

Pretrial Risk Assessment Tool Validation

PRETRIAL PILOT PROGRAM

COUNTY OF SACRAMENTO

JULY 2021



Impact of COVID-19 Pandemic on Pretrial Pilot Program

The Budget Act of 2019 requires that Pretrial Pilot Program courts collaborate with local justice system partners to make data available to the Judicial Council as required to measure the outcomes of the pilots. Senate Bill 36 (Hertzberg; Stats. 2019, ch. 589) established tool validation and reporting requirements for pretrial services agencies using a pretrial risk assessment tool; these requirements are mandatory for all pilot projects.

Throughout much of period covered by this report, the United States experienced the COVID-19 global pandemic. On March 4, 2020, Governor Gavin Newsom declared a state of emergency to protect public health and safety, and formalized efforts by the California Department of Public Health, California Health and Human Services Agency, Governor's Office of Emergency Services, and other state agencies and departments to mitigate this public health crisis. On March 19, 2020, orders from the Governor and the California Department of Public Health directed all California residents to stay home except when performing essential jobs or shopping for necessities.

On March 27, 2020, the Governor issued an order that gave the Judicial Council of California and the Chief Justice authority to adopt emergency rules and take other necessary actions to respond to the COVID-19 health and safety crisis. The Judicial Council adopted various emergency measures to support courts in providing essential services while helping to safely reduce jail populations. These measures, together with policies adopted by individual courts in response to the crisis, have impacted the population eligible for participation in the Pretrial Pilot Program.

On April 6, 2020, the Judicial Council adopted a statewide emergency bail schedule that set presumptive bail at \$0 for most misdemeanors and lower-level felonies, with specified exceptions, but retained court discretion in setting bail. The emergency rule was intended to safely reduce jail populations and protect justice system personnel and public health while promoting consistency in pretrial release and detention throughout the state. The Judicial Council repealed the emergency bail schedule rule effective June 20, 2020, but encouraged courts to adopt local emergency bail schedules with \$0 bail or significantly reduced bail levels to meet their county's public health and safety conditions.

As a result of local criminal justice system policies and the emergency bail schedule, pilot courts observed significant reductions in booking rates and jail populations during this time. Under these temporary emergency policies, many individuals who would otherwise have been eligible for program participation were cited and released in the field or released on \$0 bail upon booking without undergoing a risk assessment. Crime and arrest patterns were also likely affected by COVID-19 and shelter-in-place orders. Criminal case dispositions also slowed during this time period.

Therefore, the population of program participants is very likely different than would be seen in the absence of the pandemic, both in terms of reduced numbers and composition. In addition, the validation analyses in this report are limited to bookings with final dispositions in order to observe the full pretrial period. As California emerges from the COVID-19 pandemic, we anticipate that program participation will grow, with more individuals served.

SACRAMENTO PSA VALIDATION INTRODUCTION

LEGISLATIVE MANDATE

This report fulfills the legislative mandates of the Budget Act of 2019 (Assem. Bill 74; Stats. 2019, ch. 23), and Senate Bill 36 (Stats. 2019, ch. 589). In AB 74, the Legislature directed the Judicial Council to administer pretrial projects in the trial courts. The goals of the Pretrial Pilot Program, as set by the Legislature, are to:

- Increase the safe and efficient prearraignment and pretrial release of individuals booked into iail:
- Implement monitoring practices with the least restrictive interventions necessary to enhance public safety and return to court;
- Expand the use and validation of pretrial risk assessment tools that make their factors, weights, and studies publicly available; and
- Assess any disparate impact or bias that may result from the implementation of these programs.

SB 36 requires each pretrial services agency that uses a pretrial risk assessment tool to validate the risk assessment tool used by the agency by July 1, 2021, and on a regular basis thereafter, and to make specified information regarding the tool, including validation studies, publicly available.

AB 74 provided funding to the Judicial Council "for costs associated with implementing and evaluating the Pretrial Pilot Program, including, but not limited to "....(e) Assisting the pilot courts in validating their risk assessment tools." This report, in accordance with AB 74 and SB 36, provides information on the validation of the PSA pretrial risk assessment tool used by Sacramento.

SB 36 requires pretrial risk assessment tools to be validated. SB 36 defines "validate" as follows:

"Validate" means using scientifically accepted methods to measure both of the following:

(A) The accuracy and reliability of the risk assessment tool in assessing (i) the risk that an assessed person will fail to appear in court as required and (ii) the risk to public safety due to the commission of a new criminal offense if the person is released before the adjudication of the current criminal offense for which they have been charged.

(B) Any disparate effect or bias in the risk assessment tool based on Gender, Race, or ethnicity.

(Sen. Bill 36, § 1320.35(b)(4).)

VALIDATION METHODS

Descriptive statistics are presented, exploring basic features of the data such as demographics and showing the overall distributions of arrest offenses and adverse outcomes. The distributions of risk scores are shown in groupings of risk level defined by the tool developer.

A Receiver Operating Characteristic (ROC) curve model has been used to provide the Area Under the Curve (AUC) statistic for each outcome of interest. The outcomes of interest are:

- Failure to appear (FTA)
- New arrest

- New filing
- New conviction
- New violent arrest

The AUC value is a single number that represents the ability of the tool to differentiate between individuals who are lower or higher risk across the range of the tool. The AUC is calculated for each outcome overall, and separately for each gender and race/ethnicity group to examine whether the ability of the tool to differentiate individuals by risk differs by gender or race/ethnicity.

For criminal justice risk assessments, a common metric for evaluating AUC values is derived from Demarais and Singh (2013)¹, who defined AUC values less than 0.55 as poor, 0.55-0.63 as fair, 0.64-0.70 as good, and 0.71-1.00 as excellent.

The observed rate of adverse outcomes at each score is presented. The pattern of these rates is an indicator of the accuracy of the tool, showing whether risk scores predict monotonic increasing failure rates for each outcome of interest.

Logistic regression is used to test whether risk scores statistically significantly predict the likelihood of each outcome of interest, and whether any differences in outcomes by risk level across gender or race/ethnicity are statistically significant. Statistical significance is a technical term used in analyses to indicate that it is very unlikely that a result or difference occurred by chance. Statistical significance does not necessarily indicate the size of the result or difference.

To measure any predictive bias in the tools, fitted curves of the rates of adverse outcomes at each score are shown separately by gender and race/ethnicity groups. Logistic regression has been used to test whether the likelihood of each outcome of interest by risk level differs across gender or race/ethnicity groups in a manner that is statistically significant.

The risk scores presented in this report are calculated using a scoring scheme designed by the tool developers. The tool takes into account aspects of an individual's criminal history, current criminal offense, history of failures to appear in court, age, and other factors (see Appendix A, Tables 1 and 2 for the factors and weights specific to the FTA, NCA, and NVCA subscales of the PSA). Gender and race are not used to calculate risk scores.

This report analyzes risk scores and associated outcomes for individuals who were released from custody pretrial. Individuals may have been released in a variety of ways by a Sheriff or judge, including on bail. This report does not look at judicial decision-making or judges' use of the risk assessment tool.

Further research is needed to analyze the elements that may be driving the observed differences and whether there are data-driven modifications to the tool's risk factors or weights that can further improve the predictive power of the tool.

¹ Desmarais, S. L., & Singh, J. P. (2013). Risk assessment instruments validated and implemented in correctional settings in the United States. *Lexington, KY: Council of State Governments*.

DEFINITIONS

- **Pretrial period** is the time period starting at booking of an individual at the jail and ending at resolution of any and all cases associated with that booking
- **Failure to appear** (FTA) is measured using court records documenting issuance of a bench warrant for FTA during the pretrial period.
- New arrest² is any new arrest during the pretrial period reported to the California Department of Justice (CA DOJ)
- **New filing** is any new arrest during the pretrial period that results in charges filed with the court and reported to the CA DOJ³
- **New conviction** is any new arrest during the pretrial period that results in a conviction reported to the CA DOJ during the data collection period⁴
- **New violent arrest** is any new arrest during the pretrial period for an offense on the list of PSA Pretrial Pilot consensus violent offense list, which includes felonies and misdemeanors of a violent nature. For the full list of offenses see Appendix A.

VALIDATION SAMPLE SIZES

For purposes of this report, general validation results are shown when the sample size was greater than 200. For analyses of predictive bias by race/ethnicity and gender, subgroup results are shown when the overall sample was at least 1,000 and each subgroup size was greater than 200. Sample sizes smaller than these may not produce reliable results. Sacramento meets sample size requirements for both general validation and analyses of predictive bias.

DATA DESCRIPTION AND LIMITATIONS

The data set for the pretrial risk assessment tool validation was created using data from the court and two agencies in the county, as well as statewide data from the California Department of Justice.

DATA SOURCES

- **Jail booking data**: Sacramento sheriff's office provided information on all individuals booked into local county jail, including booking dates, charges, and releases.
- Probation data: Sacramento probation department performed pretrial assessment services and provided pretrial risk assessment information, including assessment dates, scores, and recommendation for those assessed.
- Court case data: Sacramento superior court provided court case information, including pretrial disposition dates and the issuance of warrants for failures to appear for those with felony or misdemeanor criminal filings.

² New criminal offenses are defined in four ways to capture different outcomes of interest. All new criminal offense indicators are measured using data from the California Department of Justice (CA DOJ).

³ CA DOJ records on arrests are likely more complete than CA DOJ records on court filings and dispositions. Court reporting to the CA DOJ is incomplete.

⁴ Because of the short timeframe of the data collection period and delays in court reporting to the CA DOJ, new convictions may not be a complete measure of all arrests during the pretrial period that result in a conviction.

California Department of Justice Data (CA DOJ) data: The California Department of Justice
provided arrest and disposition data, including out-of-county filings, for booked defendants.

DATE RANGE

The time period for this validation extends from October 22, 2019 to October 24, 2020.

DATA LINKING AND FILTERING

After data were collected from each source, they were standardized and linked together to create a validation dataset of bookings with associated pretrial risk assessment information, relevant court case information, and outcomes during the pretrial period. Local justice agencies keep separate data systems, and not all data were able to be matched across agencies. Due to the limited timeframe of the data and the effects of COVID-19 on court operations, data are likely skewed towards dispositions that occur in a shorter time frame compared to all dispositions, and many individuals who were released pretrial may not have had final dispositions during the data collection period and therefore could not be included in the validation sample. The only bookings included in the validation dataset were those for which the individual was released pretrial and there was a final disposition associated with the booking because outcomes during the pretrial period were a primary interest of this analysis and also so that the full pretrial period could be observed. This report refers to each booking linked with an associated assessment and completed pretrial period as a "pretrial observation."

The table below shows the number of assessments at each stage of filtering, and the type of validation that will be presented based on the sample size.

Table A - Counts of all assessments at each stage of filtration for evaluation sample

Tool Name	County	Assessments		Pretrial Complete		Validation Type
PSA	Sacramento	16,808	6,018	3,561	1,303	General + Bias

DESCRIPTIVE STATISTICS

DEMOGRAPHICS

Table B provides the number of assessments in the evaluation dataset, the racial/ethnic and gender makeup, and the median age. Black and White racial/ethnic groups make up nearly equal shares (35% and 36%) of the population being evaluated. The Hispanic racial/ethnic group make up 23 percent evaluation data set. The sample is primarily male (82%) and the median age is 33. ⁵

⁵ Non-binary, other, and unknown genders represented less than 0.1% of the bookings in the evaluation dataset.

Table B - Demographic Profile of Evaluation Dataset

		Race/Ethnicity (%)			Gene	der (%)		
County	Total	Black	White	Hispanic	Other	Male	Female	Median Age
Sacramento	1,304	35	36	23	6	82	18	33

ARREST OFFENSES

Felony arrests represented the majority of bookings (62%); misdemeanor arrests were a smaller share (38%). Violent offenses⁶ represented 20% of bookings in the dataset, while property offenses were 19% and drug offenses 18% of bookings in the dataset. DUI offenses were 7% of bookings, while DV offenses made up 13% of bookings in the evaluation dataset.

Table C - Distribution of Arrest Offense Type

County	Felony	Misdemeanor	Violent	Property	Drug	DUI	DV
Sacramento	62	38	20	19	18	7	13

ADVERSE OUTCOMES

Several different adverse outcomes are measured during the pretrial period from pretrial release to disposition. Failure to appear (FTA), measured as bench warrants issued for FTA during the pretrial period, was recorded for 31.3% of pretrial observations. New arrests during the pretrial period were recorded for 46.1% of pretrial observations. New arrests during the pretrial period resulting in filed charges were recorded for 22.8% of pretrial observations, and new arrests during the pretrial period resulting in convictions were recorded for 17% of pretrial observations.⁷ New violent arrests⁸ (including felony and misdemeanor arrests for offenses of a violent nature) were recorded during the pretrial period for 10.7% of pretrial observations.

Table D - Rates of Pretrial Misconduct

County	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest
Sacramento	31.3	46.1	22.8	17.0	10.7

CONDITIONS OF MONITORING/SUPERVISION

⁶ Violent offenses as defined by the pilot consensus PSA Violent Offense List, see Appendix B. These include both felonies and misdemeanors that are violent in nature.

⁷ New arrest, new filing, and new conviction data are measured using CA DOJ data. New arrests and new violent arrests are reported to the CA DOJ from arresting agencies, whereas new filings and new convictions are reported to the CA DOJ from courts. The CA DOJ may have incomplete records of filings and convictions from the courts because of difficulties or delays in reporting, and not all new arrests during the pretrial period may have been resolved during the data collection period.

⁸ New violent arrests are defined by the PSA Violent Offense List (see footnote 6 above)

Data on supervision conditions were collected from the county probation department. However, data quality was low and was therefore not used in the analyses. Supervision conditions may have affected outcomes and may have been applied differentially according to risk score which could confound results. Further research is needed to determine the impact of supervision conditions and to separate out the efficacy of the tools from the efficacy of supervision conditions.

SACRAMENTO PSA VALIDATION

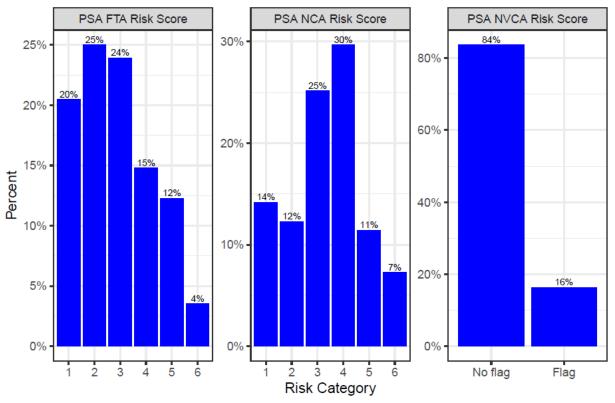
GENERAL VALIDATION

The following charts show the distribution of risk levels for individuals in Sacramento in the evaluation dataset assessed with the PSA tool, for each PSA subscale. The PSA FTA subscale was designed to predict the risk of failure to appear in court. The PSA NCA scale was designed to predict the risk of a new arrest, and the PSA NVCA flag was designed to predict new arrest for a violent crime. As determined by the tool developers, the FTA and NCA subscales are each divided into 6 risk levels with 1 representing the lowest risk and 6 the highest, and the NVCA subscale is divided into a binary flag, such that a flag represents higher risk of new violent crime and no flag represents lower risk of new violent crime.⁹ Lower scores were more common for the FTA subscale, mid-range scores were more common for the NCA subscales, and 16 percent of assessed individuals received a NVCA flag.

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⁹ The NVCA subscale is scaled to a 1-6 scale, and then scores 1-3 are categorized as no flag and scores 4-6 are categorized as flagged.

Sacramento Distribution of Assessments by PSA Risk Category



PSA FTA Risk Score	Total	PSA NCA Risk Score	Total
1	267	1	185
2	326	2	160
3	312	3	328
4	193	4	387
5	160	5	149
6	46	6	95

PSA NVCA Risk Score	Total
No flag	1,091
Flag	213

The following table shows the AUC values for the PSA scales for each outcome of interest. The AUC value is a single number that represents the ability of the tool to differentiate between individuals who are lower or higher risk across the range of the tool. For criminal justice risk assessments, a common metric for evaluating AUC values is derived from Demarais and Singh (2013)¹⁰, who defined AUC values less than 0.55 as poor, 0.55-0.63 as fair, 0.64-0.70 as good, and 0.71-1.00 as excellent. By these definitions, the AUC values for the PSA in Sacramento are excellent for FTA, are good for new arrest and new filing, and fair for new conviction and new violent arrest.

¹⁰ Desmarais, S. L., & Singh, J. P. (2013). Risk assessment instruments validated and implemented in correctional settings in the United States. *Lexington, KY: Council of State Governments*.

The 95% confidence interval is also shown, which represents the range of AUC estimates the true AUC value is statistically 95% likely to fall between. A smaller range indicates that given the size of the sample and pattern of the data, the AUC is able to be estimated with greater precision. None of the 95% confidence intervals fall below the fair range.

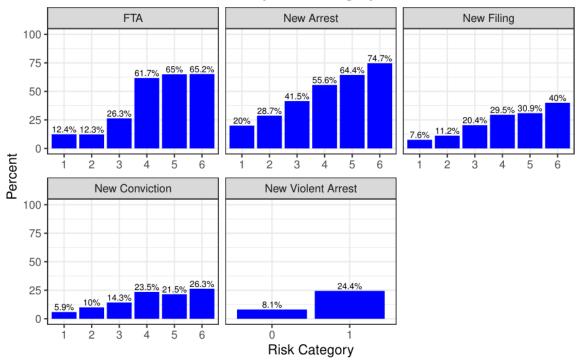
Risk Score	Outcome	AUC	CI (95%)
PSA FTA	FTA	0.765	0.737-0.793
PSA NCA	New Arrest	0.684	0.656 - 0.711
PSA NCA	New Filing	0.651	0.619 - 0.684
PSA NCA	New Conviction	0.629	0.593 - 0.666
PSA NVCA	New Violent Arrest	0.616	0.575 - 0.658

 $^{^{\}rm a}$ N = 1303

The following series of charts shows the rate of various adverse outcomes during the pretrial period at each risk level of the PSA, using each of the PSA subscales for the relevant outcomes. The PSA-FTA risk scale is used for the outcome of FTA. The PSA-NCA risk scale is used for the outcomes of new arrest, new filing, and new conviction. The PSA-NVCA risk flag is used for the outcome of new violent arrest. For each outcome of interest¹¹, observed rates of the outcome generally increase as the assessed risk level increases. This pattern is largely consistent across outcomes and risk levels, except for the FTA outcome between risk level 1 and risk level 2, and the new conviction outcome between risk level 4 and risk level 5.

¹¹ See validation methodology section for definitions of each outcome of interest

Sacramento PSA Outcomes by Risk Category



The following table shows the results from logistic regression models predicting each outcome of interest. The models control for the number of days the defendant spent released during the pretrial period. For each outcome of interest, the models show that the relevant PSA risk score is statistically significantly (p<0.001) associated with the likelihood of the outcome during the pretrial period.

			Dependen	t variable:	
	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest
	(1)	(2)	(3)	(4)	(5)
PSA FTA Risk Score	0.730*** (0.052)				
PSA NCA Risk Score		0.557*** (0.047)	0.461*** (0.053)	0.382*** (0.057)	
PSA NVCA Risk Score					1.360*** (0.197)
Days Released	-0.002^* (0.001)	$0.004^{***} $ (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)
Constant	-2.763^{***} (0.222)	-2.581^{***} (0.222)	-3.543^{***} (0.267)	-3.604^{***} (0.288)	-2.911^{***} (0.210)
Observations	1,304	1,304	1,304	1,304	1,304
Log Likelihood Akaike Inf. Crit.	-676.310 $1,358.620$	-814.175 $1,634.350$	-649.444 $1,304.888$	$-563.557 \\ 1{,}133.113$	-420.242 846.484

Note:

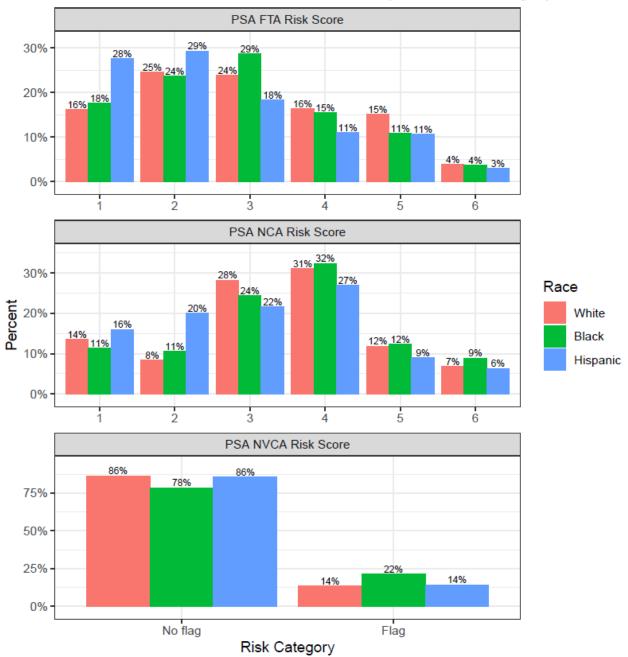
*p<0.05; **p<0.01; ***p<.001

ANALYSIS OF BIAS

Race

The following chart shows the distribution of risk assessment scores by race/ethnicity. The distribution of scores varies by race/ethnicity most notably for NVCA score, with Black individuals receiving a new violent crime flag proportionately more frequently than white and Hispanic individuals.

Sacramento Distribution of Assessments by PSA Risk Category



PSA FTA Risk Score	White	Black	Hispanic
1	75	81	83
2	114	109	88
3	111	132	55
4	76	71	33
5	70	50	32
6	18	17	9

PSA NCA Risk Score	White	Black	Hispanic
1	63	52	48
2	39	49	60
3	131	112	65
4	144	149	81
5	55	57	27
6	32	41	19

PSA NVCA Risk Score	White	Black	Hispanic
No flag	401	361	257
Flag	63	99	43

The number of assessed individuals in each race/ethnicity group is sufficient to run statistical tests that look at how the PSA tool scales performed by race/ethnicity.

The following table shows the AUC values¹² and 95% confidence intervals for each outcome of interest and relevant PSA risk subscale separately for each race/ethnicity group. All AUC values are in the fair to excellent range. Confidence intervals are wide due to relatively small sample sizes, particularly for some groups. Statistical testing¹³ indicates that the evidence is not strong enough to conclude there is a true difference in the AUC between groups.

		AUC			CI (95%)			
Risk Score	Outcome	White	Black	Hispanic	White	Black	Hispanic	
PSA FTA	FTA	0.771	0.734	0.767	0.725-0.817	0.686-0.782	0.702-0.833	
PSA NCA	New Arrest	0.668	0.641	0.711	0.621 - 0.716	0.592 - 0.69	0.652 - 0.769	
PSA NCA	New Filing	0.608	0.636	0.689	0.553 - 0.662	0.58 - 0.692	0.619 - 0.759	
PSA NCA PSA NVCA	New Conviction New Violent Arrest	$0.592 \\ 0.604$	$0.616 \\ 0.638$	$0.662 \\ 0.569$	$\begin{array}{c} 0.531\text{-}0.654 \\ 0.532\text{-}0.677 \end{array}$	0.554-0.677 0.576-0.7	$\begin{array}{c} 0.582 \text{-} 0.743 \\ 0.479 \text{-} 0.658 \end{array}$	

^a N White = 463, N Black = 461, N Hispanic = 299

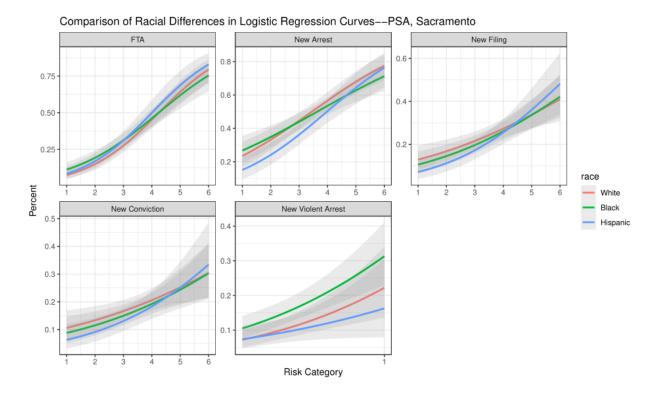
The following series of charts show the results of statistical models of the predictive power of the relevant PSA subscale for each outcome of interest for each race/ethnicity group. Each line represents the probability of each outcome of interest at each risk level separately for each race/ethnicity. The grey area around each line represents a 95% confidence interval – where the grey areas do not overlap the evidence indicates there is likely a true difference between the groups, where the grey areas overlap the evidence may not be strong enough to conclude that there are differences between them.

For all outcomes the confidence intervals of the lines for Black, Hispanic, and white individuals overlap, indicating that there may be insufficient evidence to conclude any true difference in the likelihood of those outcomes for individuals of different across these groups with the same score. The confidence

¹² See p. 7 for description of the meaning of AUC values.

¹³ DeLong's test for two ROC curves

intervals are notably wider for the new violent arrest outcome, because new violent arrest is a rarer outcome which diminishes the ability of the model to make precise predictions.



The following table shows the results of a logistic regression which predicts each outcome of interest by the relevant PSA subscale risk score, race, and number of days spent released. This statistical test compares Black and Hispanic individuals with white individuals. Risk level on the relevant PSA subscale is in each case a statistically significant (p<0.001) predictor of the outcome of interest. The number of days the individual was out on release also was a statistically significant predictor of all of the crime-related outcomes, but not the FTA outcome, indicating that the longer an individual spends on release the more likely the individual is to experience the new arrest, new filing, new conviction, or new violent arrest.

Additionally, Black race is a statistically significant (p< 0.05) predictor of new violent arrest. The results indicate that Black individuals had a higher probability of new violent arrest compared to white individuals with the same risk scores.

Hispanic ethnicity is a statistically significant (p<0.05) predictor of new arrest. The results indicate that Hispanic individuals had a lower probability of new arrest compared to white individuals with the same risk scores.

This statistical test is limited, however, because it tests for an overall effect of race across the full risk scale, and it is possible that there may be different patterns across particular ranges of the tool subscales. The next table will use a more complex statistical model that allows for this possibility.

	$Dependent\ variable:$					
	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest	
	(1)	(2)	(3)	(4)	(5)	
PSA FTA Risk Score	$0.714^{***} (0.054)$					
PSA NCA Risk Score		0.519*** (0.049)	0.432*** (0.055)	0.360*** (0.059)		
PSA NVCA Risk Score					1.311*** (0.201)	
Race:Black	$0.139 \\ (0.157)$	-0.096 (0.140)	-0.108 (0.160)	-0.125 (0.175)	0.428^* (0.212)	
Race:Hispanic	0.147 (0.183)	-0.336^* (0.160)	-0.170 (0.186)	-0.207 (0.206)	-0.096 (0.265)	
Days Released	-0.002 (0.001)	0.004*** (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)	
Constant	-2.861^{***} (0.252)	-2.346^{***} (0.239)	-3.355*** (0.285)	-3.421^{***} (0.308)	-3.027^{***} (0.248)	
Observations Log Likelihood Akaike Inf. Crit.	$1,224 \\ -640.204 \\ 1,290.408$	1,224 -770.237 $1,550.474$	$ \begin{array}{c} 1,224 \\ -619.601 \\ 1,249.202 \end{array} $	1,224 -538.424 $1,086.848$	$ \begin{array}{r} 1,224 \\ -403.480 \\ 816.961 \end{array} $	

Note: *p<0.05; **p<0.01; ***p<.001

The following table shows the results of a logistic regression which predicts each outcome of interest by the relevant PSA subscale risk score, race, the interaction between race and the PSA risk score, and number of days spent released. Risk score is a statistically significant (p<0.001) predictor of each outcome of interest, as is the number of days released for all outcomes except FTA. This statistical test again compares Black and Hispanic individuals with white individuals.

The results indicate that there is no statistically significant interaction between Black race or Hispanic ethnicity and the relevant PSA subscale risk scores on any of the outcomes of interest. In the absence of a statistically significant interaction, the above model with no interaction is more appropriate to demonstrate the impact of race.

			Dependen	t variable:	
	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest
	(1)	(2)	(3)	(4)	(5)
PSA FTA Risk Score	0.759*** (0.088)				
PSA NCA Risk Score		0.547*** (0.080)	0.372*** (0.086)	0.317*** (0.092)	
PSA NVCA Risk Score					1.353*** (0.361)
Race:Black	0.578 (0.436)	0.325 (0.400)	-0.271 (0.483)	-0.242 (0.525)	0.403 (0.259)
Race:Hispanic	0.111 (0.482)	-0.611 (0.454)	-0.816 (0.545)	-0.678 (0.588)	0.010 (0.307)
Days Released	-0.002 (0.001)	$0.004^{***} $ (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)
FTA*Black	-0.133 (0.122)				
FTA*Hispanic	0.018 (0.140)				
NCA*Black		-0.120 (0.108)	0.045 (0.121)	0.032 (0.131)	
NCA*Hispanic		0.084 (0.126)	0.178 (0.140)	0.130 (0.150)	
NVCA*Black					0.056 (0.455)
NVCA*Hispanic					-0.385 (0.599)
Constant	-3.019^{***} (0.350)	-2.443^{***} (0.325)	-3.134^{***} (0.374)	-3.260^{***} (0.404)	-3.037^{***} (0.263)
Observations Log Likelihood Akaike Inf. Crit.	1,224 -639.373 1,292.747	1,224 -768.749 1,551.498	1,224 -618.761 $1,251.521$	1,224 -538.039 $1,090.077$	$ \begin{array}{r} 1,224 \\ -403.145 \\ 820.291 \end{array} $

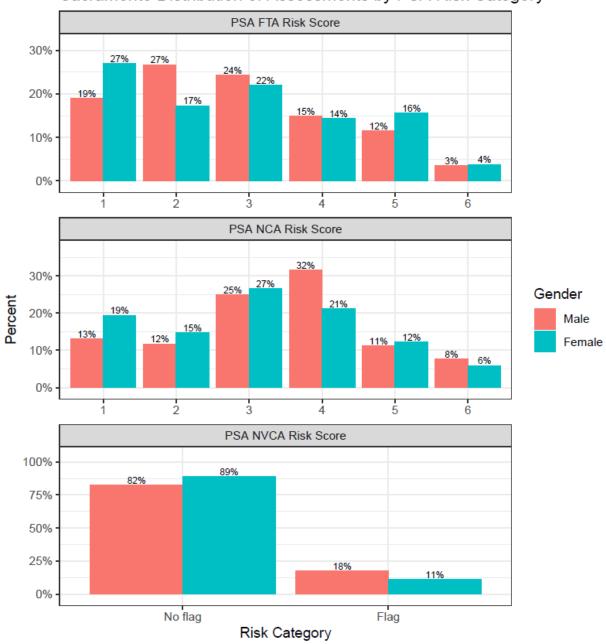
Note:

*p<0.05; **p<0.01; ***p<.001

Gender

The following chart shows the distribution of risk assessment scores by gender. Women are less likely to have a NVCA flag compared to men.

Sacramento Distribution of Assessments by PSA Risk Category



PSA FTA Risk Score	Male	Female	PSA NCA Risk Score	Male	Female
1	203	64	1	139	46
2	285	41	2	125	35
3	260	52	3	265	63
4	159	34	4	337	50
5	123	37	5	120	29
6	37	9	6	81	14

PSA NVCA Risk Score	Male	Female
No flag	880	211
Flag	187	26

The number of assessed individuals in each gender group is sufficient to run statistical tests that look at how the PSA tool scales performed by gender.

The following table shows the AUC values¹⁴ and 95% confidence intervals for each outcome of interest and relevant PSA risk subscale separately for women and men. With the exception of AUC values for new violent criminal activity and new conviction for men which fall into the fair range, all other AUC values are in the good to excellent range. Statistical testing¹⁵ indicates that there is a statistically significant difference in AUC for men compared to women for the outcome of new filing, but no other differences are statistically significant. The results indicate that the PSA NCA subscale has a stronger ability to distinguish between individuals who are lower or higher risk for women than for men for the outcome of new filing.

		AUC		CI (95%)	
Risk Score	Outcome	Female	Male	Female	Male
PSA FTA PSA NCA PSA NCA PSA NCA PSA NVCA	FTA New Arrest New Filing New Conviction New Violent Arrest	0.743 0.715 0.739 0.688 0.595	0.770 0.674 0.633 0.616 0.621	0.676-0.81 0.65-0.781 0.654-0.824 0.589-0.788 0.503-0.687	0.739-0.801 0.643-0.705 0.597-0.668 0.576-0.655 0.575-0.667

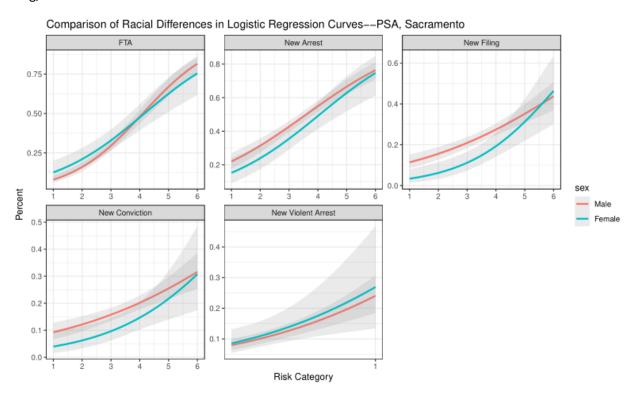
^a N Female = 237, N Male = 1066

The following series of charts show the results of statistical models of the predictive power of the relevant PSA subscale for each outcome of interest for women as compared to men. Each line represents the probability of each outcome of interest at each risk level separately for each gender. The grey area around each line represents a 95% confidence interval — where the grey areas do not overlap the evidence indicates there is likely a true difference between the groups, where the grey areas overlap the evidence may not be strong enough to conclude that there are differences between them.

¹⁴ See section XXX for description of the meaning of AUC values.

¹⁵ DeLong's test for two ROC curves

Because there are fewer women at the high end of the risk distributions, the 95% confidence intervals tend to be wider at the high end of the distributions for each outcome. Across most outcomes the confidence intervals for the line for men and the line for women is entirely overlapping, indicating there may not be sufficient evidence to conclude there is a true difference. However, for the outcome of new filing, women show a lower rate of this outcome at the lower end of the PSA NCA subscale.



The following table shows the results of a logistic regression which predicts each outcome of interest by the relevant PSA subscale risk score, gender, and number of days spent released. This statistical test compares women with men. Risk level on the relevant PSA subscale is in each case a statistically significant (p<0.001) predictor of the outcome of interest. The number of days the individual was out on release was also a statistically significant predictor of all outcomes, indicating that the longer an individual spends on release the more likely the individual is to experience an FTA, new arrest, new filing, new conviction or new violent arrest.

Female gender is a statistically significant predictor of new filing and new conviction, and the negative coefficient values indicate that women are statistically significantly less likely to experience a new filing or new conviction compared to men with the same risk score.

This statistical test is limited, however, because it tests for an overall effect of gender across the full risk scale, and as can be seen from the above charts there may be different patterns for women as compared to men especially for the new filing outcome. The next table will use a more complex statistical model that allows for this possibility.

	$Dependent\ variable:$					
	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest	
	(1)	(2)	(3)	(4)	(5)	
PSA FTA Risk Score	0.729^{***} (0.052)					
PSA NCA Risk Score		0.553^{***} (0.047)	0.455*** (0.053)	0.376*** (0.057)		
PSA NVCA Risk Score					1.366*** (0.198)	
Female	0.129 (0.173)	-0.304 (0.158)	-0.549** (0.202)	-0.461^* (0.221)	0.075 (0.239)	
Days Released	-0.002^* (0.001)	0.004^{***} (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)	
Constant	-2.780^{***} (0.224)	-2.518*** (0.224)	-3.449^{***} (0.270)	-3.520^{***} (0.291)	-2.925^{***} (0.214)	
Observations Log Likelihood Akaike Inf. Crit.	1,304 -676.036 $1,360.072$	1,304 -812.292 1,632.584	1,304 -645.443 1,298.887	1,304 -561.225 $1,130.449$	1,304 -420.193 848.387	

Note: *p<0.05; **p<0.01; ***p<.001

The following table shows the results of a logistic regression which predicts each outcome of interest by the relevant PSA subscale risk score, gender, the interaction between gender and the PSA risk score, and number of days spent released. Risk score is a statistically significant (p<0.001) predictor of each outcome of interest, and the number of days spent released is also a statistically significant predictor for all outcomes. This statistical test again compares women with men as the base group.

The results indicate that there is not a statistically significant interaction between gender and risk score on any of the outcomes of interest. In the absence of a statistically significant interaction, the above model with no interaction is more appropriate to demonstrate the impact of gender.

			Dependen	t variable:	
	FTA	New Arrest	New Filing	New Conviction	New Violent Arrest
	(1)	(2)	(3)	(4)	(5)
PSA FTA Risk Score	0.768*** (0.059)				
PSA NCA Risk Score		0.538*** (0.052)	0.413*** (0.057)	0.349*** (0.062)	
PSA NVCA Risk Score					1.355*** (0.214)
Female	0.698 (0.424)	-0.570 (0.429)	-1.685^{**} (0.648)	-1.151 (0.656)	0.057 (0.277)
Days Released	-0.002^* (0.001)	0.004^{***} (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)
FTA*Female	-0.175 (0.121)				
NCA*Female		0.080 (0.119)	$0.300 \\ (0.157)$	0.186 (0.162)	
${\rm NVCA*Female}$					0.072 (0.552)
Constant	-2.905*** (0.243)	-2.468^{***} (0.235)	-3.297^{***} (0.278)	-3.419^{***} (0.301)	-2.921^{***} (0.216)
Observations Log Likelihood Akaike Inf. Crit.	1,304 -675.012 1,360.025	1,304 -812.065 $1,634.131$	1,304 -643.498 1,296.996	1,304 -560.548 $1,131.096$	$ \begin{array}{r} 1,304 \\ -420.185 \\ 850.370 \end{array} $

Note: *p<0.05; **p<0.01; ***p<.001

Appendix A

Table 1. Public Safety Assessment (PSA): Factors and Weights

Risk Factor	Response	Weight				
FAILURE TO APPEAR (0-7)						
Pending Charge at the Time of the Offense	No	0				
rending charge at the fille of the offense	Yes	1				
Prior Conviction	No	0				
FIIOI CONVICTION	Yes	1				
Drien Feilungs to Ammoon Bretniel in Boot 2	0	0				
Prior Failures to Appear Pretrial in Past 2 Years	1	2				
rears	2 or More	4				
Prior Failure to Appear Pretrial Older than 2	No	0				
Years	Yes	1				
NEW CRIMINAL A	ACTIVITY (0-13)					
Age at Current Arrest	23 or Older	0				
Age at Current Arrest	22 or Younger	2				
Donding Change at the Time of the Office	No	0				
Pending Charge at the Time of the Offense	Yes	3				
Dischard Continue	No	0				
Prior Misdemeanor Conviction	Yes	1				
2. 2. 2	No	0				
Prior Felony Conviction	Yes	1				
	0	0				
Prior Violent Conviction	1 or 2	1				
	3 or more	2				
	0	0				
Prior Failure to Appear Pretrial in Past 2 Years	1	1				
	2 or More	2				
	No	0				
Prior Sentence to Incarceration	Yes	2				
NEW VIOLENT CRIMII	NAL ACTIVITY (0-7)					
Commont Violant Office	No	0				
Current Violent Offense	Yes	2				
Current Violent Offense & 20 Years Old or	No	0				
Younger	Yes	1				
	No	0				
Pending Charge at the Time of the Offense	Yes	1				
2	No	0				
Prior Conviction	Yes	1				
	0	0				
Prior Violent Conviction	1 or 2	1				
	3 or More	2				

Source: Public Safety Assessment: Risk Factors and Formula, Laura and John Arnold Foundation (2013)

Table 2. Public Safety Assessment (PSA): Factors and Weights

Outcome Measure	Raw Score	Risk Scale
	0	1
	1	2
	2	3
Failure to America (FTA)	3	4
Failure to Appear (FTA)	4	4
	5	5
	6	5
	7	6
	0	1
	1	2
	2	2
	3	3
Nov. Crimainal Askiniku (NCA)	4	3
New Criminal Activity (NCA)	5	4
	6	4
	7	5
	8	5
	9-13	6
Outcome Measure	Raw Score	NCVA Flag
	0	No
	1	No
	2	No
Now Violant Criminal Activity (NVCA)	3	No
New Violent Criminal Activity (NVCA)	4	Yes
	5	Yes
	6	Yes
	7	Yes

Source: Public Safety Assessment: Risk Factors and Formula, Laura and John Arnold Foundation (2013)

Appendix B

PSA Violent Offense List

PC CODE	Description
	Obstructing or resisting exec officer in performance of duty; threats, force,
69	or violence
136.1(c)(1)	Intimidating/Threat Witness/Victim and Act is accompanied by force
140(a)	Threatening Witnesses, victims or informants.
. ,	Removal or taking of weapon other than firearm from peace officer during
148(b)	commission of resisting offense
	Removal or taking of firearm from peace officer during commission of
148(c)	resisting offense
	Removal or taking of weapon firearm from peace officer engaged in
148(d)	performance of duty
148.10(a)	Resist Po: Cause death/SBI
149	Assault by a public officer
151	Advocacy to kill or injure peace officer
	Use of coercion or violence to solicit or recruit another to actively participate
186.26(c)	in criminal street gang
187(a)	Murder first or second degree
191.5(a)	Gross vehicular manslaughter while intoxicated
192(a)	Voluntary manslaughter
192(b)	Involuntary manslaughter
192(c)(1)	Vehicular manslaughter with gross negligence
192(c)(3)	Vehicular manslaughter
192.5(a)	Vehicular manslaughter in the operation of a vessel while intoxicated
192.5(b)	Vehicular manslaughter in the operation of a vessel while intoxicated
192.5(c)	Vehicular manslaughter in the operation of a vessel
203	Mayhem
205	Aggravated Mayhem
206	Torture
207(a)	Kidnapping
207(b)	Kidnap -14 to com I&I
207(c)	Kidnapping by false pretense
207(d)	Kidnapping from outside the state
208(b)	Kidnap child under 14 yrs
209(a)	Kidnapping for ransom
209(b)(1)	Kidnap: commit rob/rape/etc
209.5(a)	Kidnap during carjacking
210.5	False imprisonment of a hostage
667.85	Kidnap to deprive parent
211	Robbery: first or second degree
212	Fear defined for robbery
212.5	Robbery; degrees
214	Train robbery
215	Carjacking

247.4/-)	Association a model of efficient
217.1(a)	Assault on a public official
217.1(b)	Attempted murder of a public official
218	Train wrecking; attempt; punishment.
218.1	Obstructing railroad track; punishment.
219	Train derailing or wrecking; punishment.
219.1	Throwing missile at common carrier with bodily harm
0.4.0.0	Throwing hard substance or shooting missile at train or other
219.2	conveyance
222	Assault with intent to commit mayhem, rape, sodomy, oral copulation,
220	or any violation of Section 264.1, 288, or 289
220(a)(1)	Assault with intent to commit a felony
220(a)(2)	Assault with intent to commit a felony-victim under 18
	Assault to commit a felony during the commission of a first degree
220(b)	burglary
	Administering to another any chloroform, ether, laudanum, or any
222	controlled substance, anesthetic, or intoxicating agent
236	False imprisonment
	Human trafficking; provisions regarding minors; consideration of total
236.1	circumstances
237(a)	False imprisonment
240	Assault
241	Assault
241.1	Assault on custodial officer
241.2	Assault on school or park property
	Assault against person on public transportation, both on property of and
241.3	within motor vehicle of provider
241.4	Assault on peace officer of a school district
241.5	Assault on a highway worker
241.6	Battery on school employee
241.7	Assault against jurors
241.8(a)	Battery against member of us armed forces
242	Battery
243	Battery
243.1	Battery on custodial officer
243.2(a)(1)	Battery on pers on school/park/grnds
243.25	Battery on an elder or dependent adult
243.3	Battery on transportation personnel/passenger
243.35	Battery on public transportation provider
243.4	Sexual battery
243.5(a)(1)	Assault or battery on school prop
243.6	Battery on school employee
243.65(a)	Battery against a highway worker
243.7	Battery against jurors
243.8(a)	Battery against a sports official
	Aggravated battery by gassing on peace officer or local detention facility
243.9(a)	employee
244	Aslt w/caustic chem/etc
244.5(b)	
243.35 243.4 243.5(a)(1) 243.6 243.65(a) 243.7 243.8(a)	Battery on public transportation provider Sexual battery Assault or battery on school prop Battery on school employee Battery against a highway worker Battery against jurors Battery against a sports official Aggravated battery by gassing on peace officer or local detention facility employee

244.5(c)	Assault with stun gun or taser on peace officer or firefighter
245(a)(1)	Force/adw-not firearm: gbi
245(a)(2)	Aslt w/ firearm on person
245(a)(3)	Aslt w/machinegun on person
245(a)(4)	Force/adw not firearm: gbi
245(b)	Assault w/semiauto rifle
245(c)	Adw not f/arm: po/fire: gbi
245(d)(1)	Assault with a firearm upon a peace officer or firefighter
245(d)(2)	Assault on peaceofficer/firefighter with semiautomatic firearm
245(d)(3)	Machine gun/assault weapon on a peace officer/firefighter
245.2	Assault (adw/gbi) upon transportation personnel, mass transit personnel
245.3	Assault (adw/gbi) upon a custodial officer
245.5(a)	Adw/gbi schl emp: no f/arm
245.5(b)	Assault with firearm on a school employee
245.5(c)	Adw/stun gun or taser: school employee
245.6	Hazing resulting in death/serious bodily injury
246	Shoot: inhab dwell/veh/etc
246.3(a)	Firearm disch w/neg
246.3(b)	BB device disch w/ neg
261(a)	Rape
261.5(a)	Sex intercourse w/mnr -18
261.5(b)	Sex w/minor: + or - 3 yrs
261.5(c)	Sex w/minor:3+ yrs younger
261.5(d)	Sex w/minor: perp 21+ vic-16
262(a)(1)	Rape spouse by force/etc
262(a)(2)	Rape spouse und c/sub/etc
262(a)(3)	Rape: spouse uncon of act
262(a)(4)	Rape: spouse - threat to kidnap, inflict extreme pain, serious bodily injury
262(a)(5)	Rape: spouse - threat to incarcerate, arrest, deport
262(a)(6)	Rape of spouse by threat to arrest or deport
264.1	Rape/etc: cncrt force/viol
266a	Taking a person for prostitution
266b	Abduction to live in illicit relation; using force
	Unlawful sexual intercourse, sexual penetration, oral copulation, or
	sodomy; consent procured by false or fraudulent representation with intent
266c	to create fear
266h(b)	Pimping a minor
266i(b)	Pandering a minor
266j	Procurement of child under age 16 for lewd and lascivious acts
267	Abduction; person under 18 for purpose of prostitution
269(a)	Agg sex aslt: mnr: frce/etc
273.4	Female genital mutilation
	Injuring a spouse, cohabitant, fiancé, boyfriend, girlfriend or child's
273.5(a)	parent
273.5(f)	Inf crpl inj: sps/etc w/pr
273.6(b)	Viol crt ord to prev domes viol – results in physical injury
	Domestic violence w/prior – act of violence or a credible threat of
273.6(d)	violence
. ,	

273a(a)	Willful cruel to child/poss inj/death
273a(b)	Willful cruelty to child
273ab(a)	Assault of child under 8 by force likely to produce GBI resulting in death
	Assault of child under 8 by force likely to produce GBI resulting in brain
273ab(b)	injury, paralysis
273d(a)	Inflict injury upon child
278	Child stealing
285	Incest
286(b)	Sodomy: person under 18
286(c)	Sodomy: person under 14
286(d)	Sodomy in concert w/force
286(f)	Sodomy: vict uncons of act
286(g)	Sodomy: vict incapbl:consent
286(h)	Sodomy: vic/def in mntl inst
286(i)	Sodomy: no ok: vict drugged
286(j)	Sodomy by impersonation
286(k)	Sodomy under color of authority
288(a)	Lewd or lasciv acts/w/child und 14yrs
288(b)	Lewd/lasc acts w/child under 14 or dependent person
288(c)	Lewd/lasc act w/chld 14/15:def 10yr+ or dependent person
288.2(a)	Harmful mtr sent w/int of seduc minor
288.3	Contact with intent to commit sex act
288.4	Arranging a meeting with minor for lewd purposes
288.5(a)	Continuous sexual abuse of child
288.7(a)	Sex/sodomy with a child under 10
288.7(b)	Oral copulation/sexual penetration with a child under 10
287(b)	Oral copulation w/pers und 18yrs
287(c)	Oral copul w/person und 14/by force
287(d)	Oral cop in concert: vic incap of con
287(f)	Oral cop: vic uncon/asleep
287(g)	Oral copulation of an incompetent person
287(h)	Oral cop: vic/def in mntl inst
287(i)	Oral copulation by anesthesia or controlled substance
287(j)	Oral copulation by impersonation
287(k)	Oral copulation under color of authority
288a(b)	Oral copulation w/pers und 18yrs
288a(c)	Oral copul w/person und 14/by force
288a(d)	Oral cop in concert: vic incap of con
288a(f)	Oral cop: vic uncon/asleep
288a(g)	Oral copulation of an incompetent person
288a(h)	Oral cop: vic/def in mntl inst
288a(i)	Oral copulation by anesthesia or controlled substance
288a(j)	Oral copulation by impersonation
288a(k)	Oral copulation under color of authority
289	Sexual pen with force/etc
289.6(a)(3)	Sex: emp/etc cnf/detention fac
311.4(a)	Using Minors for Sex Acts
311.4(b)	Using Minors for Commercial Sex Acts
(**)	• • • • • • • • • • • • • • • • • • • •

311.4(c)	Using Minors for Sex Acts
347(a)	Poisoning, willful poison/etc food/etc
368(b)	Cause harm/death elder dep adult
368(c)	Elder/dependent adult cruelty
368(f)	False imprison: elder/dep adult violence
404(a)	Rioting
70 (0)	Exhibit firearm or deadly weapon other than gun. Drawing, exhibiting, or
417(a)	using firearm or deadly weapon; self defense; peace officers.
417(b)	Exhibit firearm. Drawing, exhibiting, or using a firearm
.=.(0)	Exhibit firearm in presence of p.o. Drawing, exhibiting, or using firearm
417(c)	or deadly weapon; self defense; peace officers.
417.3	Exhibit firearm pres beh occupt
417.8	Exhibit firearm/etc: resist arrest
422.6(a)	Violate civil rights by force or threat
451(a)	Arson causing great bodily injury
451(b)	Arson: inhabited structure/property
451.1	Arson with added circumstances
451.5(a)	Aggravated arson
452(a)	Causing fire that causes gbi
452(b)	Causing fire that causes gor Causing fire of inhabited struc/prop
455	Arson attempts and acts preliminary or in furtherance
	Stalking
646.9(a)	-
646.9(b)	Stalking/temp restraining order
647.6(a)(1)	Annoy/molest child under 18yrs
647.6(b)	Annoy/molest child/ill entry of bldg
647.6(c)	Annoy/etc child -18 w/prior
667.61(d)(2)	Felony sex offenses; victim kidnapped increasing risk of harm
667.61(d)(3)	Felony sex offenses; victim tortured
667.61(e)(1)	Felony sex offense; victim kidnapped
667.61(e)(2)	Felony sex offenses during commission of burglary
667.61(e)(4)	Felony sex offenses against more than one victim
667.61(e)(5)	Felony sex offenses -tying or binding of victim or another person
667.8	Kidnap to commit sex offense
667.85	Kidnap child under 14 yrs
674	Sex offense by daycare provider
836.6(c)	Escape from custody by force or violence
4500	Assault by a life prisoner
4501	Assault by a state prisoner
4501.1(a)	Aggravated battery
4501.5	Battery on non-confined person by prisoner
4503	Holding of hostages; offense
4530(a)	Escape from custody by force and violence
	Escape from alternative custody by force or violence by person booked
4532(a)(2)	on misdemeanor
	Escape from alternative custody by force or violence by person booked
4532(b)(2)	on felony
11413(a)	terrorism by explosion
11413(b)	terrorism by explosion (specified places)

and the second s
weapons of mass destruction: use and damage to life
weapons of mass destruction: use and damage to public natural
resources
weapons of mass destruction: creation of new pathogens
Use of destructive device and explosive to injure/destroy
Explosion with intent to murder
Explosion of destructive device causing bodily injury
Explosion causing death, mayhem, GBI
Discharge of firearm at another person from motor vehicle
Use of firearm to intimidate a voter
Attempted murder?
Attempted robbery
SBI caused by flight from peace officer
Death caused by flight from peace officer

All attempts (PC 664), conspiracy (PC 182), solicitation (PC 653f), and accessory (PC 31) only if before the act of any of the offenses identified here also meet the definition of a violent offense for purposes of administering the PSA.