



## Youth Level of Service Case Management Inventory (YLS/CMI) Risk Category Cut Point Analysis - Revised September, 2017

### Introduction

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A recently completed validation study<sup>i</sup> for the Youth Level of Service Case Management Inventory (YLS/CMI) for youth receiving probation services with the Juvenile Probation (JP) Division of the Hennepin County Department of Community Corrections and Rehabilitation (DOCCR) found that the YLS/CMI is a valid measure of risk to reoffend for JP youth in general and for gender and racial subgroups. A recommendation of that study was the completion of a cut point analysis to determine if there is evidence of a need to modify current risk categorization.

Determination of risk categories is a task that considers multiple factors, including distribution of scores, benefits analysis, resources of the organization, and the projected uses of the categorization. As can be seen from consideration of the complex interaction of these factors, there is no one right answer for setting cut points for risk categorization. A careful analysis and interpretation of data can provide a recommendation as an aid in decision making going forward.

A cut point analysis was completed in March of 2016<sup>ii</sup> identifying four optimal risk categories to provide best practices interventions to JP youth. This revision to that report provides the same analysis with the risk levels of High and Very High combined to form a three category risk classification. DOCCR population estimates are updated to reflect the 2016 youth population and six YLSCMI records with no match to DOCCR systems are eliminated from the normative sample. Appendices providing summary information regarding probation offense as well as gender and racial subgroups are also included in this revision.

Cut point analysis was based upon all DOCCR initial YLS/CMI assessments from 2009 through February 12<sup>th</sup>, 2016.

### Methodology

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All initial assessments for DOCCR youth from January 1st, 2009 through February 12<sup>th</sup>, 2016 were collected from the Statewide Supervision System.. This provided the normative sample for analysis of the distribution of total scores.

The recent validation study of DOCCR youth showed that most recidivism occurs within one year of the assessment. Therefore, one year recidivism was determined to be most useful for cut point analysis. To allow for resolution of cases, recidivism data is available one year following the end of the recidivism period, per DOCCR policy. Following this policy, recidivism data was available for the subset of initial assessments conducted through 2013. One year recidivism data was collected from the Minnesota Criminal Event Database (MNCED). One year recidivism was defined as the occurrence of misdemeanor

or above offense within one year of the YLS/CMI assessment date. New offenses must be resolved with a subsequent adjudication or conviction, and the definition makes adjustments to account for correctional out of home placements.

The number of recidivism offenses occurring within one year were tabulated for each assessed youth. Offenses were split into Felony versus Non-Felony based upon the adjudicated or convicted level of offense. Offenses were ranked according to the severity of the offense as defined by Minnesota Offense Category ratings to create an Offense Rank Score,. Type of Offense was further categorized into those most relevant to public safety to determine Person Offense Recidivism. Offense types, Offense Ranking, and Person Offense categories are displayed in Table 1.

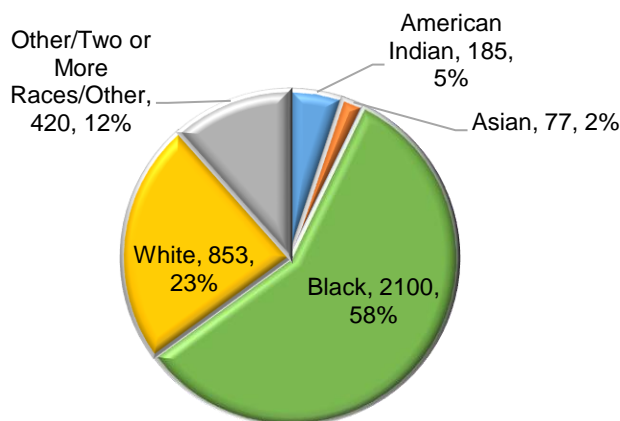
**Table 1. Offense Categories and Ranking**

Public Safety Category	Type of Offense	Offense Rank	Public Safety Category	Type of Offense	Offense Rank	
Person Offenses	Homicide	30	Non-Person Offense	Drugs	17	
	Criminal Vehicular Operation - Death	29		Burglary	16	
	Criminal Sexual Conduct	28		Crimes Against Family (ex. Child Neglect)	15	
	Kidnapping	27		Escape	14	
	Domestic Assault	26		Crimes Against Administration of Justice	13	
	Assault (Non-Domestic)	25		Crimes Against Government	12	
	Criminal Vehicular Operation - Bodily Harm	24		Prostitution	11	
	Robbery	23		Obscenity	10	
	Other Person Offense	22		Vehicle Theft Related	9	
	Harassment/Stalking/Bias	21		Forgery/Counterfeiting	8	
	Weapons	20		Theft	7	
	Arson	19		Property Damage	6	
	Felony DWI	18		Stolen Property	5	
					Disturbing Peace/Privacy	4
					Traffic	3
			Gambling	2		
			Status/Other	1		
			-----	No Recidivism	0	

A benefits analysis utilized ROC curve analysis of total scores as predictive of one year recidivism. Other analysis included frequencies, percent recidivism, Pearson R and Spearman Rho correlation, Independent T-Test and Analysis of Variance comparison of means, and Chi Square analysis of subgroup differences.

The sample consisted of 3641 initial YLS/CMI assessments completed on DOCCR youth between January 1<sup>st</sup>, 2009 and February 12<sup>th</sup>, 2016. Those assessed were predominately Male (76%), with almost one fourth Female (24%). Hispanics comprised nine percent (9%) of the sample. Figure 1 displays the racial distribution of youth in the sample.

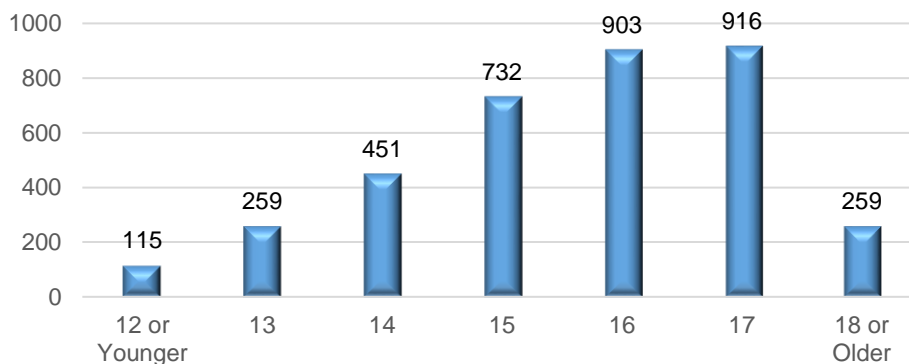
Figure 1. Sample Racial Distribution



Sample youth were most frequently Male (76%), Non-Hispanic (91%), and Black (59%).

The average age of sample youth was 16, with ages ranging from 10 to 18 years of age<sup>1</sup>. Figure 2 displays the age distribution for the total sample.

Figure 2. Sample Age Distribution



Most sample youth were 16 to 17 years of age (50%).

One year recidivism data was gathered for the 2548 initial assessments completed from 2009 through 2013. The demographic characteristics of youth in this subsample were consistent with full sample demographics.

<sup>1</sup> Bodurtha, P.

Normative Analysis

American Indian and Black youth had significantly higher YLS/CMI initial scores, compared to Asians and Whites.

The average YLS/CMI total score for all youth in the sample was 15.3 with a standard deviation of 8.1. Females and males had similar scores on average, (15.5 versus 15.2, T-test,  $P > .05$ ). Total scores varied across racial lines (ANOVA,  $P < .000$ ), with American Indians and Blacks having higher average scores compared to other racial designations (see Figure 3).

Figure 3. Average YLS/CMI Total Score by Race

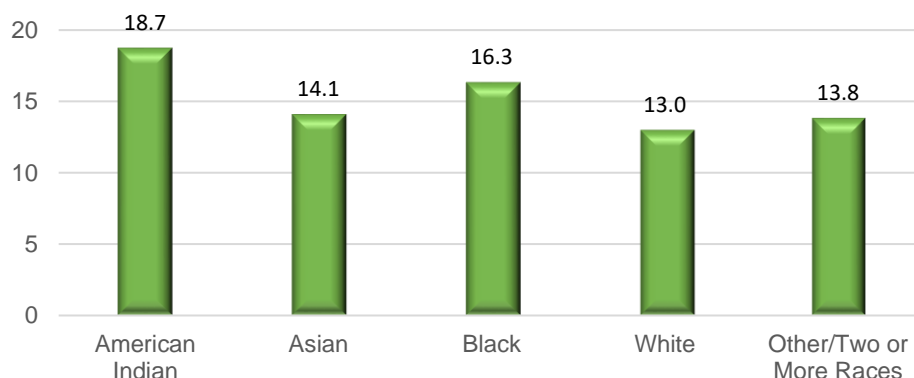
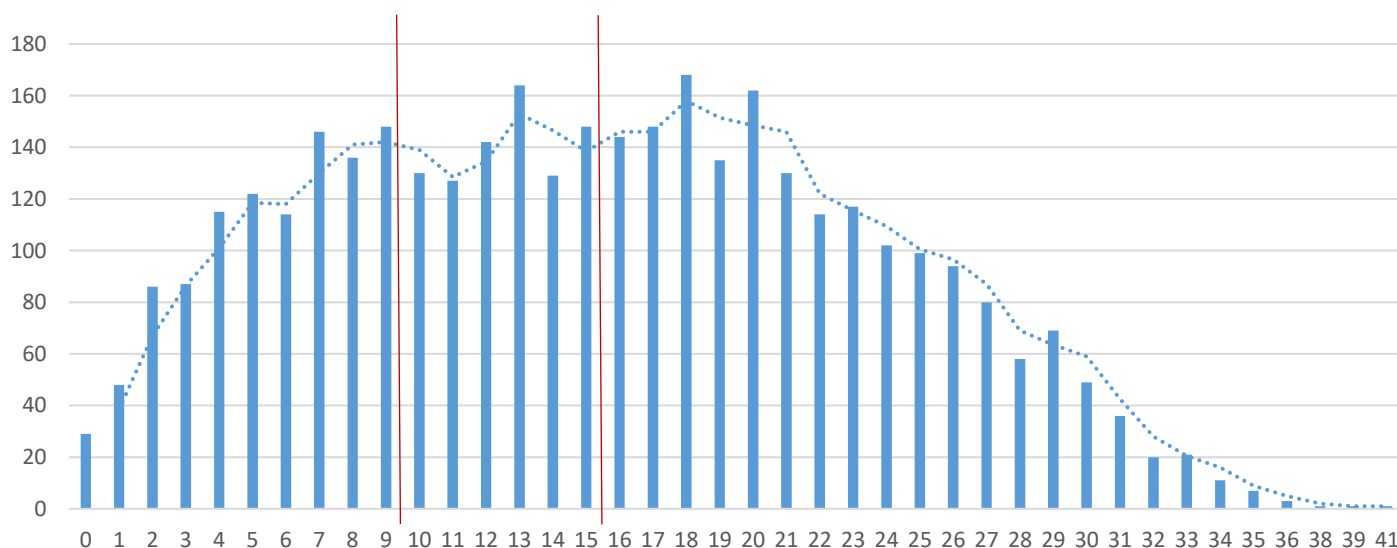


Figure 4 displays the frequency distribution of total YLS/CMI scores. When viewing the distribution of scores as it relates to possible risk category cut points, shifts in shape that deviate from the expected bell curve of the distribution, whether normal or skewed, may indicate the intersection of separate risk level populations. Based upon these unexpected changes in the distribution shape, tentative cut points have been added to Figure 4, represented by red vertical lines.

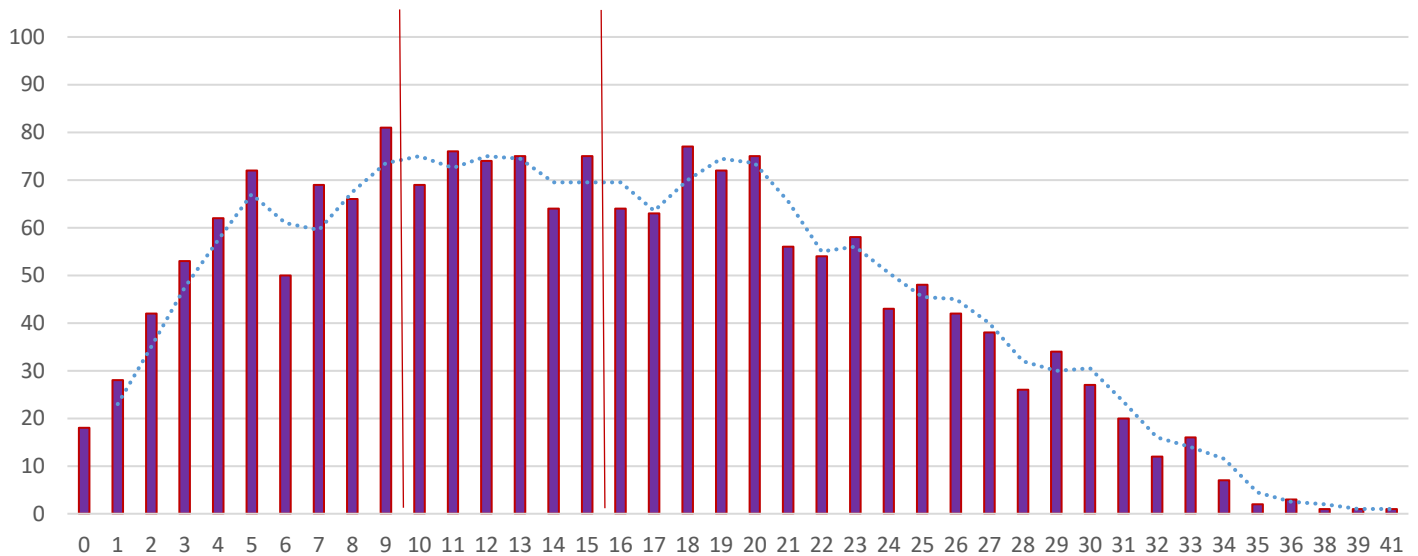
Figure 4. Distribution of YLS/CMI Total Scores with Tentative Risk Category Cut Points



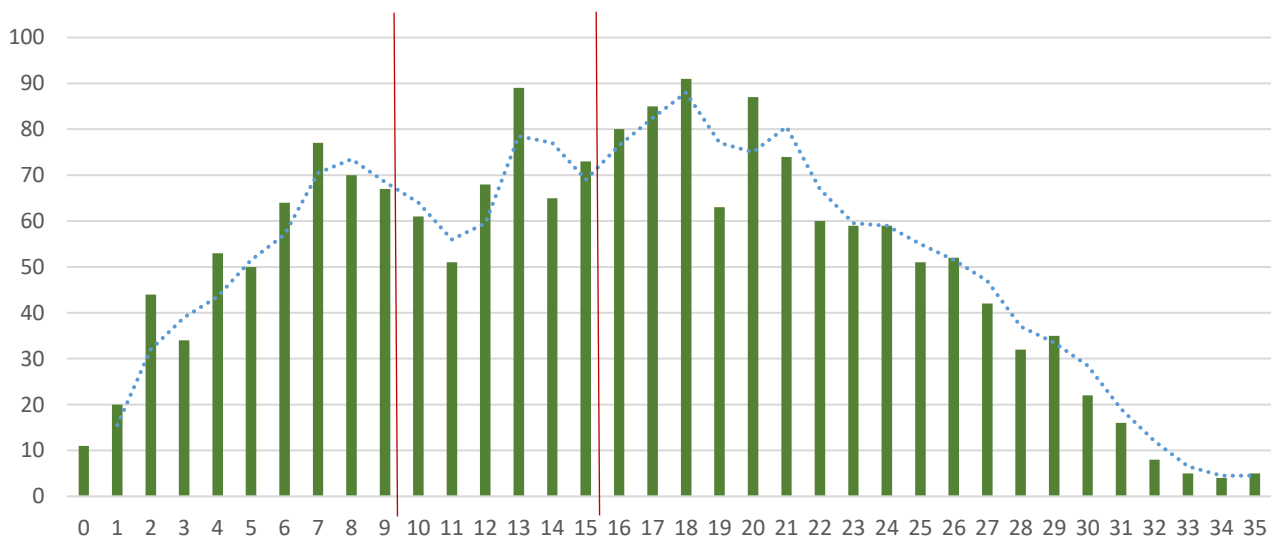
To confirm the stability of the distribution of YLS/CMI total scores, the sample was split by date of assessment, comparing distributions for assessments through March 2012 to those completed most recently. A DOCCR 2015 YLS/CMI Quality Assurance Report shows a marked improvement in assessor proficiency and accuracy over this normative sample period of time,<sup>2</sup> giving greater confidence in the distribution of most recent assessments if the distributions are misaligned. Figures 5 and 6 show the comparison of earliest assessments to most recent assessments.

- Split file distributions are well aligned, confirming the stability of the normative YLS/CMI total score distribution.
- Distribution patterns are more clearly delineated in the more recent assessments.

**Figure 5. Distribution of YLS/CMI Total Scores Thru March 2012 with Tentative Cut Points**



**Figure 6. Distribution of YLS/CMI Total Scores From April 2012 with Tentative Cut Points**



<sup>2</sup> Ahrens, J. (2015, June) "YLS/CMI Quality Assurance Report" *Hennepin County Community Corrections and Rehabilitation*: [www.co.hennepin.mn.us](http://www.co.hennepin.mn.us)

The one year recidivism rate for the total recidivism sample (assessments through 2013) was 38.8%, with the rate of one year person recidivism (those with an offense most relevant to public safety) at 14.1%. One year recidivism rates varied significantly across age, ethnic racial ( $p < .01$ ) and gender ( $p < .05$ ) subgroupings, as displayed in Table 2. Person and Felony recidivism rates are also displayed.

**Table 2. One Year Recidivism Rate across Demographic Subgroups**

Subgrouping Variable	Subgroup Category	Subgroup Sample (N)	One Year Recidivism Rate	One Year Person Recidivism Rate	One Year Felony Recidivism Rate
Age	12 Years or Younger	78	43.6	19.2	16.7
	13 Years of Age	182	41.8	25.3	14.8
	14 Years of Age	340	43.2	18.5	15.3
	15 Years of Age	520	40.8	16.7	15.0
	16 Years of Age	614	42.5	13.0	12.4
	17 Years of Age	633	35.1	9.6	10.6
	18 Years of Age	181	19.9	3.9	5.0
Gender	Female	609	35.3	9.4	3.9
	Male	1939	39.9	15.6	15.4
Ethnicity	Hispanic	217	28.1	10.1	11.1
	Non-Hispanic	2181	41.0	15.0	13.3
Race	American Indian	126	34.1	14.3	12.7
	Asian	58	19.0	6.9	6.9
	Black	1487	46.9	18.2	16.5
	White	637	25.0	6.3	5.0
	Two or More/Other	240	32.5	10.8	10.4

For those who reoffended within one year following an initial assessment, more than one third (38.7%) reoffended multiple times.

There was a significant relationship between YLS/CMI total scores and subsequent recidivism ( $R = .27, p < .000$ ).

There was a significant relationship between YLS/CMI total scores and subsequent recidivism ( $R = .27, p < .000$ ). When viewing the most serious recidivism offense rank, this relationship is even stronger. A similarly strong relationship was found between total YLS/CMI scores and the highest recidivism offense level (Felony, Gross Misdemeanor, Misdemeanor) as well as number of recidivism offenses within one year..

Significant relationships between YLS/CMI scores and Recidivism variables were also confirmed with correlational analysis for male and female subgroups as well as Hispanics, Blacks and Whites. Sample sizes for American Indians (126) and Asians (58) were insufficient for analysis.

Table 3 displays Spearman Rho (rank order) correlations between YLS/CMI total scores and recidivism offense variables for the total sample and demographic subgroups.

**Table 3. Subgroup Spearman Rho Correlations between YLS/CMI Scores and Recidivism Variables**

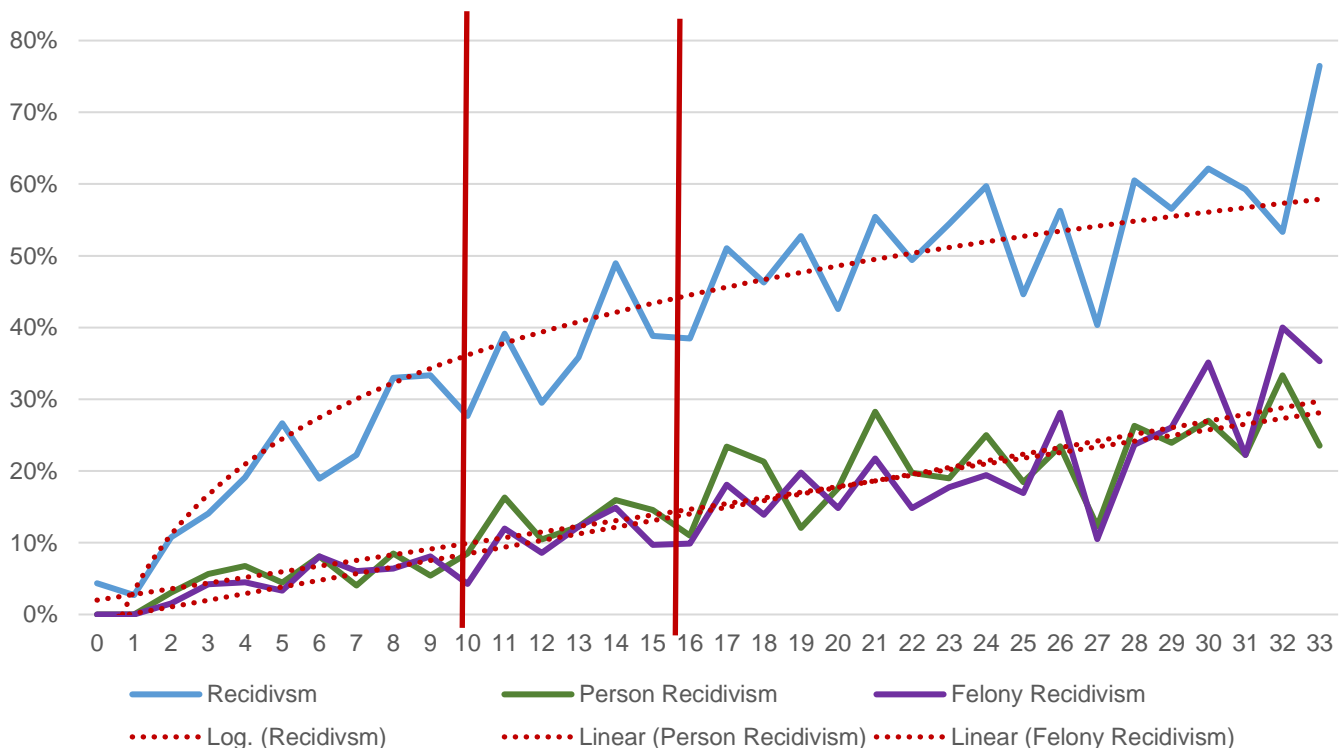
Recidivism Variable	Total Sample	Female	Male	Hispanic	Black	White
Any One Year Recidivism	.27**	.20**	.29**	.39**	.22**	.29**
Any Person Recidivism	.19**	.10*	.21**	.22*	.17**	.20**
Highest Recidivism Offense Level	.28**	.22**	.30**	.40**	.24**	.30**
Highest Recidivism Offense Ranking	.28**	.20**	.30**	.40**	.23**	.31**
Number of Recidivism Offenses	.28**	.20**	.31**	.41**	.24**	.30**

\* Correlation is significant at the .05 level (2-tailed) \*\* Correlation is significant at the 0.01 level (2-tailed).

Figure 7 visually displays the relationship between total YL/CMI scores and recidivism rates, with tentative cut points represented by red vertical lines.

- The rate of occurrence of any recidivism within one year shows a log linear<sup>3</sup> relationship to YLS/CMI total scores, with a less steep slope at high score ranges.
- The rate of occurrence of person recidivism and felony recidivism displays a linear relationship to YLS/CMI total scores, with a constant positive slope over the full range of scores.

**Figure 7. One Year Recidivism, Person Recidivism, and Felony Recidivism Rates by YLS/CMI Score\***

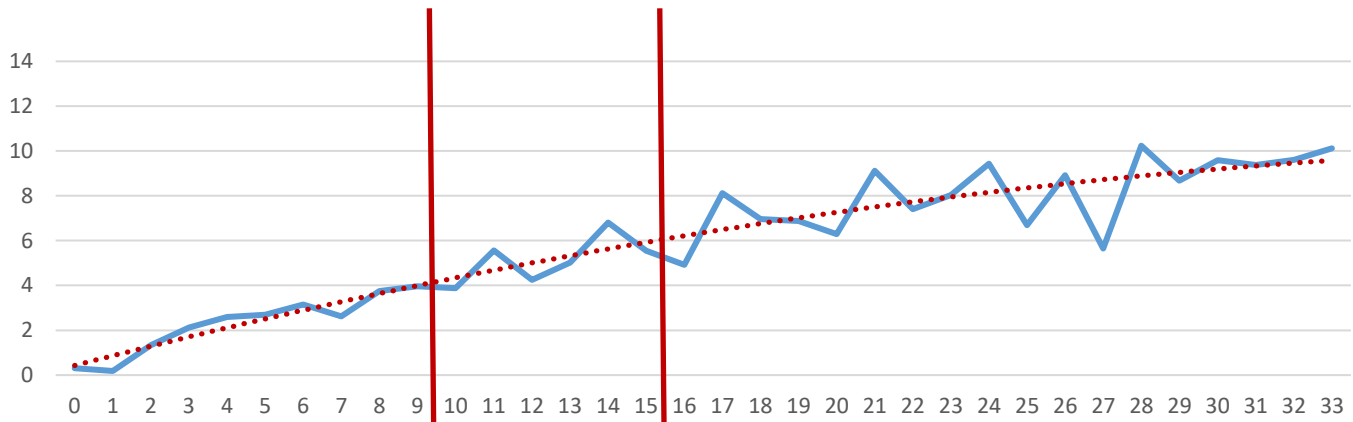


\*Score above 33 are not included, due to low frequency (N<10).

<sup>3</sup> A (log) transformation provides the best fit model, generally relying on ratios rather than absolute values to explain the relationship between the two variables values.

Figure 8 visually displays the relationship between total YLS/CMI scores and average highest offense ranking, with tentative cut points represented by red vertical lines.

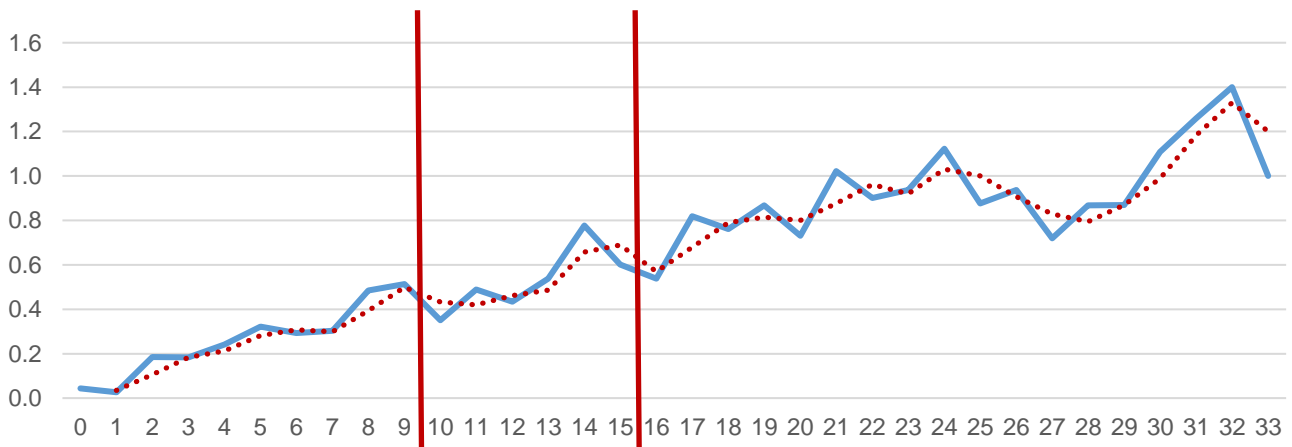
**Figure 8. Average Highest Recidivism Offense Ranking within One Year by YLS/CMI Score\***



\*Score above 33 are not included, due to low frequency (N<10).

Figure 9 visually displays the relationship between total YLS/CMI scores and number of recidivism offenses occurring within one year of assessment, with tentative cut points represented by red vertical lines.

**Figure 9. Average Number of Recidivism Offenses within One Year by YLS/CMI Score\***



\*Score above 33 are not included, due to low frequency (N<10).

## Benefits Analysis

A ROC Curve is a useful graphical representation of the true positive (sensitivity) and false negative (1-specificity) classifications of recidivism for each possible score of the YLS/CMI. In interpreting area under the curve, .50 (green reference line) is the level of chance, so that areas greater than .5 (above the green reference line) indicate greater predictive power and the benefit gained from using the YLS/CMI for risk assessment. Table 4 gives area under the curve for prediction of one year recidivism, person recidivism, and felony recidivism. An area of .64 or above is considered good predictive validity.<sup>iii</sup>



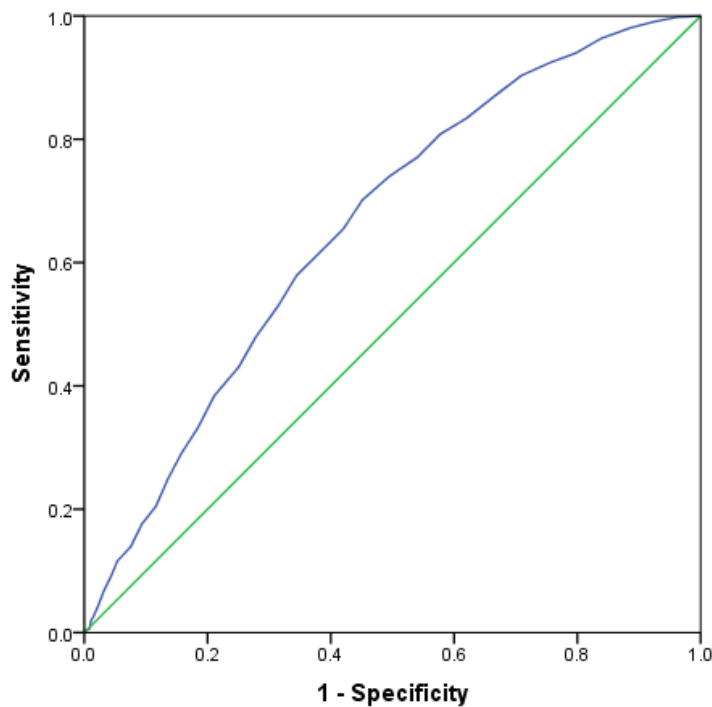
**Table 4. Area under the Curve for YLS/CMI Total Score Prediction of Recidivism Variables**

Recidivism Variable	Area Under the Curve	Standard. Error <sup>*</sup>	Asymptotic Significance <sup>**</sup>	Confidence Interval	
				Lower Bound	Upper Bound
Any One Year Recidivism	.66	.011	.000	.64	.68
Any Person Recidivism	.65	.014	.000	.63	.68
Any Felony Recidivism	.67	.015	.000	.64	.70

\* Under the nonparametric assumption    \*\*Null hypothesis true area=.50

Figure 10 displays the ROC curve for prediction of one year recidivism for the total sample.

**Figure 10. Area under the Curve for YLS/CMS Total Score Prediction of One Year Recidivism**



### *Cut Point Analysis*

The usefulness of tentative cut points based upon the normative distribution of total scores in categorizing levels of risk was analyzed. Table 5 shows the percent of accuracy in correctly identifying recidivists (sensitivity) and eliminating non-recidivists (specificity) for each score of the YLS/CMI.

**Table 5. Sensitivity and Specificity of All Possible Cut Points in Classifying Recidivism Risk**

Risk Category	YLS/CMI Score*	One Year Recidivism	
		Sensitivity	Specificity
Low Risk (0-9)	0.00	100.0%	0.0%
	.50	99.9%	1.4%
	1.50	99.8%	3.8%
	2.50	99.1%	7.5%
	3.50	98.1%	11.4%
	4.50	96.4%	16.1%
	5.50	93.9%	20.3%
	6.50	92.5%	24.2%
	7.50	90.3%	29.1%
	8.50	87.2%	33.2%
Moderate Risk (10-15)	9.50	83.4%	37.9%
	10.50	80.8%	42.3%
	11.50	77.2%	45.8%
	12.50	73.9%	50.6%
	13.50	70.1%	54.9%
High Risk (16 and Above)	14.50	65.5%	58.0%
	15.50	61.4%	62.0%
	16.50	57.9%	65.6%
	17.50	53.0%	68.5%
	18.50	47.9%	72.2%
	19.50	43.0%	75.0%
	20.50	38.4%	78.9%
	21.50	33.2%	81.5%
	22.50	29.2%	84.2%
	23.50	24.8%	86.5%
	24.50	20.5%	88.4%
	25.50	17.6%	90.7%
	26.50	13.9%	92.5%
	27.50	11.6%	94.6%
	28.50	9.3%	95.6%
	29.50	6.7%	96.9%
	30.50	4.3%	97.8%
	31.50	2.7%	98.5%
	32.50	1.9%	98.9%
	33.50	0.6%	99.2%
34.50	0.4%	99.7%	
35.50	0.3%	99.8%	
37.00	0.1%	99.9%	
38.50	0.0%	99.9%	
40 or Above	0.0%	99.9%	

\* The smallest cutoff value is the minimum observed test value, and the largest cutoff value is the maximum observed test value. All the other cutoff values are the averages of two consecutive ordered observed test values.

Table 6 shows recidivism rates for tentative risk categories as well as averages for the risk variables of recidivism offense ranking and number of recidivism offenses within one year. A more detailed listing of recidivism offenses across tentative risk categories can be found in Appendix A.

**Table 6. One Year Recidivism Rates across Tentative Risk Categories**

Recidivism Variable	Low Risk (0-9)	Moderate Risk (10-15)	High Risk (16 and Above)
Any One Year Recidivism	21.8%	36.5%	50.5%
Any Person Recidivism	5.3%	13.0%	20.1%
Any Felony Recidivism	5.0%	10.3%	18.6%
Average Recidivism Offense Ranking*	12.0	13.6	14.8
Average Recidivism Offenses*	1.4	1.5	1.7

\*Averages are based upon the subgroup of youth who reoffended.

The tentative cut points based upon a view of the normative distribution of scores are well aligned with optimal cut points with regard to recidivism identification (see Table 5) as well as recidivism outcomes (see Table 6).as explained below.

- Cut Point 10 (Low Risk 0-9): More than eighty percent (83%) of youth who recidivated within one year are moved on to higher risk categories while almost forty percent (38%) of those with no recidivism offense are retained within low risk classification.
- Cut Point 16 (Moderate Risk 10-15, High Risk 16+): More than sixty percent (61%) of youth who recidivate within one year on moved on to the high risk categories while more than sixty percent (62%) of those with no recidivism offense are retained in either moderate or low risk categories. Those at highest risk for public safety relevant offenses, felony offenses, and multiple offenses within one year of assessment are moved on to the high risk category.

## Comparison of Current and Modified Risk Categories

The YLS/CMI includes a professional override, where the assessor utilizes professional judgement and knowledge about the youth being assessed to adjust the risk categorization (ex. from low risk to moderate risk). Some studies have found that the use of overrides have reduced the accuracy of the YLS/CMI in predicting re-offense<sup>iv</sup> and should be used with caution. For DOCCR initial YLS/CMI assessments, overrides are rarely used to change current risk categorization (N=46, 1%). Due to these small numbers, overrides do not significantly impact risk classification among initial YLS/CMI assessments.

Table 7 provides a comparison of current and modified risk categories for outcome variables. The current risk categories of High and Very High are combined for comparison purposes. Using a sample of those 773 juveniles receiving probation services with DOCCR on 12/31/2016, excluding STS, Restitution, and Low Level Offenders, estimates of risk distributions for current and modified cut points are also provided.

**Table 7. Comparison of Current and Modified Risk Categories for Outcome Variables**

Outcome Variable	Low Risk			Moderate Risk			High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Youth Distribution	24.3%	28.3%	+4.0%	54.6%	23.0%	-31.6%	21.2%	48.7%	+27.5%
Estimated DOCCR Distribution*	187	219	+32	422	178	-244	164	376	+212
Rate of One Year Recidivism	19.8%	21.8%	+2.0%	41.8%	36.5%	-5.3%	53.9%	50.5%	-3.4%
Rate of Person Recidivism	5.3%	5.3%	0.0%	15.3%	13.0%	-2.3%	21.5%	20.1%	-1.4%
Rate of Felony Recidivism	4.5%	5.0%	+0.5%	12.9%	10.3%	-2.6%	21.6%	18.6%	-3%

\*Estimated distributions are based upon youth receiving DOCCR probation services on 12/31/2016.

For those youth who reoffended within one year, Table 8 provides a comparison of current and modified risk category averages of outcome variables including the highest recidivism offense rank and number of recidivism offenses.

**Table 8. For Youth who Reoffend, Comparison of Current and Modified Risk Category Outcomes.**

Outcome Variable	Low Risk			Moderate Risk			High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Average Highest Recidivism Offense Ranking	12.2	12.0	-0.2	14.0	13.6	-0.4	15.0	14.8	-0.2
Average Number of Recidivism Offenses	1.4	1.4	0.0	1.6	1.5	-0.1	1.8	1.7	-0.1

Appendix B gives normative and comparative summaries of outcome variables for gender subgroups. Appendix C provides similar information for racial subgroups.

A recent validation study found that the YLS/CMI is a valid measure of risk to reoffend for DOCCR youth as well as subgroups including males, females, youth of color, and whites. The results of this study confirm the validity of the YLS/CMI to predict risk to reoffend over a one year period. Based upon a benefits analysis, the YLS/CMI has sufficient predictive power to be a valuable tool for risk assessment (AUC=.66), with similar results for subgroups of males, females, Hispanics, Blacks, and Whites.

A cut point analysis determined that a modification of current risk categories gives a greater discrimination of risk populations. Cut points tentatively set based solely upon normative data were confirmed as most effective in discriminating risk populations when viewing outcome measures, both in terms of the likelihood of recidivism within one year and the nature of recidivism offenses.

This revised report merges previously designated Very High risk classifications into the High risk classification. As previous research with the DOCCR youth population has shown, the youth currently identified as Very High risk represent a very small portion of the DOCCR youth receiving probation services (0.4%). This designation is considered to be of limited usefulness from an intervention standpoint and may place a burdensome label on youth. Within any of the three recommended risk categories, youth with higher YLSCMI score within that category recidivate at higher rates than those with lower scores within the same category.

With the recommended modifications, youth within risk categories can be described as follows.

**Low Risk (0-9):** Comprising almost thirty percent (28%) of those receiving an initial YLS/CMI assessments, most low risk youth (approximately 80%) will not recidivate within one year of their initial assessment. For those that do, most will reoffend only once (73%) and their offenses will primarily consist of non-felony offenses (77%) that are not directly relevant to public safety (76%).

**Moderate Risk (10-15):** Comprising almost one fourth (23%) of those receiving an initial YLS/CMI assessment, the majority of moderate risk youth (64%) will not recidivate within one year of their initial assessment. For those that do, most reoffend only once (68%) and their offenses will primarily consist of non-felony offenses (72%) that are not directly relevant to public safety (65%).

**High Risk (16-27):** Comprising almost half (49%) of those receiving an initial YLS/CMI assessment, approximately half of high risk youth (50%) will recidivate within one year of their initial assessment. For those that do, a significant portion reoffend more than once (44%) and they are at high risk for felony offenses (37%) that are directly relevant to public safety (40%).

Uncontrolled factors that introduce error into the measure of one year recidivism in this study include intervention based upon use of the initial assessment, length of supervision, possible adult incarceration, and offenses occurring outside of Minnesota. Most of these factors would likely introduce either random error or a muting of the relationship at high scores on the YLS/CMI. In other words, it is most likely that the power of risk prediction found in this analysis is the minimum and may well be stronger if more controls were in place.

1. Continue use of the YLS/CMI for assessment of risk to reoffend.
2. Modify Risk Categories as follows:  
Low Risk (0-9) Moderate Risk (10-15) High Risk (16+)
3. Collect a sufficient sample (N>300) of American Indian and Asian youth receiving an Initial YLS/CMI assessment for future analysis.



Authored by Debra Nonemaker, Consultant  
Nonemaker Consulting

On behalf of  
Danette Buskovick, Manager, Policy, Planning & Evaluation

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<sup>i</sup> Bodurtha, P. and Boyce, T. (2016) "Validation Study of the Youth Level of Service (YLS) Assessment in Hennepin County" *Hennepin County Community Corrections and Rehabilitation*, <http://www.co.hennepin.mn.us>

<sup>ii</sup> Nonemaker, D. (2016, March). "Youth Level of Service Case Management Inventory Risk Category Cut Point Analysis." *Hennepin County Community Corrections and Rehabilitation* <http://www.co.hennepin.mn.us>

<sup>iii</sup> Desmarais, S. and Singh, J. (2013). "Risk Assessment Instruments Validated and Implemented in Correctional Settings in the United States: An Empirical Guide, Council of State Governments Justice Center : <https://csgjusticecenter.org/wp-content/uploads/2014/07/Risk-Instmrnts-Guide.pdf>

<sup>iv</sup> Wormith, J. S., Hogg, S., & Guzzo, L. (2012). The predictive validity of a general risk/needs assessment inventory on sexual offender recidivism and an exploration of the override. *Criminal Justice and Behavior*, 39, 1511-1538. doi:10.1177/009385481245574

## Appendix A

### Most Serious Recidivism Offenses for Modified Risk Categories

Recidivism Offense	Low Risk (0-9)		Moderate Risk (10-15)		High Risk (16+)		Total	
	N	%	N	%	N	%	N	%
Homicide	0	0.0%	2	0.3%	3	0.2%	5	0.2%
Criminal Sexual Assault	1	0.1%	4	0.7%	4	0.3%	9	0.4%
Kidnapping	0	0.0%	0	0.0%	1	0.1%	1	0.0%
Domestic Assault	9	1.2%	12	2.0%	24	2.0%	45	1.8%
Assault	20	2.7%	32	5.4%	122	10.2%	174	6.8%
Robbery	5	0.7%	10	1.7%	54	4.5%	69	2.7%
Harrasment/ Stalking/Bias	1	0.1%	3	0.5%	1	0.1%	5	0.2%
Weapons	4	0.5%	14	2.4%	32	2.7%	50	2.0%
<b>Person Total</b>	<b>40</b>	<b>5.3%</b>	<b>77</b>	<b>13.0%</b>	<b>241</b>	<b>20.1%</b>	<b>358</b>	<b>14.1%</b>
Drugs	7	0.9%	2	0.3%	8	0.7%	17	0.7%
Burglary	9	1.2%	10	1.7%	35	2.9%	54	2.1%
Escape	7	0.9%	12	2.0%	47	3.9%	66	2.6%
Crimes Against Administration of Justice	12	1.6%	14	2.4%	33	2.7%	4	2.0%
Crimes Against Government	0	0.0%	1	0.2%	0	0.0%	1	0.0%
Prostitution	0	0.0%	1	0.2%	0	0.0%	1	0.0%
Vehicle Theft	0	0.0%	0	0.0%	2	0.2%	3	0.1%
Forgery/Counterfeiting	8	1.1%	1	0.2%	22	1.8%	31	1.2%
Theft	34	4.5%	38	6.4%	104	8.7%	176	6.9%
Property	6	0.8%	6	1.0%	17	1.4%	29	1.1%
Stolen Property	5	0.7%	9	1.5%	18	1.5%	32	1.3%
Disturbing Peace/Privacy	20	2.7%	29	4.9%	55	4.6%	104	4.1%
Traffic	11	1.5%	16	2.7%	20	1.7%	47	1.8%
Status/Other	5	0.7%	1	0.2%	4	0.3%	10	0.4%
<b>Non-Person Total</b>	<b>124</b>	<b>16.5%</b>	<b>140</b>	<b>23.6%</b>	<b>366</b>	<b>30.4%</b>	<b>630</b>	<b>24.7%</b>
No Recidivism	589	78.2%	377	63.5%	594	49.5%	1560	61.2%
<b>Total</b>	<b>753</b>	<b>100.0%</b>	<b>594</b>	<b>100.0%</b>	<b>1201</b>	<b>100.0%</b>	<b>2548</b>	<b>100.0%</b>

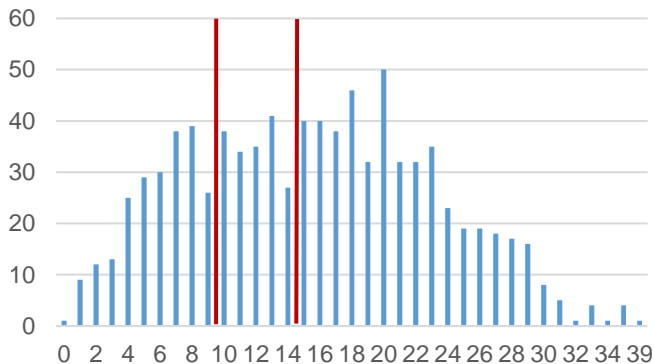
## Appendix B

### Summary of Gender Risk Levels and Outcomes

This appendix provides a comparative summary of scores, current/modified risk levels, and outcomes for gender subgroups. Figure 1b and 2b display the distribution of scores for gender subgroups, with trend lines in red designating modified risk boundaries. Table 1b shows average domain scores for gender subgroups.

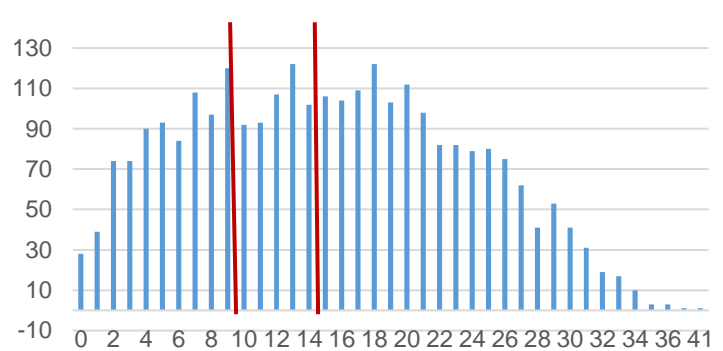
**Figure 1b. Score distribution for Females**

(N=878)



**Figure 2b. Score distribution for Males**

(N=2757)



**Table 1b. Average domain scores by gender subgroups.**

Racial Subgroup	Prior/ Current Offenses	Family/ Parenting	Education/ Employment	Peer Relations	Substance Abuse	Leisure/ Recreation	Personality/ Behavior	Attitude/ Orientation
Female (N=878)	.72	2.58	3.00	2.03	1.22	1.59	2.97*	1.39
Male (N=2757)	.78	2.26	3.04	2.10	1.43*	1.57	2.53	1.54
Total (N=3635)	.76	2.34	3.03	2.09	1.38	1.57	2.64	1.50

\*A significantly higher score compared to other gender subgroup ( $p < .01$ ).

Tables 2b and 3b provide comparisons of current and modified risk categories on outcome variables across gender subgroups. Current high and very high risk categories are combined to create a comparable three risk classification. Estimated distributions are based upon youth receiving DOCCR probation services on December 31<sup>st</sup>, 2016 (N=773). Averages for highest recidivism offense ranking and number of recidivism offenses are calculated for the subgroup of youth who reoffended within each risk category.

Tables 2b and 3b present descriptive summaries of data and are not necessarily indicative of statistical significance when comparing subgroups or risk level modifications. Interpretation of these summaries should rely heavily upon overall patterns, previous findings of validity of risk prediction for gender subgroups in Hennepin County, and the cut point analysis of the full norming and one year recidivism samples.

Person and felony recidivism events are rarer and therefore more difficult to predict. They are most appropriately used to provide additional confirmation of cut points with the full sample cut point analysis and should be interpreted very cautiously.

Columns displaying changes in descriptive summaries based upon changes in risk level ranges do not necessarily denote a significant change and many may not rise above the error band for splits by risk level for subgroup samples.



**Table 2b. Comparison of current and modified risk categories on outcome variables for Females (N=609).**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	22%	25%	+1%	58%	25%	-44%	20%	50%	+43%
Estimated DOCCR Youth Distribution	27	31	+4	71	31	-40	25	61	+36
Rate of One Year Recidivism	22.1%	24.1%	+2.0%	36.5%	31.6%	-4.9%	46.7%	43.1%	-3.6%
Rate of Person Recidivism	6.6%	7.0%	+0.4%	9.4%	5.9%	-3.5%	12.3%	12.4%	+0.1%
Rate of Felony Recidivism	0.7%	1.3%	+0.6%	3.7%	3.9%	+0.2%	8.2%	5.4%	-2.8%
Average Highest Recidivism Offense Ranking*	12.7	12.9	+0.2	12.2	11.2	-1.0	12.6	12.7	+0.1
Average Number of Recidivism Offenses*	1.3	1.4	+0.1	1.4	1.5	+0.1	1.4	1.4	0.0

\*Averages are calculated for the subgroup of youth who reoffend.

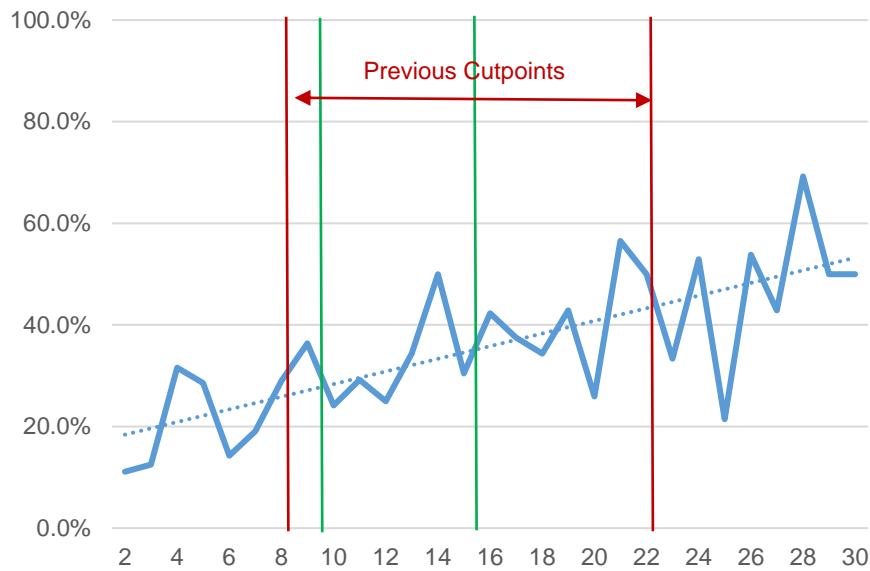
**Table 3b. Current and modified risk categories on outcome variables for Males (N=1939).**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	25%	29%	+5%	53%	23%	-30%	22%	48%	+25%
Estimated DOCCR Youth Distribution	163	188	+25	344	150	-194	143	312	+169
Rate of One Year Recidivism	19.2%	21.2%	+2.0%	43.6%	38.2%	-5.4%	56.0%	53.0%	+3.0%
Rate of Person Recidivism	4.9%	4.9%	0.0%	17.4%	15.4%	-2.0%	24.2%	22.7%	-1.5%
Rate of Felony Recidivism	5.5%	6.1%	+0.6%	16.1%	12.4%	-3.7%	25.6%	22.9%	-2.7%
Average Highest Recidivism Offense Ranking*	12.1	11.8	-0.3	14.5	14.2	-0.3	15.6	15.4	-0.2
Average Number of Recidivism Offenses*	1.4	1.4	0.0	1.6	1.4	-0.2	1.8	1.8	0.0

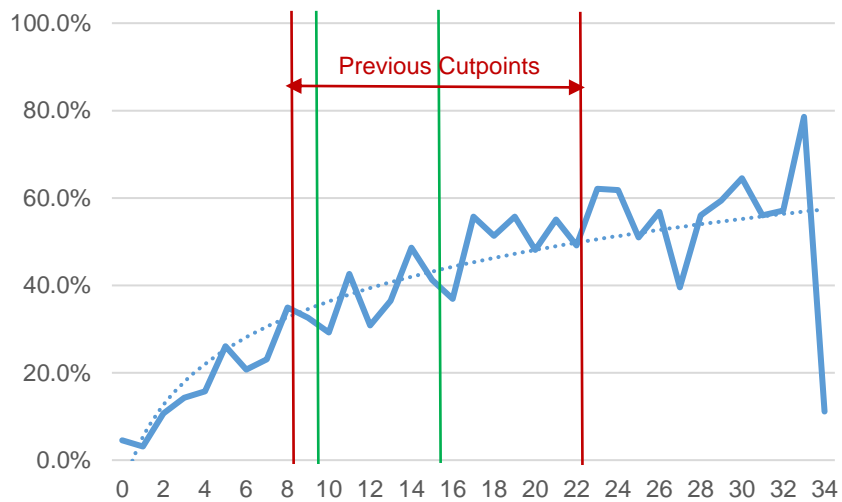
\*Averages are calculated for the subgroup of youth who reoffend.

To provide greater context for interpreting Tables 2b and 3b, the distribution of one year recidivism rates by YLS/CMI scores for gender subgroups are displayed in Figures 3b and 4b. Modified risk levels are denoted by green drop lines while previous risk levels are shown with red drop lines as well as being labeled. Trend lines tracking the estimated nature of the relationship between risk scores and recidivism rates are also added.

**Figure 3b. One year recidivism rates by YLS/CMI score for Females (N=609).**



**Figure 3b. One year recidivism rates by YLS/CMI score for Males (N=1939).**



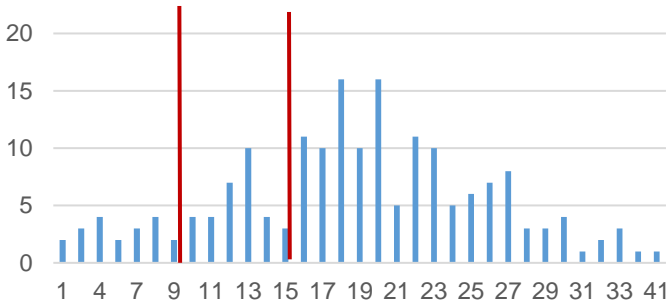
The relationship between YLSCMI scores and recidivism appears to be fairly linear for females. For males, a log linear relationship is displayed, with steeper increases in recidivism rates in lower score ranges and rates increasing at a slower pace with higher scores.

## Appendix C

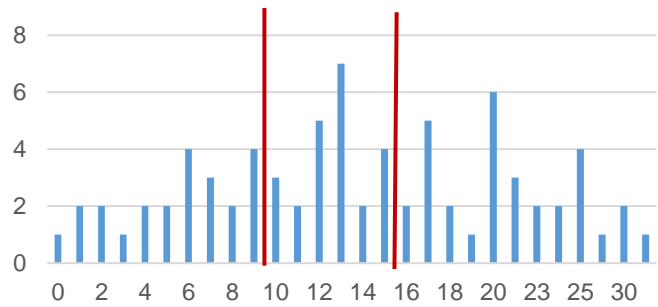
### Summary of Racial Risk Levels and Outcomes

This appendix provides a comparative summary of scores, current/modified risk levels, and outcomes for racial subgroups. Figure 1c through 5c display the distribution of scores for racial subgroups, with trend lines in red designating modified risk boundaries. Table 1c shows average domain scores for racial subgroups.

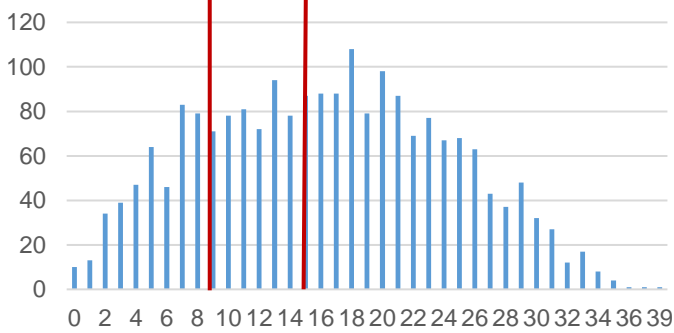
**Figure 1c. Score distribution for American Indians (N=185)**



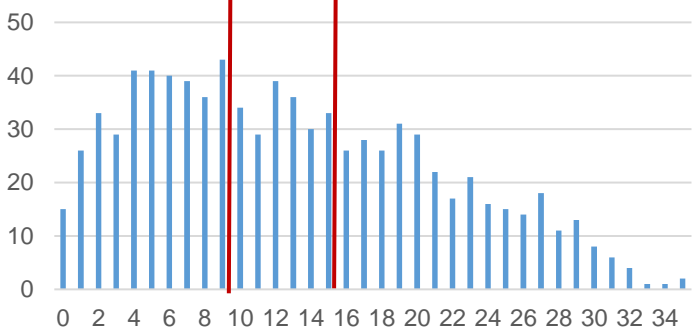
**Figure 2c. Score distribution for Asians (N=77)**



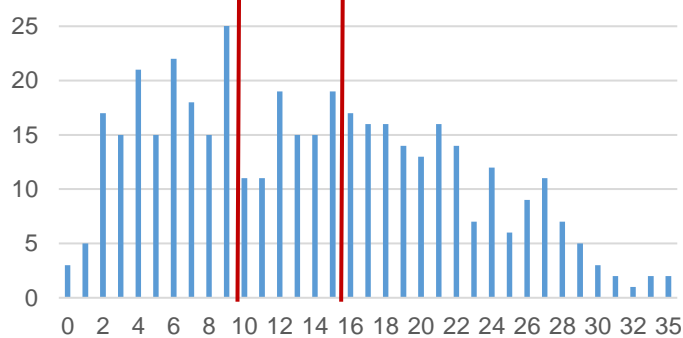
**Figure 3c. Score distribution for Blacks (N=2100)**



**Figure 4c. Score distribution for Whites (N=853)**



**Figure 5c. Score distribution for Two or More Races/Other (N=420)**



**Table 1c. Average domain scores by racial subgroup.**

Racial Subgroup	Prior/ Current Offenses	Family/ Parenting	Education/ Employment	Peer Relations	Substance Abuse	Leisure/ Recreation	Personality/ Behavior	Attitude/ Orientation
American Indian (N=185)	.90*	2.90*	3.50*	2.64*	2.09*	2.02*	2.80*	1.84*
Asian (N=77)	.68	2.34	2.57	1.88	1.36	1.68*	2.19	1.39
Black (N=2100)	.90*	2.46*	3.41*	2.22*	1.18	1.66*	2.83*	1.63*
White (N=853)	.53	2.01	2.28	1.70	1.72*	1.28	2.30	1.17
Other/Two or More Races (N=420)	.50	2.17	2.53	1.96	1.36	1.51	2.35	1.41

\*A significantly higher score compared to other racial groups (p<.01).

Tables 2c through 6c provide comparisons of current and modified risk categories on outcome variables across racial subgroups. Current high and very high risk categories are combined to create a comparable three risk classification. Estimated distributions are based upon youth receiving DOCCR probation services on December 31<sup>st</sup>, 2016 (N=773). Averages for highest recidivism offense ranking and number of recidivism offenses are calculated for the subgroup of youth who reoffended within each risk category.

**Table 2c. Comparison of current and modified risk categories on outcome variables for American Indians (N=126)\*.**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	10%	11%	+1%	61%	17%	-44%	29%	72%	+43%
Estimated DOCCR Youth Distribution	4	4	0	24	7	-17	12	29	+17
Rate of One Year Recidivism	15.4%	20.0%	+4.6%	32.5%	33.3%	+0.8%	44.4%	36.7%	-7.7%
Rate of Person Recidivism	7.7%	13.3%	+5.6%	16.9%	9.5%	-7.4%	11.1%	15.6%	+4.5%
Rate of Felony Recidivism	15.4%	13.3%	-2.1%	10.4%	14.3%	+3.9%	16.7%	12.2%	-4.5%
Average Highest Recidivism Offense Ranking**	20.5	20.3	-0.2	16.2	10.1	-6.1	12.6	15.6	+3.0
Average Number of Recidivism Offenses**	2.0	2.0	0.0	1.4	1.3	-0.1	1.2	1.3	+0.1

\*Summaries may be unstable due to small sample size.

\*\*Averages are calculated for the subgroup of youth who reoffend.

**Table 3c. Current and modified risk categories on outcome variables for Asians (N=58).\***

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	25%	30%	+5%	60%	30%	-30%	15%	40%	+25%
Estimated DOCCR Youth Distribution	3	3	0	6	3	-3	1	4	+3
Rate of One Year Recidivism	5.9%	5.0%	-0.9%	21.9%	12.5%	-9.4%	33.3%	36.4%	+3.1%
Rate of Person Recidivism	5.9%	5.0%	-0.9%	6.3%	0.0%	-6.3%	11.1%	13.6%	+2.5%
Rate of Felony Recidivism	5.9%	5.0%	-0.9%	9.4%	0.0%	-9.4%	0.0%	13.6%	+13.6%
Average Highest Recidivism Offense Ranking**	25.0	25.0	0.0	14.0	10.0	-4.0	12.7	14.5	+1.8
Average Number of Recidivism Offenses**	1.0	1.0	0.0	1.4	1.5	+0.1	1.3	1.4	+0.1

\*Summaries may be unstable due to small sample size.

\*\*Averages are calculated for the subgroup of youth who reoffend.

**Table 4c. Comparison of current and modified risk categories on outcome variables for Blacks (N=1487).**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	20%	23%	+3%	56%	23%	-33%	24%	54%	+30%
Estimated DOCCR Youth Distribution	99	114	+15	278	114	-164	119	268	+149
Rate of One Year Recidivism	28.9%	31.5%	+2.6	49.1%	41.9%	-7.2%	57.5%	56.5%	-1.0%
Rate of Person Recidivism	8.4%	8.2%	-0.2%	18.9%	16.3%	-2.6%	25.4%	23.9%	-1.5%
Rate of Felony Recidivism	7.1%	8.2%	+1.1%	16.1%	11.8%	-4.3%	25.6%	22.6%	-3.0%
Average Highest Recidivism Offense Ranking*	12.8	12.7	-0.1	14.5	14.6	+0.1	15.8	15.2	-0.6
Average Number of Recidivism Offenses*	1.4	1.5	+0.1	1.7	1.5	-0.2	1.8	1.8	0.0

\*Averages are calculated for the subgroup of youth who reoffend.

**Table 5c. Comparison of current and modified risk categories on outcome variables for Whites (N=637).**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	35%	40%	+5%	50%	24%	-26%	15%	36%	+16%
Estimated DOCCR Youth Distribution	33	38	+5	48	23	-25	14	34	+20
Rate of One Year Recidivism	12.0%	12.3%	+0.3%	26.8%	26.8%	0.0%	48.5%	38.2%	-10.3%
Rate of Person Recidivism	1.3%	1.5%	+0.2%	6.4%	6.7%	+0.3%	17.2%	11.4%	-5.8%
Rate of Felony Recidivism	1.3%	1.2%	-0.1%	4.8%	5.4%	+0.6%	14.1%	9.2%	-4.9%
Average Highest Recidivism Offense Ranking*	8.9	9.3	+0.4	10.8	9.9	-0.9	14.4	13.2	-1.2
Average Number of Recidivism Offenses*	1.2	1.2	0.0	1.3	1.3	0.0	1.7	1.6	-0.1

\*Averages are calculated for the subgroup of youth who reoffend.

**Table 6c. Comparison of current and modified risk categories on outcome variables for Two or More Races/Other (N=240).\***

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	31%	37%	+6%	53%	22%	-33%	16%	41%	27%
Estimated DOCCR Youth Distribution	41	49	+8	70	29	-41	21	54	+33
Rate of One Year Recidivism	9.2%	14.0%	+4.8%	41.7%	36.5%	-5.2%	48.6%	48.4%	-0.2%
Rate of Person Recidivism	3.9%	3.2%	-.7%	15.7%	13.5%	-2.2%	8.1%	16.8%	+8.7%
Rate of Felony Recidivism	1.3%	2.2%	+0.9%	15.0%	15.4%	+0.4%	13.5%	15.8%	+2.3%
Average Highest Recidivism Offense Ranking**	13.0	10.0	-3.0	14.5	14.6	+0.1	10.3	13.8	+3.5
Average Number of Recidivism Offenses**	1.1	1.1	0.0	1.5	1.5	0.0	1.6	1.6	0.0

\*Summaries may be unstable due to small sample size.

\*\*Averages are calculated for the subgroup of youth who reoffend.

The sample sizes for racial groups of American Indians, Asians, and two or more races are not sufficient for reliable summaries. Table 7 combines youth of color (nonwhite) into one subgroup.

**Table 7c. Comparison of Current and Modified Risk Categories on Outcome Variables for Youth of Color (N=1911).**

Outcome Variable	Low Risk			Moderate Risk			High/Very High Risk		
	Current (1-8)	Modified (1-9)	Change	Current (9-22)	Modified (10-15)	Change	Current (23+)	Modified (16+)	Change
Normative Sample Distribution	21%	25%	+4%	56%	23%	-33%	23%	52%	+29%
Estimated DOCCR Youth Distribution	142	170	+28	380	156	-224	156	353	+197
Rate of One Year Recidivism	24.0%	26.8%	+2.8%	46.2%	39.8%	-6.4%	55.1%	53.4%	-1.7%
Rate of Person Recidivism	7.4%	7.3%	-0.1%	18.0%	15.1%	-2.9%	22.4%	22.2%	-0.2%
Rate of Felony Recidivism	6.2%	7.1%	+0.9%	15.3%	11.9%	-3.4%	23.3%	20.8%	-2.5%
Average Highest Recidivism Offense Ranking*	13.1	12.7	-0.4	14.6	14.4	-0.2	15.2	15.1	-0.1
Average Number of Recidivism Offenses*	1.4	1.5	+0.1	1.6	1.5	-0.1	1.8	1.7	-0.1

\* Averages are calculated for the subgroup of youth who reoffend.

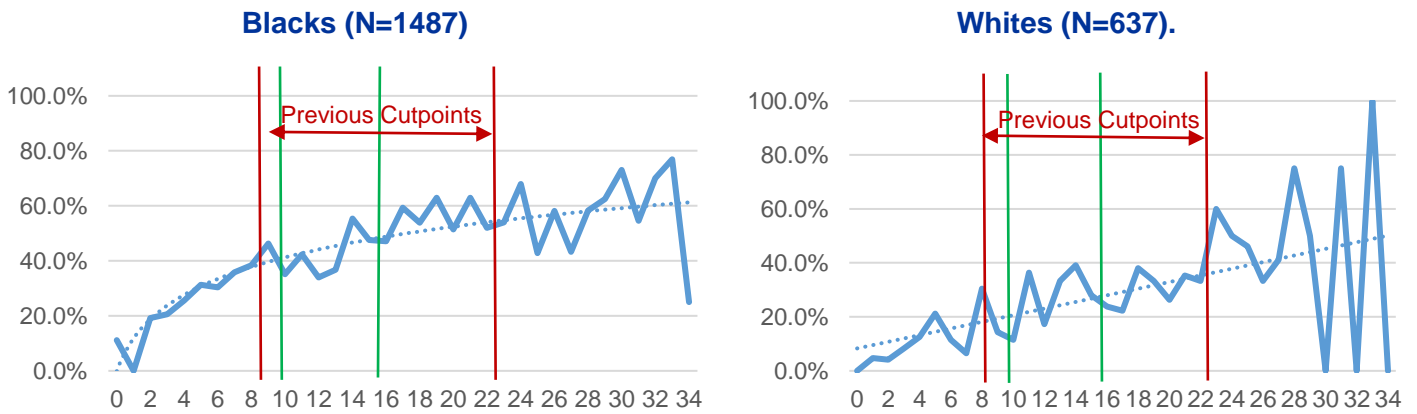
Tables 2c through 7c present descriptive summaries of data and are not necessarily indicative of statistical significance when comparing subgroups or risk level modifications. Interpretation of these summaries should rely heavily upon overall patterns, previous findings of validity of risk prediction for whites and youth of color in Hennepin County, and the cut point analysis of the full norming and one year recidivism samples.

As noted above, specific summaries for American Indians, Asians, and youth of two races may be unstable due to small sample size. Larger samples of these subgroups are necessary before drawing any interpretive conclusions. Person and felony recidivism events are rarer and therefore more difficult to predict. They are most appropriately used to provide additional confirmation of cut points with the full sample cut point analysis and should be interpreted very cautiously.

Columns displaying changes in descriptive summaries based upon changes in risk level ranges do not necessarily denote a significant change and many may not rise above the error band for splits by risk level for subgroup samples.

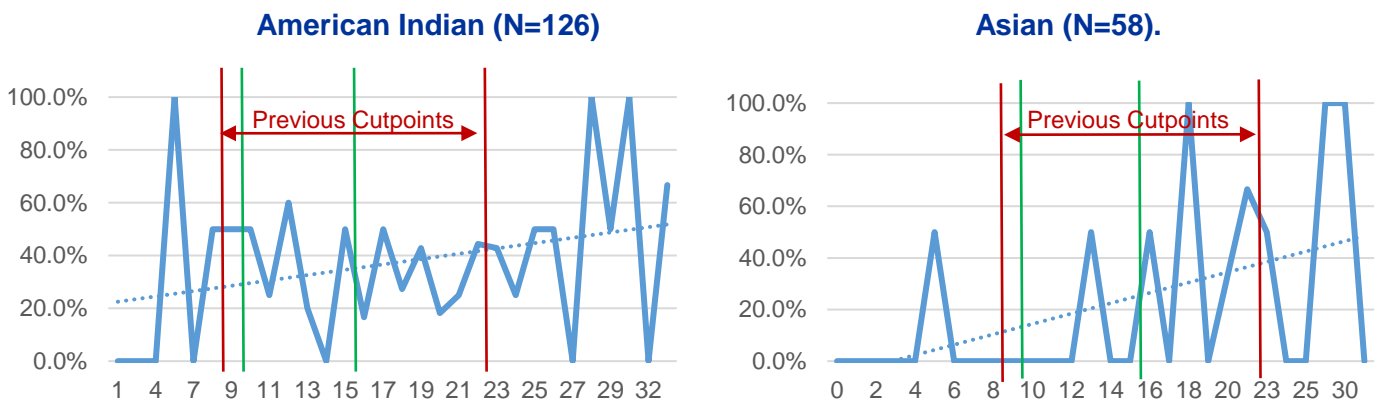
To provide greater context for interpreting Tables 2c and 7c, the distribution of one year recidivism rates by YLS/CMI scores for racial subgroups are displayed in Figures 6c through 8c. Modified risk levels are denoted by green drop lines while previous risk levels are shown with red drop lines as well as being labeled. Trend lines tracking the estimated nature of the relationship between risk scores and recidivism rates are also added.

**Figure 6c. One year recidivism rates by YLS/CMI score for**



The relationship between scores and recidivism appears more linear for whites and log linear for blacks. This indicates that for whites recidivism increases at a fairly constant rate with increased YLSCMI scores. For black youth, recidivism rate rise more quickly in lower score ranges and at a slower pace with higher scores.

**Figure 7c. One year recidivism rates by YLS/CMI score for**



The sample size for American Indian and Asian subgroups is not adequate for meaningful comparative analysis, as Figure 7c clearly shows.

**Figure 8c. One year recidivism rates by YLS/CMI score for**

