

# RISK ASSESSMENT FACTSHEET

## Virginia Pretrial Risk Assessment Instrument (VPRAI)

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**Note:** Though the VPRAI was first developed in 2003, the tool was revised in 2007 to remove the “Outstanding Warrants” factor and was further revised in 2016. Though we describe both the original tool (referred to as “VPRAI”) and the 2016 revised tool (referred to as “VPRAI-Revised”) in this factsheet, our focus is on the 2016 revised tool. More information about the 2003 tool can be found in Source 1.

### **Who created the risk assessment?**

The VPRAI was created by the Virginia Department of Criminal Justice Services, led by Marie VanNostrand, Ph.D. The VPRAI-Revised was developed by Luminosity, Inc. (a private company) and was supported by the Virginia Department of Criminal Justice Services. The researchers who worked on the VPRAI-Revised were Mona J.E. Danner, Ph.D. (Old Dominion University), Marie VanNostrand, Ph.D. (Luminosity, Inc.), and Lisa M. Spruance, M.S. (Independent Consultant).

### **How large was the training data set?**

The training data set for the VPRAI had 1,971 cases. The training data set for the VPRAI-Revised had 14,383 cases.

### **How was the training data set collected and assembled (i.e., what jurisdiction(s) is it from)?**

The training data set for the VPRAI was collected by the Virginia Department of Criminal Justice Services from a sample of defendants arrested in one of seven different Virginia localities. The localities “varied substantially in community characteristics,” including, community type, population, sex, race, and socioeconomic status. (See Source 1, page 4). Data was collected from personal interviews, by consulting various criminal and state records, and by contacting defendant references. The researchers used a sampling procedure for interviewing defendants “to account for variances in arrest due to time of day, day of week, month, and season” (See source 1, page 4).

The training data set for the VPRAI-Revised was a subset of data collected and used for another study about pretrial release in Virginia (See Source 4). The training data set for the VPRAI-revised came from Virginia localities using the VPRAI. (Source 5).

### **Over what time frame was the data collected?**

For the VPRAI, data was collected from a “sample of defendants arrested in select Virginia localities between July 1, 1998 and June 30, 1999..The cases were tracked until final disposition through the use of court and other official records to determine the pretrial outcome” (Source 1).

For the VPRAI-Revised, the data collection process occurred from October 2012 through December 2014 (Source 4).

**What factors (i.e., defendant characteristics) were included in the data set? This question pertains to all the factors that were available about defendants, not necessarily all the factors that were used to train or develop the model.**

The VPRAI training data set had 50 factors that had to do with “demographic characteristics, physical and mental health, substance abuse, residence, transportation, employment and school status, income, the charge(s) against the defendant, and criminal history” (Source 1; see Source 1 for full list).

For the VPRAI-Revised training data set, “each case contain[ed] a VPRAI and data on charge category, demographics, supervision and outcome” (Source 5) as well as information on 20 additional alternative risk factors pertaining to charge type, failure to appear, violent convictions, employment, and drug abuse (Source 5).

**Does the dataset include instances of defendants who were detained? If so, does the data include outcomes for those people (i.e., did the data account for counterfactual estimation; if so, how)?**

No - defendants who were detained were filtered out of both the VPRAI and VPRAI-Revised training data sets; the samples that were used contained defendants who had been released at some point in the observed pretrial process (Source 1; Source 4).

**Are there any known issues or errors with the data?**

Criminal justice data sets, in general, often suffer from measurement error and sample bias. The tool creators did not note any more specific issues in their development reports.

**In what year was the risk assessment created?**

The VPRAI was created in 2002 and fully implemented in 2005. The VPRAI-Revised was developed in 2015-2016.

**What factors, among all the factors in the training data, were considered in the development of the risk assessment? If not all factors were considered, how were those that were considered chosen?**

For the VPRAI, all factors were considered. The VPRAI-Revised was built by examining the VPRAI and exploring whether alternative or additional factors could improve the tool (Source 1). Thus, the development of the VPRAI-Revised considered the factors on the VPRAI as well as 20 additional or alternative risk factors (Source 5).

**How were factors that were considered ultimately chosen for exclusion or inclusion in the final model (the risk assessment itself)?**

For the VPRAI, researchers used a variety of bivariate analysis techniques to “identify the statistically significant variables (risk factors) related to pretrial outcome (success or failure pending trial).” The researchers used the results of the bivariate analyses to build a binary logistic regression model (see Source 1 for more).

The original VPRAI had nine factors. However, in a validation study conducted in 2007, Luminosity, Inc. and the Virginia Department of Criminal Justice Services decided to alter the VPRAI by removing the factor “Outstanding Warrants.” They did so after determining that the factor “was not a statistically significant predictor of pretrial outcome” and that the risk assessment without “Outstanding Warrants” “was a slightly better predictor of pretrial outcome when compared to the original 9 factor model” (Source 2).

For the VPRAI-Revised, a variety of statistical techniques were used to examine the eight factors in the VPRAI (the one without “Outstanding Warrants”) and test whether alternatives would improve the tool’s performance in any way. This analysis led to alterations to two factors, the addition of one factor, and the removal of one factor (Source 5).

**Does the final model include as a factor(s) arrests that did not lead to convictions?**

The VPRAI considered “Charge Type” and “Pending Charge(s)” (Source 1). The VPRAI-Revised includes “Charge is felony drug, theft, or fraud” and “Pending charge” (Source 5). It is important to note that such current or pending charges may or may not have ultimately lead to a conviction.

**Does the final model include socioeconomic factors such as housing and employment status? Does the final model include personal health factors such as mental health or substance abuse?**

Yes - the VPRAI included “Length at Current Residence,” “Employed/Primary Child Caregiver,” and “History of Drug Abuse” (Source 1). The VPRAI-Revised includes “Unemployed at time of arrest” and “History of drug abuse” (Source 5).

**How were weights assigned to each factor included in the final model? (rounding correlation coefficients, Burgess Method, etc.)**

For the VPRAI, weights were assigned by applying a transformation to the coefficients from the binary logistic regression model and then rounding to the nearest whole number (Source 1). For the VPRAI-Revised, weights were assigned by rounding the odds ratios from the logistic regression model for the VPRAI-revised (See Source 5 for more information).

**How does the final model define outcomes (i.e., during the model development process, was there a distinct outcome defined for each type of failure (flight risk, new crime, new violent crime, etc.) or were outcomes compounded?**

Both the VPRAI and VPRAI-Revised compound outcomes into a single outcome. This was the “pretrial outcome, defined as success or failure pending trial” where “a defendant was classified as a ‘failure’ pending trial if he failed to appear for a scheduled court appearance or was arrested for a new offense pending trial” (Source 1).

According to Kenneth Rose, “Future plans are to separate failure by risk of failure to appear in court and new alleged criminal offenses. In addition to new alleged criminal offenses, distinguishing between violent and non-violent may be another future consideration.”

**What does the output of the model look like (i.e. a score on a scale of 1-10, etc.)?**

The output of the VPRAI-Revised is a score between 0 and 14.

**Does the model output risk level designations or convert raw scores into risk level designations such as “low risk,” “moderate risk,” and “high risk”?**

For the VPRAI-Revised, numerical scores are collapsed into six different risk levels (see Source 5 for more information on the risk levels).

**What proportion of samples in the training data set failed at each risk score and/or level (i.e., what percentage of people with a score of 5 or a label of “moderate risk” actually failed to appear)?**

For the VPRAI-Revised, we present failure rates by risk level in the training data below. (Source 5; see source 5 for failure rates by risk score).

Risk Level	Score Range	Any Failure Rate
1	(0-2)	6.1%
2	(3-4)	9.8%
3	(5-6)	14.9%
4	(7-8)	21.4%
5	(9-10)	29.3%
6	(11-14)	37.1%

**Did the model developers assess the predictive validity of the model? If so, how (reported AUC, FPR, TPR, etc.)?**

Yes - the predictive validity for both the VPRAI and the VPRAI-Revised were assessed by the tool developers using a variety of statistical techniques, including calculating AUC values, tests of statistical significance, and plotting failure rates in the training data as a function of risk scores (See sources 1, 2, and 5 for more information).

**Where is the risk assessment used?**

There is no definitive list of where the VPRAI or VPRAI-R are used. The risk assessment is used statewide in Virginia and in a number of counties in California. According to Dr. VanNostrand, "It was...adopted in Summit County, Ohio in 2004 and later independently validated by Dr. Chris Lowenkamp through the University of Chicago. A couple of years later it was adopted in Lake County, Illinois and later independently validated by Court researchers. It was then implemented in 10 counties in Michigan. After that the use of the tool spread rapidly. A survey...in 2012...revealed it was being used in counties in at least 12 states."

**Are the factors and weights of the risk assessment publicly available?**

Yes, the factors and weights for both the VPRAI and the VPRAI-Revised are publicly available.

**Does the risk assessment cost money for a jurisdiction to adopt? Does the adoption of the risk assessment require training? If so, by who?**

According to Dr. Marie VanNostrand, "The VPRAI is public domain and free. There are some consultants who offer training and implementation TA for a fee."

According to Kenneth Rose of the Virginia Department of Criminal Justice Services, "Implementation and training outside of Virginia is up to the other outside agency to determine."

**Does the risk assessment come with any sort of software or software package?**

In Virginia, "The VPRAI is automated and contained in the Pretrial and Community Corrections Case Management System (PTCC)" (Source 7).

However, according to Kenneth Rose, "The software/database used in Virginia is for Virginia agencies only. Software implementation is up to the outside agency to determine." According to Dr. Marie VanNostrand, the VPRAI may also be included in some off the shelf software applications.

**Does the risk assessment involve or require an in-person interview?**

Yes, the risk assessment requires an in-person interview.

**How does the risk assessment account for missing information?**

If information is missing, the risk assessment cannot be completed.

**Has the risk assessment been analyzed on non-training data for predictive validity? Has the risk assessment been analyzed with training data or non-training data with regard to performance for different race groups? Has the risk assessment been analyzed with training data or non-training data with regard to performance for different genders? If so, by who, when, and using what data?**

Yes. Numerous validation studies have been completed for the VPRAI, including ones with a focus on the VPRAI's predictive power across race and gender groups. The VPRAI-Revised was created as a result of a validation study intending to improve the original VPRAI.

Validation studies have been performed in the state of Virginia and elsewhere, including in Mecklenburg County, North Carolina, Oakland County, Michigan, Summit County, Ohio, Lake County, Illinois, and Mecklenburg, NC. A number of these studies are included in the “Information retrieved from” section; others can be found online.

In Riverside County, California, a validation study that modified the VPRAI led to the creation of the Riverside Pretrial Risk Assessment Instrument (RPRAI). See source 9.

#### **Information retrieved from:**

[1] Marie VanNostrand Ph.D., *Assessing Risk Among Pretrial Defendants in Virginia: The Virginia Pretrial Risk Assessment Instrument* (April 2003)

[2] Marie VanNostrand, Ph.D. and Kenneth J. Rose (Luminosity, Inc.), *Pretrial Risk Assessment in Virginia* (May 1, 2009)

[3] Marie VanNostrand, Ph.D. (Luminosity, Inc.), Kenneth J. Rose (Luminosity, Inc.), and Kimberly Weibrecht, J.D. (Crime and Justice Institute at CRJ), *In Pursuit of Legal and Evidence-Based Pretrial Release Recommendations and Supervision* (March 2011)

[4] Mona J.E. Danner, Ph.D. (Old Dominion University), Marie VanNostrand, Ph.D. (Luminosity, Inc.), Lisa M. Spruance, M.S. (Independent Consultant), *Risk-Based Pretrial Release Recommendations and Supervision Guidelines* (August 2015)

[5] Mona J.E. Danner, Ph.D. (Old Dominion University), Marie VanNostrand, Ph.D. (Luminosity, Inc.), Lisa M. Spruance, M.S. (Independent Consultant), *Race and Gender Neutral Pretrial Risk Assessment, Release Recommendations, and Supervision: VPRAI and Praxis Revised* (November 2016)

[6] Kenneth Rose, *Virginia Pretrial Risk Assessment Instrument (VPRAI) & Praxis Overview*, Pretrial Services Stakeholder Group: Workgroup B (June 11, 2018)

[7] Virginia Department of Criminal Justice Services, *Virginia Pretrial Risk Assessment Instrument (VPRAI) Instruction Manual 4.3* (April 2018)

[8] Information from Dr. Marie VanNostrand and Kenneth Rose.

[9] Brian Lovins and Lori Lovins, Correctional Consultants Inc. *Riverside Pretrial Assistance to California Counties (PACC) Project: Validation of a Pretrial Risk Assessment Tool*.

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