

The Development of an Actuarial Risk Assessment Instrument for U.S. Pretrial Services

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THE ENACTMENT OF the Pretrial Services Act of 1982 (18 U.S.C. §3152) represented the high-water mark of a major reform movement in the United States. Inspired by the research efforts of Arthur Beeley (1927) and Caleb Foote (1954) and affirmed by the work of the Vera Institute (1961), the legislation ensured that the federal courts would have their own personnel exclusively committed to assisting with pretrial release and detention decisions. The new personnel were to “collect, verify, and report to the judicial officer, prior to the pretrial release hearing, information pertaining to the pretrial release of each individual charged with an offense...” The mandate further directed officers to “where appropriate, include a recommendation as to whether such an individual should be released or detained and, if release is recommended, recommend appropriate conditions...” (§3154). As federal courts implemented the legislation, judicial officers began receiving objective, verified information—information that they soon began to rely upon. Officers performing the pretrial services function became deeply involved in a challenging calculus, i.e., determining if citizens, presumed innocent, would lose their liberty while the government sought to prove its allegations of criminal conduct.

Subsequent legislation broadened the scope of the court’s concern to include not only a defendant’s future court appearance but also the safety of the community (see the Bail Reform Act of 1984). Both are to be “reasonably assured” by conditions that mitigate any risks posed by the defendant. Among the factors to be considered by the court, pretrial services’ area of expertise quickly became the “history and characteristics of the person,” including the defendant’s “character, physical and mental condition, family ties, employment, financial resources, length of residence in the community, community ties, past conduct, history relating to drug or alcohol abuse, criminal history, and record concerning appearance at court proceedings” (§3142 (g)(3)(A)). Officers learned to interview defendants, verify information, run record checks, explore release options and type a full report for submission to the court in a matter of hours, not days. There was no calculation for pretrial services officers akin to the sentencing guidelines that had debuted during the same period; officers began to identify the specific factors that, either by statute or by their own experience, indicated risk. Once risks were identified, officers recommended conditions to mitigate those risks to a degree that would “reasonably assure” future appearance and community safety. As prosecutors and defense counsel made their respective arguments, pretrial services officers emerged as true professionals

and remained an impartial body assisting the court's decision-making.

During the last five to ten years, the rate of pretrial release detention has steadily increased ([VanNostrand and Keebler, 2009](#)). As of March, 2009, 53 percent of pretrial defendants were ordered held in pretrial detention, *excluding* those in the United States illegally (TABLE h-14a> Caseload Tables FY 2009—Second Quarter). A variety of factors contributed to this growth, although, according to the results of recent analyses, 60 percent can be attributed to a steadily increasing risk of the defendants being charged in federal court ([VanNostrand & Keebler, 2009](#)). Today, pretrial detention is more the norm than the exception for citizens charged in federal court. This reality has not only deprived thousands of liberty, but has produced massive expenditures and logistical nightmares for those responsible for pretrial detention (see [VanNostrand and Keebler 2009](#) and also OFDT summary statistics at <http://www.usdoj.gov/ofdt/summary.htm>). While this may not yet represent a crisis in the federal criminal justice system, it does stand on its head the presumption of innocence and, frankly, the vision of the founding fathers (see the Eighth Amendment of the U.S. Constitution, which protects against excessive bail).

This is the context in which we should consider the adoption of a risk prediction tool. With such an actuarial tool, we can now more effectively assess defendant risk and we can improve the recommendations we make to the court. There is a well-documented history of professionals rejecting actuarial tools as an affront to their clinical or otherwise experienced judgment. Time and time again, however, actuarial tools have shown greater predictive power than clinical judgment. “The predictive criterion validity of actuarial assessments of major risk and/or need factors greatly exceeds the validity of unstructured clinical judgment” ([Andrews et al., 2006:21](#); see [Grove and Meehl, 1996](#) and [Grove, Zald, Lebow, Snitz, & Nelson, 2000](#) for a thorough review of this topic). While we do not minimize the commitment and value that officers add, the current pretrial assessment process is indeed “unstructured clinical judgment.” For those steeped in the research, practitioners’ frequent resistance to actuarial tools is unconscionable; some have lamented that “Failure to conduct actuarial risk assessments or consider its results is irrational, unscientific, and unprofessional” ([Zinger 2004: 607](#)).

The term “actuarial” can sound quite foreign to the field of criminal justice. According to the *Encyclopedia Britannica*, actuaries “compute the probability of the occurrence of various contingencies of human life such as birth, marriage, sickness, unemployment, accidents, retirement and death. *They also evaluate the hazards of property damage or loss and the legal liability for the safety and well-being of others*” (emphasis added). Is that not, in effect, what we as officers do as we assess risk and make release or detention recommendations? Actuarial tools are increasingly being adopted to improve other professions where individual practitioners are asked to make difficult decisions about potentially risky situations and/or individuals. (See for instance [Doueck, English, DePanfilis, and Moote 1993](#) for an example of risk assessment in the area of child welfare. See also [Hilton, Harris, and Rice 2009](#) for an application of risk assessment to police decision-making in domestic violence situations.) It is now apparent that the use of an actuarial assessment aid can improve our ability to make release and detention recommendations. Below we present the findings on the development of such an instrument for federal pretrial services.

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Method

In this section we review some brief information regarding the sample used in this study and the method employed to develop and validate the risk assessment instrument. Detailed descriptions of the sample and some of the multivariate analyses are presented in VanNostrand and Keebler ([2009](#)).

Participants

The current study began with all defendants (n = 565,178) entering the federal system between

FY2001 and FY2007. Given that the current study focused on predicting pretrial success or failure while on bond, those cases that were detained during pretrial were deleted from the sample. This process reduced the sample by 335,248 (59 percent of the cases). Due to missing data, the final sample size for analyses relating to the development of the pretrial risk instrument varies between 185,827 and 215,338. The sample size used in any particular analysis is dependent on the variables used in the analyses and the rate of missing data associated with those variables (see [VanNostrand and Keebler, 2009](#) for specific details on missing data).

Measures

There were numerous measures (over 70) in the larger dataset; however, variables of interest for the construction and validation of the pretrial risk instrument included several predictor or independent variables and two dependent variables. Independent measures included defendant demographics, offense details, criminal history, substance use information, mental health information, and residential, educational, and employment status. The specific measures used in the development and validation of the risk assessment instrument were: number of prior felony convictions, number of prior failure-to-appears, pending charges, current offense type, current offense level, age at interview, highest educational level, employment status, home ownership, and substance use. These variables were identified as policy-relevant and empirically related to pretrial outcomes through multivariate analyses conducted by VanNostrand and Keebler (2009) and additional multivariate models run for this study.

Two dependent measures (outcomes) were included in this study. The first measure, FTA/NCA, was considered to be present and an indicator of failure if the defendant either failed-to-appear in court or was charged with a new criminal arrest while on pretrial release. The second dependent measure, FTA/NCA/TV, was considered to be present and also an indicator of failure if the defendant either failed-to-appear, was arrested for a new criminal charge while on pretrial release, or had his/her bond revoked due to technical violations.

Analysis

Our analysis was fairly straightforward and consistent with prior research on the development of risk instruments ([Gottfredson and Snyder, 2005](#)). More specifically, we used a split sample process for construction and validation. We identified potential risk factors based on the results of VanNostrand and Keebler (2009) as well as on the results of supplementary logistic regression analyses using a split sample process and bootstrapping. Once a set of risk factors was identified, we assigned points to those risk factors and calculated a risk score. The relationship between this score and the outcomes of interest was evaluated. We then applied the risk calculation to the remaining 50 percent of the sample to determine if the risk instrument held across the two halves of the larger sample. The results of these analyses are presented in the next section.

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Results

After running a series of bivariate analyses and multivariate logistic regression models, we identified a number of factors relevant to predicting pretrial outcomes and scoring schemes for each of those factors. As indicated in [Table 1](#), most factors relate to criminal history and the specifics of the current offense. However, four measures are dynamic and measure substance abuse, home ownership (community ties), educational attainment, and employment status. The factors identified are very similar to those identified in previous research on the prediction of pretrial risk. Note that there are varying point values for some items; however, most items are scored in a 0 and 1 format. Even those items with multiple point values still use a simple weighting process (0, 1, or 2 points).

[Table 1](#) reports the failure rates based on the two outcome measures for all defendants (column labeled A), the construction sample (column labeled C) and the validation sample (column

labeled V). The total number of cases in the entire sample ranges from 185,827 to 215,338, depending on the variables used in the bivariate analysis. The total number of cases in the construction and validation samples ranges between 90,655 and 107,893, depending on the variable used in the bivariate analysis. As noted in [Table 1](#), there is very little variation in the relationships across the construction and validation samples. All relationships are statistically significant at the $p < .001$ level.

[Table 2](#) presents the average risk scores, standard deviations, and values for the area under the curve (AUC) for the receiver-operating-characteristic (ROC). As indicated in [Table 2](#), the average score for the two samples is 6.8 and the standard deviation is 2.5. The AUC values produced when predicting failure as measured by the FTA/NCA measure are .694 for the construction sample and .690 for the validation sample. As indicated by the upper and lower confidence intervals, these two values do not differ significantly. The AUC values when using the total risk score to predict the FTA/NCA/TV measure for the two samples are .726 and .725. Again, as indicated by the confidence intervals, these two values do not differ significantly from one another.

The next table, [Table 3](#), displays the number of offenders in each risk category and the failure rates for each outcome measure. This information is presented for the overall sample as there were no significant differences in failure rates between the construction and validation samples. Five categories were identified and were labeled category I through V. [Table 3](#) presents the number of defendants within each category, the failure rates for the outcome measures of interest, the odds of success, and PSO release recommendations for the entire sample.

As indicated in [Table 3](#), a full 30 percent of the defendants fall into the lowest risk category (Category I). Almost similar percentages fall into categories II and III (29 and 26 percent respectively). Much smaller percentages of defendants were placed into categories IV and V. Note that with both measures of failure the rates increase from one category to the next. The failure rates for category V are 10 times the failure rates for category I defendants when considering FTA/NCA. A similar trend is also noted when considering the FTA/NCA/TV measure.

In addition to the failure rates for each category, there are odds-of-success for each outcome measure and the percentage of defendants where the PSO recommended release. The odds of success are interpreted as the odds of a success occurring to the odds of success not occurring. Note that the odds of success during pretrial release do drop quickly when moving from one category to the next; however, even with the highest-risk category, the odds of success occurring is either 4:1 or 2:1 depending on how success is defined. Similarly, the rate at which PSOs recommend release also drops quickly across categories (from 86 percent for category I to 13 percent for category V). It should be noted that the instrument was not developed nor in use when these release recommendations were made.

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Discussion

The purpose of this article was to provide an argument in favor of risk assessment in the federal pretrial system and a brief description of the process used to develop a proposed pretrial risk instrument. Given that the role of the pretrial services officer is similar to that of an actuary, it appears that an actuarial assessment would enhance a pretrial services officer's ability to fulfill this role. The instrument presented in this article provides a quick and accurate way for pretrial services officers to begin to develop an empirical understanding of the risk posed by pretrial defendants. The next step in the process of implementing a pretrial risk assessment in the federal pretrial services system will be full use of the information provided by the instrument in structuring recommendations about release and conditions of release.

The legislative history of pretrial services is one of a reform movement that sought to protect the rights of citizens and to make sure that there are not two systems of justice, one for the

affluent and another for the less fortunate. Examining the probabilities of failure and odds of success in [Table 3](#) prompts the question: What did Congress intend in §3142(c) when it directed judicial officers to “reasonably assure” a defendant’s future appearance or the safety of the community? Is “reasonably assure” a 49-to-1 wager? Or a 4-to-1 wager? When what hangs in the balance is the liberty of someone who has been charged, but not convicted, of a crime, braver bets are called for. The risk prediction instrument offers, we believe, an opportunity to use science to reinvigorate the pretrial services mission.

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Table 1.
Risk factors and failure rates by sample

Variable	FTA/NCA			FTA/NCA/TV		
	A	C	V	A	C	V
Number of felony convictions						
0-None	6	6	6	10	10	10
1-One to four	11	12	11	19	19	19
2-Five or more	16	15	16	26	26	26
Prior FTAs						
0-None	6	6	6	11	11	11
1-One to four	12	12	11	22	22	21
2-Five or more	15	15	14	26	26	26
Pending cases						
0-No	6	6	6	11	11	11
1-Yes	12	12	12	22	22	22
Current offense type						
0-Theft/fraud, violent, other	4	5	4	8	8	8
1-Drug, firearms, immigration	10	10	10	18	18	18

Offense class						
0-Misdemeanor	4	4	5	6	6	6
1-Felony	8	8	7	14	14	14
Age at interview						
0-47 and older	4	3	4	6	6	6
1-27 to 46	7	7	7	13	13	13
2-26 or younger	9	9	9	17	17	16
Highest education						
0-College degree	3	3	3	5	5	5
1-High school degree, vocational, some college	6	6	6	11	11	11
2-Less than high school or GED	10	10	10	19	19	19
Employment status						
0-Employed	6	6	6	10	10	10
1-Unemployed	9	9	9	17	17	17
Residence						
0-Own/purchasing	4	4	4	7	7	7
1-Rent, other, no place to live	8	8	8	15	15	15
Current drug problems						
0-No	5	5	5	7	7	7
1-Yes	10	10	10	19	19	19

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Table 2.
Average Scores, Standard Deviations, and AUC values
by sample

Sample	FTA/NCA			FTA/NCA/TV			Average	Stan Dev
	Lower	AUC	Upper	Lower	AUC	Upper		
All	.687	.692	.696	.722	.726	.729	6.83	2.49
Construction	.687	.644	.700	.722	.726	.729	6.83	2.49
Validation	.683	.690	.696	.720	.725	.730	6.82	2.49

Lower=Lower Bound 95% CI for AUC; Upper = Upper Bound 95% CI for AUC.

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**Table 3.
Failure Rates, Odds of Failure, and PSO Release
Recommendations.**

Risk Category	N	%	FTA/ NCA*	Odds of Success	FTA/NCA/TV*	Odds of Success	PSO Release Recommendation
Category I (0-4)	55,243	30	2%	49:1	3%	32:1	86%
Category II (5-6)	53,193	29	6%	16:1	10%	9:1	60%
Category III (7-8)	47,915	26	10%	9:1	19%	4:1	41%
Category IV (9-10)	20,833	11	15%	6:1	29%	2:1	28%
Category V (11+)	4,555	3	20%	4:1	35%	2:1	13%
* P < .001							

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