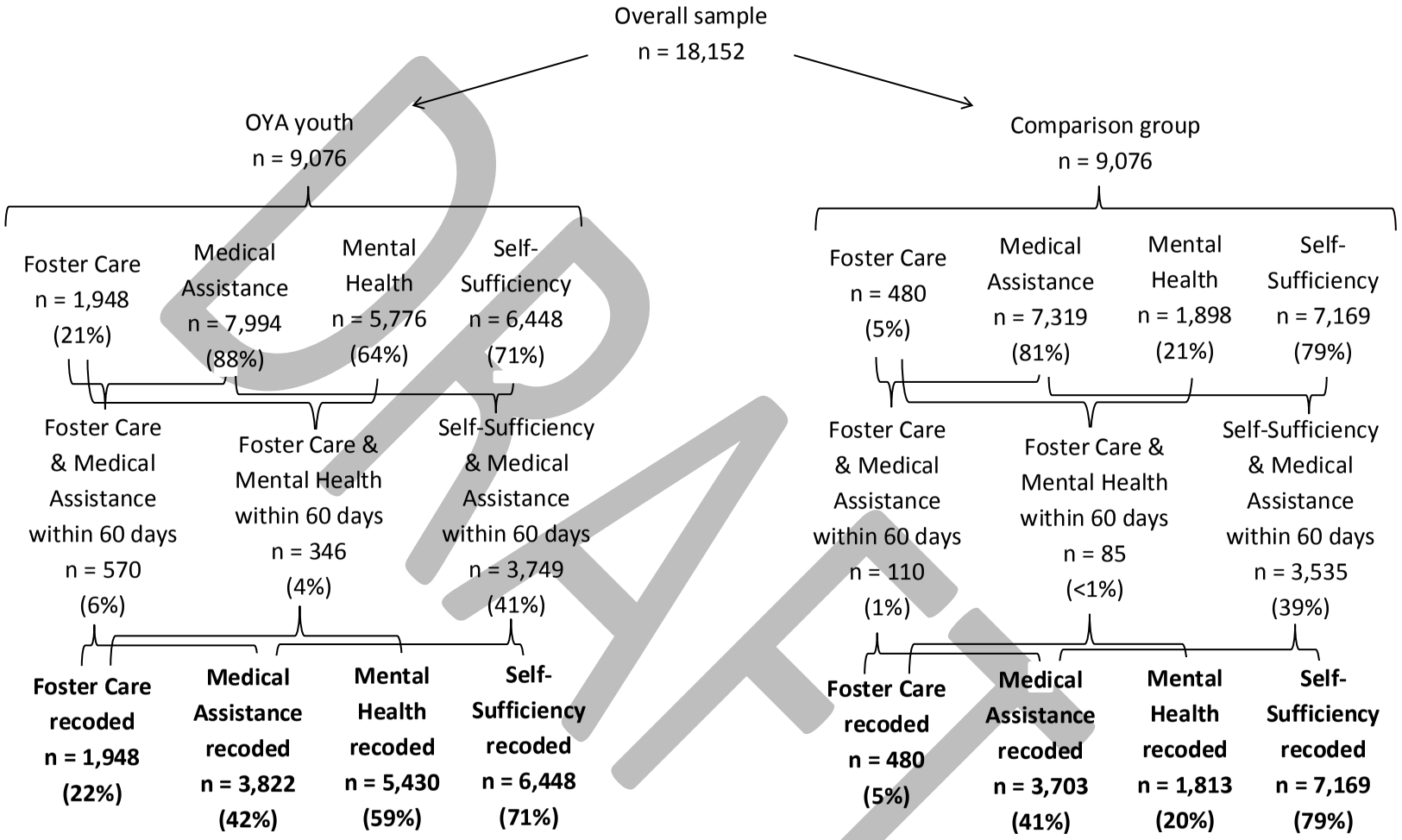

Figure 1.

Impact to data after recoding to account for program overlap.

Table 1.

Sex and race/ethnicity information for sampled OYA youth (n=9,076) and the comparison group (n=9,076).

	OYA Youth		Comparison Group	
	n	Percent	n	Percent
Sex				
Male	7,480	83%	4,519	50%
Female	1,596	17%	4,557	50%
Race/Ethnicity				
Caucasian	6,400	70%	5,622	62%
Hispanic/Latino	1,440	16%	1,116	12%
African American	726	8%	326	4%
Native American	329	4%	247	3%
Asian	80	1%	214	2%
Other/Unknown	101	1%	1,503	17%

Caucasian, followed by 16% Hispanic/Latino, 8% African American, 4% Native American, 1% Asian, and 1% Other/Unknown. In the comparison group, 62% of individuals are Caucasian, followed by 12% Hispanic/Latino, 4% African American, 3% Native American, and 2% Asian. Seventeen percent of individuals in the comparison group are classified within the race/ethnicity category of Other/Unknown.[11]

Additional descriptive information specific to OYA youth and their commitment to probation or close custody is presented in Table 2. The majority of OYA youth were between the ages of 14 and 17 years old (86%) at the time of first commitment to OYA. Forty-nine percent were adjudicated in Oregon counties surrounding either the Portland metro area (Multnomah, Washington, and Clackamas) or Salem metro area (Marion, Polk, and Yamhill).[12] Sixty percent were entering OYA for the first time on a felony probation disposition; twenty-eight percent were committed to OYA on a close custody disposition, and the remaining 12% were convicted as adults and committed to close custody under DOC jurisdiction. For the majority (37%) of sampled OYA youth, the most severe charge on the disposition was a property offense, followed by 28% with a person (i.e., violent) offense, and 19% with a sex offense. The most severe charge on dispositions for the remaining 12% of OYA youth included Substance Abuse (7%), Criminal-Other (4%), Weapons offenses (3%), and Violation of a Public Order (2%). The mean score on the OYA Recidivism Risk Assessment (ORRA) was 25 (*SD*=16), indicating that upon intake the average sampled OYA youth had a 25% probability of being adjudicated/convicted for a new felony within 3 years of their commitment to probation or release from close custody. The mean score on the OYA Recidivism Risk Assessment-Violent (ORRA-V) was 16 (*SD*=10), indicating that upon intake the average sampled OYA youth had a 16% probability of being adjudicated/convicted for a new violent felony within the same period of time.[13]

[11] Relative to OYA youth, a significantly larger proportion of individuals in the comparison group have a race/ethnicity classification of "Other/Unknown" due to inconsistencies found within DHS/OHA records. Individuals with missing and/or inconsistent race/ethnicity information across different program areas are classified as "Other/Unknown."

[12] Per the terms of the data sharing agreement established between OYA and DHS|OHA, some of the 36 Oregon counties were collapsed into groups by DHS|OHA staff (see Table 2).

[13] Because of the extensive time period covered by the OYA data (i.e., 2000-2013), Youth Typology information was not available for the majority of sampled youth and is therefore not reported.

Table 2.

Descriptive information specific to sampled OYA youth (n=9,076).

Variable	n	Percent	Mean	*SD*	Range
Age at Commitment			15.6 years	1.4 years	12-19 years
12 – 13 years	754	8%			
14 – 15 years	3,237	36%			
16 – 17 years	4,544	50%			
18 – 19 years	541	6%			
County of Disposition					
Multnomah	1,240	14%			
Washington	892	10%			
Clackamas	948	10%			
Yamhill, Polk, Marion	1,387	15%			
Columbia, Clatsop, Tillamook, Lincoln	550	6%			
Benton, Linn, Lane	1,250	14%			
Douglas, Coos, Curry	610	7%			
Josephine, Jackson	809	9%			
Jefferson, Deschutes, Crook	440	5%			
All others[14]	950	11%			
Disposition Type					
OYA Probation	5,415	60%			
OYA Close Custody	2,516	28%			
DOC Close Custody	1,145	12%			
Most Severe Charge on this Disposition					
Property	3,406	37%			
Person	2,522	28%			
Sex Offense	1,723	19%			
All others[15]	1,425	16%			
OYA Recidivism Risk Assessment			25	16	2 - 98
OYA Recidivism Risk Assessment-Violent			16	10	1 - 82

Findings

Data reflecting the prevalence of program involvement among OYA youth, the comparison group, and across the entire sample are presented in Table 3. Self-Sufficiency is by far the most heavily accessed program area across the entire sample, with records indicating 75% accessed one or more Self-Sufficiency programs at least one time prior the study end date (i.e., date of OYA commitment or date of 19th birthday). Medical Assistance programs were accessed by 42% of the overall sample,[16] 40% have records of

[14] Hood River, Wasco, Sherman, Gilliam, Wheeler, Grant, Harney, Malheur, Klamath, Lake, Morrow, Umatilla, Wallowa, Baker.
[15] Substance Abuse (7%), Criminal-Other (4%), Weapons offenses (3%), and Violation of a Public Order (2%).
[16] Per the Medical Assistance variable that was recoded to account for concurrent Foster Care and/or Self-Sufficiency involvement.

Table 3.

Program involvement of OYA youth (n=9,076), the comparison group (n=9,076), and across the entire sample (n=18,152).

Program Area/Type	Overall Sample	OYA Youth	Comparison Group
Self-Sufficiency	**13,617 (75%)**	**6,448 (71%)**	**7,169 (79%)**
SNAP	10,849	4,975	5,874
TANF	1,587	865	722
Child Care Services	832	454	378
Domestic Violence Programs	280	137	143
Other Self-Sufficiency	69	17	52
Medical Assistance[17]	**7,525 (41%)**	**3,822 (42%)**	**3,703 (41%)**
Poverty-Level Medical Care	3,050	1,158	1,892
Foster/Substitute Care-Medical	1,604	1,452	152
Children's Health Insurance Program	1,057	421	636
TANF-Related Medical Care	892	498	394
Citizen-Alien/Waived Emergency Medical	574	192	382
Other Medical Assistance	348	101	247
Mental Health Treatment Services[18]	**7,243 (40%)**	**5,430 (59%)**	**1,813 (20%)**
Child/Adolescent Basic Outpatient	6,021	4,506	1,515
Crisis Services	918	691	227
Psychiatric Residential and Day Treatment	229	206	23
Other Mental Health Treatment Services	75	27	48
Alcohol & Drug Treatment Services	**4,620 (25%)**	**3,929 (43%)**	**691 (8%)**
Outpatient Drug Treatment	3,385	2,941	444
Outpatient Alcohol Treatment	959	790	169
Residential Drug and Alcohol Treatment	223	182	41
Other Alcohol and Drug Treatment Services	53	16	37
Child Welfare: Child Protective Services[19]	**3,252 (18%)**	**2,161 (24%)**	**1,091 (12%)**
Threat of harm	1,629	1,001	628
Neglect or Mental Injury	1,015	681	334
Physical abuse	572	444	128
Sexual abuse	451	302	149
Child Welfare: Foster Care	**2,428 (13%)**	**1,948 (22%)**	**480 (5%)**
Number of programs accessed	***M*=2 (*SD*=1)**	***M*=2.6 (*SD*=1)**	***M*=1.7 (*SD*=0.9)**
One program	6,825 (37%)	1,760 (10%)	5,065 (28%)
Two programs	5,374 (30%)	2,697 (15%)	2,677 (15%)
Three programs	3,439 (19%)	2,536 (14%)	903 (5%)
Four programs	1,823 (10%)	1,493 (8%)	330 (2%)
Five programs	597 (3%)	502 (3%)	95 (<1%)
Six programs	94 (<1%)	88 (<1%)	6 (<1%)

[17] Recoded variable to account for overlap between Medical Assistance and either Foster Care and/or Self-Sufficiency.
[18] Recoded variable to account for overlap between Mental Health Treatment Services and Foster Care.
[19] A single child maltreatment claim may include multiple types of abuse.

involvement with Mental Health Treatment Services,[20] and 25% were involved with Alcohol and Drug Treatment Services. Eighteen percent of the overall sample had at least one contact with Child Protective Services, and 13% were placed in Foster Care at least one time prior to the study end date. In terms of the number or count of different program areas individuals accessed over time, 37% of the overall sample have records of involvement with a single program, 30% were involved with two programs, 19% accessed four, and 3% had contact with five. Only 1% were involved with all six DHS/OHA program areas prior to either OYA commitment or their 19th birthday. The average (mean) number of programs accessed over time for the entire sample is 2 (*SD*=1). Differences in program involvement between OYA youth and the comparison group are illustrated below.

Research Question 1: Differences Between Groups

Our first research question asks, how do the histories of social service program involvement among youth committed to OYA compare to those of individuals who are not involved with OYA? Chi square analyses were conducted to examine differences in the social service program involvement of OYA youth versus the comparison group. The Chi square statistic allows researchers to determine whether differences in one variable are related to differences in another variable or to chance alone. In other words, the Chi square statistic examines patterns between variables and provides evidence as to whether these patterns significantly differ from what would be expected through random variation (i.e., chance). Chi square is used in the current analysis to determine whether OYA commitment is statistically related to previous involvement in a particular social service program. If there are no significant differences in prior service program involvement between OYA youth and the comparison group (i.e., suggesting that program contact is due to chance alone and not related to the individual's eventual involvement with OYA), the proportion of youth who had contact with each program area would be equally distributed across the four possible combinations of program access (did access vs. did not access) and group membership (OYA youth vs. comparison group).[21] To illustrate, we know that 75% (n=13,617) of the overall sample including both OYA youth and the comparison group accessed Self-Sufficiency programs at least once prior to their study end date (i.e., date of OYA commitment or 19th birthday). We also know that 50% (n=9,076) of the sample are youth who were committed to OYA and the other 50% (n=9,076) are individuals who were not committed to OYA. If involvement with Self-Sufficiency is not associated with being either an OYA youth or part of the comparison group, one would expect by pure chance that 75% of OYA youth and 75% of individuals in the comparison group would have records indicating Self-Sufficiency involvement prior to their outcome end date.

Results of the Chi square analysis are presented in Table 4. Findings indicate statistically significant differences in the social service histories of OYA youth relative to individuals in the comparison group across all program areas but one.

Self-Sufficiency. Data indicate significant differences in Self-Sufficiency involvement between OYA youth and the comparison group prior to the study end date, $\chi^2(1) = 152.8$, $p < .0001$. Seventy-one percent of OYA youth accessed one or more Self-Sufficiency programs prior to OYA commitment, which is significantly less than the proportion expected by chance (i.e., 75%). In contrast, 79% of individuals in the comparison group were involved with Self-Sufficiency at least once prior to their 19th birthday—4% more than expected

[20] Per the Mental Health Treatment Services variable that was recoded to account for concurrent Foster Care involvement.

[21] Specifically, (1) OYA youth who accessed the program, (2) OYA youth who did not access the program, (3) individual in comparison group who accessed the program, and (4) individual in comparison group who did not access the program.

Table 4.

Differences in program involvement between OYA youth (n=9,076) and the comparison group (n=9,076).

	Accessed program prior to study end date			
Program Area/Type	n	%	χ^2(df)	Significance *(p)*
Self-Sufficiency – Full Sample	13,617	75%	152.8(1)	<.0001[a]
OYA Youth	6,448	71%[-]		
Comparison Group	7,169	79%[+]		
Medical Assistance[22] – Full Sample	7,525	41%	3.2(1)	.073[b]
OYA Youth	3,822	42%[nd]		
Comparison Group	3,703	41%[nd]		
Mental Health Treatment Services[23] – Full Sample	7,243	40%	3005.5(1)	<.0001[c]
OYA Youth	5,430	59%[+]		
Comparison Group	1,813	20%[-]		
Alcohol & Drug Treatment Services – Full Sample	4,666	25%	3065.7(1)	<.0001[d]
OYA Youth	3,963	44%[+]		
Comparison Group	703	8%[-]		
Child Welfare: Child Protective Services – Full Sample	3,252	18%	428.8(1)	<.0001[e]
OYA Youth	2,161	24%[+]		
Comparison Group	1,091	12%[-]		
Child Welfare: Foster Care – Full Sample	2,428	13%[+]	1024.6(1)	<.0001[f]
OYA Youth	1,948	22%[+]		
Comparison Group	480	5%[-]		

[+] Proportion who accessed program is significantly larger than expected by chance; [-] Proportion who accessed program is significantly smaller than expected by chance; [nd] No statistical difference between proportion expected to access program and proportion that indeed accessed program. [a] Cramer's V = .09; [b] Cramer's V=.01; [c] Cramer's V=.41; [d] Cramer's V=.41; [e] Cramer's V=.15; [f] Cramer's V=.24.

by chance. Although the Chi square statistic is significant, the magnitude of the effect is small,[24] Cramer's V = .09.

Medical Assistance. There are no statistically significant differences between OYA youth and the comparison group with regard to involvement in Medical Assistance programs prior to the study end date, $\chi^2(1) = 3.2$, $p = .07$. Forty-two percent of OYA youth and 41% of individuals in the comparison group accessed one or more Medical Assistance programs prior to either OYA commitment or their 19th birthday. The proportion of individuals who were involved with Medical Assistance from each group are statistically the same as expected by chance (i.e., 42%).

[22] Recoded variable to account for overlap between Medical Assistance and either Foster Care and/or Self-Sufficiency.

[23] Recoded variable to account for overlap between Mental Health Treatment Services and Foster Care.

[24] Based on Cohen's (1992) estimates for correlations and Chi square contingency tables where values of .10 represent a small effect, values of .30 reflect a moderate effect, and values of .50 represent a large effect. Unlike significance values (i.e., *p* values), effect size is not influenced by sample size and can be interpreted as the magnitude of the difference between the two groups. A small effect size suggests the differences between groups (although statistically significant) are modest; a large effect size indicates the differences between groups are substantial, and so on. Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Mental Health Treatment Services. Patterns of involvement with Mental Health Treatment Services differ significantly between OYA youth and the comparison group, $\chi^2(1) = 3005.5$, $p < .0001$. Findings indicate that 59% of OYA youth were involved with Mental Health Treatment Services at least one time prior to OYA commitment, which is a significantly larger proportion than expected by chance (i.e., 40%). Only 20% of individuals in the comparison group were involved with Mental Health Treatment Services prior to their 19th birthday—half of the proportion expected by chance. The effect size is moderate to large, Cramer's $V = .41$.

Alcohol and Drug Treatment Services. Analyses indicate that involvement with Alcohol and Drug Treatment Services also differed between OYA youth and the comparison group, $\chi^2(1) = 3065.7$, $p < .0001$. Forty four percent of OYA youth have records of involvement with Alcohol and Drug Treatment Services prior to OYA commitment—nearly twice the proportion expected by chance (i.e., 25%). In stark contrast, only 8% of individuals in the comparison group accessed Alcohol and Drug Treatment Services prior to their 19th birthday which is significantly fewer than expected by chance. Again, the magnitude of the effect is moderate to large, Cramer's $V = .41$.

Child Welfare: Child Protective Services. Data suggest the proportions of OYA youth and individuals in the comparison group who had contact with Child Protective Services prior to OYA commitment also differed significantly from chance, $\chi^2(1) = 428.8$, $p < .0001$. Records indicate that 24% of OYA youth and 12% of individuals in the comparison group had a least one contact with Child Protective Services prior to either OYA commitment or their 19th birthday. That is, 24% of OYA youth were identified on at least one substantiated child maltreatment claim versus 12% in the comparison group. The proportion of OYA youth who had contact with Child Protective services is significantly larger than expected, whereas the proportion of individuals in the comparison group is significantly smaller than expected by chance (i.e., 18%). The effect size in this case is small to moderate, Cramer's $V = .15$.

Child Welfare: Foster Care. Differences in contact with Foster Care between OYA youth and the comparison group were also significant, $\chi^2(1) = 1024.6$, $p < .0001$. Records for 22% of OYA youth indicated at least one Foster Care episode prior to OYA commitment, which is a significantly larger percentage than expected by chance (i.e., 13%). Only 5% of individuals in the comparison group had records showing at least one Foster Care episode prior to their 19th birthday—less than half the proportion expected by chance. The effect size is just below moderate, Cramer's $V = .24$.

Count of programs accessed. An independent samples t-test was conducted to determine whether the social service histories of OYA youth and the comparison group differed in terms of the average number of program areas accessed prior to the study end date. Table 5 shows that the average (mean) number of different program areas accessed by OYA youth is significantly larger than the average number accessed by individuals in the comparison group, $t(18{,}150) = 62.6$, $p < .0001$. Before OYA commitment, OYA youth were involved with an average of 2.6 (SD=1.2) DHS/OHA program areas. In contrast, individuals in the comparison group were involved with about 1.7 (SD=0.9) different program areas prior to their 19th birthday. In other words, OYA youth are more likely to have been involved with a larger variety of program areas before OYA commitment relative to individuals in the comparison group prior to their 19th birthday.

Research Question 2: Program Involvement and the Probability of OYA Commitment

Our second research question concerns the statistical importance of involvement in a given DHS/OHA program area relative to the probability of commitment to OYA. Specifically, does contact with a certain program area increase or decrease the estimated probability that an individual in the overall sample is committed to OYA? To answer this question, dichotomous variables indicating each sampled individual's

Table 5.

Average number of program areas accessed by OYA youth versus the comparison group prior to study end date.

Number of Programs Accessed	n	Mean (*SD*)	*t*	Significance *(p)*
OYA Youth	9,076	2.6 (*1.2*)	62.6	<.0001
Comparison Group	9,076	1.7 (*0.9*)		

history of involvement with Self-Sufficiency (Yes/No), Medical Assistance (Yes/No), Mental Health Treatment Services (Yes/No), Alcohol and Drug Treatment Services (Yes/No), Child Protective Services (Yes/No), and Foster Care (Yes/No), were entered into a backward stepwise logistic regression model predicting OYA commitment (Yes/No).

Results of the final model are presented in Table 6. Dichotomous variables representing involvement in Alcohol and Drug Treatment Services, Mental Health Treatment Services, Foster Care, Self-Sufficiency, and Medical Assistance remained in the model at its final step, and together significantly predicted OYA commitment (-2LL = 18,908.57; $\chi^2[5] = 6{,}255.45$, $p < .0001$). Regression coefficients indicate that involvement in Alcohol and Drug Treatment Services significantly predicts OYA commitment ($\beta = 2.06$, $p < .0001$) such that individuals who were involved with this program area at least once prior to the study end date were nearly seven times more likely to be committed to OYA (Odds ratio$[OR]_{A\&D\ Treatment} = 7.83$). Previous involvement with Mental Health Treatment Services also predicts OYA commitment ($\beta = 1.57$, $p < .0001$) such that individuals with Mental Health Treatment Services records were almost five times more likely to be committed to OYA ($OR_{Mental\ Health\ Treatment} = 4.81$). Regression coefficients also suggest that involvement with Foster Care significantly predicts OYA commitment ($\beta = 1.36$, $p < .0001$). Sampled individuals whose records indicate at least one Foster Care episode prior to the study end date were nearly four times more likely to be committed to OYA ($OR_{Foster\ Care} = 3.91$). Previous Self-Sufficiency involvement also predicts OYA commitment, but in the opposite direction ($\beta = -0.36$, $p < .0001$). Odds ratios indicate that the probability of OYA commitment was about 30% less for sampled individuals whose service histories include Self-Sufficiency programming prior to the study end date ($OR_{Self\text{-}Sufficiency} = 0.69$). Finally, model statistics suggest involvement with Medical Assistance significantly predicts OYA commitment ($\beta = 0.14$, $p < .0001$), such that the probability of OYA commitment is about 15% greater for sampled individuals who were in contact with this program area ($OR_{Medical\ Assistance} = 1.15$).

The accuracy of the final model in predicting OYA commitment was assessed by examining the area under the receiver operating characteristic curve (AUC). Analyses produced an AUC of .81, suggesting the combination of variables in the final model accurately predicted OYA commitment in this sample of individuals about 81% of the time.

Interpretation

The current analysis expanded upon OYA's preliminary feeder system work by comparing the social service histories of OYA youth with those of a random sample of individuals with no OYA involvement. Sample selection procedures revealed that OYA commitment is a relatively rare event among Oregon citizens who are involved with one or more DHS/OHA program areas during childhood and/or adolescence. To illustrate, recall that the comparison group was selected from a pool of n=632,384 individuals who were born between January 1, 1981 and July 21, 2001 and accessed one or more DHS/OHA program areas before the

Table 6.

Final step of the backward stepwise logistic regression model predicting OYA commitment within the sample of OYA youth (n=9,076) and the comparison group (n=9,076).[a]

Variable	β	S.E.	Wald	df	Sig.	Odds ratio
Constant	-1.01	.05	457.90	1	.000	0.37
Alcohol and Drug Treatment Services involvement (Yes/No)	2.06	.05	1874.26	1	.000	7.83
Mental Health Treatment Services involvement (Yes/No)	1.57	.04	1794.15	1	.000	4.81
Foster Care involvement (Yes/No)	1.36	.06	517.59	1	.000	3.91
Self-Sufficiency involvement (Yes/No)	-0.36	.04	73.82	1	.000	0.69
Medical Assistance involvement (Yes/No)	0.14	.04	13.20	1	.000	1.15

[a] AUC = .81.

age of 19. Likewise, sampled OYA youth (n=9,076) were also born between January 1, 1981 and July 21, 2001 and accessed one or more DHS/OHA program areas before OYA commitment. Therefore, of the 641,460 total individuals who were born during the same time period and accessed at least one DHS/OHA program area during childhood and/or adolescence, only 9,076 (1.4%) experienced OYA commitment. This certainly suggests that the majority of individuals who are involved with social services early in life do not become involved with OYA. Among those who do, our analysis indicates that certain patterns of program involvement may be observed in the data.

With regard to differences in service history, results suggest that OYA youth differ significantly from the comparison group in both the type and number of program areas accessed prior to their study end date. The prevalence of contact with Mental Health Treatment Services, Alcohol and Drug Treatment Services, Foster Care, and Child Protective Services was significantly higher among OYA youth relative to the comparison group; whereas contact with Self-Sufficiency prior to the study end date was more likely among non-OYA individuals in the comparison group. The rate of previous involvement with Medical Assistance was statistically equal between OYA youth and the comparison group, however the proportion of individuals who accessed Medical Assistance prior to the study end date was slightly larger among OYA youth. Findings also indicate that the average number of different program areas accessed prior to the study end date was significantly larger among OYA youth relative to the comparison group. OYA youth were involved with nearly 3 different program areas prior to OYA commitment, whereas individuals in the comparison group were involved with about 2 programs before their 19th birthday. More detailed explanation of the findings appears below. Limitations to interpretation are considered in the final section.

Differences in Program Involvement between OYA Youth and the Comparison Group

The largest discrepancy between the social service histories of OYA youth and the comparison group is found in contact with Alcohol and Drug Treatment Services. Nearly half (44%) of the sample of OYA youth had records of contact with Alcohol and Drug Treatment Services at least once prior to OYA commitment, while only 8% of the comparison group were involved with this program area before their 19th birthday. In the regression model predicting OYA commitment, Alcohol and Drug Treatment Services produced an odds ratio of 7.83 indicating that sampled individuals with records of alcohol and/or drug treatment are nearly eight times more likely to become involved with OYA. This finding may suggest that youth who become

involved with OYA are more likely than those in the comparison group to struggle with substance abuse and require treatment for these problems. Previous research corroborates the link between youth substance abuse and delinquency such as interpersonal assault and carrying a weapon at school; however much of the prior literature also suggests that both substance abuse and delinquency among youth may be related to earlier experiences of physical abuse and victimization.[25] Given that we found a higher incidence of child maltreatment among OYA youth relative to the comparison group, the current findings may also indicate an underlying connection between previous victimization, substance abuse, and eventual delinquency.

Similarly large differences were found between the sample of OYA youth and the comparison group regarding history of Mental Health Treatment Services. Data indicate that more than half (59%) of OYA youth were involved with Mental Health Treatment Services prior to OYA commitment versus 20% of individuals in the comparison group before their 19th birthday. Estimates from the model predicting OYA commitment suggest that a history of Mental Health Treatment Services—and theoretically mental illness—increases the odds of becoming involved with OYA nearly fivefold. These results align with others regarding mental illness among delinquent and non-delinquent youth. For example, prior studies have estimated the rate of mental health disorders to be somewhere between 67-85% among delinquent youth in a variety of custody settings.[26,27] Estimates of mental illness among youth in the general population range between 20-40%,[28,29] similar to the findings from our comparison group.

There were also significant discrepancies in Child Welfare involvement between OYA youth and the comparison group. Records indicate that only 5% of individuals in the comparison group experienced Foster Care prior to their 19th birthday, and 12% had contact with Child Protective Services. In stark contrast, approximately 22% of OYA youth were in Foster Care at least once before commitment, and 24% were identified on at least one maltreatment claim substantiated by Child Protective Services. Although involvement with Child Protective Services did not remain in the statistical model predicting OYA commitment, estimates for the effect of Foster Care on the probability of OYA commitment were quite large. The odds ratio for Foster Care involvement was 3.91, suggesting that sampled individuals who experienced at least one Foster Care episode prior to the study end date were nearly four times more likely than those with no history of Foster Care to become involved with OYA. The association between Child Welfare involvement and OYA commitment corroborates other research on the issue of "crossover youth" (i.e., youth who have histories of contact with both the Child Welfare and delinquency systems).[30] Previous literature indicates that children and youth who experience parental abuse and neglect are significantly more likely to engage in

[25] Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: What protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *Journal of Adolescent Health, 35*(5), 424.e1-424.e10.

[26] Robertson, A. A., Dill, P. L., Husain, J., & Undesser, C. (2004). Prevalence of mental illness and substance abuse disorders among incarcerated juvenile offenders in Mississippi. *Child Psychiatry and Human Development, 35*(1), 55-74.

[27] Shufelt, J. L., & Cocozza, J. J. (2006). *Youth with mental health disorders in the juvenile justice system: Results from a multi-state prevalence study.* Retrieved from National Center for Mental Health and Juvenile Justice website: http://www.ncmhjj.com/wp-content/uploads/2013/07/7.-PrevalenceRPB.pdf

[28] Cocozza, J. J. (1992). *Responding to the mental health needs of youth in the juvenile justice system.* Seattle, WA: The National Coalition for the Mentally Ill in the Criminal Justice System.

[29] Merikangas, K. R., He, J. P., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L.,…Swendsen, J. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Survey Replication-Adolescent Supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry,49*(10), 980-989. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2946114/

[30] Feyerherm, W., & Johnson, S. (2012). Juvenile Justice and Child Welfare: Estimates of the crossover between Oregon's systems. Report prepared for the Oregon Youth Development Council. Retrieved July 22, 2014 from http://www.ode.state.or.us/wma/ydd/1aaoregonjuvenilejusticeandchild welfarecrossoveryouth.pdf

delinquent behavior than children with no history of maltreatment.[31] Research on the relationship between Foster Care and criminal behavior is somewhat mixed, however a substantial amount of evidence suggests that both out-of-home placement and placement instability while in Foster Care correlate with later delinquency.[32, 33] Further analysis is necessary to determine whether the current effect of Foster Care on the probability of OYA commitment is influenced by placement instability and/or other experiences a youth may encounter during an out-of-home placement.

Findings indicate the relationship between Self-Sufficiency and OYA commitment differed from that of other program areas. Self-Sufficiency was the most commonly utilized program area among both OYA youth and the comparison group, however the prevalence of contact with Self-Sufficiency prior to the study end date was significantly larger among individuals in the comparison group (79%) relative to OYA youth (71%). The effect of Self-Sufficiency involvement on the probability of OYA commitment was also opposite of the effects of other program areas. Odds ratios indicate that the probability of OYA commitment is reduced by 30% among those who were involved with Self-Sufficiency programming prior to the study end date. This finding is somewhat surprising given prior research that suggests a connection between poverty and criminal behavior.[34] However, the current finding may instead approximate a measure of certain parental/family characteristics within the context of poverty, and their impact on children's later delinquency. Specifically, the decreased probability of OYA commitment associated with Self-Sufficiency involvement and the higher rate of Self-Sufficiency utilization within the comparison group may suggest that these individuals were more likely to be part of families who possessed the skills necessary to seek out and obtain assistance during times of instability. In other words, the comparison group and OYA youth may have experienced the same level of poverty and/or deprivation prior to the study end date, but caregivers for individuals in the comparison group may have been more capable of meeting their family's needs through seeking Self-Sufficiency. It is reasonable to imagine that such proactive, help-seeking behavior modeled by caregivers might moderate the relationship between poverty and children's later delinquency. Regardless, this finding along with its interpretation should be considered carefully. Any interpretation of the connection between poverty and delinquency is incomplete without reflecting on other important moderating issues including neighborhood characteristics, unemployment, educational achievement, and social/psychological factors. At the very least, our findings suggest that the relationship between poverty, Self-Sufficiency utilization, and later delinquency is complex and requires ongoing thought and analysis.

Finally, results indicate involvement in Medical Assistance was fairly similar between OYA youth and individuals in the comparison group prior to the study end date. Records show that 41% of individuals in the comparison group were involved with Medical Assistance prior to their 19th birthday, and 42% of OYA youth engaged in one or more Medical Assistance programs prior to OYA commitment. Results of the Chi square analysis indicate the prevalence of contact with this program area is statistically equal between the two groups (p = .07); however estimates derived from the regression model suggest that involvement with Medical Assistance significantly predicts the probability of OYA commitment. Odds ratios indicate that engagement with this program area prior to the study end date corresponds with a 15% increase in the

[31] Hoeve, M., Semon Dubas, J., Eichelsheim, V. I., van der Laan, P. H., Smeenk, W., & Gerris, J. R. M. (2009). The relationship between parenting and delinquency: A Meta-analysis. *Journal of Abnormal Child Psychology, 37,* 749-775.

[32] Ryan, J. P., & Testa, M. F. (2005). Child maltreatment and juvenile delinquency: Investigating the role of placement and placement instability. *Children and Youth Services Review, 27*(3), 227–249.

[33] Doyle, J. J., Jr. (2007). Child protection and child outcomes: Measuring the effects of foster care. *The American Economic Review, 97*(5), 1583–1610.

[34] For a recent review, see: Farrington, D.P., Loeber, R., & Ttofi, M. M. (2012). Risk and protective factors for offending. In B. C. Welsh & D. P. Farrington (Eds.), *The Oxford Handbook of Crime Prevention* (pp. 46-69). New York, NY: Oxford University Press.

probability of OYA commitment. The statistical importance of Medical Assistance involvement in the regression model may be driven largely by an apparent connection with Foster Care—particularly among OYA youth in the sample—that remains despite our efforts to recode the data to account for this overlap. While we recoded data points for individuals who were involved simultaneously (i.e., within 60 days) with Medical Assistance and Foster Care, there are additional cases that we did not recode where Medical Assistance benefits were likely prompted by Foster Care involvement at some point in time. Indeed, Table 2 shows that 40% of the OYA youth who were involved with Medical Assistance received this benefit via the "Foster/Substitute Care-Medical" subprogram, as well as 4% of individuals in the comparison group. The majority (51%) of individuals in the comparison group who were involved with Medical Assistance instead received benefits via the "Poverty-Level Medical Care" subprogram. In other words, the majority of OYA youth who were involved with Medical Assistance were provided these benefits because of a home removal and placement in Foster Care; whereas the majority of individuals in the comparison group who were involved with Medical Assistance accessed these benefits via a different avenue. These different pathways to accessing Medical Assistance may be contributing to the statistical significance of this program area in the prediction of OYA commitment, and are worth exploring further. Future analyses will continue to attempt to isolate the independent effects of Medical Assistance and Foster Care involvement on the probability of OYA commitment.

Predicting OYA Commitment from History of Social Services

The statistical model containing variables representing involvement with Mental Health Treatment Services, Alcohol and Drug Treatment Services, Foster Care, Self-Sufficiency, and Medical Assistance is significantly associated with the probability of OYA commitment. The AUC statistic of .81 indicates that the model accurately predicts OYA commitment in the current sample. The model is also well-equipped to detect "true positives" and "true negatives," although it does a slightly better job identifying true positives. Table 7 shows that the model correctly predicts OYA involvement 79% of the time and correctly predicts no OYA involvement 74% of the time. If one considers how the current model might be applied, it is reasonable to assert that a model with greater ability to predict true positives may be more important than one with greater ability to predict true negatives. For example, the model might be used to assess an individual's probability of OYA commitment and to determine whether that person is in need of more services to prevent involvement with the juvenile justice system. In that case, it might be better to over-identify individuals as needing additional targeted services instead of missing out on providing services to those who are truly in need. In other words, the potential consequences of more false positives are much less problematic than those related to more false negatives.

Table 7.

Classification table indicating the model's ability to correctly predict OYA involvement and no OYA involvement.

	Predicted		
Observed	OYA Involvement -No-	OYA Involvement -Yes-	Percentage Correct
OYA Involvement - No	6,728[a]	2,348[b]	74%
OYA Involvement - Yes	1,927[c]	7,149[d]	79%
Overall Percentage			76%

[a] True negatives; [b] False positives; [c] False negatives; [d] True positives.

Limitations

Like all research in the social sciences, the current analysis was conducted within the context of unique limitations and all findings should be interpreted with care and consideration. It is first important to acknowledge that although the current analysis relies upon longitudinal data, it is not a prospective study of the probability of OYA commitment within the general population. Because of the nature of the data available to us, we selected a comparison group from a pool of individuals who were involved with at least one of five social service program areas. In an effort to conduct the most equitable comparison as possible, we limited our sample of OYA youth to those who also had participated in at least one program area prior to OYA commitment. Certainly a more ideal method of estimating the true probability that an individual will become involved with the juvenile justice system is to follow a large group of research participants from birth through the age of 19—regardless of their involvement with social service programs. Such a birth-to-justice system analytical approach will be possible with the future addition of Oregon birth records to the current data.

Another consideration is that the current analysis did not examine records of local law enforcement or county juvenile department contact. Commitment to OYA represents the final phase in the continuum of Oregon juvenile justice interventions, and it is likely that OYA youth in the current study experienced informal and/or formal county supervision prior to OYA commitment. It is possible that the higher prevalence of contact with certain program areas (e.g., Alcohol and Drug Treatment and Mental Health Treatment) among OYA youth versus the comparison group is due to connections established through their involvement with the local juvenile department. Indeed, some individuals in the comparison group may have had contact with law enforcement and/or juvenile departments and were connected with services via those resources. Permission has recently been obtained to include records of juvenile department contact in future analyses within this body of work; therefore we will soon be able to identify social service program involvement that occurs independent of contact with the juvenile justice system and further refine our estimates of the probability of OYA commitment.

The current analysis also demonstrated that, due to the inherent overlap in the delivery and receipt of social services, it is difficult to isolate the independent effects each program area has on the probability of OYA commitment. Without additional case-level data, we are only able to make assumptions about the ways in which individuals connect with different program areas and adjust the data and interpret the findings accordingly. Current decisions relative to data recoding were made based on information received from content experts in the different social service fields, and adjustments were made carefully and conservatively. We will continue to develop and refine methods of accounting for program overlap in the data throughout our future analyses.

Next Steps

OYA's first feeder system analysis explored the prevalence of social service utilization among youth committed to OYA. The results of that analysis indicated that up to 90% of youth may be involved with DHS/OHA programs prior to arriving at OYA, confirming the notion that opportunities for early intervention exist within Oregon's social service system. In the current analysis, we identified specific areas within the social service system that deserve further exploration and where interventions may best be targeted (i.e., Alcohol and Drug Treatment Services, Mental Health Treatment Services, and Child Welfare/Foster Care). The

next feeder system analysis will rely upon the findings from the current study and concentrate on data from education and program areas that contribute to the probability OYA commitment. Questions that will be addressed include: What do the data in these areas tell us about individual and/or family-level characteristics and program utilization that predict OYA involvement? Focus will be concentrated on various factors such as type of treatment received, program dose and/or length, program instability (e.g., multiple Foster Care placements), and program participation and completion. Individual and family-level characteristics such as age, individual and family risk and protective factors, and adverse childhood events will also be examined.