ABSTRACT

DUHART CLARKE, SARAH ELIZABETH. Predictive Validity of the Public Safety Assessment for Indigent Defendants. (Under the direction of Dr. Sarah L Desmarais).

Background: All U.S. states are currently engaged in pretrial reform efforts. These reform efforts typically involve moving away from traditional bail practices and towards the implementation and use of pretrial risk assessment tools. The purpose of the current study was to examine the performance of Public Safety Assessment (PSA) (VanNostrand & Lowenkamp, 2013) scores among indigent defendants, with the specific aims of: 1) Determining the predictive validity of the results of the PSA within a sample of indigent defendants; and 2) Determining whether the PSA scores demonstrate predictive bias against indigent defendants.

Methods: The PSA was completed for 522 randomly selected defendants who were arrested in May 2018 in a large, metropolitan area in the southeastern U.S. The 11 PSA items were coded for each individual using court and criminal records, and were then weighted and summed into scaled scores for NCA risk, scaled scores for FTA risk, and raw scores for NVCA risk, as well as the NVCA binary risk flag indicator, all in accordance with the PSA manual. Outcomes of FTA, NCA, and NVCA were recorded for 12 months post index charge, or until the index charge case was closed. To address Aim 1, descriptive statistics were calculated for the overall sample and the subsample of indigent defendants, and sensitivity, specificity, NPVs, PPVs, AUC values, and ORs were calculated for each of the PSA subscales within the subsample of indigent defendants. To address Aim 2, a matched sample of indigent defendants and non-indigent defendants was created, matching on sociodemographic and legal characteristics. Then, binary logistic regressions and ROC analyses were conducted using the matched sample.

Results: With respect to Aim 1, results indicated that the PSA had "fair" to "good" predictive validity among a subsample of indigent defendants. With respect to Aim 2, analyses did not show predictive bias for any of the PSA subscales as a function of indigent status.

Conclusion: Overall, results of this study indicate that the PSA subscales are a valid approach for assessing risk of failure to appear and new criminal activity during the pretrial period among indigent defendants. Future research should continue to examine the predictive validity and predictive fairness of pretrial risk assessment tools with indigent defendants and other vulnerable subgroup populations.

Predictive Validity of the Public Safety Assessment for Indigent Defendants

by
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BIOGRAPHY

Sarah Elizabeth Duhart Clarke grew up in Salem, Oregon. After graduating with her Bachelor of Science from Western Oregon University in 2016, Sarah began working as a public health analyst in the Behavioral Research Division of RTI International. In the fall of 2018, Sarah joined the Applied Social and Community Psychology program at North Carolina State University. Broadly, she is interested in conducting research that services individuals impacted by the criminal justice system, particularly for those that belong to vulnerable populations. She currently lives in North Carolina with her partner and their three dogs, Perseus, Daisy, and Roman.

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Introduction

Background

Over 65% of defendants in the United States are unable to afford their own counsel, known as "indigent defendants" (Harlow, 2000). The small body of research that has examined this population suggests that indigent defendants tend to experience more negative criminal justice outcomes compared to their non-indigent counterparts across all stages of case processing. To demonstrate, compared to defendants who can afford their own counsel, indigent defendants tend to have higher odds of pleading guilty, being convicted, receiving longer custodial sentences, and experiencing very long delays in their legal proceedings (Heaton, Mayson, Steven, 2017; Linhorst, Dirks-Linhorst, McGraugh, Choate, & Riley, 2017; Roach, 2017; ABA, 2004). Indigent defendants are also less likely to be referred for evaluations of their competency to stand trial, which may mean that indigent defendants are less able to aid and assist their counsel during the court process (Linhorst et al., 2017). Further, and of particular relevance to this project, indigent defendants are disadvantaged within the pretrial process, specifically, such that they are more likely to be detained pretrial compared to their peers who can afford their own counsel (Heaton et al., 2017; Linhorst et al., 2017; Roach, 2017). Pretrial detainment is widely recognized as the starting point for an accumulation of disadvantage and negative sequalae that plays out during the remainder of case processing (e.g., Ottone & Scott-Hayward, 2018; Stevenson, 2018; Heaton, et al., 2017).

Pretrial Practices

Historically, pretrial processes and decisions within the United States have centered around bail practices. The overall purpose of bail is to ensure that defendants will show up to their court dates for the crimes they are accused of (ABA, 2019). Bail amounts are determined by

judicial decision-makers (e.g., judges, magistrates) and are intended to be reflective of the defendant's threat to public safety (i.e., their likelihood of committing a new crime, particularly a new violent crime) and their flight risk (i.e., their likelihood to not show up to their next court date). Judicial decision-makers may also choose to release a defendant into the community without bail, if they determine that they are not a significant public safety or flight risk. Defendants who receive bail are assigned a bail amount at their first hearing; if they are unable to pay this amount, they will remain in jail throughout the pretrial process.

Though bail is only intended to reflect public safety and flight risk, research has shown that decisions regarding bail amounts are often influenced by extralegal and even subjective factors – that is, information about defendants and their circumstances that are beyond what is legally relevant to the case and decision at hand (Eckhouse, Lum, Conti-Cook, & Ciccolini, 2018; Richardson & Goff, 2013; Banks, Eberhardt, & Ross, 2006). For instance, research demonstrates that men tend to receive higher bail amounts than women, even after controlling for legally relevant factors (Ball & Bostaph, 2009; Demuth & Steffensmeier, 2004; Pinchevsky & Steiner, 2016). Additionally, controlling for legally relevant factors, Black and Hispanic defendants tend to receive higher bail amounts than their White counterparts (Arnold, et al., 2018; Demuth, 2003; Schlesinger, 2005; Wooldredge, Frank, Goulette, & Travis, 2015). The few studies that have been conducted on indigent defense status and assigned bail have shown that indigent defendants may receive higher bail amounts than their non-indigent counterparts and may also be denied bail, and therefore detained pretrial, more often than non-indigent defendants (Duhart Clarke, et al., 2019; Williams, 2017). These higher bail amounts or denial of bail altogether lead to higher odds of pretrial detention among indigent defendants.

As noted earlier, defendants detained pretrial (whether they are indigent or not) are more likely to experience negative criminal justice, social, and economic consequences than defendants who are released pretrial. In particular, defendants detained pretrial are more likely to engage in plea negotiations, take a guilty plea deal, and be convicted of their charges (Ottone & Scott-Hayward, 2018; Stevenson, 2018; Heaton, et al., 2017; Sacks, et al., 2015; Philips, 2012; Cohen & Reaves, 2007; McCoy, 2007; Kellough & Wortley, 2002). Once convicted, defendants who were detained pretrial are more likely to receive sentences that include a period of incarceration (as opposed to community supervision or other non-custodial alternatives) and receive longer sentences compared to defendants who are not detained pretrial (Stevenson, 2018; Austin, 2017; Heaton, et al., 2017; Philips, 2012). Further, defendants detained pretrial are also more likely to experience negative consequences even outside of their criminal justice outcomes. Research has demonstrated that defendants detained pretrial experience damaged family bonds, poorer physical and mental health, loss of employment, and loss of housing (Ottone & Scott-Hayward, 2018; Rabinowitz, 2010; Bak, 2002). Within a bail-centric pretrial system, then, indigent defendants have higher odds of experiencing these negative outcomes, as they are, by definition, more financially disadvantaged than their non-indigent counterparts and less likely to be able to post bail.

Due to widespread concerns and criticisms regarding bail practices, jurisdictions have begun exploring methods of promoting fairness and equity in pretrial decisions. Indeed, all states are currently engaged in reform related to pretrial decision-making (National Conference of State Legislation, 2018). Many such efforts have involved moving away from resource-based, monetary bail systems towards risk-based models through the implementation of pretrial risk assessment tools (Stevenson & Mayson, 2017). Briefly, pretrial risk assessment tools are

intended to forecast public safety risk and risk of failing to appear to court, thereby providing an empirical foundation for judicial decisions (Desmarais & Lowder, 2019; van Eijk, 2017). In addition to moving away from resource-based bail systems, pretrial risk assessment tools also aid reducing disparities in criminal justice outcomes by reducing the influence of subjective factors in pretrial decisions. While the intent of such risk-based reform is to reduce disparities in criminal justice outcomes and eliminate systemic biases, there are concerns that the use of risk assessment tools may actually contribute to increases in disparities. Much of the discussion in this arena has focused on the degree to which pretrial risk assessment tools may be racially biased due to their inclusion of items that potentially act as a proxy for race, such as criminal history (Kamorowski, Schreuder, de Ruiter, Jelicic, & Ask, 2018; "The use of pretrial 'risk assessment' instruments", 2018).

Numerous actuarial risk assessment tools (i.e., tools that assign numerical values to a defendant's likelihood of pretrial failure) have been developed to aid in the pretrial process. Currently, some of the most widely used pretrial risk assessment tools are the Correctional Offender Management Profiling for Alternative Sanctions (COMPAS; Dieterich, 2010), Colorado Pretrial Assessment Tool (CPAT; Pretrial Justice Institute, 2012), Virginia Pretrial Risk Assessment Instrument (VPRAI; VanNostrand, 2003), Ohio Risk Assessment System Pretrial Assessment Tool (ORAS-PAT; Latessa, Smith, Lemke, Makarios, & Lowenkamp, 2009), Federal Pretrial Risk Assessment (PTRA; Lowenkamp & Whetzel, 2009), and Public Safety Assessment (PSA; VanNostrand & Lowenkamp, 2013). Pretrial risk assessment tools are typically administered after a defendant has been arrested and booked into jail, but before they have their first court hearing.

Most pretrial risk assessment tools include items that represent three domains: 1) individual characteristics, 2) criminal/case characteristics, and 3) environmental characteristics (Desmarais & Lowder, 2019). Individual characteristics include items such as age, employment, education, or substance use. Criminal characteristics include items related to the defendant's current charges and their criminal history, including the severity of their current charge, prior criminal convictions, or prior incarceration. Environmental history most commonly includes the defendant's living situation (e.g., renting versus owning their living residence). To administer, most risk assessment tools require that someone interviews the defendant to obtain all the necessary information, with the exception of the PSA which can be completed using administrative and criminal records (VanNostrand & Lowenkamp, 2013).

Once the assessment has been administered, the pretrial risk assessment tool will provide guidelines for assigning risk scores. Typically, pretrial risk assessment tools will assign an overall score to indicate total risk of pretrial failure (i.e., failing to appear to court and of committing a new crime while on pretrial release). Some pretrial risk assessment tools will also break this total score down into risk scores for specific events, most commonly failure to appear and new criminal activity (Desmarais & Lowder, 2019). Using these risk scores, judicial decision-makers then determine whether the defendant should be assigned bail, how much bail they should be assigned, and/or if the defendant should be detained or released pretrial.

While these pretrial risk assessment tools pose an opportunity for reducing bias within pretrial practices, the current empirical research is sparse. A recent meta-analysis identified only 11 studies that examined the predictive validity of these pretrial risk assessment tools (Desmarais, Zottola, Lowder, & Duhart Clarke, in press). Generally, these validation studies have demonstrated that the six most common pretrial risk assessment tools produce scores with

good predictive validity, suggesting that their use may help support more accurate, consistent, and transparent pretrial decision-making (Desmarais et al., in press). These findings are consistent with those of an earlier review of the literature that similarly showed that pretrial risk assessment tools had "fair" validity for predicting failure to appear and "good" validity for predicting re-arrest (Bechtel, Holsinger, Lowenkamp, & Warren, 2017).

That said, few studies have examined the predictive validity of pretrial risk assessments across different subgroups (Cohen & Lowenkamp, 2019; DeMichele et al., 2018; Danner, VanNostrand, & Spruance, 2016; Danner, VanNostrand, & Spruance, 2015; VanNostrand, 2003). When examined, studies have focused on race (typically Black vs. White) and sex. Results of the predictive validity across racial subgroups have been mixed. For example, the PTRA and VPRAI demonstrated comparably good predictive validity across racial groups, while some results on the PSA had slightly lower predictive validity among defendants of color than White defendants (Cohen & Lowenkamp, 2019; DeMichele et al., 2018; Danner et al., 2016; Danner et al., 2015; VanNostrand, 2003). Results of the predictive validity of pretrial risk assessments as a function of defendant sex also have been mixed. For most of the pretrial risk assessment tools' domains, the predictive validity appeared to be higher for women than for men; however, other domains indicated a higher predictive validity for men than for women (Cohen & Lowenkamp, 2019; DeMichele et al., 2018; Danner et al., 2016; Danner et al., 2015; VanNostrand, 2003). For example, within the PTRA, the predictive validity for new criminal activity scores was higher for women, but the predictive validity for new violent criminal activity scores was higher for men (Cohen & Lowenkamp, 2019). The sparse literature and inconsistent findings on the predictive validity of pretrial risk assessment tools indicates a need for more

research to examine the effectiveness of these tools, particularly within relevant subgroups, such as indigent defendants.

In fact, the validity with which risk assessment tools forecast pretrial outcomes for indigent defendants has not been examined in any study. And yet, indigent defendants may be even more vulnerable to (unintended) adverse effects of criminal justice reform efforts that involve implementing pretrial risk assessment tools. That is, almost all pretrial risk assessment tools include at least one item that is directly or indirectly related to indigent status, such as current employment, living situation, financial responsibilities, or debt (Desmarais et al., in press; Eckhouse et al., 2018; van Eijk , 2017). Even in jurisdictions that are not using risk assessment tools to inform pretrial release decisions, the legal statutes include direct measures of socioeconomic status within their pretrial release guidelines (Bail Reform Act of 1984, 1984). Thus, there are both legal and pragmatic mechanisms through which these socioeconomic variables are informing judicial decisions and, ultimately, contributing to class inequality (Eckhouse et al., 2018; Goddard & Meyers, 2018). This evidence indicates that, regardless of current reform efforts, there is a large potential for biases attributable to indigent defense status to influence judicial decisions at multiple justice system stages due to the cumulative impacts of pretrial detainment.

The Proposed Study

The purpose of the current study was to examine the performance of PSA (VanNostrand & Lowenkamp, 2013) scores among indigent defendants within a population of individuals arrested and booked into a large county jail in a metropolitan area of the southeastern United States. The specific aims of the study were: 1) To determine the predictive validity of the results

of the PSA within a sample of indigent defendants; and 2) To determine whether the PSA scores demonstrate predictive bias against indigent defendants.

Method

Study Context

The data in the current study were collected as part of a retrospective evaluation of the PSA. The PSA was the chosen pretrial risk assessment tool by decision-makers in this county for a couple reasons. First, the PSA is one of the most widely used pretrial risk assessment tools in the United States (Desmarais et al., in press). Second, the PSA's predictive validity has been tested in three separate studies across two different study samples, making it one of the more validated pretrial risk assessment tools. As reviewed earlier, these studies suggest generally good predictive validity (Brittain, 2018; DeMichele, et al., 2018; VanNostrand & Lowenkamp, 2013), but also highlight potential concerns regarding its performance with subgroups. Third, the PSA is the only pretrial risk assessment tool that does not require a defendant interview, as it is based completely on information that can be pulled from administrative and criminal records (which is behind its widespread adoption). Finally, and perhaps of greatest relevance to the current study, the PSA is also the only pretrial risk assessment tool that does *not* include items directly related to socioeconomic status, which may mean that it is more appropriate for use with indigent defendants.

Sample

The PSA was completed for 522 randomly selected defendants who were arrested in May 2018 in a large, metropolitan area in the southeastern United States. May 2018 was chosen because it gave a higher likelihood of the cases selected being closed within the 12-month follow-up period, based upon the typical time from arrest to case closure in the study

jurisdiction. However, within the full sample, 20 cases were still pending after 12-months; for these cases, outcomes were only examined for the 12 months following their index charge. In the current study jurisdiction, defendants that are eligible for indigent status are defendants who are unable to afford their own attorney and have been charged with an offense that could result in imprisonment, which includes some traffic offenses in the study jurisdiction. This jurisdiction currently includes two different types of indigent defendants: 1) defendants with public defenders, and 2) defendants with court-appointed counsel. Public defenders are full-time, state-paid attorneys. Defendants with court-appointed attorneys are those that were determined to be of indigent status, but no public defender was currently available to take their case. Thus, these defendants were instead given attorneys that also work privately but will take county-appointed cases if there is no public defender available to assist them. While indigent defense services are paid for by the state, the defendant is required to pay back the money spent on their defense *if they are found guilty*.

Procedure

Data were drawn from the county jail's administrative database for individuals booked into the county jail during May 2018. Individuals held for any reason besides arrest (e.g., detained by Immigration and Customs Enforcement, serving weekend sentences, etc.) were excluded. An individual's May 2018 booking was considered their index booking during the study period. Data drawn from the jail's administrative database and the state's court records were used to complete the PSA. Follow-up data for new criminal activity (NCA) and new violent criminal activity (NVCA) were collected from the same databases following the date of their index booking through May 2019 (i.e., 12 months). For failure to appear (FTA) data, research assistants pulled data for each defendant from their court records within the county clerk's office.

Each individual is included only once in the database. Six research assistants and one employee from the pretrial services office used statewide arrest records to collect demographic information, details regarding the index offense, and to fill out the PSA for each individual. All research assistants received training in the Automated Criminal Infractions System (ACIS) and completed a set of 20 practice cases to consensus.

Measures

     PSA. The 11 PSA items across three subscales (i.e., FTA, NCA, and NVCA) were coded for each individual using court and criminal records (see **Appendix**). Risk assessment items included age, current charges, pending charges, prior misdemeanors, prior felonies, prior violent crimes, prior FTAs, and prior incarceration. The PSA items were then weighted and summed into raw scores for FTA, NCA, and NVCA. These raw scores are then turned into scaled FTA risk scores ranging from 1 to 6, NCA risk scores ranging from 1 to 6, and the NVCA binary risk flag indicator in accordance with the PSA manual. In addition to these scaled scores, the current study also examined the performance of the raw NVCA risk scores ranging from 0 to 7[1]. For each of these, a higher score indicated higher risk.

     Pretrial outcomes. Three outcome variables were coded in accordance with the PSA guidelines. FTA was measured as any instance in which a defendant failed to show up for a scheduled court date for their index booking offense. NCA was measured as an arrest for any criminal or traffic offenses that occurred during the pretrial period after their date of index booking. Traffic offenses were only included if they were punishable by jail time. NVCA was measured as an arrest for any violent offense(s) during the pretrial period after their date of index booking.

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[1] In practice, the total points assigned to the NVCA are converted to a binary "violence flag" (no, yes) to indicate an elevated likelihood of being arrested for a new violent crime.

Analyses

  Aim 1. To determine the predictive validity of the PSA among a sample of indigent defendants, I first conducted descriptive statistics of indigent defendants. Descriptive statistics include participant characteristics of age, race, and sex; PSA scores for the FTA, NCA, and NVCA subscales; PSA item endorsements; criminal justice characteristics of highest charge level and violent or non-violent index offenses; and criminal justice outcomes of FTA, NCA, and NVCA.

  Next, I determined the predictive validity of the PSA among indigent defendants by calculating sensitivity and specificity, positive and negative predictive values (NPV and PPV, respectively), odds ratios (ORs), and area under the curve scores (AUCs). These values were calculated for each subscale of the PSA (FTA, NCA, and NVCA) using the pretrial outcomes of FTA, NCA, and NVCA, respectively. Since NPV and PPV analyses require a binary predictor, FTA and NCA scores I recoded and collapsed into "low risk" (scores of 1-2), "medium risk" (scores of 3-4), and "high risk" (scores of 5-6), in keeping with practices used in prior studies (Desmarais et al., in press; Singh, Serper, Reinharth, & Fazel, 2011). Then, I calculated NPV and PPV analyses first for low and medium risk versus high risk, and then for low versus medium and high risk, in accordance with methodology used in other assessments of predictive validity. I used the NVCA binary flag indicator to calculate NPV and PPV for NVCA. For OR and AUC calculations, I used the FTA and NCA scaled scores, and the NVCA raw scores. With each subscale, an AUC value above .64 and an OR above 3.00 is indicative of good predictive validity (Chen, Cohen, & Chen, 2010; Rice & Harris, 2005). Scores below these cut-offs indicate fair or poor predictive validity.

Aim 2. To test for predictive bias in the PSA as a function of indigent status, I followed the methods used in prior research (e.g., Lowder, Morrison, Kroner, & Desmarais, 2019; Skeem & Lowenkamp, 2016). While these studies examined racial biases in risk assessment, their methods are applicable to any potential source of bias. These methods also are consistent with the standards for education and psychological testing for assessing test bias, more generally (AERA, APA, NCME, & Joint Committee on Standards for Educational and Psychological Testing, 2014).

I started by creating the matched sample in SPSS. Indigent defendants were matched to non-indigent defendants on age, race, sex, highest charge, and number of charges. I then used two separate strategies to test predictive bias. First, to examine differences in the strength of prediction, I computed the AUC values of each subscale for indigent defendants and their matched non-indigent counterparts. I then compared the AUC values between these groups using z-scores, with significant differences between z-scores for each group indicating discrepancy in the strength of the PSA's ability to predict pretrial outcomes between indigent and non-indigent defendants.

Second, I conducted bivariate logistic regression models for each type of outcome (i.e., any FTA, any NCA, and any NVCA). For each of these outcomes, models were conducted hierarchically: first, I included only indigent status as a predictor for the outcome; second, only total scores for the appropriate subscale were included as a predictor for the outcome; third, I included both indigent status and total scores as predictors for the outcome; and fourth, I included indigent status, total scores, and the interaction between indigent status and total scores as predictors. A significant interaction between indigent status and total scores (i.e., the fourth model) is indicative of predictive bias, and would thus require further examination of the

direction of the effect to determine whether the predictive bias is against indigent or non-indigent defendants.

Power. I conducted power analyses in relation to NVCA, as this is the least likely outcome (estimated rate of 10% in study sample) and will thus provide the most conservative estimates. I conducted power analyses for ROC analyses and bivariate logistic regression models. For the ROC analyses, an AUC value of .64 is generally accepted in the field of risk assessment as being indicative of "good" predictive validity (Rice & Harris, 2005). A sample size of $n = 363$ is needed to achieve power .80 with an alpha of .05 to detect AUC = .65, calculated using MedCalc for Windows, version 16.0 (MedCalc Software, Ostend, Belgium). For the logistic regression models, a sample size of $n = 308$ is needed to achieve power .80 with alpha .05 to detect a small effect size (i.e., OR = 1.50, see Chen et al., 2010), calculated using G*Power for Windows, version 3 (Faul, Erdfelder, Lang, & Buchner, 2007). Together, these power analyses suggest that the current sample size of 522 is more than sufficient for the described analyses.

Results

Aim 1

Descriptives. Within the study sample, 280 individuals were indigent defendants (53.6%), 198 were non-indigent defendants (37.9%), and 44 individuals had unknown indigency status (8.4%). Within indigent defendants, about half had court-appointed attorneys (46.8%), half had public defenders (52.5%), and two had unknown attorney types (0.7%). Forty-six individuals had an unknown attorney type (8.8%). For the sample of 280 indigent defendants, the average age was 32.27 years. Two-thirds of indigent defendants were Black (67.1%), and about two-thirds were men (65.4%). Most indigent defendants were charged with an index charges that

were misdemeanors (70.7%). Descriptive statistics for the demographics for the subsample of indigent defendants can be seen in **Table 1**. Fifty-nine indigent defendants were charged with an index offense that was considered violent in nature (21.1%). The majority of indigent defendants' cases were resolved within the 12-month follow-up period (96.4%); 10 indigent defendants (3.6%) still had pending cases 12 months after their index charge. In terms of outcomes, 28.9% of indigent defendants failed to appear to court for their index charges at some point during their case; 42.9% were arrested for new criminal activity within 12 months after their index offense; and 9.3% were arrested for new violent criminal activity within 12 months after their index offense.

      PSA Scores. For the FTA subscale of the PSA, indigent defendants had an average scaled score of 3.45 ($SD = 1.54$, range = 1-6). For the NCA subscale of the PSA, indigent defendants had an average scaled score of 3.63 ($SD = 1.48$, range = 1-6). Forty indigent defendants (14.3%) received a positive flag for NVCA. For raw NVCA scores, indigent defendants had an average score of 2.03 ($SD = 1.35$, range = 0-6). Endorsement of specific items among indigent defendants is displayed in **Table 2**.

      Predictive validity. Results of the sensitivity, specificity, NPV, and PPV analyses can be seen in **Table 3**. Overall, each PSA subscale had sensitivity values within 37.5% to 86.3%, specificity values within 38.6% to 88.2%, NPVs above 69.9%, and PPVs within 25.0% to 63.6%. For each PSA subscale analysis, NPVs were higher than PPVs. Considered together, these results indicate that the PSA subscales are better at predicting who will *not* engage in the examined pretrial outcomes than they are at predicting who will engage in the pretrial outcomes. Results of ROC analyses for FTA indicated "fair" predictive validity, on the cusp of "good" predictive validity (AUC = .625, SE = .037, CI = .552, .699, p = .001). NCA and NVCA both indicated

"good" predictive validity for indigent defendants (AUC = .693, SE = .032, CI = .631, .755, $p <$ .001; AUC = .663, SE = .062, CI = .542, .783, p = .006). Logistic analyses showed that for FTA, indigent defendants were 1.36 times more likely to fail to appear for a court date with each 1-point increase in their FTA scaled scores (OR = 1.356, CI = 1.134, 1.622, p = .001). With each 1-point increase in their scaled NCA scores, indigent defendants were 1.64 times more likely to be arrested for any new criminal activity (OR = 1.641, CI = 1.366, 1.971, $p <$ .001). For NVCA, indigent defendants were 1.57 times more likely to be arrested for new violent criminal activity with each 1-point increase in their raw NVCA scores (OR = 1.574, CI = 1.185, 2.090, p = .002).

Aim 2

Matching procedures resulted in three exact matches and 185 fuzzy matches, for a total of 376 individuals. Demographics for each group in the matched sample are displayed in **Table 1**. Independent samples t-test and chi-square analyses were conducted on each of the variables that individuals were matched on to ensure there were no significant differences. Age, sex, highest index charge, and number of index charges were all not significant (ps ≥ .699). Race, however, was found to differ significantly between groups, even after matching (χ^2 = 15.203, p = .01). This difference likely reflects the very small numbers of individuals who were identified as being Asian, Native American, Hispanic, or "other". Since I was unable to match indigent to non-indigent defendants on race, logistic regression analyses for Aim 2 include race as a control variable.

Analyses comparing AUC values failed to find evidence of predictive bias. Specifically, for the scaled FTA scores, indigent defendants had an AUC value of .616 (SE = .047, CI = .523, .709, p =.014) and non-indigent defendants had an AUC value of .612 (SE =.054, CI =.505, .718, p= .042). The difference between these two values was not statistically significant (Z = 0.060, p

= .952, CI = -0.137, 0.145). For the scaled NCA scores, indigent defendants had an AUC value

of .717 (SE = .037, CI = .643, .790, $p < .001$) and non-indigent defendants had an AUC value of

.748 (SE = .038, CI = .673, .823, $p < .001$). The difference was not statistically significant (Z = -

0.585, $p = .558$, CI = -0.136, 0.074). Finally, for the raw NVCA scores, indigent defendants had

an AUC value of .708 (SE = .066, CI = .580, .837, $p = .006$) and non-indigent defendants had an

AUC value of .664 (SE = .066, CI = .535, .793, $p = .057$). Again, the difference was not

statistically significant (Z =0.478, $p = .633$, CI = -0.137, 0.226).

Results of each of the logistic regressions are displayed in **Table 4**. The race control

variable was not a significant predictor in any step of any of the regressions. Subscale scores for

each of the outcomes were significant each time they were introduced in all of the models (ps $\leq$

.034), with the exception of step four in the NVCA regression ($p = .091$). Indigent status was

only a significant predictor in the first step of the model testing the outcome of FTA ($p = .026$),

which indicates that indigent defendants had a higher rate of FTA during follow-up than did non-

indigent defendants. However, indigent status was not a significant predictor in any of the other

steps or regressions (ps $\geq$ .084). Finally, the interaction effect of indigent status by subscale was

not significant in any model (ps $\geq$ .636), indicating that the PSA subscales do not show evidence

of predictive bias as a function of indigent defense status.

Discussion

The purpose of this study was to examine the predictive validity and predictive fairness

of the PSA subscales among indigent defendants in a large metropolitan county in the

southeastern United States. The findings of the current study add to the current field of literature

on pretrial risk assessment tools. Only a small handful of studies have examined the predictive

validity of pretrial risk assessment tools; of the studies that have been done, researchers have

identified inconsistencies in sampling, outcome definitions, and statistical analyses that make it difficult to compare predictive validity results across studies (Desmarais et al., in press). The current study adds to this field by using recognized rigorous methods (Skeem & Lowenkamp, 2016; Singh, Yang, Mulvey, & The RAGEE Group, 2015) to: 1) elucidate the predictive validity of each of the PSA's subscales for indigent defendants, and 2) determine if the PSA subscales demonstrate predictive bias as a function of indigent status. My findings as they relate to each of these aims and their implications are discussed in detail below.

With respect to Aim 1, overall, findings of this study suggest that the PSA demonstrates fair to good levels of predictive validity among indigent defendants. Indeed, AUC values were all significant and .625 or greater. These values are very much in keeping with the AUC values that we see for PSA subscales in other samples (e.g., DeMichele et al., 2018), with pretrial assessments completed using risk assessment instruments, and in the field of risk assessment more generally (see, for example Bechtel et al., 2018; Desmarais et al., in press; Desmarais, Johnson, & Singh, 2016). However, there also were discrepancies in the level of predictive validity suggested across different statistical tests, in that AUC values indicated higher predictive validity than the calculated NPV, PPV, and ORs. Researchers tend to recognize two components of predictive validity in statistical tests: calibration and discrimination (Singh, 2013). Calibration refers to how well the tool's perceived risk aligns with actual risk, while discrimination refers to how well a risk assessment tool is able to separate individuals who go on to engage in an outcome (e.g., FTA or NCA) from those who do not. In the current study, calibration was measured via NPV, PPV, and OR calculations.

For each subscale, NPVs were higher than PPVs, indicating that subscales are better at predicting who will *not* engage in pretrial outcomes than predicting who will. Further, findings

indicated higher rates of false positives than false negatives, with the exception of the NCA

subscale when low/medium risk versus high risk was used. On the one hand, the rate of false

positives is of particular interest to civil rights groups, as high false positive rates indicates

higher incarceration rates for individuals who actually pose little risk of FTA or NCA ("The use

of pretrial 'risk assessment' instruments", 2018). The rate of false negatives, on the other hand, is

of particular interest to stakeholders concerned about public safety, as high false negative rates

indicates higher rates of pretrial release for individuals who are likely to FTA or be involved in

NCA (Mayson, 2018). Findings of the current study may indicate higher likelihood of

individuals being detained pretrial when they pose little to no flight or public safety risk;

however, it is also possible that these results are due to low outcome rates within the study

sample.

Additionally, ORs from the binary logistic regressions indicated "poor" to "fair"

predictive validity among indigent defendants, while AUC values indicated "fair" to "good"

predictive validity. This discrepancy between ORs and AUC values in their indicated predictive

validity is likely due to ORs' dependency on base rates in the study sample. Thus, low rates of

FTA and NCA in the current study sample are likely to impact logistic regression analyses,

resulting in lower ORs. Further, ORs are more reflective of a tool's calibration, while AUCs are

more reflective of a tool's discrimination. Within the current study, results indicate that the

predictive validity of PSA subscales for indigent defendants has "poor" to "fair" calibration, and

"fair" to "good" discrimination. Thus, overall, results suggest that among indigent defendants,

the PSA subscales are able to distinguish individuals who go on to engage in pretrial outcomes

from those who are successful during the pretrial period (i.e., discrimination), but that the

assigned risk scores do not always align with actual risk (i.e., calibration). That said, while some

have argued for the importance of such calibration measures (see, for example, Mayson, 2019), the external validity of these measures in relation to the PSA FTA and NCA subscales is questionable. Indeed, NPV and PPV analyses require dichotomized versions of the FTA and NCA subscales, but the PSA subscales are not dichotomous in practice; instead, stakeholders make recommendations for pretrial decisions using the full scale. Further, OR calculations assume that there is equal interval distance between each subscale score; however, this is often not true in judicial decision-makers' interpretations of risk scores. Therefore, keeping in mind the ways in which these PSA subscales are interpreted and used in practice, results of the current study suggest that the PSA is a viable option for assessing risk of failure to appear and new criminal activity in indigent defendants.

With respect to the second study aim, results failed to find any evidence of predictive bias as a function of indigent defense status. Indeed, across all analyses, there were no statistically significant differences between the predictive validity estimates for the sample of matched indigent defendants and non-indigent defendants, nor were there significant interaction effects of indigent defense status and the PSA ratings. One reason that the PSA, specifically, did not show predictive bias as a function of indigent status may be because there are no items that directly relate to socioeconomic status included in any of the subscales. Other pretrial risk assessment tools often include items related to socioeconomic status, such as employment status, home ownership, or financial responsibilities. Since indigency status is primarily determined by individuals' socioeconomic status, it is possible that the PSA's lack of items directly related to socioeconomic status protected against predictive bias as a function of indigent status. Research on the predictive validity and fairness of other pretrial risk assessment tools with indigent

defendants is needed to better understand the relationship between specific items and indigency status.

Results of the current study are similar to results of the other studies that have examined the predictive validity of the PSA. The two studies conducted on a sample of defendants in Kentucky indicated that the PSA subscales had "good" to "excellent" predictive validity, primarily based on AUC values (DeMichelle et al., 2018; VanNostrand & Lowenkamp, 2013). Further, DeMichelle and colleagues (2018) examined the predictive validity of the PSA subscales across subgroups by sex (men, women) and race (Black, White): analyses indicated that PSA subscales had "fair" to "good" predictive validity across all subgroups, but demonstrated potential predictive bias as a function of race. A study done with a sample of defendants in Florida indicated that the PSA subscales of FTA and NCA had "fair" and "good" predictive validity, respectively (Brittain, 2018). Brittain's (2018) study also found no evidence of predictive bias as a function of race or sex within their sample. Taken together, the findings of previous studies and the findings of the current study suggest that the PSA overall has "fair" to "excellent" predictive validity and is generally consistent across subsamples. However, given the indications of predictive bias as a function of race in the study conducted by DeMichelle and colleagues (2018), future research should continue to examine the predictive fairness of the PSA subscales across subgroups. Further, future research would benefit from including the intersections of multiple social identities (e.g., indigent status and race) in its examinations of the predictive fairness of the PSA.

Finally, while not related to predictive validity or fairness of the PSA, an interesting finding of the study was that indigent defendants had more FTAs than non-indigent defendants. This finding resulted even after controlling for race, which suggests financial resources and/or

indigent status are not a proxy for race within the current sample. Further, this finding demonstrates that financial resources have a stronger impact on FTAs than other sociodemographic characteristics. Indeed, previous research has shown that common reasons defendants fail to appear for their court cases often directly relate to financial resources, such as work conflicts, transportation difficulty, and family conflicts (e.g., childcare) (Bornstein, Tomkins, Neeley, Herein, & Hamm, 2012). FTAs often lead to other negative consequences for defendants, such as increased fees and fines, revocation of posted bail, and even the issuance of warrants for arrest (Gouldin, 2018). Further, FTAs are included on pretrial risk assessment tools (including the PSA) as risk items, thus leading to higher risk scores for individuals who have failed to appear for court cases in the past. As such, the ability to appear for court cases may be another way in which indigent defendants are disadvantaged within criminal justice court proceedings. Findings from the current study, in combination with what is known from previous research, suggest that indigent defendants would benefit from resources that would aid in their ability to appear for their scheduled court dates.

In addition to adding to the current field of research on pretrial risk assessment tools, findings from the current study also have implications for pretrial reform efforts. Broadly, findings of this study demonstrate that pretrial risk assessment tools are a viable option for predicting pretrial outcomes for indigent defendants. Indigent defendants constitute a large group of people in the criminal justice system, yet they have historically been disadvantaged in pretrial processes (Heaton et al., 2017; Linhorst et al., 2017; Roach, 2017). Bail practices often disadvantage indigent defendants, as indigent defendants are, by definition, financially disadvantaged, and thus less likely to be able to post bail. Further, legal statutes informing pretrial release decisions often include socioeconomic considerations within their pretrial release

guidelines (Bail Reform Act of 1984, 1984). Results of the current study indicate that the PSA subscales have "fair" to "good" predictive validity for indigent defendants, and demonstrate no predictive bias as a function of indigent status. As such, pretrial risk assessment tools, such as the PSA, may present a fairer way of determining whether indigent defendants are detained or released pretrial than current bail practices.

Limitations

Conclusions of this study are limited in a couple ways. First, the current study had a relatively small sample size of only about 500 people. In order to ensure there was sufficient power for analyses, the statistical tests I was able to run had limited flexibility. For instance, I was unable to conduct binary logistic with three-way interactions (e.g., subscale scores by indigent status by race). As previous research has demonstrated the importance of considering intersectionality within statistical analyses (Paik, 2017), future researchers should include interactions with subscale scores, indigency status, and race, sex, or other socially defined groups. Second, due to sample size constraints, different attorney types were grouped together into "indigent" and "non-indigent" defense categories. Studies that examine differences across indigent and non-indigent samples tend to separate results for people with court-appointed attorneys, public defenders, retained attorneys, and no attorneys. However, in the current study, people with court-appointed attorneys and public defenders were grouped together in the "indigent" group, and people with retained attorneys and no attorneys (i.e., people who waived their right to an attorney or self-represented) were grouped together in the "non-indigent" group. While this study does examine differences among these groups of indigent defendants vs. non-indigent defendants broadly, future studies would benefit from teasing out the differences between specific types of attorneys. The third limitation of the current study is that I was unable

to match on race when creating the matched sample of indigent and non-indigent defendants. This, again, was due in-part to a sample size considerations. In order to maintain a large enough sample size for analyses, race was instead used a control variable in analyses. Finally, the last limitation of this study is that results are primarily applicable to the current study jurisdiction. The use of pretrial risk assessment tools is dependent on the policies and practices within the jurisdiction in which its implemented. Additionally, indigent defense systems vary widely by jurisdiction. As such, other jurisdictions will need to re-run analyses of this study with their own study samples in order to determine the predictive validity and fairness of pretrial risk assessment tools for the populations they aim to serve.

Conclusion

This study adds to the current field of research on the use of pretrial risk assessment tools. Specifically, this was the first study of its kind to examine the predictive validity and fairness of a pretrial risk assessment tool within a subsample of indigent defendants. Further, this study adds to the small handful of studies that have been conducted on the predictive validity of the PSA. Overall, results of this study indicate that the PSA subscales are a viable option for assessing risk of failure to appear and new criminal activity within indigent defendants. These findings are particularly important as the PSA is currently one of the most widely implemented pretrial risk assessment tools in the United States (Desmarais et al., in press), and indigent defendants constitute the majority of defendants within the criminal justice system (Harlow, 2000). Additionally, findings of the current study indicated that indigent defendants have higher rates of FTAs, most likely due to restricted financial capabilities. As such, indigent defendants would most likely benefit from resources that would aid in their ability to appear for their scheduled court dates. Future research should continue to examine the predictive validity and

predictive fairness of pretrial risk assessment tools with indigent defendants and other vulnerable

subgroup populations.

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Table 1. *Demographic Characteristics*

| | Full Indigent Defendant Sample (N = 280) | | Matched Sample | | | |
| | | | Indigent Defendants (N = 188) | | Non-Indigent Defendants (N = 188) | |
	Mean	SD	Mean	SD	Mean	SD
Age	32.27	(11.07)	32.72	(11.085)	32.84	(11.109)
Number of Index Charges	1.94	(1.409)	2.01	(1.497)	1.95	(1.432)
	n	(%)	n	(%)	n	(%)
Sex						
Men	183	(65.4%)	142	(75.5%)	142	(75.5%)
Women	97	(34.6%)	46	(24.5%)	46	(24.5%)
Race						
White	74	(26.4%)	51	(27.1%)	81	(43.1%)
Black	188	(67.1%)	129	(68.6%)	98	(52.1%)
Hispanic	13	(4.6%)	7	(3.7%)	4	(2.1%)
Asian	2	(0.7%)	1	(0.5%)	2	(1.1%)
Native American	2	(0.7%)	0	(0%)	1	(0.5%)
Other	1	(0.4%)	0	(0%)	2	(1.1%)
Highest Charge						
Misdemeanor	198	(70.7%)	142	(75.5%)	142	(75.5%)
Felony	82	(29.3%)	46	(24.5%)	46	(24.5%)
Attorney Type						
Court-appointed	131	(46.8%)	95	(50.5%)	—	
Public Defender	147	(52.5%)	93	(49.5%)	—	
Retained	—		—		159	(84.6%)
Waived	—		—		28	(14.9%)
Self-represented	—		—		1	(0.5%)

Table 2. *Endorsement of PSA Items among Indigent Defendants*

		Frequency of Endorsement	
PSA Item Number	PSA Item Description	n	(%)
1	Age at current arrest: 22 or younger	62	(22.1%)
2	Current violent offense	35	(19.7)
2a	Current violent offense and 20 years old or younger	10	(3.6%)
3	Pending charge at the time of offense	176	(62.9%)
4	Prior misdemeanor conviction	183	(65.3%)
5	Prior felony conviction	81	(29.0%)
5a	Prior conviction	191	(68.2%)
6	Prior violent conviction = 0	217	(77.5%)
6	Prior violent conviction = 1	31	(11.1%)
6	Prior violent conviction = 2	14	(5.0%)
6	Prior violent conviction=3 or more	18	(6.4%)
7	Prior failure to appear (past 2 years) = 0	159	(56.8%)
7	Prior failure to appear (past 2 years) = 1	79	(28.2%)
7	Prior failure to appear (past 2 years) = 2 or more	42	(15.0%)
8	Prior failure to appear older than 2 years	127	(45.3%)
9	Prior sentence to incarceration	96	(34.3%)

Table 3. *Sensitivity, Specificity, NPV, and PPV Values for PSA Subscales within Indigent Defendants*

PSA Subscale		Sensitivity		Specificity		NPV		PPV	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI
FTA	Low/Medium vs. High	37.5	29.1 - 46.5	78.9	74.6 - 82.9	79.5	77.1 - 81.8	36.6	30.1 - 43.7
	Low vs. Medium/High	78.9	70.8 - 85.6	38.6	33.8 - 43.6	84.9	79.8 - 89.0	29.5	27.0 - 32.0
NCA	Low/Medium vs. High	43.6	36.7 - 50.7	84.0	79.5 - 87.8	69.9	67.1 - 72.6	63.6	56.5 - 70.1
	Low vs. Medium/High	86.3	80.8 - 90.7	40.9	35.4 - 46.5	82.3	76.3 - 87.0	48.4	45.7 - 51.0
NVCA	No flag vs. Flag	38.5	20.2 - 59.4	88.2	83.6 - 91.9	93.2	81.1 - 95.0	25.0	15.6 - 37.6

Table 4. *Hierarchical Binary Logistic Regression Models Testing Predictive Fairness*

		Model 1		Model 2		Model 3		Model 4	
		β	95% CI	β	95% CI	β	95% CI	β	95% CI
FTA	Race	1.15	0.87-1.53	1.15	0.86-1.53	1.15	0.86-1.53	1.15	0.86-1.53
	Indigent Status	1.75*	1.07-2.85	—		1.56	0.94-2.54	1.51	0.42-5.46
	Scaled Score	—		1.32***	1.12-1.56	1.32***	1.12-1.56	1.32*	1.02-1.69
	Indigent Status*Scaled Score	—		—		—		1.01	0.72-1.41
	R^2	0.025		.069		.069		.069	
NCA	Race	1.00	0.77-1.30	0.94	0.712-1.250	0.94	0.71-1.25	0.95	0.71-1.25
	Indigent Status	1.18	0.77-1.80	—		0.90	0.57-1.44	1.08	0.28-4.09
	Scaled Score	—		1.82***	1.54-2.14	1.82***	0.54-2.14	1.86***	1.48-2.34
	Indigent Status*Scaled Score	—		—		—		0.95	0.69-1.33
	R^2	.002		.207		.207		.207	
NVCA	Race	0.88	0.52-1.50	0.83	0.46-1.50	0.83	0.46-1.50	0.82	0.46-1.48
	Indigent Status	1.39	0.64-3.04	—		1.13	0.50-2.55	0.80	0.15-4.22
	Raw Score	—		1.60***	1.21-2.11	1.60***	1.21-2.11	1.47	0.94-2.28
	Indigent Status*Raw Score	—		—		—		1.15	0.65-2.03
	R^2	.005		.075		.075		.077	

*Notes: *p<.05, **p<.01, ***p<.001*

APPENDIX

The Public Safety Assessment Items and Scoring

PUBLIC SAFETY ASSESSMENT

PSA Points and Scales

Points and Scales/Flag

Calculate points by using the Risk Factor tables. Then convert total points to scaled score/flag.

Failure to Appear (FTA)

Risk Factor	Points
Pending charge at the time of offense	No = 0 / Yes = 1
Prior conviction (misdemeanor or felony)	No = 0 / Yes = 1
Prior failure to appear in past 2 years	0 = 0 / 1 = 2 / 2 or more = 4
Prior failure to appear older than 2 years	No = 0 / Yes = 1

Total FTA Points		FTA Scaled Score
0	=	1
1	=	2
2	=	3
3	=	4
4	=	4
5	=	5
6	=	5
7	=	6

New Criminal Activity (NCA)

Risk Factor	Points
Age at current arrest	23 or older = 0 / 22 or younger = 2
Pending charge at the time of offense	No = 0 / Yes = 3
Prior misdemeanor conviction	No = 0 / Yes = 1
Prior felony conviction	No = 0 / Yes = 1
Prior violent conviction	0 = 0 / 1 = 1 / 2 = 1 / 3 or more = 2
Prior failure to appear in past 2 years	0 = 0 / 1 = 1 / 2 or more = 2
Prior sentence to incarceration	No = 0 / Yes = 2

Total NCA Points		NCA Scaled Score
0	=	1
1	=	2
2	=	2
3	=	3
4	=	3
5	=	4
6	=	4
7	=	5
8	=	5
9	=	6
10	=	6
11	=	6
12	=	6
13	=	6

New Violent Criminal Activity (NVCA)

Risk Factor	Points
Current violent offense	No = 0 / Yes = 2
Current violent offense AND 20 years old or younger	No = 0 / Yes = 1
Pending charge at the time of the offense	No = 0 / Yes = 1
Prior conviction (misdemeanor or felony)	No = 0 / Yes = 1
Prior violent conviction	0 = 0 / 1 = 1 / 2 = 1 / 3 or more = 2

Total NVCA Points		NVCA Flag
0	=	No
1	=	No
2	=	No
3	=	No
4	=	Yes
5	=	Yes
6	=	Yes
7	=	Yes

This document (PSA Points and Scales) is used with the Guide to Assessor Training when implementing the Public Safety Assessment. See psapretrial.org for more information and a list of all implementation guides.