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Self-Reported Inmate Conduct: Using Static and Dynamic Factors to Predict Inmate Recidivism

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Abstract:	This article used Walter's criteria of dynamic factors in prison assessment to ass the predictive capabilities of the Prison Inmate Inventory (PII) in a sample of offenders from a Southeastern State in the United States. Nested negative binomial regression was used, as well as ROC/AUC to evaluate accuracy. The results demonstrated that, beyond the effects of demographic and static variables, dynamic factors incrementally improved model fit and estimated counts of among female inmates, non-White inmates, and inmates reporting more disciplinary actions and violent behavior. All PII scales demonstrated accuracy above .50, however only two were within the range considered acceptable for criminal justice instruments. Practical implications are discussion.

Self-Reported Inmate Conduct: Using Static and Dynamic Factors to Predict Inmate Recidivism

In 2009, state and federal prisoner incarcerations increased by approximately 4,000 prisoners (West, Sabol, & Greenbaum, 2011). Moreover, data revealed a 63% increase in violent inmates among state prison populations from 2000-2008, the largest proportion of prison growth in the past decade (West, Sabol, & Greenbaum). In addition to inmate violence, recidivism is a concern of corrections staff and policymakers. In a unique, state-by-state comparison study, the PEW Center on the States (2011) study found that, on average, approximately 40% of inmates returned to prison within three years of release. The percentage of inmates who returned to prison varied by state and across regions but ranged from 24% to 68%. If an inmate was re-incarcerated for a new crimes or for a technical violations while on parole or probation it was counted as recidivism. Rates of re-incarceration for new crimes ranged from 8% to 25% while the rates for technical violations ranged from 2%-51% (PEW Center on the States, April 2011). It is clear that the rates of re-incarcerations vary widely; however, an average recidivism rate of 40% threatens public safety and places a strain on already overburdened correction department resources.

Recently, many probation and parole departments are adopting strategies and implementing policies to address inmate violence and recidivism while simultaneously improving public safety. Recidivism strategies include implementing evidence based practices into supervision, preparing inmates for release at the time of their admission, and evaluating risk using assessment tests (PEW Center on the States, September 2011; Austin, 2003). Researchers have identified several factors associated with inmate risk. These factors represent two categories, static and dynamic factors. Static factors are historical aspects of the offender that are

considered unchangeable. Static factors for inmates include gender, the current age of the offender, prior criminal history, prior arrest history, the age of first conviction for an offense, and victim characteristics (e.g., male victims, female victims, stranger victims) (Andrews & Bonta, 2010). Dynamic factors are considered aspects of the inmate that are amenable to change. Denial, substance abuse, and antisocial traits are considered dynamic factors that can be addressed through treatment or other interventions (Nunes, Hanson, Firestone, Moulden, Greenberg & Bradford, 2007; Yates, 2009). Dynamic factors, while not as thoroughly examined as static factors, have implications for inmate risk, treatment compliance, and corrections outcomes (Yates). Degiorgio and Donato (2013) found that the addition of dynamic factors increased predictive ability of a probationer risk classification instrument. Moreover, Degiorgio (2013a) found that use of three specific dynamic factors, adjustment, violence, and stress management, improved a model risk prediction among inmates. PII risk classifications Low Risk and Severe Risk, were predictive of estimated probation revocations for female offenders (Degiorgio, 2013b). This study seeks to build on earlier work on dynamic factors (Walters, 2012) using inmate test data from a State in the Southeastern United States.

Methodology

Participants

Data were received from 1,610 inmates from the Southeastern region of the United States who completed the Prison Inmate Inventory (PII) from September 1, 2013 – August 31, 2014. The PII was completed as part of their screening or intake procedures. Test data were extracted from the test developer's, Behavior Data Systems (BDS), research database for analysis. There were 117 invalid tests which were removed from subsequent analyses. According to scoring methodology scores at the 90th percentile or above on the Truthfulness Scale denotes attempts to

'fake good' or deny problems. At the 90th percentile, remaining scale scores are considered invalid and unreliable. Table 1 summarizes self-reported inmate demographic information.

Inmates responded to several answer sheet items regarding their criminal history. As might be expected, reported criminal history was extensive for the majority of offenders. Ninety-nine percent had one or more arrests with almost 50% having 4 or more felonies; 42% had one or more alcohol-related arrests; 41% had at least one or more DUI arrests, and 78% had at least one or more drug-related arrests; 79% had one or more probation sentences; 59% had at least one probation revocation; 63% had one or more parole sentences, and 45% had at least one parole revocation. The average number of months inmates had left to serve was 17.0 months; the average number of years they had spent incarcerated was 4.25 years.

Instrument

The Prison Inmate Inventory (PII) is an assessment that combines both static and dynamic factors to categorize inmate risk. The Prison Inmate Inventory (PII) was designed to assess prisoner risk and need, determine necessary levels of supervision, and support decisions regarding status or classification changes. The scales of the PII represent dynamic factors, areas that are amenable to change and treatment. Static factors on the PII include demographic information and self-reported responses to criminal history questions.

Degiorgio (2013a) established the construct validity and reliability of the PII, as well as its appropriateness for use among female inmates (Degiorgio, 2013b). As noted earlier, prior research of the PII confirmed that the Adjustment Scale and Violence Scale significantly improved model fit when predicting recidivism (Degiorgio, 2013a). All PII scales included in this study presented evidence of adequate reliability ($\alpha > .86$). Additional information about the

Prison Inmate Inventory (PII) can be found on the test developer's website: www.prison-inmate-inventory.com

High Need Variable

At the request of the Department of Corrections, whose data were used in this study, a scorning methodology was incorporated to aid in the identification of individuals with high needs. Corrections officials had observed that inmates with multiple complaints, grievances, and disciplinary action required disproportionately more officer time and resources. Consequently, four items were added and endorsement of these items raised inmate risk classification. The four items, along with the percentages of endorsed items are presented in Table 2. Approximately 5% of inmates endorsed all four of the grievance and disciplinary items; 12% endorsed three of the items, 19% endorsed two of the items, and 32% endorsed one of the items. Overall, 67% of inmates had a compliant, grievance or conflict with another inmate or officer. These four items were used to create a new 'High Need' variable, which summed the number of reported grievance and disciplinary responses; item range was 0 -4; *0 = no reported conflicts, complaints, grievances or disciplinary action; 1= at least one reported conflict, complaint, grievance of disciplinary action; 2= two reported conflicts, complaints, grievance or disciplinary action; 3 = three reported conflicts, complaints, grievance or disciplinary action; 4 = at least four reported conflicts, complaints, grievances, reprimands, or disciplinary action.*

Procedures

The new variable, 'high need', was included as a predictor variable in the analyses along with six static variables, and six dynamic factors (PII scales). The 'high need' variable was included to determine its relationship to recidivism, as well as its role in the overall model fit. Static factors were gender, race/ethnicity, total arrests, felony arrests, alcohol-related arrests, and

drug-related arrests. To facilitate the analysis, race/ethnicity was collapsed into two categories, 'White' and 'Non- White'. Dynamic factors included percentile scores for the Alcohol Scale, Drug Scale, Self-Esteem Scale, Violence Scale, Antisocial Scale, and Adjustment Scale. As noted earlier, Degiorgio (2013a) confirmed that the Violence Scale and Adjustment Scale scores contributed to recidivism prediction. Moreover, research has confirmed that problems with alcohol and drugs are dynamic factors and when treatment intensity is matched with problem severity, relapse and recidivism are impacted (Andrews & Bonta, 2010; Matheson, Doherty, & Grant, 2011).

Age was used as an offset variable to account for the time needed to accumulate criminal acts. Probation revocation was used as the dependent variable. This variable was selected because it clearly identifies prior recidivism. Revocations, when viewed as recidivism, are considered indicators of "return on correctional investment" (PEW Center on the States, April 2011).

Correlation analysis revealed that predictor variables were related but were not higher than .65. To ensure proper model fit a test for multicollinearity was conducted. Results did not reveal mulitcollinearity among variables, subsequently additional regression analyses were completed.

Negative binomial regression was selected for this study as its use is appropriate and necessary when analyzing non-normally distributed data like number of probation revocations, which are count variables. A traditional regression would be inappropriate and bias the results and subsequent interpretation. Moreover, negative binomial regression does not assume independence of future events like arrests and revocations (Trulson, DeLisi, & Marquart, 2011). To facilitate model interpretation, the PII scales were divided by 10; thus, regression coefficients

correspond to a 10% change in the given scale rather than a 1% change. Bonferroni adjustment was used to control for experimentwise error (.003).

Four nested models of fit were conducted to ensure that the addition of dynamic factors contributed to overall model fit and predictive capabilities. The first model served as the baseline (intercept) model and included no predictor variables; the second model added static factors (demographics and criminal history items); the third model added dynamic factors (PII percentile scores), and the final model included all previous variables and added the 'high need' variable.

Accuracy was assessed using ROC/AUC analyses (receiver operating characteristics/area under the curve analysis) and was selected because it simultaneously measures specificity and sensitivity of the assessment, and is not influenced by low base rates (like reoffending). The AUC statistic conveys the probability that a randomly selected repeat offender would have a more deviant score than a randomly selected offender who has not reoffended (Craig & Beech, 2009). To facilitate this analysis, a binary variable was created using probation revocations, *0=non- recidivist; 1=recidivist* and risk range percentiles for each scale were used.

ROC/AUC analyses used percentile scores for each of the PII scales included in the study, along with the new binary variable. Any finding with an AUC above .50 had predictive validity better than chance (50/50). Interpretation of AUC results varies depending on the needs of the test user but generally accepted clinical standards indicate 1.0 -.90 = excellent, .90 -.80 = good, .80 -.70 = fair, .70 -.60 = poor, and .60 -.50 = very poor. Fazel et al (2013) reported that most criminal justice instruments have AUC scores between .66 and .72.

Results

The overall regression model was statistically significant; moreover, most individual variables were statistically significant and contributed to the overall model fit. Beta coefficients

indicated positive relationships between gender, race, arrests, and high needs with probation revocations. Negative relationships between felonies, drug-related arrests, alcohol-related arrests and probation revocations emerged. Among dynamic factors, negative relationships were revealed between alcohol, drug, self-esteem and antisocial scales and probation revocations. Violence and adjustment dynamic factors had a positive relationship with probation revocations. The results of the final model are presented in Table 4.

The baseline model that included just the intercept did not fit the data well, χ^2 (1491) = 18737.06, $p < .99$. Next, a model estimating the predictive effects of the demographic and criminal history factors was conducted. This model fit the data well, χ^2 (1485) = 17247.44, p = .000, and improved fit beyond the baseline model. Chi-square delta was used to compare nested-models, $\chi^2_{diff}(6) = 1489.62$, $p < .001$. Adding demographics and criminal history variables improved the prediction model.

A third negative binomial regression was estimated to test the hypothesis that the dynamic factors of alcohol, drug, violence, self-esteem, antisocial, and adjustment predicted probation revocations beyond the demographic and static factors. The model including the dynamic factors fit the data well, χ^2 (1479) = 15663.01, p = .001, and resulted in improved fit beyond the model with static factors, $\chi^2_{diff}(7) = 1584.40$, $p < .001$. These results indicated that, beyond demographic and static variables, dynamic factors are important for the prediction of probation revocations.

Finally, a model that included the 'high need' variable was added to the estimation. The model included all previous static and dynamic factors. The additional variable fit the model reasonably well, χ^2 (1478) = 15636.43, p = .001, and a comparison revealed $\chi^2_{diff}(1) = 26.58$, $p <$ .001, a slight improvement.

Using incident ratios, [Exp (B) -1 x 100], the number of probation revocations was significantly related to two of the six dynamic factors. The largest predictor was adjustment; the number of probation revocations rose 1000% for every 10% increase in adjustment problems. Violence was also significantly predictive of probation revocation, accounting for an 18% increase in the number of revocations for every 10% increase in violent behavior. Female inmates had revocation counts 23% greater than male inmates and non-White offenders had 176% estimated counts of probation revocations greater than White inmates. Moreover, inmates with multiple arrests, had revocation rates 23% higher than inmates with fewer arrests. Inmates designated as 'high need' had estimated probation revocations 47% higher than inmates with fewer needs.

Results of the AUC analysis revealed all PII scales were above the .50 threshold; results are presented in Figure 1. Alcohol Scale (.53), Drug Scale, (.59), Violence Scale (.58), Self-Esteem Scale (.55), Antisocial Scale (.62) and Adjustment Scale (.66) predicted revocations better than chance. Craig and Beech (2009) assert that these AUC indices correspond to small and medium effect sizes respectively (p. 200). Table 5 presents ROC sensitivity and specificity information along with positive and negative likelihood ratios (LR) for the Antisocial and Adjustment Scale, the two scales with medium effect sizes.

For the Antisocial Scale and Adjustment Scale, sensitivity percentages were above 53%. Practically interpreted, 5 out of 10 offenders who scored above 70th percentile (Problem Risk range) had probation revocations. Specificity percentages were at about 60% meaning that 6 out of 10 offenders below the 70th percentile did not have probation revocations.

Discussion

As noted earlier, Walters' (2012) three criteria for dynamic risk, guided this analysis; a) dynamic factors are statistically and clinically significant predictors of outcome, b) dynamic factors are

incrementally valid relative to static factors, and c) changes in risk factors predict outcome and outcome risk. To that end a series of regression analyses were conducted to assess statistical and clinical significance of individual variables, as well as assess an overall model of risk prediction. The results demonstrate that, beyond the effects of demographic and static variables, dynamic factors, may increase the likelihood of criminal behavior leading to revocations. Moreover, dynamic factors contributed incrementally to the overall model and results from this study are similar to those found by Degiorgio (2013a). Specifically the Adjustment Scale and Violence Scale contributed most significantly to the overall model.

Inclusion of the 'high need' variable contributed to the overall prediction model and suggests a relationship between acts committed while incarcerated and inmate activities after release. Of interest was the higher estimated counts of female revocations; this finding is inconsistent with previous PII research (Degiorgio, 2013a) and may reflect unique characteristics of inmates at this correctional facility. Also noteworthy was the high estimated count of revocations for non-white offenders and inmates with higher needs and more violent offenses. These indicators, along with dynamic factors, provide correctional staff with information to aid in decision making, as well as guide supervision and treatment services.

Critics have argued that findings such as those presented above have little practical utility in decision making—specifically, release decisions should not be made on the basis of race/ethnicity and gender. The rather unimpressive ROC/AUC (accuracy) of the dynamic factors would seem to support this conclusion; however, this argument fails to appreciate the importance of identifying areas that are responsive to treatment and interventions. Methodologically, models like those tested here, assume the offender is unchanging and that prior criminal acts reflect a persistent state of criminal propensity. Statistical constraints, however, conflict with research findings that reveal prosocial activities, substance abuse treatment, and strong positive peer

relationships, all dynamic factors, can reduce recidivism rates and delay relapse for inmates and offenders (Andrews & Bonta, 2010).

The addition of the 'high need' variable suggests that beyond traditionally examined factors behaviors and actions committed while incarcerated can impact inmate counts of probation revocations. This study met two of the three criteria established by Walters. Additional data on changes to risk factors for inmates are needed in order to establish that the PII meets the third criteria.

Limitations

These analyses were conducted using data extracted from the Behavior Data Systems database which limits the ability to draw causal conclusions about these predictors and recidivism. As noted above, reliance on a static, dependent variable (probation revocations) introduces bias into the study (Saltzman, Paternoster, Waldo, & Chiricos, 1982) and may lead to an overestimation of the relationship between the variables. Moreover, the author and test developer have limited knowledge, or input into, how the PII is administered to inmates by the correction department. Corrections staff were provided general test administration guidelines as outlined in the training manual; however inconsistencies in test administration, security classification, and environment may have impacted results. Field research using the PII should include a description of administration procedures, as well as examined the accuracy of risk prediction on recidivism rates. To this end, collaboration with agencies to examine long term test data would expand the existing knowledge of inmate recidivism and treatment planning.

This study adds to the existing literature on dynamic factors in prisoner assessment. Prior history, as well as areas targeted for intervention and treatment can guide classification and supervision decision making, as well as areas for treatment and intervention. Incorporating

assessment into correctional facility policies and properly identifying offenders, has been associated with reduced recidivism, reduced costs, and increased public safety (PEW Center on the States, 2011).

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Table 1.

Demographic Characteristics

	n	%
Gender		
Male	1. 339	89.5
Female	157	10.5
Race/Ethnicity		
White	863	57.8
Black	534	35.8
Hispanic	64	4.3
Other	32	2.1
Education		
8th grade or less	96	6.4
Some high school	609	40.8
GED/HSD	704	48.4
Some college	65	4..0
College graduate	18	1.2
Marital Status		
Single	809	54.3
Married	314	21.1
Divorced	220	14.8
Separated	127	8.5

Table 2

High Need Variable Summary

When I am wronged or treated unfairly, I:

- 7.3% complained when they were wronged or treated unfairly
- 12.6% filed a complained when they were wronged or treated unfairly
- 12.4% reported both complaining and filing a complaint

During the last year I have:

- 22.1% had disciplinary action
- 5.9% lost privileges
- 7.5% was written up

During the last 6 months I have been given:

- 9.5% a verbal reprimand
- 6.0% a written reprimand
- 10.5% both verbal and written reprimands

During the last 6 months, I have had conflicts or problems with:

- 13.2% inmate(s)
- 4.2% officer (s)
- 12.1% reported both inmate and officer conflicts

Table 3

Descriptive Statistics for Model Variables

	Min	Max	Mean	SD
Age	19	67	34.69	9.91
Criminal history				
Probation revocations	0	10	.97	1.25
Lifetime arrests	0	10	6.69	3.08
Felony arrests	0	10	4.21	2.74
Alcohol-related arrests	0	10	1.38	2.49
Drug-related arrests	0	10	2.25	2.18
High Need	0	4	1.25	1.17
PII Scales				
Alcohol	0	99	52.22	25.49
Drug	3	99	74.18	21.27
Antisocial	8	95	65.77	20.69
Violence	3	99	56.35	26.06
Self-esteem	3	99	57.60	24.02
Adjustment	11	96	73.61	18.71

Table 4.

Negative Binomial Regression Coefficients

Variables	*B*	*SE*	*p*	Exp(B)	% Exp (*b*)
Female	.21	.34	.59	1.24	23.4
Non-White	1.0	.21	.000	2.76	171.8
Total Arrests	.20	.04	.000	1.23	23.1
Felony Arrests	-.66	.04	.000	.519	
Alcohol-related arrests	-.92	.05	.000	.40	
Drug-related arrests	-.06	.05	.20	.94	
Alcohol Scale	-.53	.05	.000	.590	
Drug Scale	-.16	.07	.02	.86	
Self-Esteem Scale	-.66	.04	.000	.52	
Violence Scale	.17	.05	.002	1.18	18.5
Antisocial Scale	-.54	.10	.000	.58	
Adjustment Scale	2.66	.10	.000	14.36	1329.6
High need	.39	.08	.000	1.47	47.7

Table 5

ROC values for PII

Scale	AUC	Sensitivity	1-Specificity	+LR	-LR
Antisocial	.617	.53	.64	.83	1.21
Adjustment	.658	.64	.63	1.02	.98

Sensitivity = probability that a test result will be positive (above 70th percentile) when the inmate has a probation revocation, expressed as percentage; Specificity = probability that a test result will be negative (below 70th percentile) when the offender has no probation revocations, expressed as a percentage; Positive Likelihood Ratio = ratio between the probability of a positive score (above 70th percentile) result given the presence of a probation revocation and the probability of a positive score (above 70th percentile) given no probation revocation, Sensitivity/1-Specificity; Negative Likelihood Ratio = ratio between the probability of a negative test result (below 70th percentile) with a probation revocation and the probability of a negative test (below 70th percentile) with no probation revocation, 1-Specificity/Sensitivity.

Figure 1

ROC/AUC for PII Scales