

FY 2013 JUVENILE RECIDIVISM SAMPLE: MULTIVARIATE ANALYSIS

In the 2005 Session of the North Carolina General Assembly, the legislature amended Chapter 164 of the General Statutes to direct the North Carolina Sentencing and Policy Advisory Commission to conduct biennial juvenile recidivism studies on adjudicated youth in the state. The 2017 *Juvenile Recidivism Study* marks the sixth biennial report on statewide rates of juvenile recidivism and follows a sample of 14,120 juveniles who had a delinquent complaint processed in the juvenile justice system in FY 2013.¹

Throughout the juvenile recidivism report, recidivism (defined as a subsequent juvenile complaint and/or adult arrest) was described in association with various single factors (e.g., level of involvement, sample offense type, risk level). In order to consider how multiple factors, taken together, affect the probability of recidivism, multivariate analysis was conducted using the 2017 *Juvenile Recidivism Study* sample.

Multivariate analysis is a statistical tool used to estimate the relationship between a set of independent variables (e.g., sex, race, age) and a dependent variable (i.e., recidivism), while also quantifying the singular contribution of each of the variables in the model.^{2,3,4} For example, this type of analysis allows for a determination of whether level of involvement (i.e., petition, no petition) has any relationship with a juvenile's probability of recidivism, controlling for other factors such as age, gender, race, or risk level. The reported effects provide information about the strength of the relationship (how strongly the factor affects the probability of recidivism), as well as the direction of the relationship (whether the factor increases or decreases the probability of recidivism). Generally, only estimated effects that are statistically significant – that is, highly unlikely the result of random variation in the sample (or chance) – are discussed in this brief. *Note that, although these analyses may reveal that a relationship exists, it does not necessarily mean that an independent variable is the cause of the particular outcome. Rather, it indicates a statistical association, which may or may not be due to a causal relationship.*

Using logistic regression, three models were developed to determine how a variety of independent variables may be related to the probability of recidivism for three groups of juveniles in the 2017 *Juvenile Recidivism Study*: (1) all juveniles, (2) juveniles adjudicated and disposed, and (3) juveniles diverted. The findings summarized in Figure 1 are consistent across the three models.

¹ See the North Carolina Sentencing and Policy Advisory Commission's May 2017 *Juvenile Recidivism Study: FY 2013 Juvenile Sample* for further details at http://www.nccourts.org/Courts/CRS/Councils/spac/Documents/ncspaciuvrecid_2017.pdf.

² For definitions of these and other terms and/or variables used in this research brief see Appendix A or the 2017 *Juvenile Recidivism Study*.

³ Logistic regression estimates the logit (i.e., the logarithm of the odds) of an outcome occurring. This type of analysis is most appropriate for regression models with a dichotomous dependent variable, such as whether recidivism occurred. Additional information about methodology and model fit for this study is available upon request.

⁴ Given that a relationship between *all* variables is modeled in multivariate analysis, findings in this research brief may differ slightly from the bivariate findings reported in the 2017 *Juvenile Recidivism Study*.

Figure 1
Key Predictors of Juvenile Recidivism
Three-Year Follow-Up

Age at Offense	Juveniles aged 12 to 13 years at offense had the highest probability of recidivism when compared to the other age groups (i.e., 6-9 years, 10-11 years, 14-15 years)
Prior Juvenile Complaints	For <u>each</u> prior complaint, the probability of recidivism increased between 5% and 8%. Prior complaints had the greatest impact on juveniles diverted.
Mental Health Needs	Mental health needs increased the probability of recidivism between 7% and 10%. Mental health had the greatest impact on juveniles adjudicated and disposed.
Risk Level: RL1 (lowest) – RL5 (highest)	As risk level increased, the probability of recidivism increased. Juveniles within RL5 had the highest probability of recidivism across all three models.

SOURCE: NC Sentencing and Policy Advisory Commission, FY 2013 Juvenile Recidivism Sample

Logistic Regression Analysis Variables, Results, and Interpretation

Dependent Variable (Outcome Measure)

The three logistic regression analyses model one dependent variable, a combination variable measuring whether a juvenile had a juvenile complaint and/or an adult arrest (recidivism) during the three-year follow-up period.

Independent Variables

Independent variables in each of the models include gender, race, age at sample event, felony sample offense type, school-based offense indicator, prior contact with the juvenile justice system (i.e., prior number of juvenile complaints, prior Juvenile Crime Prevention Councils (JCPC) program admissions), risk level, needs level, and individual risk/needs measures, such as mental health, substance abuse, and negative family association indicators. Additional variables include level of involvement (i.e., petition, no petition) in the overall model, disposition level in the adjudicated and disposed model, and diversion status in the diverted model.

Results and Interpretation

Table 1 provides the estimated effect of each independent variable on the probability of recidivism during the three-year follow-up period for the FY 2013 juvenile recidivism sample for all juveniles (Model 1), juveniles adjudicated and disposed (Model 2), and juveniles diverted (Model 3).

Table 1
Effect of Personal and Juvenile Justice Factors on Recidivism
Three-Year Follow-Up

Independent Variables	Model 1: All Juveniles Average Recidivism Probability = 43% (n=13,148)	Model 2: Juveniles Adjudicated and Disposed Average Recidivism Probability = 54% (n=4,340)	Model 3: Juveniles Diverted Average Recidivism Probability = 37% (n=4,661)
Personal Characteristics			
Male	12%	13%	11%
Nonwhite	12%	14%	10%
Age at Sample Event			
6-9 years	-26%	-20%	-24%
10-11 years	-9%	N.S.	-9%
12-13 years	Reference	Reference	Reference
14-15 years	-11%	-14%	-12%
Sample Offense Type			
Felony	-6%	-8%	N.S.
School-Based Offense			
Offense was School-Based	-5%	-5%	N.S.
Prior Contacts with JJ System			
Prior # Complaint(s)	5%	7%	8%
Prior JCPC Admission	N.S.	5%	N.S.
Risk Level			
RL1 (lowest)	Reference	Reference	Reference
RL2	10%	15%	9%
RL3	19%	22%	18%
RL4	25%	29%	22%
RL5 (highest)	29%	37%	32%
Needs Level			
Low	Reference	Reference	Reference
Medium	4%	N.S.	8%
High	N.S.	N.S.	30%
Individual Risk/Needs Items			
Mental Health	9%	10%	7%
Substance Abuse	3%	5%	N.S.
Negative Family Association	5%	N.S.	5%
Level of Involvement			
Petition	N.S.	n/a	n/a
Disposition Level			
Level 1	n/a	Reference	n/a
Level 2	n/a	-8%	n/a
Level 3	n/a	-34%	n/a
Diversion Status			
Approved for Court	n/a	n/a	35%
R²	13%	12%	16%
Max Rescaled R²	18%	16%	21%

Note: There were 972 juveniles with missing risk and/or needs assessments excluded from the multivariate analysis. "N.S" indicates the estimated effects are not statistically significant.

SOURCE: NC Sentencing and Policy Advisory Commission, FY 2013 Juvenile Recidivism Sample

Model 1

For all juveniles, the probability of recidivism was 43%. Notably, age at offense seemed to play a significant role in predicting recidivism. Compared to juveniles aged 12 to 13 years at offense, juveniles aged 6 to 9 had the lowest recidivism probability (-26%). Ten to 11 year olds and 14 to 15 year olds had similar recidivism probabilities (-9% and -11% respectively) when compared to juveniles aged 12 to 13 years at offense. Risk level also appeared to be a strong predictor of recidivism, with probabilities increasing significantly as risk level increased. Prior complaints and mental health needs also increased the probability of a recidivist event (5% and 9% respectively).

Additional findings indicated males and nonwhite juveniles had a higher probability of recidivism when compared to their counterparts (12% each) and the probability of recidivism was lower for juveniles with a school-based offense (-5%). Juveniles with substance abuse needs and negative family associations had higher probabilities of recidivism than their counterparts. Surprisingly, level of involvement (petition versus non-petition) was a non-significant predictor of recidivism. Greater examination of the data revealed that the effect of level of involvement is accounted for by two other variables – prior number of complaints and risk level – and when these two variables are excluded from the analysis, level of involvement becomes a significant predictor of recidivism.

Model 2

The overall probability of recidivism for juveniles adjudicated and disposed was 54%. For juveniles adjudicated and disposed, age at offense, risk level, prior complaints, and mental health needs also appeared to play a significant role in predicting recidivism. Compared to juveniles aged 12 to 13 years at offense, those aged 6 to 9 at offense and 14 to 15 years at offense had much lower probabilities of recidivism. As risk level increased from RL1 to RL5, the probability of recidivism increased significantly, with RL5 juveniles having a 37% higher probability of recidivism than RL1 juveniles. Each prior juvenile complaint increased the probability of recidivism by 7%, while mental health needs increased the probability of a recidivist event 10%.

Disposition level data also were examined to determine whether level of disposition was a significant predictor of recidivism. Compared to juveniles receiving a Level 1 disposition (e.g., community-based programs, probation), juveniles with a Level 2 disposition (e.g., intensive probation, group home placements, regimented training programs, house arrest) were 8% less likely to recidivate and those with a Level 3 disposition (i.e., commitment to a Youth Development Center or YDC) were 34% less likely to recidivate. Time at risk, or window of opportunity to recidivate, most likely would explain this finding. Juveniles with a Level 3 disposition have a smaller window of opportunity to recidivate since they spend a portion of their follow-up period in an YDC. As such, juveniles with less restrictive dispositions have greater time at risk, and greater opportunity to recidivate. Controlling for time at risk in future studies would allow greater understanding of the relationship between disposition level and recidivism.

Model 3

For juveniles diverted, the overall probability of recidivism was 37%. Similar to the other two models, age at offense, risk level, prior complaints, and mental health needs were significant predictors of recidivism. Compared to juveniles aged 12 to 13 years at offense, juveniles aged 6 to 9 years at offense had the lowest recidivism probability, followed by juveniles 14 to 15 years and juveniles aged 10 to 11 years. The probability of recidivism increased significantly as risk level increased from RL1 to RL5;

juveniles within RL5 had a 32% higher probability of recidivism than RL1 juveniles. Juveniles with prior complaints had a higher probability of recidivism than those with no prior complaints – an 8% increase for each complaint, and the probability of recidivism increased 7% for juveniles with mental health needs.

Needs level was a significant predictor of recidivism for juveniles diverted, although it did not appear to be a significant predictor in the other models. Compared to juveniles with low needs, recidivism increased 8% for those with medium needs and 30% for those with high needs. However, given the small proportion of juveniles in a medium and high needs level, results should be interpreted with caution.

Diversion status was included in the model to determine whether juveniles with a successful diversion had lower probability of recidivism than those with an unsuccessful diversion.⁵ Compared to those with a successful diversion, juveniles with an unsuccessful diversion had a 35% higher probability of recidivism. The higher probability of recidivism for this group is somewhat expected, given these juveniles were given an additional opportunity to succeed with a diversion plan/contract for their sample complaint, but subsequently had their case referred back to juvenile court due to noncompliance.

Summary

This research brief examined how multiple factors, taken together, affected the probability of recidivism using data from the 2017 *Juvenile Recidivism Study*. Notably, four factors seemed to consistently predict the probability of recidivism for juveniles across all three models: age at offense, the number of prior juvenile complaints, mental health needs, and risk level. Not only were these findings consistent across the three models, but they were also consistent with the descriptive findings in the 2017 *Juvenile Recidivism Study*.⁶

Compared to juveniles aged 12 to 13 years at offense, juveniles aged 6 to 9 had the lowest levels of recidivism in all three models, followed by those aged 14 to 15 years and those 10 to 11 years. Consistent with findings from the juvenile recidivism study, this further suggests that intervening with appropriate resources for the age group with the highest recidivism rate may affect juveniles' rate of reoffending.

A direct relationship was observed between the juveniles' assessed risk and recidivism. Juveniles within RL5 had the highest probability of recidivism when compared to other risk levels, with recidivism probabilities decreasing as risk level decreased. A juvenile's prior contact with the juvenile justice system, a component of risk, was also directly related to recidivism in all three models. These findings may indicate an increased need for targeting resources for juveniles within higher risk levels.

Needs level was not a consistent predictor of recidivism across the three models. However, mental health needs, one component of the needs assessment, consistently predicted an increase in recidivism across all models (7% to 10% higher). Although needs level is not designed to predict recidivism, an

⁵ Juveniles with an unsuccessful diversion had a petition filed by a court counselor due to non-compliance with a diversion plan/contract for the juvenile's sample complaint.

⁶ Age at offense, number of prior complaints, and risk level were examined in-depth in the *Juvenile Recidivism Study*, while mental health needs were not.

accurate measure of needs is an essential component in identifying proper treatment programs, and determining whether the programs are targeting the appropriate juveniles for services. Due to the small number of juveniles with a high needs level in each of the models, results in this brief may not accurately reflect the impact of needs level on juvenile recidivism.

In conclusion, the findings presented in this brief support many of the findings reported in the Sentencing Commission's *2017 Juvenile Recidivism Study* and provide greater understanding of factors contributing to juvenile recidivism by using multivariate analysis. The Sentencing Commission looks forward to its continued collaborative work with the Department of Public Safety's Division of Adult Correction and Juvenile Justice to further understand juvenile recidivism and combining any lessons learned to make improvements to the juvenile justice system in North Carolina.

APPENDIX A GLOSSARY OF TERMS

Dependent Variable: A variable whose values are predicted by the independent variable(s). It is the outcome or event under examination (i.e., recidivism).

Dichotomous Measure: A variable that has two, and only two, distinct categories. It may measure the presence or absence of an event or characteristic, for example, the variable “recidivism” (had recidivism or did not have recidivism). Alternatively, it may measure a characteristic that, by its nature, has only two possible values. An example is sample offense type (felony or misdemeanor).

Effect: The influence of a specific independent variable on the dependent variable. In this study, it refers to the percentage change in the dependent variable that is attributable to the independent variable being examined.

Independent Variable: A variable that is thought to predict the dependent variable. Examples of independent variables in this study include age, gender, and risk level.

Logistic Regression: A multivariate statistical analysis technique that produces estimates of the association of a set of independent variables with a dichotomous dependent variable, while also quantifying the singular contribution of each of the variables in the model.

Statistically Significant: When the effect of a variable is larger or smaller than would have been expected to have occurred by chance. In large samples, it is common for many variables to achieve statistical significance, but statistical significance does not necessarily imply substantive significance/causation.