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Minnesota Pretrial Assessment Tool

Validation Study

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Executive Summary

The Minnesota Pretrial Release Evaluation Form and Assessment Tool (MNPAT)[1] is a pretrial risk assessment form used by 82 counties across the state of Minnesota in accordance with Minnesota Judicial Council Policy 524 and Minn. Stat. § 629.74.

This report describes the results of a validation study conducted on the scored section of the MNPAT by the Minnesota Judicial Branch. The validation study set out to answer the following questions:

- Is the MNPAT, as it is currently being used, a valid tool for use as a pretrial assessment?
- Does the MNPAT tool, as it is currently being used, show bias toward defendants of different races or genders?
- In what way should the risk factors on the MNPAT be weighted to arrive at a more accurate and less biased risk score?
- In what way should the risk score be converted to better communicate a defendant's risk of pretrial failure?

The results support the conclusion that the MNPAT, as it is currently being used, is a valid tool for use as a pretrial assessment. However, while the MNPAT is predicative of pretrial failure, overall predictiveness could be improved and predictiveness of the tool varies by race. Specifically, the MNPAT is more predictive for White defendants than it is for either Black defendants or Native American defendants. For both Black and Native American defendants, the predictiveness of the tool is negligible.

Upon the recommendation of the Validation Committee[2], the authors explored alternative risk models and scores. This exploration resulted in three revised models. All three models showed higher overall levels of predictiveness for the sample along with improved predictiveness for each racial group. After discussing the benefits and challenges of each model, the Validation Committee supported and recommended a risk model and score that includes three factors:

1. **Employment/School status** (0 or 6 points)**:** Points are assigned if the defendant is employed/attending school less than 20 hours a week and not receiving public income assistance.
2. **Pending case** (0 or 8 points): Points are assigned if the defendant has a pending case.
3. **Current monitoring** (0 or 4 points): Points are assigned if the defendant has a current monitoring status of pretrial conditional release, probation, revoked probation, or supervised release.

[1] See Appendix A for the current form

[2] See Appendix D for the Validation Committee membership

Evidence from the validation study suggested that the above model was more predictive than the current tool and did not exhibit racial or gender bias (i.e., was free of significant predictive disparities between different racial or gender groups).

In addition to the revised model above, the committee recommended that judges be provided an estimated percentage range for the likelihood a defendant, with a given risk score, will be successful on pretrial release (i.e., will attend all hearings and not commit a new offense).[3]

The above recommendations were approved by the Minnesota Judicial Council, the administrative policy-making authority of the Minnesota Judicial Branch, in January 2023.

The remainder of this report describes the details of the MNPAT validation.

[3] See Appendix C for the revised MNPAT form

Definitions

Pretrial Form: Template for recording factors of a particular defendant and the current charge used to inform the pretrial release decision. A form does not assign a score or recommendation for pretrial release decisions and does not assign a weight for different factors. A Pretrial Form is also known as a "pretrial evaluation form," "bail form," or "form."

Pretrial Risk Assessment Tool: A research-based instrument comprised of predictive factors that are weighted and scored to inform pretrial release decisions (based on categorized risk of pretrial failure). The tool is used to assist the court, or its designated authority, in making pretrial release decisions. A Pretrial Risk Assessment tool is also known as a "model," "tool," or "scale."

Pretrial Window: Period between a defendant's release to when the present case is disposed.

Failure to Appear: The defendant failed to appear (FTA) for a court appearance on the present case and was issued a bench warrant for failure to appear.

New Crime: The defendant committed a new crime (Targeted Misdemeanor[4], Gross Misdemeanor, or Felony) during the pretrial window and the defendant was ultimately convicted of that crime.

Pretrial Failure: The defendant had either a failure to appear or a new crime during the pretrial window.

Validation: A study of the effectiveness of a particular tool at predicting the outcome it seeks to predict (e.g., pretrial failure) for a particular population.

Predictiveness: Ability of a pretrial risk assessment tool to accurately assign higher risk scores to defendants with higher likelihoods of pretrial failure. This is measured by the AUC (area under the receiver operating characteristic curve) and has a value with a range of 0 to 1. A value of 0.5 indicates that the tool has no predictive ability. As the number gets closer to 1, the tool is more accurately identifying individuals with a higher likelihood of pretrial failure.

Bias: The tendency to treat those in a specific group (e.g., race, gender) differently or unfairly. Applied to validation studies, it is the tendency of a tool to exhibit different levels of predictiveness to a specific group relative to other groups. Bias in validation studies is also referred to as "disparity" or "predictive disparities."

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[4] Minn. Stat. § 299C.10: "A targeted misdemeanor is a misdemeanor violation of section 169A.20 (driving while impaired), 518B.01 (order for protection violation), 609.224 (fifth-degree assault), 609.2242 (domestic assault), 609.746 (interference with privacy), 609.748 (harassment or restraining order violation), 617.23 (indecent exposure), or 629.75 (domestic abuse no contact order)."

Introduction

The MNPAT Validation study is the first multi-jurisdictional pretrial risk assessment tool validation study following the Minnesota Judicial Council's approval of Judicial Council Policy 524: Pretrial Release Evaluation in January 2018. Before this policy, a patchwork of pretrial practices and tools were used across the state. Following a multi-year effort to study and recommend changes to pretrial policies and practices[5], Judicial Council Policy 524 eliminated the use of bail schedules throughout Minnesota and required validated pretrial risk assessment tools be used in each jurisdiction. The policy established a common tool, the Minnesota Pretrial Release Evaluation Form and Assessment Tool (MNPAT)[6], that was approved for use in all 87 counties. The policy allowed counties to opt-out from using the MNPAT, but still required those counties to validate the selected tool on the local population for which the tool was used. In early 2018, five counties opted-out of the statewide process and 82 counties opted to use the MNPAT.

The MNPAT Implementation Committee met throughout 2018 to coordinate statewide training, education, and technical assistance with the implementation of the MNPAT. Counties began using the form and tool in December 2018 and comprehensive data collection started in April 2019.

Judicial Council Policy 524 requires pretrial risk assessment tools be validated as soon as practicable following implementation or any approved change. Following the MNPAT's implementation, validation was planned to begin in mid-2020. However, due to the COVID-19 pandemic and its impact on court operations and case processing, a Validation Committee[7] was not convened until March 2021 to begin the validation process.

The Validation Committee sought to validate the tool in line with its guiding principle to seek the "most predictive, least-biased" tool. This study represents the culmination of the Validation Committee's work, including a literature review, analysis of the predictiveness of the current MNPAT, an examination of bias in the current MNPAT, the revised MNPAT options, and the recommendation approved by the Judicial Council in January 2023.

[5] Minnesota Judicial Branch - Pretrial Release Initiative (mncourts.gov)

[6] See Appendix A

[7] See Appendix D

Literature Review

Over the last two decades, pretrial release processes and decision-making have been the subject of extensive research. One critical area of focus for pretrial research has been the information judges have available at the point of determining whether an in-custody defendant will be assessed bail, released on conditions, or released on their own recognizance.

Historically, decisions about the release of defendants often relied on little objective information and were made based on subjective discretion (Lowenkamp et al., 2008). More recently, jurisdictions across the United States have used actuarial tools, often called pretrial risk assessments, to aid in the pretrial release decision making process. Approximately 62% of jurisdictions across the U.S. use a pretrial risk assessment (Pretrial Justice Institute, 2019). These tools are used to identify defendants who are more likely to be a danger to the community and who are less likely to appear in court once released.

Advocates for pretrial risk assessments have argued these tools help make the pretrial release decision-making process more consistent and less biased, can reduce jail populations, and can help jurisdictions allocate resources to higher-risk defendants (DeMichele et al., 2020). Some of the objections made by opponents of pretrial risk assessments are that the assessments can perpetuate long-standing racial biases reflected in the data used to develop the tool, that predictions do not suggest ways to decrease the likelihood of failure, and that there is also a lack of transparency in the development and validation of the assessments (Desmarais & Lowder, 2019; Robinson & Koepke, 2019). Further, overstating a defendant's risk can lead to low-risk defendants receiving intensive pretrial supervision, which can have the unintended consequence of increasing the likelihood of recidivism (Lowenkamp et al., 2006; Lowenkamp & Latessa, 2004). Another criticism raised is that the assessments' focus on risk of failure contradicts the presumption of innocence, while pretrial failure is still an uncommon outcome for defendants (The Leadership Conference on Civil and Human Rights, 2019).

Pretrial risk assessments typically quantify the defendant's risk to public safety and the likelihood of failing to appear for court hearings. However, they often differ in the risk factors included, how risk factors are converted into one or more risk scores, and the cutoffs applied to the risk score to create categories corresponding to different levels of risk (e.g., 0 – 6 = "low risk," 7-10 = "moderate risk," etc.) (Copp et al., 2019; Desmarais & Lowder, 2019; Kujava, 2019; Podkopacz & Loynachan, 2018).

When jurisdictions develop their own pretrial risk assessment, they often do so by identifying theoretically relevant risk factors, gathering data on defendants in their jurisdiction using the proposed assessment, and validating the tool against relevant outcomes using data analyses and statistics (e.g., whether the defendant committed a new crime during the pretrial window or had a failure to appear citation). Because this is a resource-intensive process, many jurisdictions often implement pre-existing tools that were developed and validated using samples from different jurisdictions (Pretrial Justice Institute, 2019).

Although the risk factors measured by pretrial assessments vary, there are some relatively consistent risk factors used across many assessments (Bechtel et al., 2011). These risk factors typically include:

- Defendant's age
- Current employment status and history
- Residential history, current status, and community ties
- Criminal justice history
- Current offense severity
- Financial history, and current financial resources
- Physical and mental health history
- Substance abuse needs
- Previous court appearance history

While pretrial risk assessment validation studies can vary in terms of their methodology, they have some common characteristics. Validation studies usually define validity in terms of the tool's ability to predict pretrial failure (Desmarais & Lowder, 2019; Lowder et al., 2021). They also tend to conduct one or more analyses to identify racial/ethnic and gender bias (Copp et al., 2019; Kujava, 2019; Podkopacz & Loynachan, 2018). These validation studies often use regression-based models to examine the validity of the risk assessment (e.g., logistic regression), but studies differ in the predictors used (e.g., individual risk factors, total risk score, etc.) and how authors define and quantify bias (e.g., difference in predictiveness values between racial groups, comparing outcomes by risk level and racial groups, etc.). Currently, there is no widely accepted set of standards for the validation of pretrial risk assessments.

Minnesota Pretrial Release Evaluation Form and Assessment Tool

In 2015, a study conducted by Minnesota's State Court Administrator's Office (SCAO) found that pretrial release practices varied across the state in terms of the services available, use of pretrial risk assessments, decisions about how to score risk factors, and decisions about the use of bail. This study led to the formation of the Pretrial Release Initiative, a Minnesota Judicial Branch led initiative comprised of statewide justice partners that examined pretrial practices through the lens of law, policy, and research. As part of this initiative, nationwide policy and research around the use of pretrial risk assessment tools informed a more consistent approach to the use of pretrial risk assessment tools statewide. In late 2017 and early 2018, the Minnesota Judicial Council considered and approved Minnesota Judicial Council Policy 524 which required judges in each county to use evidenced-based risk assessment tools when making pretrial release decisions. From this policy, the Minnesota Pretrial Release Evaluation Form and Assessment Tool was approved for statewide use. The tool component of the form was based on the pretrial risk assessment tool used by Minnesota's Hennepin County at the time (The 2015 Hennepin County Pretrial Scale). The Judicial Council policy also included a process by which counties could use an alternative risk assessment.

The MNPAT was implemented in December of 2018. While the tool had been validated within Hennepin County prior to its implementation statewide (Podkopacz & Loynachan, 2015), it had not yet been validated using data from other Minnesota counties implementing the tool. At the time of this report's publishing, 82 of Minnesota's 87 counties use the statewide tool. Anoka, Cass, Hennepin, Sherburne, and Wright counties opted out of using the statewide tool and chose to implement and validate a tool on their local population.

Factors on the MNPAT

The current version of the MNPAT contains non-scored demographic and case information related to the defendant, as well as a scored section which is used to calculate a defendant's pretrial risk of committing a new crime or failing to appear for a future hearing. The form is typically completed following an interview with the defendant. In jurisdictions or circumstances in which an interview cannot be conducted, a questionnaire can be completed by the defendant, which the probation agent later transfers into the MNPAT.[8]

The MNPAT assessment tool is comprised of seven scored factors:

Main Charge (0, 3, 6, 9, or 12 points): Points are assigned based on the type of main charge:

1. Gross misdemeanor DWI (3 points)
2. Felonies and misdemeanor person-related not on the Judicial Review list or Gross Misdemeanor person-related offenses on Judicial Review (6 points)
3. Presumptive Probation Felony Offenses on Judicial Review list (9 points)
4. Presumptive Commit Felony Offenses on the Judicial Review list (12 points)

Employment/Incomes Sources or School Status (0 or 3 points): Points are assigned if the defendant is employed/attending school less than 20 hours a week and not receiving public income assistance.

Current Problematic Chemical Use (0 or 1 point): Points are assigned if the defendant has a demonstrated pattern of problematic chemical use.

Homeless or Three or More Address Changes in Past Year (0 or 1 point): Points are assigned if the defendant is homeless, had three or more address changes, or moved between friends/shelters in the past year.

Age at First Delinquency Adjudication/Conviction (0 or 1 point): Points are assigned if the defendant was adjudicated delinquent of a felony between their 14th birthday and 18th birthday, or was convicted in adult court of a misdemeanor, gross misdemeanor, or felony before their 26th birthday.

[8] See Appendix B

Criminal Conviction History: Points are assigned for each of a defendant's criminal convictions, based on the level of the offense at sentencing, as outlined below:

1. Felony person convictions (9 points each)
2. Non-felony person convictions (6 points each)
3. Other felony convictions (2 points each)
4. Other non-felony convictions (1 point each; excludes Petty Misdemeanors and Misdemeanor driving offenses that are not a DWI)

Bench Warrants (0, 6, or 9 points): Points are assigned for a defendant's failure to appear history during the previous three years as outlined below:

1. Three or more fail to appear bench warrants (9 points)
2. One to two fail to appear bench warrants (6 points)

Once a MNPAT is completed for a defendant, a total risk score is calculated. Because criminal convictions are scored based off a defendant's complete history, there is no upper limit to the MNPAT score. The total risk score is also converted to one of three levels of risk: 0 - 11 = "lower," 12 - 25 = "moderate," 26 or greater = "higher." Judges use the risk score and risk level, in addition to other legally permissible information, to inform their pretrial release decisions.

Validation of the Minnesota Pretrial Assessment Tool

Minnesota Judicial Council Policy 524 states that:

> *The MNPAT and any other approved tool, upon implementation and after any approved change, must be validated as soon as practicable and regularly based on a process and schedule established by the State Court Administrator's Office (SCAO). At a minimum, validation studies must be done every 5-7 years and meet minimum requirements set forth by SCAO. These minimum requirements include, but are not limited to, utilizing appropriate advanced statistical analysis techniques, bias testing, and incorporating only data-driven results in the final risk assessment tool.*

To guide and support the validation of the MNPAT, a Validation Committee of thirteen voting members was formed.[9] The committee was staffed by SCAO research and project management staff and was supported by the subject matter expertise of Fourth Judicial District Court (Hennepin County) and Department of Corrections research staff. The committee also benefited from the observation and input from public defender and probation stakeholders.

[9] See Appendix D for a list of the Validation Committee membership. The committee was composed of five judges, two representatives from the Department of Corrections, one county probation representative, one community corrections representative, one county attorney, one public defender, one tribal court representative, and one representative from the State Court Administrator's Office.

The Validation Committee's role was to:

- Give feedback on the metrics and methodology used for the validation study.
- Produce a final recommendation on any changes to the process, policies, and/or the MNPAT tool for Judicial Council consideration.
- Support stakeholders in implementing Judicial Council-approved changes (if any) to the MNPAT.

The committee met six times in 2021 and twice in 2022. As part of the initial feedback collection process, a statewide survey of judges and probation staff was conducted to assess how the MNPAT was being used, identify challenges, and solicit ideas for improvement. Stakeholder feedback was also collected throughout the validation process to help inform the committee's decision-making and final recommendations.

The committee's final recommendations, including a revised tool and form were approved by the Judicial Council in January 2023.

The remainder of this report describes the details of the validation study's methodology, results, and recommendations made based on the results.

Methodology

Research Questions

The study questions, methodology, and analysis plan were all drafted and finalized before data analysis was conducted. This allowed the Validation Committee and research staff to review and provide feedback on the proposed study, ensuring that the questions were clear and that the methods were appropriate.

This validation study aimed to answer four questions:

- Is the MNPAT, as it is currently being used, a valid tool for use as a pretrial assessment?
- Does the MNPAT tool, as it is currently being used, show bias toward defendants of different races or genders?
- In what way should the risk factors on the MNPAT be weighted to arrive at a more accurate and less biased risk score?
- In what way should the risk score be converted to better communicate a defendant's risk of pretrial failure?

All data analyses were carried out using the open-source statistical programming language R (R Core Team, 2020). The logistic regression models described below were fit using the logistf function from the logistf R package (Heinze et al., 2020). A significance level of α = 0.05 was used for all hypothesis tests. Details of the analysis plan and data used for answering each question are provided below.

Analysis Plan

Question 1: Is the MNPAT, as it is currently being used, a valid tool for use as a pretrial assessment?

Question 1 was answered by fitting a binary logistic regression model in which pretrial failure was regressed on the pretrial risk score. The outcome was pretrial failure, rather than separate models for new crime and failure to appear, because the overall score on the current MNPAT is used as an indicator of risk for the combined outcome of pretrial failure. The pretrial risk score was the single independent variable in the model because the risk score reflects the current practice in terms of how the risk factors are weighted and added together to produce a single risk score that is predictive of pretrial failure.

The (baseline) model took the form:

$$ln(\frac{P}{1-P}) = \beta_0 + \beta_1 X_{1i}$$

Where P = probability of a pretrial failure, β_0 is the intercept, β_1 is the coefficient reflecting the relationship between the pretrial risk score (X_{1i}) and the outcome. Model fit for question 1 was assessed through fit indices such as pseudo R^2, χ^2 goodness of fit test, and Akaike information

criterion (AIC). Model characteristics such as accuracy, sensitivity, and specificity were also examined.[10] This approach is consistent with methods used in other pretrial risk assessment validation studies (Copp et al., 2019; Kujava, 2019). It was hypothesized that the pretrial risk score would be positively associated with the likelihood of pretrial failure.

Question 2: Does the MNPAT tool, as it is currently being used, show bias toward defendants of different races or genders?

Question 2 was answered by fitting a series of binary logistic regression models separately by different racial groups and separately by gender. These results were compared across demographic groups for differences in the value of the model coefficients, statistical significance, and other attributes such as accuracy, sensitivity, and specificity.

Additionally, this question was examined by fitting two additional models (one for race, and one for gender) that regressed pretrial failure on the risk score as well as the relevant demographic variables. These (risk score demographic bias) models took the form:

$$ln(\frac{P}{1-P}) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 (X_{1i} * X_{2i})$$

Where P = probability of a pretrial failure, β_0 is the intercept, β_1 is the coefficient reflecting the relationship between the pretrial risk score (X_{1i}) and the outcome, β_2 is the coefficient reflecting the relationship between a demographic variable (i.e., race or gender) (X_{2i}) and the outcome, and β_3 is the coefficient reflecting the relationship between an interaction term between pretrial risk score and a demographic variable ($X_{1i} * X_{2i}$) and the outcome. This last coefficient (β_3) helps answer the question of whether the relationship between pretrial risk score and failure is the same for different demographic groups. These two models (one for race and a separate one for gender) were compared against the baseline model (i.e., the model fit to answer the first research question). The models were compared via a likelihood ratio test, and on their values for fit indices such as AIC. It was expected these more robust models would fit similarly to the baseline model, providing evidence that the MNPAT, as it is currently being used, does not show evidence of racial or gender bias. This approach is consistent with methods used in other pretrial risk assessment validation studies to examine bias (Copp et al., 2019; Kujava, 2019).

Question 3: In what way should the risk factors on the MNPAT be weighted to arrive at a more accurate and less biased risk score?

Question 3 was answered by using a two-pronged approach. First, consistent with other pretrial risk assessment validation studies, the records in the analytic sample were randomly split into a construction sample and a validation sample (Lowenkamp et al., 2008; Lowenkamp, 2009). The

[10] The research team met with the Validation Committee to determine their value-based judgments of acceptable values for these metrics. This feedback informed the review of the results.

nature of this split was informed by a power analysis, conducted using the GPower 3.1 software program (Faul et al., 2009), to ensure that there was sufficient statistical power to detect the effect of risk factors on pretrial failure. Then, using the construction sample, a series of binary logistic regression models were fit regressing the pretrial failure outcome on different combinations of risk factors. This process consisted of adding and removing candidate risk factors and testing their performance. Competing models were compared on AUC values and model fit indices (i.e., AIC, likelihood ratio test).

The (risk factor) models used to answer question 3 took the form:

$$ln(\frac{P}{1-P}) = \beta_0 + \sum \beta_r X_{ri}$$

Where P = probability of a pretrial failure, β_0 is the intercept, and β_r are the coefficients reflecting the relationships between individual risk factors (e.g., chemical use) (X_{ri}) and the outcome. Consistent with previous research, preference was given to risk factors that were not highly correlated with other risk factors in the model and did not exhibit racial or gender bias (Copp et al., 2019; Podkopacz & Loynachan, 2018; VanNostrand, 2003).

Whether particular risk factors contributed to racial or gender bias (i.e., predictive disparities between races or genders) was assessed using a binary logistic regression model in which interaction terms between a demographic variable (either race or gender) was included in the model above.

These (risk factor demographic bias) models took the form:

$$ln(\frac{P}{1-P}) = \beta_0 + \beta_1 X_{1i} + \sum \beta_r X_{ri} + \sum \beta_q (X_{1i} * X_{ri})$$

Where P = probability of a pretrial failure, β_0 is the intercept, β_1 is the coefficient reflecting the relationship between a demographic variable (i.e., race or gender) (X_{1i}) and the outcome, β_r are the coefficients reflecting the relationship between individual risk factors(X_{ri}) and the outcome, and β_q are the coefficients reflecting the relationship between interaction terms between individual risk factors and the demographic variable ($X_{1i} * X_{ri}$) and the outcome. A statistically significant coefficient for β_q was taken as evidence that a particular risk factor was contributing to the racial or gender bias of a risk score derived from that model. The authors worked to obtain a set of risk factors that maximized model performance and minimized racial and gender bias. The final model that reflects the set of risk factors that met these criteria were fit to the validation sample to confirm the stability of the performance of these models with new data.

Question 4: In what way should the risk score be converted to better communicate a defendant's risk of pretrial failure?

Question 4 was discussed with the Validation Committee. The committee discussed the benefits and challenges associated with three approaches:

a) Applying cut-scores to the revised risk score to create a risk level for each defendant (e.g., a risk score between 0 and 3 is categorized as lower risk, a risk score between 4 and 6 is categorized as moderate risk, etc.).

b) Calculate and provide the predicted probability of pretrial failure for each point on the risk score scale (e.g., 12% of defendants with a risk score of 0 have a pretrial failure, 15% of defendants with a risk score of 1 have a pretrial failure, etc.).

c) Calculate and provide a range of predicted probability of pretrial failure for each point on the risk score scale (e.g., between 10% and 14% of defendants with a risk score of 0 have a pretrial failure, between 15% and 18% of defendants with a risk score of 1 have a pretrial failure, etc.).

The Validation Committee recommended the third option above. The committee also recommended presenting the predicted probability in terms of the likelihood of a defendant's success (i.e., likelihood of not having a pretrial failure). For example, a risk score of 0 could be presented as "Between 86% and 90% of defendants with a risk score of 0 do not go on to have a pretrial failure." Once the revised risk score was calculated for each defendant, the percentage of defendants with a pretrial failure was calculated for each point on the revised risk score scale. Then, a local polynomial regression was fit to the data using the revised risk score as a predictor of the percentage of pretrial failure. The standard errors from this model were used to calculate the ranges of the likelihood of pretrial failure throughout the risk score scale. Finally, these ranges (at each risk score along the scale) were converted to a range of the likelihood of success by subtracting the lower and upper values from 100%.

Population and Sample

The population of interest for this study consisted of all cases charged in the 82 counties using the statewide tool with an offense listed in Minn. Stat. § 629.74[11] and a completed MNPAT. The data used in this validation study come from three sources:

1. MNPAT, criminal history scoring, and bench warrant scoring data (described in the Data Captured on the MNPAT section) are recorded in CSTS (Court Services Tracking System) and shared with the Minnesota Judicial Branch.

2. Operational data from the Minnesota Court Information System (MNCIS) were used in the construction of the sample criteria (e.g., case disposition date) and imputing defendant demographics (e.g., self-reported race, gender), risk factors, and outcomes.

3. Incarceration and release data from the Department of Corrections.

The initial sample population included 11,684 cases. For a case to be included in the validation study's analytic sample, certain criteria must be met. The following criteria were applied to the initial sample to arrive at a final analytic sample:

[11] https://www.revisor.mn.gov/statutes/cite/629.74

- A MNPAT was completed between April 1, 2019, through March 31, 2020, and had no missing data.[12]
- The case was disposed by November 30th, 2020.
- The defendant was released prior to the disposition date.
- The defendant did not refuse the MNPAT evaluation.[13]

The final analytic sample consisted of 6,198 cases. Table 1 below presents the number and percentage of cases in the initial sample that met the study inclusion criteria. The table shows that 96.8% of defendants in the initial sample were released prior to case disposition.[14] 93.5% of cases in the initial sample had a completed MNPAT, and 56.4% of cases were disposed by November 30th, 2020.

Table 1: Analytic Sample Selection

Sample Selection Criteria	Initial Sample (N = 11,684)	Percentage
Released	11,306	96.8%
Completed MNPAT	10,923	93.5%
Case Disposed	6,589	56.4%

The following tables describe the demographic characteristics of defendants in the analytic sample relative to the initial sample.

[12] Because of a lack of a missing value flag in the underlying MNPAT data, logic was used to flag records as incomplete based on response patterns to scored items.

[13] Records were flagged as refusal based on response patterns and whether a comment was included that suggested the defendant refused.

[14] 99% of lower risk, 96.8% of moderate risk, and 96.2% of higher risk defendants were released prior to case disposition.

Table 2: Gender

Gender	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
Female	1,257 (20.3%)	2,288 (19.6%)
Male	4,918 (79.3%)	9,350 (80%)
Missing	23 (0.4%)	46 (0.4%)

Table 3: Race/Ethnicity

Race/Ethnicity	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
Asian/Native Hawaiian or Other Pacific Islander	155 (2.5%)	289 (2.5%)
Black	883 (14.2%)	1,831 (15.7%)
Hispanic	468 (7.6%)	907 (7.8%)
Multiracial	209 (3.4%)	425 (3.6%)
Native American	445 (7.2%)	910 (7.8%)
Other	63 (1%)	104 (0.9%)
White	3,350 (54%)	6,101 (52.2%)
Missing	625 (10.1%)	1,117 (9.6%)

The tables above suggest that the analytic sample was similar to the initial sample in terms of the distribution of the defendant's gender and race/ethnicity. Approximately 79.3% of the analytic sample were male and approximately 20.3% of the analytic sample were female. Over half of the analytic sample were White (54%), while about 14.2% were Black, 7.6% were Hispanic, 7.2% were Native American, 3.4% were multiracial, 2.5% were Asian/Native Hawaiian or Other Pacific Islander, and 1% had an "Other" race/ethnicity.

Table 4 below presents the number and percentage of cases across each judicial district for the analytic sample and initial sample.

Table 4: Judicial District

Judicial District	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
1	867 (14%)	1,670 (14.3%)
2	977 (15.8%)	1,660 (14.2%)
3	721 (11.6%)	1,324 (11.3%)
5	685 (11.1%)	1,132 (9.7%)
6	593 (9.6%)	1,018 (8.7%)
7	864 (13.9%)	1,912 (16.4%)
8	398 (6.4%)	688 (5.9%)
9	585 (9.4%)	1,269 (10.9%)
10	508 (8.2%)	1,011 (8.7%)

The table above shows that the analytic sample contained a similar distribution of cases from each of the judicial districts compared to the initial sample. District 2 contained the highest percentage of cases with 15.8%, followed by District 1 with 14% of cases. The other judicial districts made up between 6.4% and 13.9% of cases.

Table 5 below describes the pretrial characteristics of the defendants in the sample.

Table 5: Pretrial Characteristics

Pretrial Characteristics	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
Pretrial Release Rate	6,198 (100%)	11,306 (96.8%)
Failure To Appear**	1,042 (16.8%)	2,580 (22.1%)
New crime**	1,155 (18.6%)	1,790 (15.3%)

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$.

The table above shows that the failure to appear rate in the analytic sample was lower than the rate among the initial sample (16.8% vs. 22.1%) whereas the new crime rate was slightly higher in the analytic sample (18.6% vs. 15.3%). The overall pretrial failure rate was slightly lower in the analytic sample (30% vs. 32.5%).

Table 6 below presents characteristics of the MNPATs in the sample. Specifically, this table describes the percentage of cases with incomplete MNPATs and the method used to gather the data on the MNPAT. The method used to gather the MNPAT data (i.e., Interview, Mixed, Questionnaire, Unknown) was captured through a survey of counties and does not reflect how data were gathered for each assessment in the sample.

Table 6: MNPAT Characteristics

MNPAT Characteristics	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
Incomplete MNPAT	0 (0%)	607 (5.2%)
Interview	4,492 (72.5%)	8,181 (70%)
Mixed	180 (2.9%)	307 (2.6%)
Questionnaire	1,460 (23.6%)	3,079 (26.4%)
Unknown	66 (1.1%)	117 (1%)

The table above shows that the percentage of cases from counties that collect the MNPAT through interview was similar for the analytic sample (72.5%) and the initial sample (70%). Likewise, the percentage of cases from counties that gather MNPAT data through questionnaire and mixed methods was similar between the analytic and initial sample (23.6% vs. 26.4% and 2.9% vs. 2.6%, respectively).

Table 7 below describes the distribution of the risk score and risk level on the MNPAT for the analytic sample and initial sample.

Table 7: MNPAT Risk Level Characteristics

MNPAT Scores	Analytic Sample (N = 6,198)	Initial Sample (N = 11,684)
Risk Score**	28.7 (21.4)	30.9 (23)
Lower Risk**	1,117 (18%)	1,774 (15.2%)
Moderate Risk	2,352 (37.9%)	4,286 (36.7%)
Higher Risk**	2,729 (44%)	5,624 (48.1%)

Note: For Risk Score, values represent the Mean and (Standard Deviation) of the risk score, * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$

The table above shows that the average risk score for cases in the analytic sample was slightly lower than the average risk score for the initial sample (28.7 vs 30.9, respectively). The percentage of cases where the defendant's risk score fell within the "Lower Risk" level was slightly higher in the analytic sample than the initial sample (18% vs 15.2%) and the percentage of defendants whose risk score fell within the "Higher Risk" level was slightly lower in the analytic sample than the initial sample (44% vs 48.1% respectively).

Taken together, the results from Tables 1 through 7 above suggest that the defendants in the analytic sample tended to be a) classified as lower risk on the current MNPAT, b) less likely to have a failure to appear, and c) more likely to have a new crime, relative to the initial sample. However, the analytic sample was similar to the initial sample in terms of the demographics of the defendants and the distribution of cases across judicial districts.

Results

The Validation Committee reviewed and discussed the results related to questions 1 and 2 before determining whether questions 3 and 4 should be explored. This was done because the results for questions 1 and 2 could have suggested that the MNPAT was sufficiently valid and unbiased, rendering questions 3 and 4 unnecessary. In that case, the Validation Committee would have recommended no changes to the tool.

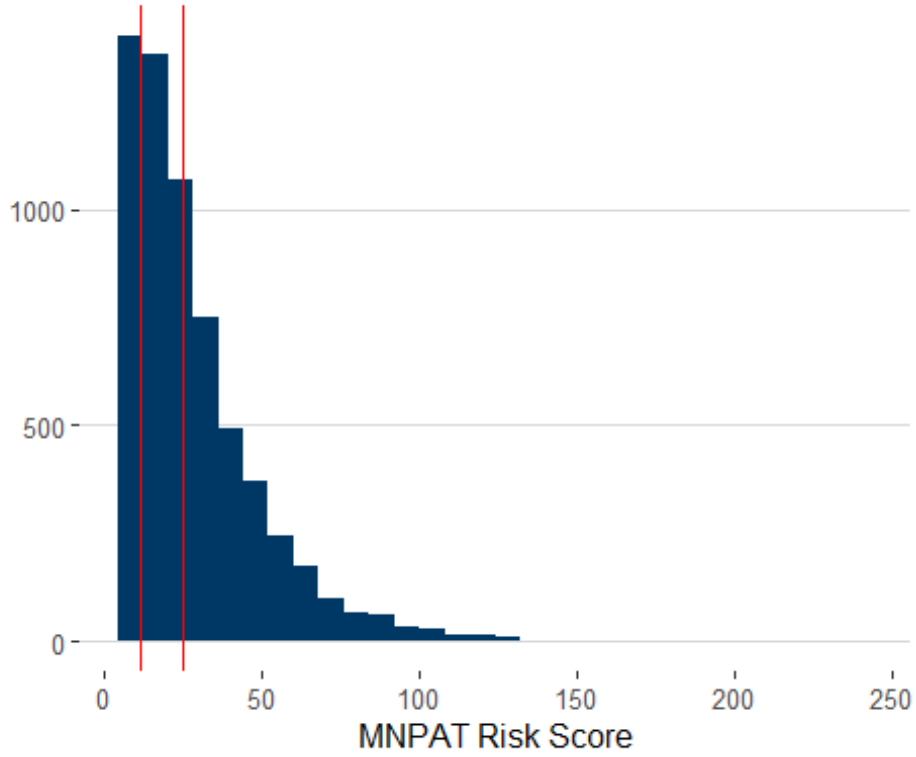
The results presented in this section are organized by study question.

Question 1: Is the MNPAT, as it is currently being used, a valid tool for use as a pretrial assessment?

To answer this study question, the distribution of MNPAT risk scores, risk levels, pretrial failure rates by risk score and risk level were explored. This was supplemented with results of statistical models predicting pretrial failure by risk score.

Figure 1 below presents the distribution of MNPAT risk scores in the sample with vertical lines for the existing cut-scores on the MNPAT (between low and moderate risk and between moderate and higher risk).

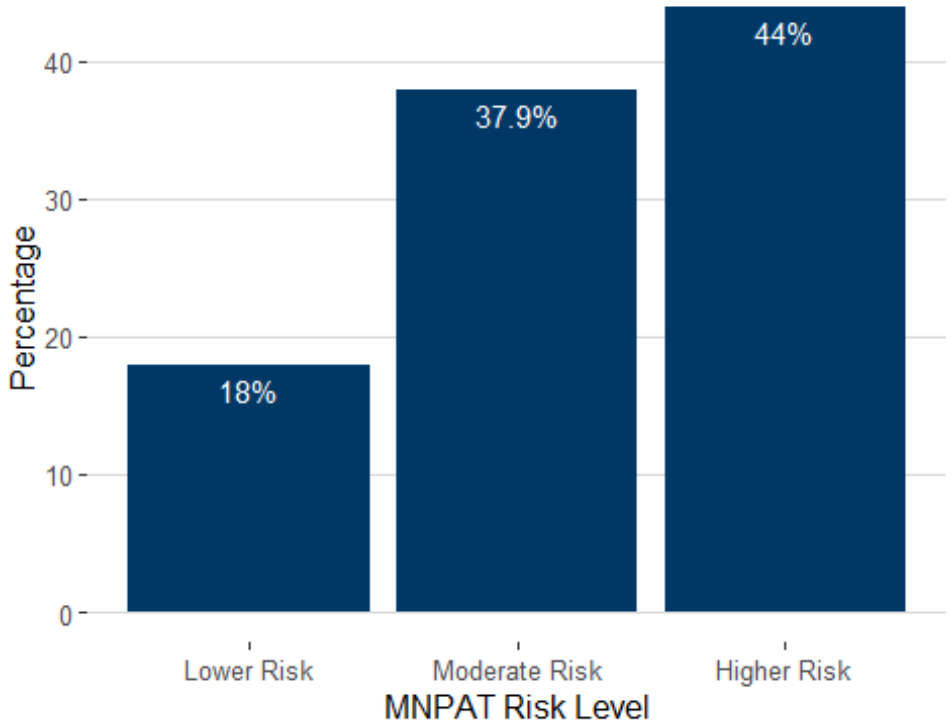
Figure 1: Distribution of MNPAT risk scores



The figure above shows that a little over half of the assessments have risk scores that fall below the higher risk cutoff of 26 while the remainder have risk scores that exceed 26. The minimum and maximum risk scores in the sample were 6 and 238, respectively.

Figure 2 presents the distribution of MNPAT risk levels in the sample.

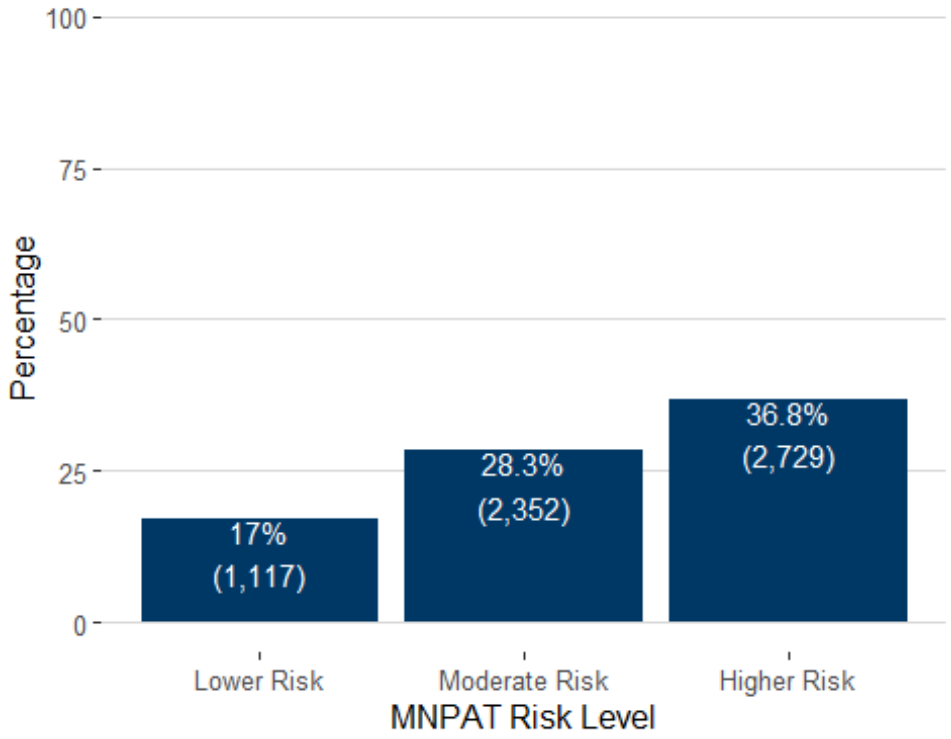
Figure 2: Distribution of MNPAT risk levels



The figure above shows that 44% of assessments fell into the higher risk category, followed by moderate risk (about 38%), and finally, lower risk (18%). This result shows that most defendants in the sample are classified as being at moderate to high risk of having a pretrial failure.

Figure 3 below presents the percentage of defendants who had a pretrial failure by their risk level on the current MNPAT.

Figure 3: Pretrial Failure by MNPAT risk levels



The figure above shows that, as expected, defendants with higher risk levels on the MNPAT tend to have higher rates of pretrial failure. Additionally, as the risk level increases, pretrial failure rates increase.

The table below presents results from a logistic regression in which pretrial failure was regressed on the defendant's MNPAT risk level.

Table 8: Pretrial failure as a function of MNPAT risk level

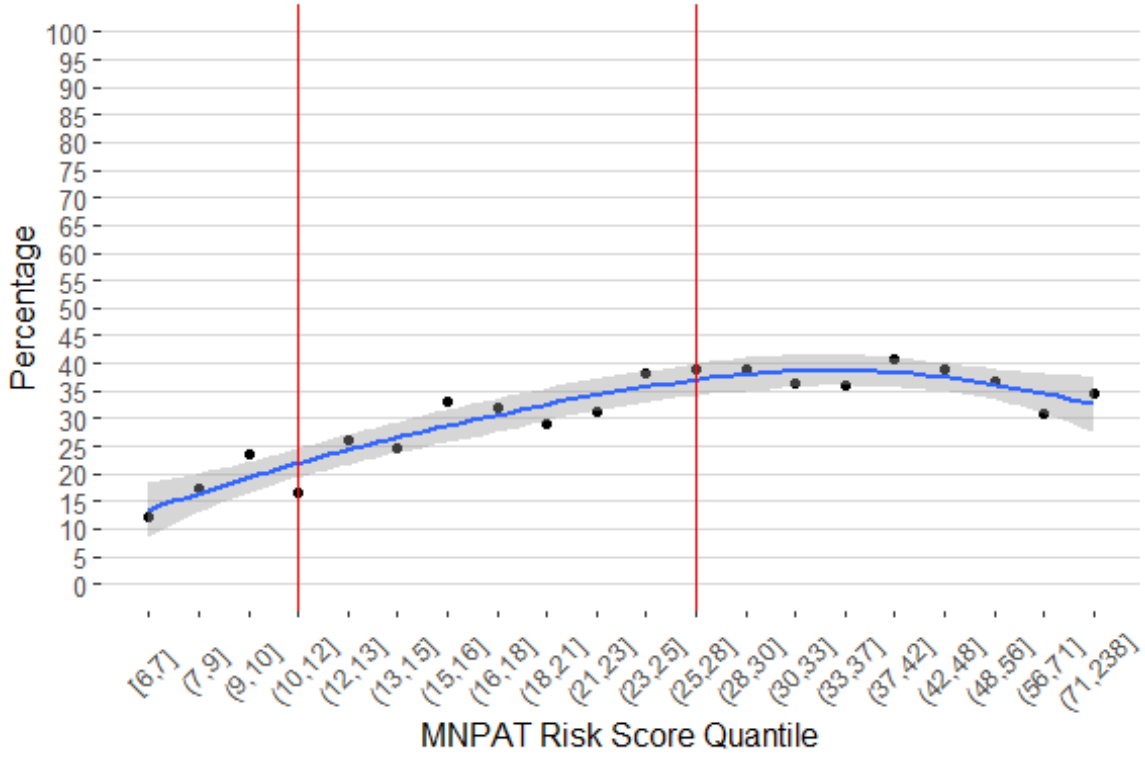
Coefficient	Estimate	Standard Error	P-value
Lower Risk (Reference group)**	-1.58	0.08	0.00
Moderate Risk**	0.66	0.09	0.00
Higher Risk**	1.05	0.09	0.00

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. Chi-square = (161.49, df = 2, p = 0), AIC = 7419.5, Nagelkerke Pseudo R-squared = 0.036, AUC = 0.5897

The results in the table above are consistent with the pattern observed in figure 4 above. Specifically, defendants in the moderate risk level were more likely to have a pretrial failure than defendants in the lower risk level. Additionally, defendants in the higher risk level were more likely to have a pretrial failure than defendants in the lower risk level.

Figure 4 presents a plot of the percentage of defendants who had a pretrial failure by quantile (20 roughly equal size groups based on the MNPAT risk score).[15] A local polynomial regression line was fit to the data and added to the plot to display the nonlinear relationship between pretrial failure rates and the risk score quantiles.[16]

Figure 4: Pretrial Failure by Risk Score



The figure above shows that the rate of pretrial failure tends to increase with the risk score up through a risk score of about 28, at which point the rate of failure flattens out and slightly decreases beyond about 37 points. This result differs from what is expected (i.e., that pretrial failure rates would continue to increase as the risk score increases, throughout the risk score scale).

Risk scores higher than 27 on the MNPAT are due to a defendant's criminal conviction history. A defendant with no previous criminal history convictions can only receive a maximum risk score of 27. However, having criminal history convictions can raise the MNPAT risk score beyond 27, and there is no limit on the number of points that can be added to the risk score based on prior convictions.

[15] Quantiles were used instead of the original risk score to provide a more informative plot because many risk scores had one or no defendants with those values.

[16] The shaded area around the line represents a 95% confidence interval.

Table 9 below presents the results of a logistic regression in which pretrial failure was regressed on the MNPAT risk score.

Table 9: Pretrial failure as a function of MNPAT risk score

Coefficient	Estimate	Standard Error	P-value
Intercept	-1.144**	0.05	<0.01
Risk Score	0.01**	0.00	<0.01

Note: * = statistically significant at p < 0.05, ** = statistically significant at p <0.01. Chi-square = (64.95, df = 1, p = 0), AIC = 7514.04, Nagelkerke Pseudo R-squared = 0.015, AUC = 0.5972, Accuracy = 0.584, Sensitivity = 0.54, Specificity = 0.602, False Positive Rate = 0.632, False Negative Rate = 0.46

The results in the table above show that as the risk score on the MNPAT increases, the rate of pretrial failure also tends to increase, and that this relationship is statistically significant. The AUC for the risk score is 0.5972 and the accuracy of the MNPAT[17] is 0.584.

Collectively, the results suggest that the MNPAT, as it is currently being used, is a valid tool for use as a pretrial assessment. The risk score and risk levels are predictive of pretrial failure, and pretrial failure rates consistently increase with risk levels on the MNPAT. However, the fact that the pretrial failure rate flattens and slightly declines above a risk score of 27 is not a desirable characteristic in a risk assessment, as it is expected that higher risk scores should reflect greater risk of failure.

[17] To calculate accuracy, defendants with risk scores that fell in the highest risk level were classified as predicted to have a pretrial failure. This is consistent with the interpretation that defendants with risk scores in the highest category are at highest risk of having a pretrial failure.

Question 2: Does the MNPAT tool, as it is currently being used, show bias toward defendants of different races or genders?

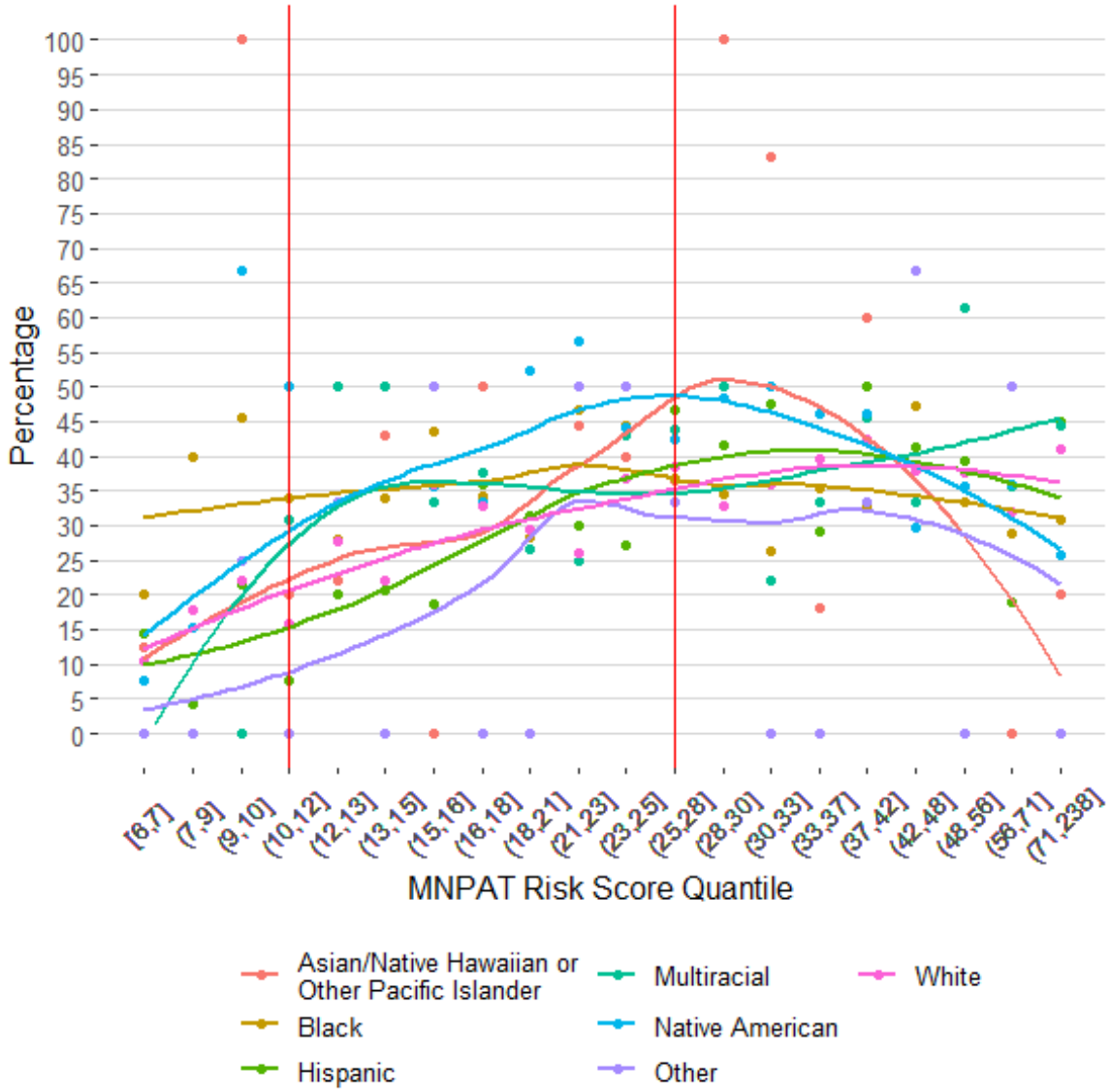
To answer this study question, an initial analysis was conducted looking at the distribution of pretrial failure rates by risk score and risk level, first by race and then by gender. Next, statistical models were used to further evaluate this question.

The first set of results examine the current MNPAT for racial bias.

Racial Bias

Figure 5 below presents the pretrial failure rates by MNPAT risk score quantile by race.

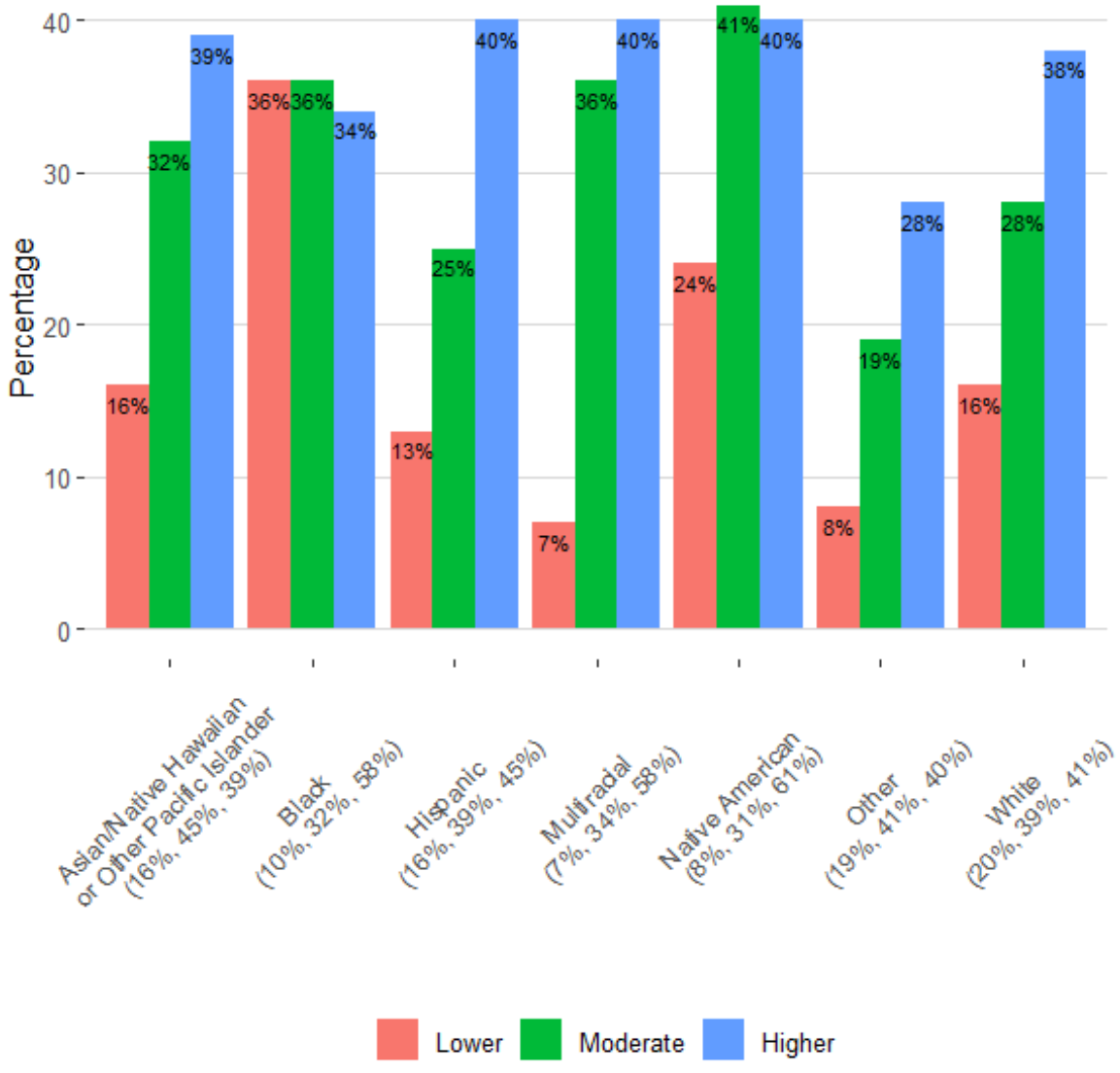
Figure 5: Pretrial Failure by MNPAT risk score by race



The figure above shows that generally, the rate of pretrial failure increases for each racial group for risk scores between 6 and 28. This rate of increase appears to be less pronounced for Black defendants. For many of the racial groups, the rate of pretrial failure appears to decline as risk scores increase beyond about 28 points. The decline is less pronounced for White defendants.

Figure 6 below presents pretrial failure rates by risk level for each racial group in the analytic sample.

Figure 6: Percentage of Pretrial Failure by Risk Level and Race



Note: The percentages on the x-axis indicate the percentage of defendants within each racial group who fall within the different risk levels (lower risk, moderate risk, higher risk)

The figure above shows that the rate of pretrial failure increases as risk level increases for most racial groups. This pattern was observed for Asian/Native Hawaiian or Other Pacific Islander,

Hispanic, Multiracial, White, and Other racial groups. However, this pattern does not appear to hold for Black and Native American defendants. For Black defendants, the rate of pretrial failure is approximately the same for the lower risk and moderate risk groups (36%), and this rate decreases slightly for the higher risk group (34%). For Native American defendants, the rate of pretrial failure increases as the risk level increases from lower risk to moderate risk (24% to 41%), and then decreases slightly for the higher risk category (40%). The patterns observed for Black and Native American defendants (i.e., decreasing pretrial failure rates at higher risk levels) is contrary to what is expected of a risk assessment. Because higher risk levels communicate higher risk of pretrial failure, pretrial failure rates should increase as risk levels increase for all racial groups.

Table 10 below presents model fit and performance metrics for the current MNPAT risk score by racial group.

Table 10: Performance of MNPAT Risk Score Predicting Pretrial Failure by Race

Metric	White (N = 3,350)	Asian/Native Hawaiian or Other Pacific Islander (N = 155)	Black (N = 883)	Hispanic (N = 468)	Multiracial (N = 209)	Native American (N = 445)	Other (N = 63)
Accuracy	0.604	0.594	0.463	0.611	0.522	0.485	0.619
Sensitivity	0.519	0.48	0.569	0.601	0.645	0.621	0.538
Specificity	0.64	0.648	0.407	0.615	0.451	0.399	0.64
False Positive Rate	0.36	0.352	0.593	0.385	0.549	0.601	0.36
False Negative Rate	0.481	0.52	0.431	0.399	0.355	0.379	0.462
ROC AUC	0.612	0.582	0.512**	0.632	0.573	0.5**	0.663
Pseudo R-squared	0.026	0.002	0.002	0.038	0.015	0.003	0.015

Note: Sensitivity is the percentage of actual failures that were correctly predicted. Specificity is the percentage of actual non-failures that were correctly predicted. False positive rate is the percentage of actual non-failures that were predicted to fail. False negative rate is the percentage of actual failures that were predicted to not fail, * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$

In the table above, the AUC values for each racial group range between 0.5 (for Native Americans) and 0.66 (for the Other racial group). Native American defendants had the lowest AUC value, indicating that the predictiveness of the MNPAT was lowest for this group. Defendants with a race classified as “Other” had the highest AUC value, indicating that the MNPAT’s risk score was most predictive for this group. The AUC values for Black and Native American defendants were significantly lower than the AUC value for White defendants. The accuracy values ranged between 0.46 (for Black defendants) and 0.62 (for the Other racial group).

Table 11 presents the results from a logistic regression model in which pretrial failure was regressed on the risk score from the current MNPAT along with race and an interaction between race and risk score.

Table 11: Pretrial failure as a function of MNPAT risk score and race

Coefficient	Estimate	Standard Error	P-value
Intercept	-1.286**	0.07	<0.01
Asian/Native Hawaiian or Other Pacific Islander	0.436	0.31	0.15
Black	0.763**	0.14	<0.01
Hispanic	-0.119	0.20	0.55
Multiracial	0.427	0.26	0.11
Native American	0.979**	0.19	<0.01
Other	-0.318	0.49	0.50
Risk Score	0.015**	0.00	<0.01
Asian/Native Hawaiian or Other Pacific Islander x Risk Score	-0.01	0.01	0.25
Black x Risk Score	-0.018**	0.00	<0.01
Hispanic x Risk Score	0.003	0.00	0.55
Multiracial x Risk Score	-0.006	0.01	0.32
Native American x Risk Score	-0.019**	0.00	<0.01
Other x Risk Score	-0.005	0.01	0.67

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. AIC = 6845.28, Nagelkerke Pseudo R-squared = 0.027, AUC = 0.5932.

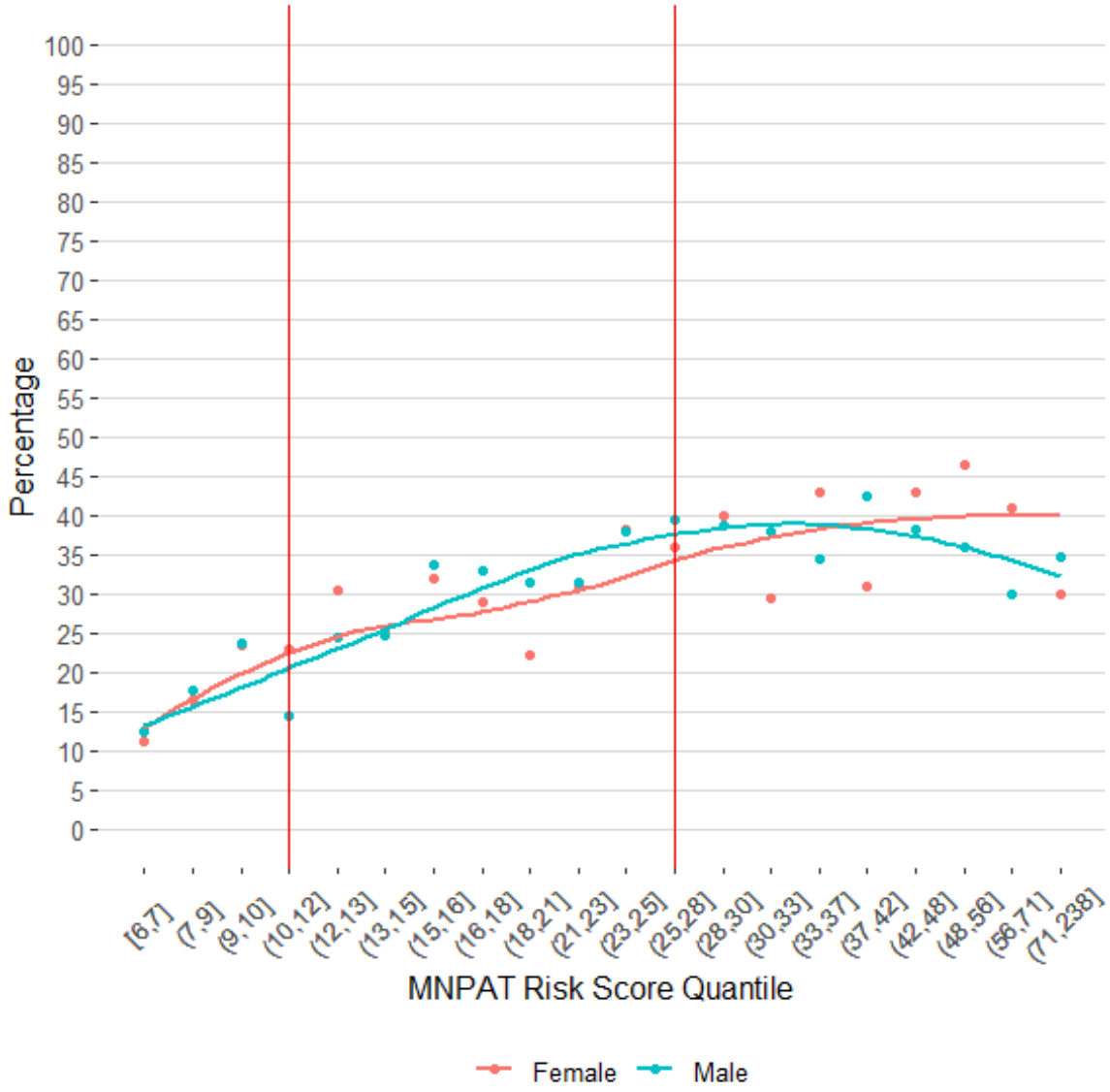
The table above shows that the relationship between risk score and pretrial failure appears to differ for Black defendants ($B = -0.018$, $p < 0.01$) and Native American defendants ($B = -0.019$, $p < 0.01$) relative to White defendants. The difference in AIC values between the model in table 10 and the model in table 12 (7514.04 - 6845.28 = 668.76) suggests that the above model, which allows the risk score's predictiveness to vary by race, fits the data better than the model that assumes a single relationship between risk score and pretrial failure. Additionally, the increase in the pseudo-R-squared value (0.015 to 0.027) further supports the model that allows the relationship between risk score and pretrial failure to vary by race. Collectively, these results (i.e., figures 5 and 6, and tables 10 and 11) suggest that the risk score and risk level on the current MNPAT do a relatively poor job of predicting pretrial failure for Black and Native American defendants (compared to White defendants).

The next set of results examine the current MNPAT for gender bias.

Gender Bias

Figure 7 below presents the pretrial failure rates by MNPAT risk score quantile by gender.

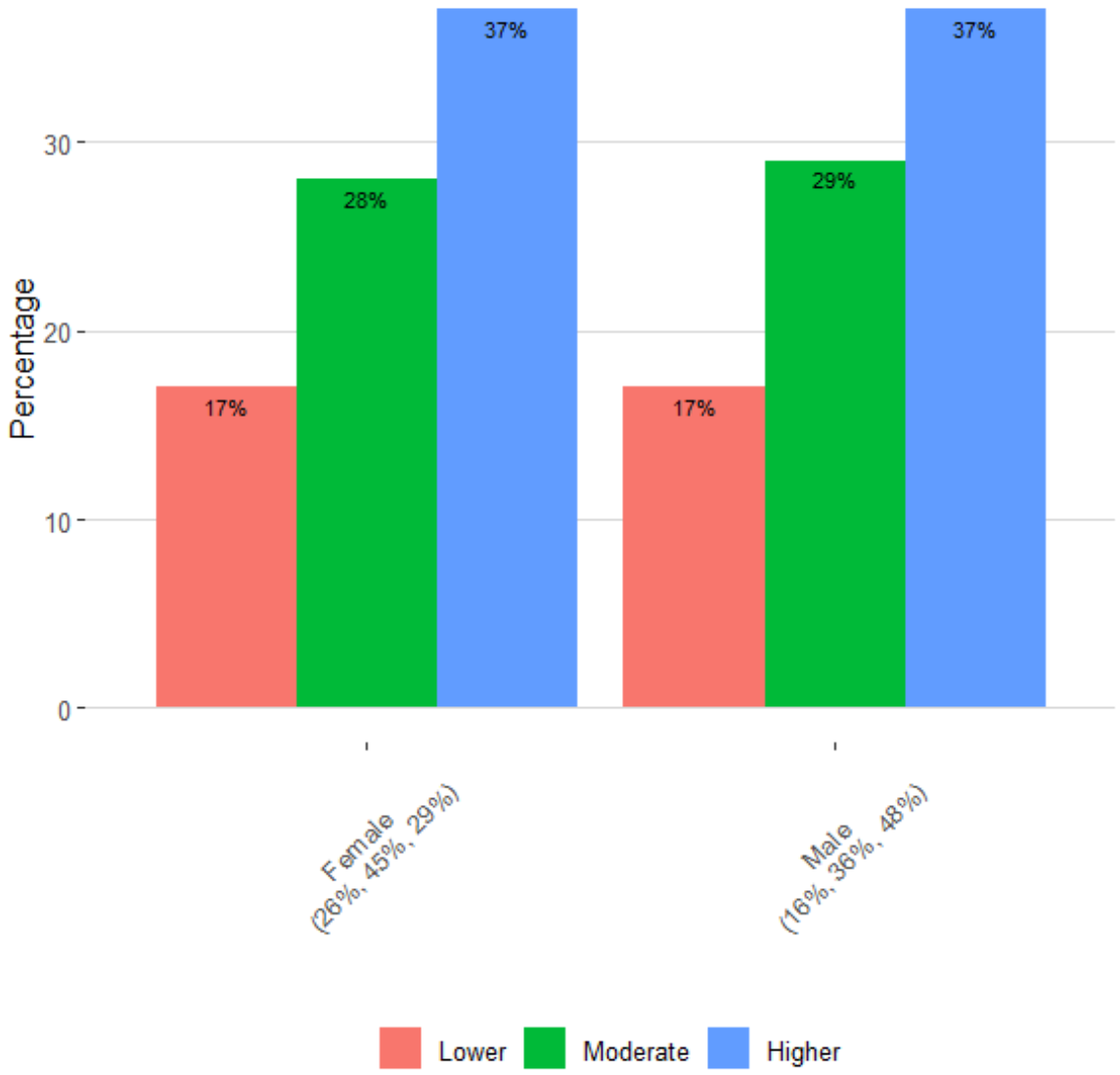
Figure 7: Pretrial Failure by MNPAT risk score by gender



In the figure above, the relationship between pretrial failure rate and the risk score appears to be similar for males and females. However, the pretrial failure rate for males appears to decrease above 37, while the failure rate is relatively flat for females in this upper range.

Figure 8 below presents pretrial failure rates by risk level for each gender in the analytic sample.

Figure 8: Percentage of Pretrial Failure by Risk Level and Gender



Note: The percentages on the x-axis indicate the percentage of defendants within each gender group who fall within the different risk levels (lower risk, moderate risk, higher risk).

As expected, the figure above shows that the pretrial failure rate for males and females increases as risk level increases.

Table 12 below presents model fit and performance metrics for the current MNPAT risk score by gender.

Table 12: Performance of MNPAT Risk Score Predicting Pretrial Failure By Gender

Metric	Female (N = 1,257)	Male (N = 4,918)
Accuracy	0.651	0.565
Sensitivity	0.388	0.576
Specificity	0.751	0.561
False Positive Rate	0.249	0.439
False Negative Rate	0.612	0.424
ROC AUC	0.616	0.589
Pseudo R-squared	0.032	0.012

Note: Sensitivity is the percentage of actual failures that were correctly predicted. Specificity is the percentage of actual non-failures that were correctly predicted. False positive rate is the percentage of actual non-failures that were predicted to fail. False negative rate is the percentage of actual failures that were predicted to not fail, * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$.

The table above shows that the accuracy of the MNPAT was approximately 0.57 for males and 0.65 for females and the AUC values were approximately 0.59 for males and 0.62 for females. The difference in the AUC values was not statistically significant, suggesting that the predictiveness of the MNPAT is similar between males and females.

Table 13 presents the results from a logistic regression model in which pretrial failure was regressed on the risk score from the current MNPAT along with gender and an interaction between gender and risk score.

Table 13: Pretrial failure as a function of MNPAT risk level and gender

Coefficient	Estimate	Standard Error	P-value
Intercept	-1.086**	0.05	<0.01
Female	-0.38**	0.13	<0.01
Risk Score	0.009**	0.00	<0.01
Female x Risk Score	0.014**	0.00	<0.01

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. AIC = 7485.54, Nagelkerke Pseudo R-squared = 0.017, AUC = 0.5918.

The table above shows that the relationship between risk score and pretrial failure appears to differ for female defendants ($B = 0.014$, $p < 0.01$) relative to male defendants. The difference in AIC values between the two models (7514.04 – 7485.54 = 28.5) suggests that the above model, which allows the risk score's predictiveness to vary by gender, fits the data better than the model that assumes a single relationship between risk score and pretrial failure. However, the pseudo-R-squared values of the two models was very similar (0.015 and 0.017) suggesting that the model that allows the relationship between risk score and pretrial failure to vary by gender fits the data similarly to the model that only includes risk score. Collectively, these results

suggest that, while there may be some small differences in the relationship between pretrial failure and risk score by gender, these differences appear to be inconsequential.

Summary of results for questions 1 and 2

Taken together, the results above suggest that:

- The MNPAT, as it is currently being used, is a valid tool for use as a pretrial assessment.
- The MNPAT is not as predictive for Black and Native American defendants (compared to White defendants).
- The MNPAT is similarly predictive for males and females.

Upon reviewing and discussing the results for questions 1 and 2, the Validation Committee decided to pursue a more predictive and less biased pretrial risk assessment using an empirical approach.[18] This required examination of study questions 3 and 4.

The next section describes the results for study question 3, "In what way should the risk factors on the MNPAT be weighted to arrive at a more accurate and less biased risk score?"

[18] The Validation Committee voted to use statistical models and empirical results to 1) choose risk factors to include (or exclude) in a revised risk score and 2) determine appropriate weights/points for each risk factor when creating a risk score.

Question 3: In what way should the risk factors on the MNPAT be weighted to arrive at a more accurate and less biased risk score?

To answer this question, the Validation Committee reviewed and identified candidate variables to be analyzed for inclusion in the empirical process and resulting model. Policy considerations about factors (e.g., number of years of criminal history to include) were also discussed and recommended. In total, 56 factors were identified for consideration in developing a more accurate risk assessment tool and score.[19] Following the candidate factor selection, the following process was undertaken:

Step 1: Using the analytic sample, pretrial failure was regressed on each candidate risk factor separately and the AUC was calculated to understand the individual predictiveness of each risk factor.

Step 2: The risk factor with the highest AUC within its category (e.g., age as a continuous variable vs. age as a trichotomous variable) was selected to proceed to the next step.

Step 3: The analytic sample was randomly split into two separate samples; a construction sample (n = 2,208) and a validation sample (n = 2,207).[20]

Step 4: Using the construction sample, pretrial failure was regressed on the set of risk factors with the highest individual AUC values from step 2, and backward elimination (based on the model AIC) was used to remove risk factors that did not significantly contribute to the prediction of pretrial failure.

Step 4 above resulted in a model with the following four risk factors:

- **Bench warrants** (Yes, No)**:** whether the defendant had any bench warrants for failure to appear in the last 3 years.
- **Employment/school status** (Yes, No): whether the defendant is employed/attending school less than 20 hours a week and not receiving public income assistance.
- **Pending case** (Yes, No): whether the defendant has a pending case.
- **Criminal conviction history** (count of convictions, no upper limit)**:** the total number of previous criminal convictions.

[19] See Appendix F.

[20] The sample used to answer study question 3 was limited to electronic records that had a detailed list of the defendant's criminal history allowing for the consideration of variations of criminal history as candidate risk factors (e.g., number of felony convictions over the last one year). This restriction reduced the analytic sample to 4,415.

Model 1

This model is referred to as "Model 1" and was considered the most predictive model. Using the entire analytic sample, Model 1 was then explored for racial and gender bias and was found to have significantly lower AUC values for Black (0.605) and Native American (0.586) defendants relative to White defendants (0.677) (see table 16 below for AUC values for each model by race). Additionally, it was found that a risk score based on this model (using the model-predicted logits) had a different relationship to pretrial failure for Black ($B = -0.363$, $p < 0.05$) and Native American defendants ($B = -0.578$, $p < 0.05$) relative to White defendants ($B = 1.002$, $p < 0.01$) (see results for "Most Predictive Model" in table 15 below).

These findings, and the Validation Committee's charge to seek the "most predictive, least-biased" model, led the authors to explore the role of individual risk factors in their contribution to the relatively poor performance of this model with Black and Native American defendants. Analyses of individual risk factors suggested that the total number of previous criminal convictions was contributing to the relatively poor performance of this model for Black defendants.

Model 2

Next, step 4 was repeated after excluding the total number of previous criminal convictions risk factor from consideration. The result was a model that consisted of the following four risk factors:

- **Bench warrants** (Yes, No)**:** whether the defendant had any bench warrants for failure to appear in the last 3 years.
- **Employment/school status** (Yes, No): whether the defendant is employed/attending school less than 20 hours a week and not receiving public income assistance.
- **Pending case** (Yes, No): whether the defendant has a pending case.
- **Current monitoring** (Yes, No)**:** whether the defendant has a current monitoring status of pretrial conditional release, probation, revoked probation, or supervised release.

This model is referred to as "Model 2" and was considered the less predictive model.

With criminal history now excluded, current monitoring emerged as a predictive factor within the model. Exploration of racial and gender bias (using the entire analytic sample) revealed that AUC value for Black defendants (0.616) was no longer significantly lower than the AUC for White defendants (0.665). Additionally, there was no longer a significant interaction term between the risk score based on this model (using the model-predicted logits) and the defendant being Black ($B = -0.243$, $p > 0.05$, see results for "Less Predictive Model" in table 15 below), suggesting that the relationship between the risk score and pretrial failure was similar between White and Black defendants.

However, this model did have a significantly lower AUC for Native American defendants (0.58) relative to White defendants (0.665). Also, the interaction term between Native American and

the risk score (B = -0.515, $p < 0.05$) was statistically significant, suggesting that the relationship between the risk score and pretrial failure was different for Native American defendants compared to White defendants (B = 0.978, $p < 0.01$).

These results led the authors to further explore the relationship between the risk factors in this model and pretrial failure by race. The results of this exploration revealed that the risk factor "any bench warrants for failure to appear in the last 3 years" was less predictive of pretrial failure for Native American defendants relative to White defendants.

Model 3

Once again, the authors removed the "any bench warrants for failure to appear in the last 3 years" from consideration and repeated step 4 above. This resulted in yet another model referred to as "Model 3" which was considered the "unbiased" model. This model consisted of the following three risk factors:

- **Employment/school status** (Yes, No): whether the defendant is employed/attending school less than 20 hours a week and not receiving public income assistance.
- **Pending case** (Yes, No): whether the defendant has a pending case.
- **Current monitoring** (Yes, No)**:** whether the defendant has a current monitoring status of pretrial conditional release, probation, revoked probation, or supervised release.

Exploration of racial and gender bias for this model revealed that AUC values for all non-White racial groups were not significantly different from the AUC for the White group and that the AUC values for males and females did not differ significantly. Additionally, interaction terms between race and the risk score based on this model were not statistically significant. These results led the authors to conclude that Model 3 was not exhibiting any racial or gender bias.

Results of All Three Models

Table 14 below presents the results for Models 1 (the most predictive), 2 (less predictive), and 3 (unbiased) based on the entire analytic sample. The results for these models using the construction and validation samples were very similar[21] suggesting these risk models would perform similarly when applied to new data.

[21] See Appendix G for Model 3 coefficients and overall AUC values based on the construction and validation samples.

Table 14: Revised Risk Score Model Results

Coefficient	Most Predictive (Model 1)	Less Predictive (Model 2)	Unbiased (Model 3)
Intercept	-1.672** (0.062)	-1.63** (0.06)	-1.567** (0.059)
Bench Warrants (Last 3 years)	0.495** (0.079)	0.531** (0.078)	N/A
Employment or School	0.48** (0.07)	0.479** (0.07)	0.535** (0.069)
Pending Case	0.733** (0.075)	0.686** (0.078)	0.771** (0.076)
Total Criminal History	0.023** (0.006)	N/A	N/A
Current Monitoring	N/A	0.203** (0.075)	0.305** (0.073)
AIC	4961.82	4970.57	5014.53
AUC	0.677	0.668	0.653
Chi-square	309.82	301.06	255.1
Chi-square df	4	4	3
Chi-square p-value	<0.01	<0.01	<0.01
Pseudo-R-squared	0.097	0.095	0.081
Racial Bias	Black, Native American	Native American	None
Intercept	-0.05 (0.086)	-0.077 (0.086)	-0.099 (0.09)
Asian/Native Hawaiian or Other Pacific Islander	0.142 (0.325)	0.132 (0.319)	-0.062 (0.36)
Black	0.058 (0.171)	0.188 (0.177)	0.319 (0.193)
Hispanic	0.336 (0.237)	0.328 (0.235)	0.371 (0.242)
Multiracial	0.144 (0.32)	0.12 (0.333)	0.261 (0.379)
Native American	-0.203 (0.231)	-0.133 (0.237)	-0.045 (0.261)
Other	0.692 (0.941)	0.895 (1.024)	0.426 (1.079)
Risk Score	1.002** (0.081)	0.978** (0.082)	0.968** (0.088)
Asian/Native Hawaiian or Other Pacific Islander x Risk Score	0.14 (0.334)	0.142 (0.33)	-0.197 (0.356)
Black x Risk Score	-0.363* (0.163)	-0.243 (0.168)	-0.139 (0.185)
Hispanic x Risk Score	0.246 (0.228)	0.239 (0.227)	0.299 (0.242)
Multiracial x Risk Score	0.094 (0.357)	0.016 (0.367)	0.085 (0.404)
Native American x Risk Score	-0.578* (0.228)	-0.515* (0.232)	-0.449 (0.257)
Other x Risk Score	0.789 (0.852)	0.987 (0.952)	0.471 (0.949)

Note: These results are based on the entire analytic sample. * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. Racial Bias indicates the racial group(s) that had a (statistically significantly) lower AUC value compared to White defendants. N/A indicates that the factor was not included in the model.

All three models presented above had higher AUC values (0.68, 0.67, 0.65) than the current MNPAT (0.60) for the sample as a whole and for each racial group, indicating that all three models above result in risk scores that are more predictive of pretrial failure than the risk score

based on the current MNPAT. See table 15 below for the AUC values for each racial group for each of the three models.

Table 15: AUC Values by Race for Each Revised Risk Score Model

Race/Ethnicity	Most Predictive (Model 1)	Less Predictive (Model 2)	Unbiased (Model 3)
White (N = 2,332)	0.677	0.665	0.649
Asian/Native Hawaiian or Other Pacific Islander (N = 134)	0.717	0.722	0.634
Black (N = 653)	0.605**	0.616	0.617
Hispanic (N = 353)	0.713	0.694	0.696
Multiracial (N = 129)	0.688	0.658	0.649
Native American (N = 260)	0.586*	0.58*	0.576
Other (N = 48)	0.72	0.708	0.68

Note: White defendants are the reference group. * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$.

The tables below present AUC values by gender for each of the three models as well as the results from logistic regression models predicting pretrial failure using each model's risk score (based on the model-predicted logits) and gender.

Table 16: AUC Values by Gender for Each Revised Risk Score Model

Gender	Most Predictive (Model 1)	Less Predictive (Model 2)	Unbiased (Model 3)
Female (N = 950)	0.686	0.671	0.645
Male (N = 3,444)	0.675	0.669	0.655

Note: Male defendants are the reference group. * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$.

Table 17: Logistic Regression Results by Model Including Gender

Coefficient	Most Predictive (Model 1)	Less Predictive (Model 2)	Unbiased (Model 3)
Gender Bias	None	None	None
Intercept	-0.001 (0.068)	0.026 (0.069)	0.023 (0.074)
Female	0.015 (0.158)	-0.114 (0.154)	-0.094 (0.164)
Risk Score	0.984** (0.065)	1.006** (0.066)	1.003** (0.072)
Female x Risk Score	0.078 (0.148)	-0.024 (0.146)	-0.007 (0.158)

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. Gender Bias indicates whether females had a statistically significantly different AUC value compared to male defendants. There were no such differences for any of the three models.

The results from tables 16 and 17 above suggest that all three models predict pretrial failure similarly for males and females. In addition to the risk scores (based on the model-predicted logits for each model) producing AUC values that were not significantly different for males and females, the relationship between these risk scores and pretrial failure was similar for males and females.

The next section describes the results for study question 4, “In what way should the risk score be converted to better communicate a defendant’s risk of pretrial failure?”

Question 4: In what way should the risk score be converted to better communicate a defendant's risk of pretrial failure?

To answer this question, the Validation Committee discussed the benefits and challenges associated with three approaches:

a) Apply cut-scores to the revised risk score to create a risk level for each defendant (e.g., a risk score between 0 and 3 is categorized as lower risk, a risk score between 4 and 6 is categorized as moderate risk, etc.).

b) Calculate and provide the predicted probability of pretrial failure for each point on the risk score scale and convert them to percentages (e.g., 12% of defendants with a risk score of 0 have a pretrial failure, 15% of defendants with a risk score of 1 have a pretrial failure, etc.).

c) Calculate a range of predicted probability of pretrial failure for each point on the risk score scale and convert them to percentages (e.g., between 10% and 14% of defendants with a risk score of 0 have a pretrial failure, between 15% and 18% of defendants with a risk score of 1 have a pretrial failure, etc.).

Option A above is the current practice with the MNPAT and is common among pretrial risk assessments (Copp et al., 2019; Kujava, 2019; Podkopacz & Loynachan, 2018). Option B was proposed as a response to the concern that risk levels (Option A) are relative and does not provide information about absolute risk (e.g., how likely is a defendant to have a pretrial failure if their score is in the "moderate" risk level?). Option C was proposed because it has the added benefit of providing a range for likelihood of a pretrial failure (for what is inherently an imperfect prediction) and addresses some other critiques of risk assessments (e.g., that results are framed in terms of failure even though most defendants do not have a pretrial failure and defendants are assumed innocent until proven guilty, etc.) (Robinson & Koepke, 2019; The Leadership Conference on Civil and Human Rights, 2019).

The Validation Committee preferred an adapted version of Option C. This involved calculating and providing the range of predicted likelihood of success (i.e., not having a pretrial failure), instead of providing a likelihood of pretrial failure.

To provide the range of predicted likelihood, a preferred model option needed to be selected and converted into a usable scale. Model 3, the 'unbiased' model was identified by the Validation Committee as the preferred model.

To arrive at weights/points for each risk factor in the selected model, each model regression coefficient was transformed into a whole-number tool weight in the following way:

Step 1: Take the regression coefficient for a risk factor and multiply it by 10.

Step 2: Round up the result from step 1 above to the nearest integer.

The steps above resulted in the following weights/points for the risk factors in model 3:

Table 18: Risk Factor Weights for Revised MNPAT

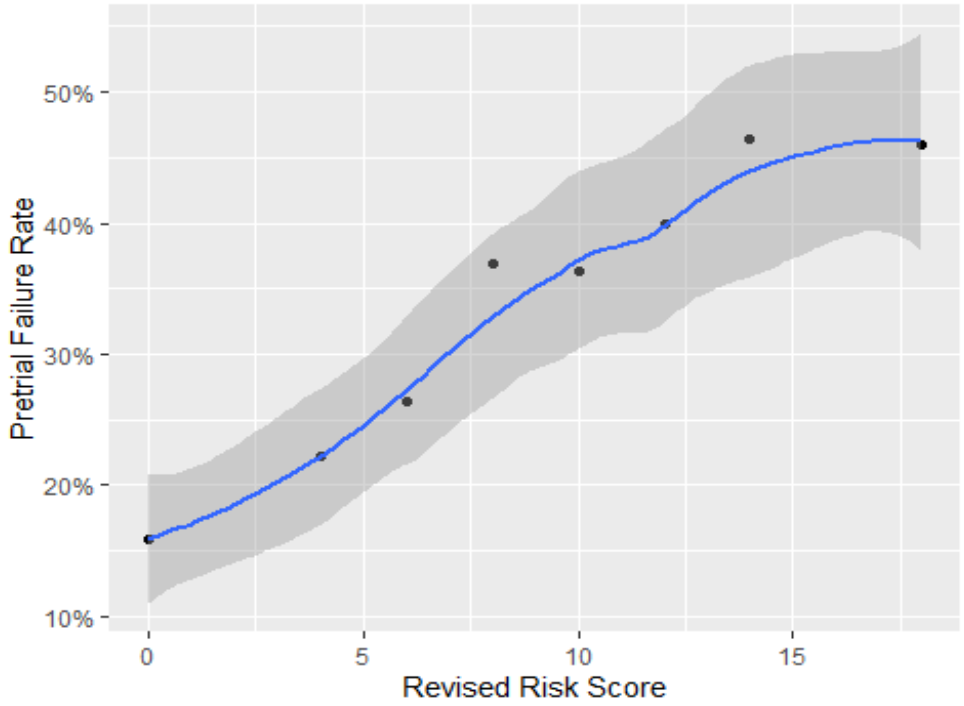
Risk Factor	Weight/Points
Employment/School Status	6
Pending Case	8
Current Monitoring	4

The process above was tested to ensure that the resulting risk score (after transforming the model coefficients into weights/points) maintained the predictive properties of the risk score derived from the model. The correlation of the risk score using the weights/points above with the model-predicted logits was 1, and as a result, the AUC values for the overall sample as well as each racial group remained the same (as the AUC values based on the model-predicted logits).

Once the revised risk score was calculated for each defendant, the proportion of defendants with a pretrial failure was calculated for each point on the revised risk score scale. Then, a local polynomial regression was fit to the data using the revised risk score as a predictor of the percentage of pretrial failure. The standard errors from this model were used to calculate the range of the likelihood of pretrial failure. Finally, this range was converted to a range of the likelihood of success by subtracting the lower and upper values for the probability of pretrial failure from 1 and multiplying the result by 100 (to arrive at percentages).

Figure 9 below presents a plot of the percentage of pretrial failure by the revised risk score. It also shows the local polynomial regression line overlaid on the plot, along with standard errors.

Figure 9: Pretrial Failure by Revised Risk Score



The figure above shows the pretrial failure rates for each point on the revised risk score. The results show that generally, as the revised risk score increases, the pretrial failure rate increases. This trend appears to flatten between about 14 and 18 points on the revised risk score scale.

Table 19 below presents the range of likelihood of success for each point on the revised risk score scale. It also presents the actual pretrial failure rate and the expected pretrial failure rate (i.e., the average of the predicted probability of failure for each defendant based on the revised risk score).

Table 19: Likelihood of Success and Average Pretrial Failure Rate by Revised Risk Score

Revised Risk Score	Lower Success Rate	Higher Success Rate	Pretrial Failure Rate	Average Estimated Failure Rate	Count
0	0.792	0.890	0.159	0.173	1,371
4	0.726	0.830	0.222	0.221	491
6	0.671	0.784	0.264	0.263	865
8	0.609	0.734	0.369	0.311	198
10	0.561	0.697	0.363	0.326	454
12	0.529	0.676	0.399	0.380	336
14	0.480	0.641	0.464	0.435	220
18	0.455	0.621	0.460	0.511	480

The table above shows that, as the defendant's risk score (based on Model 3) increases, the likelihood of pretrial failure increases from a pretrial failure rate of about 16% for a risk score of 0 to a pretrial failure rate of about 46% for a risk score of 18. Additionally, the actual pretrial failure rate for each risk score is similar to the average estimated failure rate (based on the model-predicted probability), providing further evidence that the revised risk score accurately predicts pretrial failure rate.

Validation Committee Considerations and Recommendation

The Validation Committee evaluated the current MNPAT in the context of various perspectives on the use of pretrial risk assessment tools nationwide. As a result, the Committee sought to have a transparent process and seek input from stakeholders. Feedback was collected at several stages of the project, and the committee considered the findings and recommendations in this study relative to other validation studies, both in Minnesota and nationwide.

A critical component of the Validation Committee's analysis was the goal of finding the "most predictive, least biased" tool. In risk assessment tool validations, predictiveness and bias must be weighed, as tradeoffs may need to be considered when trying to achieve both. Further, the definition of bias and how it is operationalized can impact the study and its outcomes. Notably, the methods employed in this study to define and analyze predictiveness and bias are common among validation studies. Local validation studies in Minnesota have similarly analyzed the predictiveness of tools through AUC scores and evaluated differences in predictiveness by race through AUC comparisons. However, this statewide study has a large enough sample to analyze predictiveness by individual racial groups, as opposed to grouping all persons of color into a singular comparison group.

After careful consideration of the revised MNPAT models, the Validation Committee preferred Model 3 because it was more predictive than the current MNPAT and did not show meaningful differences in predictiveness among races or genders. There was strong support for a tool that estimated risk equally among all demographic groups to ensure the scored information, including likelihoods of success and failure, were reflected equally for all defendants appearing before a judge.

However, the Validation Committee recognized that the removal of bench warrant and criminal history as scored factors on the tool was a significant shift from current practice and personal experience. Additionally, under Minnesota Rule of Criminal Procedure 6.02, the court must consider these factors when determining conditions of release and attorneys will continue to argue this information before the judge in bail hearings. For these reasons, the Validation Committee decided to recommend that a defendant's criminal history and bench warrant history be included on the form.

The Validation Committee's preference for Model 3 (the 'unbiased' model) in combination with retaining conviction history and bench warrant history on the form was brought to the Minnesota Judicial Council in January 2022 to seek additional feedback, input, and direction. The Judicial Council directed the Committee to conduct further analysis to understand how nationally used pretrial risk assessment tools would perform when applied to the validation dataset. In particular, the Council wanted to learn whether differences in predictiveness by race would be present if other tools validated elsewhere were to be used in the 82 counties using the MNPAT.

With this new charge, the Validation Committee surveyed the national pretrial landscape and selected two pretrial risk assessment tools, the PSA-Court and Ohio, for further study. Additionally, the Validation Committee included a tool validated in Cass County, MN in the

analysis. The Validation Committee asked to include the Cass County tool in the follow-up study because the validation study results for that tool showed similar differences in predictiveness by race to the MNPAT validation study. The Cass County validation study also identified conviction history as the main contributing factor to these differences in predictiveness. After applying the three tools' scoring schemas to the MNPAT validation study analytic dataset, the results showed lower overall predictiveness levels compared to the three revised models produced in study question 3, and differences in predictiveness were still present. These results can be seen in Appendix E.

After reviewing and discussing the complete validation results, including stakeholder feedback and consideration of the supplemental PSA-Court, Ohio, and Cass County tool analyses, the Validation Committee finalized Model 3 as their recommendation.

Judicial Council Decision and Implementation

In January 2023, the Validation Committee presented final recommendations to Judicial Council. Model 3 was recommended as the revised tool with conviction history and bench warrant history included on the form. Additionally, the Validation Committee recommended that detailed information about a defendant's likelihood of success be provided on the pretrial evaluation form.[22]

The above recommendations were approved by the Minnesota Judicial Council with an effective date of January 1, 2024. Validation of the revised MNPAT will occur as soon as practicable following implementation and sufficient data collection.

[22] See Appendix C for the revised MNPAT form

Appendix

Appendix A: 2018 Pretrial Release Evaluation Form and Assessment Tool (MNPAT)

Minnesota Pretrial Release Evaluation Form

Name (Last)	(First)	(Middle)	Assessment Date

Case #	County of Residence	Duration yr mo	Age

Marital Status ☐ Married ☐ Separated ☐ Never Married ☐ Divorced ☐ Widowed	# Children: # Dependents:	Have you ever been in or served in the U.S. armed forces?	☐ Yes ☐ No

Pretrial Assessment Tool Section

Pretrial Factor			Points Assigned
Main Charge: *Other Charges:*			
Employment/Income Sources or School Status			
Current Problematic Chemical Use (see definition)			
Homeless or Three or More Address Changes in Past Year			
Age at First Delinquency Adjudication/Conviction	*Age:*		
Criminal Conviction History	*# Felony Person:* *# Non-Felony Person:*	*# Other Felony:* *# Other Non-Felony:*	
Bench Warrants	*# Last 3 Years:*		
		Total Scale Score ➡	
		Pretrial Score Risk Ranges	Lower = 0-11 Moderate = 12-25 Higher = 26+

Current Monitoring Status

☐ Pretrial Conditional Release ☐ Probation ☐ Revoked Probation ☐ Supervised Release

Is the defendant currently assigned to a probation or pretrial officer? ☐ Yes ☐ No

Does the defendant have a pending case (targeted misdemeanor or higher) that has not yet reached disposition? ☐ Yes ☐ No

Comments from Collateral/Victim Sources:

Lethality Assessment Conducted ☐ Yes ☐ No ☐ Unknown	If conditions are ordered, probation recommendations for conditions of release:

MINNESOTA
JUDICIAL BRANCH

Case #	ICR/CCN #

Name: (Last)	(First)	(Middle)
SID #	FBI #	Local ID #

Additional Data Collection Questions for Validation

Was the defendant unemployed at the time of the arrest?	☐ Yes	☐ No
Has the defendant had an alcohol abuse problem in the last six months?	☐ Yes	☐ No
Has the defendant used illegal mood-altering chemicals during the last six months?	☐ Yes	☐ No

Criminal Conviction History Details

Felony

Gross Misdemeanor

Misdemeanor

Failure to Appear Bench Warrants in the Last Three Years

Date Ordered	Type	County of Issuance

Appendix B: Minnesota Pretrial Questionnaire

Minnesota Pretrial Questionnaire

Name (Last)	(First)	(Middle)		

County of Residence	Duration yr mo	DOB	Age

Street Address	Apt #	City	State	ZIP

Mailing Address	Apt #	City	State	ZIP

Employment/ Education	1. Are you currently employed?		☐ Yes	☐ No
	If Yes:	☐ Full-time	☐ Part-time	
	If Part-time:	☐ 20+ hrs/week	☐ Less than 20 hrs/week	
	2. Do you currently attend school?		☐ Yes	☐ No
	If Yes:	☐ Full-time	☐ Part-time	
	If Part-time:	☐ 20+ hrs/week	☐ Less than 20 hrs/week	
	3. If you attend school and work, do your hours for both total 20 hours or more?		☐ Yes	☐ No
	4. If you do not work outside the home, do you receive income from public assistance, social security benefits of any kind, disability benefits, or pension benefits?		☐ Yes	☐ No
	5. If you do not work outside the home, do you have financial support while you care for children, elderly parents, or a relative?		☐ Yes	☐ No
Housing	6. Have you had three or more addresses during the past 12 months?		☐ Yes	☐ No
	7. Have you moved between friends, family, and/or shelters during the past 12 months?		☐ Yes	☐ No
	8. If you do not have stable housing, do you consider yourself homeless?		☐ Yes	☐ No
Substance Use	9. Within the last 12 months have you committed a crime while under the influence of alcohol or mood-altering chemicals?		☐ Yes	☐ No
	10. Within the past 12 months have you chosen to enter substance abuse treatment?		☐ Yes	☐ No
	11. Within the past 12 months have you been court-ordered to do a chemical health evaluation or receive chemical health treatment?		☐ Yes	☐ No
	12. Within the past 12 months, have alcohol or mood-altering chemicals contributed to problems with your intimate relationship, family, work, or school?		☐ Yes	☐ No
	13. Have you had an alcohol abuse problem in the last six months?		☐ Yes	☐ No
	14. Have you used illegal mood-altering chemicals during the last six months?		☐ Yes	☐ No
Community Ties	15. What is your marital status?	☐ Married ☐ Divorced ☐ Separated ☐ Widowed ☐ Never Married		
	16. How many minor children or others live with you or receive financial support from you?			
	Children: _____ Others: _____			
	Total		_____	
Military	17. Have you ever been in or served in the United States armed forces?		☐ Yes	☐ No

Please enter the name, relationship, and phone number of someone who knows you well:	Name	Relationship	Phone

Systems Checked (Probation use only)				P.O.
☐ BCA	☐ CSTS	☐ S3	☐ MNCIS/MGA	
☐ CISR	☐ GLWS	☐ DL	☐ JMS	

Appendix C: New MNPAT form

Minnesota Pretrial Release Evaluation Form

Name (Last) (First) (Middle)	Court Case Number
Age	Date of Assessment (mm/dd/yyyy)
County of Residence:	Duration of Residence yr. mo.
No. of Children: No. of Dependents:	Have you ever been in or served in the U.S. armed forces? ☐ Yes ☐ No

Pretrial Assessment Tool Section The pretrial risk score is intended to aid in determining whether to release a defendant or assign bail and/or conditions. The total scale score is a validated predictor of pretrial success or failure.

Pretrial Factor		Points Assigned
Employment/income sources or school status	Yes - 6 pts No - 0 pts	
Pending case (targeted Misdemeanor or higher)	Yes - 8 pts No - 0 pts	
Current monitoring	Yes - 4 pts No - 0 pts	
Total Scale Score Score range: 0 - 18		

Below is a description of the likelihood that a defendant will appear at all future hearings and not commit a new offense for each pretrial risk score.

Score	Likelihood of success	Level of Risk
0	between 79% and 89%	Lower
4	between 73% and 83%	Lower
6	between 67% and 78%	Moderate
8	between 61% and 73%	Moderate
10	between 56% and 70%	Moderate
12	between 53% and 68%	Higher
14	between 48% and 64%	Higher
18	between 45% and 62%	Higher

Level of risk by score:

Lower = **0 - 4** Moderate = **6 - 10** Higher = **12 - 18**

Comments from Collateral/Victim Sources:

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Minnesota Pretrial Release Evaluation Form

Name (Last) (First) (Middle)	Court Case Number
FBI #	SID #

Assessments Completed

Lethality Assessment Conducted?	☐ Yes	☐ No	☐ Unknown
Other Assessments?	☐ Yes	☐ No	☐ Unknown

If so, list which ones:

Recommended Conditions If ordered, recommendations for conditions of release:

Additional Data Collection for Validation

Has the defendant had an alcohol abuse problem in the last six months?	☐ Yes	☐ No
Has the defendant used illegal mood-altering chemicals during the last six months?	☐ Yes	☐ No

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Minnesota Pretrial Release Evaluation Form

Name (Last) (First) (Middle)	Court Case Number

The information in the following sections was not used in the determination of the defendant's objective risk score because it does not predict risk equally well among all racial groups. This supplemental information is provided to aid in determining conditions and/or the bail amount.

Criminal Conviction History Details full history excluding petty midemeanors and misdemeanor driving offenses other than DWI.

Felony
Gross Misdemeanor
Misdemeanor

Failure to Appear Bench Warrants in the last three years

Date Ordered	County of Issuance

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Appendix D: Validation Committee Membership

Name	Role	Judicial District
Hon. Sara Grewing	Judge, Committee Chair	District 2
Hon. Jamie Cork	Judge	District 1
Traci Green	Probation Director Wabasha County Probation	District 3
John Marsolek	Community Corrections Director	District 5
Hon. Allison Krehbiel	Judge	District 5
Dan Lew	Chief 6th District Public Defender	District 6
Hon. Korey Wahwassuck	Judge	District 9
Trish Hansen	Department of Corrections Supervisor	District 9
Greg Widseth	Polk County Attorney - Minnesota County Attorneys Association	District 9
Hon. James Cunningham	Judge	District 10
Dawn Torgerson	Deputy State Court Administrator	SCAO
Al Godfrey	Department of Corrections – Field Services Coordinator	N/A
Jessica Ryan	Representative for Grand Portage Band of Chippewa Indians	N/A

Appendix E: Results Using Other Risk Models

The validation study also explored the performance of three risk scores from pre-existing pretrial risk assessments: Cass County (MN) pretrial risk assessment, Ohio Pretrial Assessment Tool (ORAS – PAT), and The Public Safety Assessment (PSA) (which includes a risk score for failure to appear and a separate risk score for new crime). The results below show the performance of these risk scores for the analytic sample in this validation study.

Coefficient	Cass County	Ohio	PSA - FTA	PSA - New Crime
Intercept	-1.592** (0.071)	-1.504** (0.071)	-1.84** (0.086)	-2.001** (0.097)
Risk Score	0.084** (0.007)	0.208** (0.019)	0.347** (0.027)	0.362** (0.028)
AIC	4585.59	4622.03	4573.27	4568.47
AUC	0.628	0.614	0.633	0.633
Chi-square	157.13	120.68	169.44	174.25
Chi-square df	1	1	1	1
Chi-square p-value	<0.01	<0.01	<0.01	<0.01
Pseudo-R-squared	0.056	0.043	0.06	0.062
Racial Bias	Black	Black	Asian/Native Hawaiian or Other Pacific Islander, Black, Native American	Black, Native American
Intercept	-0.031 (0.103)	-0.067 (0.11)	-0.046 (0.103)	-0.045 (0.101)
Asian/Native Hawaiian or Other Pacific Islander	0.206 (0.36)	-0.046 (0.469)	0.273 (0.341)	0.094 (0.358)
Black	-0.067 (0.212)	-0.033 (0.249)	-0.043 (0.187)	0.025 (0.189)
Hispanic	0.44 (0.282)	0.599 (0.321)	0.269 (0.28)	0.4 (0.274)
Multiracial	-0.2 (0.386)	0.468 (0.438)	0.33 (0.374)	0.281 (0.38)
Native American	-0.144 (0.274)	0.2 (0.332)	-0.221 (0.311)	-0.434 (0.289)
Other	0.735 (0.872)	2.159 (1.301)	0.566 (0.794)	0.487 (0.809)
Risk Score	1.086** (0.107)	1.093** (0.122)	1.052** (0.105)	1.05** (0.104)
Asian/Native Hawaiian or Other Pacific Islander x Risk Score	0.258 (0.413)	-0.258 (0.503)	0.419 (0.399)	0.06 (0.393)
Black x Risk Score	-0.56* (0.22)	-0.61* (0.251)	-0.445* (0.204)	-0.363 (0.205)
Hispanic x Risk Score	0.37 (0.301)	0.472 (0.35)	0.144 (0.288)	0.349 (0.294)
Multiracial x Risk Score	-0.455 (0.44)	0.332 (0.518)	0.331 (0.451)	0.2 (0.44)
Native American x Risk Score	-0.539 (0.307)	-0.193 (0.378)	-0.681* (0.317)	-0.907** (0.306)
Other x Risk Score	1.144 (0.965)	2.706* (1.474)	0.886 (0.815)	0.68 (0.786)

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$. Racial Bias indicates the racial group(s) that had a (statistically significantly) lower AUC value compared to White defendants.

Appendix F: Risk Factors Considered for Revised MNPAT

Category	Risk Factor	Definition	In Current MNPAT Risk Score?
Age	Age	Age in years (e.g., 18, 19, 20, etc.)	No
Age	Age	Age in categories (18 – 24, 25 – 43, 44+)	No
Main Charge	Main Charge Type	One of three categories created by Hennepin County (6-point list of charges, 9-point list of charges, 12-point list of charges)	Yes
Main Charge	Main Charge Level	Level of the main charge (Misdemeanor, Gross Misdemeanor, Felony)	No
Previous Criminal History	Felony Person Convictions	Total number of felony person convictions (0 – infinity)	Yes
Previous Criminal History	Felony Other Convictions	Total number of felony other convictions (0 – infinity)	Yes
Previous Criminal History	Non-Felony Person Convictions	Total number of non-felony person convictions (0 – infinity)	Yes
Previous Criminal History	Non-Felony Other Convictions	Total number of non-felony other convictions (0 – infinity)	Yes
Previous Criminal History	Convictions	Total convictions (0 – infinity)	No
Previous Criminal History	Felony Person Convictions	At least one felony person convictions (Yes, No)	No
Previous Criminal History	Felony Other Convictions	At least one felony other convictions (Yes, No)	No
Previous Criminal History	Non-Felony Person Convictions	At least one non-felony person convictions (Yes, No)	No
Previous Criminal History	Non-Felony Other Convictions	At least one non-felony other convictions (Yes, No)	No
Previous Criminal History	Any Convictions	At least one of any type of conviction (Yes, No)	No
Previous Criminal History	Felony Convictions	At least one felony conviction (Yes, No)	No

Category	Risk Factor	Definition	In Current MNPAT Risk Score?
Previous Criminal History	Non-Felony Convictions	At least one non-felony conviction (Yes, No)	No
Previous Criminal History	Convictions	Total convictions (0 – infinity) in the last 1, 3, 5, and 7 years*	No
Previous Criminal History	Convictions	At least one of any type of conviction (Yes, No) in the last 1, 3, 5, and 7 years*	No
Previous Criminal History	Misdemeanor Convictions	At least one misdemeanor conviction (Yes, No) in the last 1, 3, 5, and 7 years*	No
Previous Criminal History	Gross Misdemeanor Convictions	At least one gross misdemeanor conviction (Yes, No) in the last 1, 3, 5, and 7 years*	No
Previous Criminal History	Felony Convictions	At least one felony conviction (Yes, No) in the last 1, 3, 5, and 7 years*	No
Prior Bench Warrants For Failure To Appear	Bench Warrants	Total bench warrants (0 – infinity) in the last 1, 3, 5, and 7 years*	No
Prior Bench Warrants For Failure To Appear	Bench Warrants	Number of bench warrants in categories (0, 1-2, 3+) in the last 1, 3, 5, and 7 years*	Yes
Prior Bench Warrants For Failure To Appear	Bench Warrants	At least one bench warrant (Yes, No) in the last 1, 3, 5, and 7 years*	No
Current Status	Current Monitoring Status	Defendant has current monitoring status (Yes, No)	No
Current Status	Pending Case	Defendant has a pending criminal case (Yes, No)	No
Alcohol and Substances	Alcohol Abuse	Defendant has had alcohol abuse problems in last six months (Yes, No)	No
Alcohol and Substances	Illegal Chemical Use	Defendant has used illegal mood-altering chemicals in the last 6 months (Yes, No)	No
Alcohol and Substances	Problematic Chemical Use	Defendant has a pattern of problematic substance use (Yes, No)	Yes
Employment	No Employment or School Status	Defendant has no employment or school status (as currently defined on the MNPAT) (Yes, No)	Yes
Employment	Unemployment	Defendant is unemployed at the time of arrest (Yes, No)	No

Category	Risk Factor	Definition	In Current MNPAT Risk Score?
Community Ties	Homeless or 3 or more Address Changes	Defendant is homeless or had 3 or more address changes in the past 12 months (Yes, No)	Yes

Note: *The authors considered four different versions of each of these versions of criminal history (a separate variable for each time span: 1, 3, 5, and 7 years prior). In total, 56 different risk factors were considered when constructing a revised risk score.

Appendix G: Model 3 Results for Construction and Validation Samples

Coefficient	Construction Sample Estimate (SE)	Validation Sample Estimate (SE)
Intercept	-1.508** (0.082)	-1.627** (0.084)
Current Monitoring	0.293** (0.103)	0.318** (0.104)
No Employment or School	0.474** (0.098)	0.596** (0.099)
Pending Case	0.79** (0.107)	0.752** (0.109)
AUC	0.654	0.652

Note: * = statistically significant at $p < 0.05$, ** = statistically significant at $p < 0.01$.

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