THE EFFICACY OF RISK ASSESSMENT INSTRUMENTS IN JUVENILE PRETRIAL DETENTION

By

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Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Law & Economics

May 10, 2024

Nashville, Tennessee

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To the Davidson County Juvenile Court, and all those who work there striving to prevent problems, promote the positive potential in all people, and pursue fairness and hope.

ACKNOWLEDGEMENTS

I am immensely grateful to many people for their support throughout this project. Without them, the work would not have been possible. First and foremost, I will be forever indebted to my advisor, Professor Jennifer Bennett Shinall. Thank you for sharing some of your brilliance on topics big and small, week in and week out, for the last four years. I deeply appreciate your guidance, support, and dedication throughout this entire process. Thank you to my other committee members – Professors Paige Marta Skiba, Christopher Slobogin, and Mark Fondacaro – not only for your insightful feedback but also for your words of encouragement. Each member of my committee taught me to think about interesting research questions and their broader social importance. They are all inspiring.

For their enduring support and encouragement, I am grateful to my friends and family. Thank you to my parents for each being a rock I can always lean on, and to my best friends, Hyles Rudolph and Bobbi Zahn, for always being there. I was blessed beyond measure to have amazing colleagues in the PhD program. I am especially grateful for Fernando Mendoza Lopez, who has kept me sane for six years, and for the friendship of Zach Sturman, Scott Jeffrey, Kyle Blasinsky, Delaney Beck, and Sydney Schoonover. Thank you also to my Waffle House family, who cooked and served me countless breakfasts for the past six years.

Without the participation of the Davidson County Juvenile Court, I could not have carried out my research. I will be forever grateful to all the people I met there and for all they taught me. Thank you to Judge Sheila Calloway, for being a mentor, teacher, and friend. Thank you to Magistrate J. Michael O'Neil, for the many conversations on both juvenile law and farming. The immense contributions of L'Tannia Williams and Leslie Ahlgrim made this project possible. Whenever I had a question or needed data help, they were always there. Thank you to Kelly Gray,

for your humor and insight. Thank you also to Tommy Bradley, Jim Swack, Kathy Sinback, and Jennifer Wade.

Finally, this project would not have been possible without the financial support of the Vanderbilt Ph.D. Program in Law & Economics and Vanderbilt Law School's Public Interest Office. My time at Vanderbilt has been incredibly enriching, and I am deeply grateful for the opportunity to join the Ph.D. Program in Law & Economics.

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1.1 Introduction

Spending time in juvenile detention can have negative, non-rehabilitative effects on youth. It can lower educational attainment, increase recidivism and criminality, affect aggression and other behavior, and compound trauma exposure (Baron, et al. 2022; Walker & Herting 2020; Trejos-Castillo 2020; Stevenson 2017). And much like adult jails, juvenile detention centers can be concrete-enclosed incubators for mental health problems and criminogenic social contagion (Casey Foundation 2020).

Given the rehabilitative roots of the juvenile justice system, the harmful effects of detention, and the presumption of innocence, advocates over the last 20 years have pushed for a less carceral system in which community-based solutions are used to decrease dependence on secure pretrial detention (E.g., Harvell, et al. 2019). Recently, a "confluence of social, scientific, legal, and policy influences [has begun] to pave the way for the rebirth of rehabilitation in our criminal justice system." (Fondacaro, et al. 2015, p. 698). This is especially true in juvenile justice.

One targeted area of reform has been pretrial detention. Pretrial juvenile detention has traditionally been justified by the risk a juvenile poses to the safety of the community or a juvenile's risk of missing court appearances (Baron, et al. 2022; Maloney & Miller 2015). But "risk" is not easily observable to lawyers and judges. Thus, risk assessment instruments ("RAIs") have been developed to help decision-makers arrive at more accurate predictions through an algorithmic combination of risk factors. Given that algorithms are everywhere in our daily lives – from social media feeds to airline ticket prices – it should come as no surprise that they have proliferated in the criminal justice context (Garrett & Monahan 2020; Starr 2015). And because the pretrial detention decision hinges almost entirely on predictions of future behavior, risk algorithms are

especially adept for application in that context. Proponents argue that risk assessment tools can provide accuracy, objectivity, and consistency across judges and cases, in what has traditionally been a subjective human decision (Desmarais, et al. 2022). Critics, on the other hand, contend that risk assessment tools exacerbate pre-existing racial inequalities deeply rooted in the criminal justice system, do not decrease reliance on incarceration, and make inaccurate predictions (Burdeen & Shang 2021). In the end, discerning how risk assessment tools impact our juvenile justice systems is an empirical question that has only recently begun to be addressed by social scientists (E.g., Berk 2019; Vincent, et al. 2016; Maloney & Miller 2015; Chappell, et al. 2013).

In 2019, the Davidson County Juvenile Court in Nashville, Tennessee, joined the growing number of jurisdictions that use an RAI to make pretrial detention decisions. Through a partnership with the Crime and Justice Institute,[1] the court developed the Juvenile Detention Risk Assessment ("JDRA") to release eligible juveniles back to their families within hours of arrest, rather than waiting days for a detention hearing to determine if the youth is a risk of flight or danger to the community.

In this chapter, I examine the effects of implementing the JDRA in Davidson County. First, I use data on completed risk assessments to analyze the accuracy of the instrument at predicting recidivism. Next, I use county-level arrest data to estimate the impact of JDRA implementation on juvenile arrests using a difference-in-difference approach. Finally, I use facility-level monthly data collected from the Davidson County Juvenile Detention Center to examine how JDRA implementation effects the number of monthly intakes and the racial/ethnic composition of the detention center. I find that the JDRA performs reasonably well – it makes recidivism predictions better than chance and has resulted in the release of many youth who would otherwise have been

[1] Crime & Justice Institute, *Leading the Way on Pretrial Reform: Davidson County's Journey* (Sept. 2018), https://www.cjinstitute.org/publication/leading-the-way-on-pretrial-reform-davidson-countys-journey/.

detained. Further, implementing the JDRA did not increase the overall incidence of juvenile arrests. I find evidence that arrests may have decreased. Finally, I find no evidence that JDRA implementation resulted in disproportionate minority contact. The racial/ethnic composition of the detention center did not change after JDRA implementation, and arrests of non-white youth decreased by a magnitude larger than arrests of white youth.

1.2 Background & Literature

1.2.1 Juvenile Courts and Pretrial Detention of Youth

The birth of juvenile courts as a separate legal system for juvenile offenders came during the Progressive Era at the turn of the 20th century. At the time, rehabilitation was the central focus of the separate juvenile justice system, while retribution and punishment remained central to the adult criminal justice system. During the 1960s, however, critics of the juvenile justice system decried the informal processes with which youth were handled and the dearth of rehabilitation in the system. In a series of decisions, the U.S. Supreme Court intervened and extended to youth facing delinquency charges a number of procedural protections through the Due Process Clause of the 14th Amendment. For example, the Court held in *Kent v. United States*, 383 U.S. 541 (1966), that waiver of juvenile court jurisdiction requires a hearing, access to social records, and statement of reasons adequate for appellate review. In a seminal case, *In re Gault*, 381 U.S. 1 (1967), the Court held that due process requires juveniles to have notice, a right to counsel, a right against self-incrimination, and a right to confrontation of witnesses. Soon thereafter, the evidentiary standard of "proof beyond a reasonable doubt" was imposed on juvenile delinquency proceedings, *In re Winship*, 397 U.S. 358 (1970), and juveniles were extended the right against double jeopardy. *Breed v. Jones*, 421 U.S. 519 (1975).[2] The extension of numerous procedural protections enjoyed by adult

[2] However, despite the procedural revolution that occurred in juvenile justice, the Court also held that juveniles do not have a constitutional right to a jury trial. *McKeiver v. Pennsylvania*, 403 U.S. 528 (1971).

defendants was a double-edged sword. While juveniles now had more rights (and more to bargain with), juvenile courts lost some informality and began to resemble their adult court counterparts. Juveniles also were not insulated from the "tough on crime" policies of the 1970s and 1980s. By the 1990s, many states had adopted more stringent laws for juvenile offending, including laws that treated more juveniles as adults.

Three decades ago, the Supreme Court famously declared: "In our society liberty is the norm, and detention prior to trial or without trial is the carefully limited exception." *United States v. Salerno*, 481 U.S. 739, 755 (1987). Today, however, pretrial detention is so ubiquitous for adults in state and federal courts that it has become not only a norm, but an expectation (Hamilton 2022). Indeed, the number of adult pretrial detainees grew 433% between 1970 and 2015 in the United States, and pretrial detention now accounts for roughly 2/3 of local jail populations (Digard & Swavola 2019). To make matters worse, many of these individuals will never be convicted of a crime or will enter a plea deal, though innocent, simply to get released from jail (Meyers 2022; Hamilton 2022; Slobogin 2021; Subramanian, et al. 2015; Natapoff 2012).

From a legal perspective, the same principles guiding preventive, regulatory detention of adult offenders have also applied to juveniles. Since the Supreme Court approved preventive detention of juveniles in *Schall v. Martin*, 467 U.S. 253 (1984),[3] pretrial detention of youth who pose

[3] In so holding, Justice Rehnquist stressed the diminished liberty interest held by juveniles under the Due Process Clause of the 14th Amendment:

> The juvenile's countervailing interest in freedom from institutional restraints, even for the brief time involved here, is undoubtedly substantial as well. But that interest must be qualified by the recognition that juveniles, unlike adults, are always in some form of custody. Children, by definition, are not assumed to have the capacity to take care of themselves. They are assumed to be subject to the control of their parents, and if parental control falters, the State must play its part as parens patriae. In this respect, the juvenile's liberty interest may, in appropriate circumstances, be subordinated to the State's parens patriae interest in preserving and promoting the welfare of the child. *Schall*, 467 U.S. at 265 (internal citations and quotations omitted).

Nonetheless, three years later, with then-Chief Justice Rehnquist again writing for the Court, the preventive detention of *adults* (who are not children, and thus have no diminished liberty interest) based on the risk of future criminal conduct

a "serious risk" of reoffending has been commonplace across the country (Baron, et al. 2022; Walker & Herting 2020; Trejos-Castillo, et al. 2020; Harvell, et al. 2019). In *Schall*, the Supreme Court explicitly recognized the role of perceived likelihood of future criminal conduct in justifying legal decisions:

> Our cases indicate . . . that from a legal point of view there is nothing inherently unattainable about a prediction of future criminal conduct. . . . We have also recognized that a prediction of future criminal conduct is an experienced prediction based on a host of variables which cannot be readily codified. *Schall*, 467 U.S. at 278–79 (internal citations and quotations omitted).

Thus, for almost four decades, juvenile courts have looked to an arrestee's possible danger to the community (risk of recidivism) and possible failure to appear in court (risk of flight) to make detention decisions. Given that these two factors are pervasive in state criminal codes and have withstood constitutional challenge, they are a natural target for risk algorithms and pretrial risk assessment. As Kleinberg, et al. (2018) argues, "the bail application provides a template for when and how machine learning might be used to improve on human decisions." (p. 242).

Reducing youth incarceration, especially after disposition, has been the focus of legislation, such as the federal Juvenile Justice and Delinquency Prevention Act Reauthorization of 2018.[4] It has also been a priority for both government agencies, such as the Office of Juvenile Justice and Delinquency Prevention,[5] and private foundations and initiatives, such as No Kids in Prison, the Annie E. Casey Foundation's Juvenile Detention Alternatives Initiative, and the MacArthur Foundation's Models for Change. But in addition to custodial dispositions, the immediate detention of youth following arrest until adjudication has been at the forefront of a counter-

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under the Federal Bail Reform Act, 18 U.S.C. § 3142, was upheld, citing or mentioning *Schall* for support no fewer than 15 times. *See United States v. Salerno*, 481 U.S. 739, 745, 747–52 (1987).

[4] Public Law 93-415; 88 Stat. 1109, as amended by Public Law 115-385 (enacted Dec. 21, 2018).

[5] *See* OJJDRP Priorities, https://ojjdp.ojp.gov/about/ojjdp-priorities.

revolution in juvenile justice for the last 20 years (E.g., Trejos-Castillo, et al. 2020; Harvell, et al. 2019; Fondacaro, et al. 2015; Withrow 2003).

As with reforms to dispositional outcomes, one proposed tool for shifting away from pretrial detention is the use of RAIs. By diverting low-risk youth away from a carceral environment early (if they can be identified with an effective RAI), more youth can be monitored in their communities, and resources can be allocated to higher risk youth who stand to gain more from additional interventions. The Juvenile Detention Alternatives Initiative ("JDAI"), developed by the Annie E. Casey foundation, has touted the use of RAIs in juvenile detention decisions since its inception in 1993 (Steinhart 2006).

> [As of 2006], local detention risk assessment instruments have been implemented at JDAI sites in more than 15 states. These RAIs are not clones of one another. Each one is tailored to fit state and local laws, policies, and procedures. They have different names and formats. But they are all grounded in the principles of objectivity, uniformity, and risk assessment . . . , and they incorporate other common design elements (Steinhart 2006, p. 8).

By 2016, over 300 local jurisdictions from 39 states and the District of Columbia, comprised of roughly 10 million youth aged 10 to 17 (or 30% of the national total) had implemented a pretrial detention risk assessment (Casey Foundation 2016). Risk factors from a selection of JDAI tools are shown below in Table 1. Most tools at JDAI sites incorporate the youth's most serious current offense, prior delinquency findings in the last 12 months, other currently pending charges, and history of failure to appear or running away from home.

TABLE 1-1. Examples of Pretrial Juvenile Detention RAIs

Location				
Davidson County, Tennessee	*Atlantic, Camden, Essex, Hudon, & Monmouth Counties, New Jersey*	*Cook County, Illinois*	*Multnomah County, Oregon*	*State of Virginia*
Factors				
Has youth been found incompetent to stand trial?	Most severe current offense	Most serious current offense	Most serious current offense	Most serious current offense
Is the youth on strict home detention?	Number of current counts/charges	Prior authorized secure detentions	Additional current offenses	Additional current offenses
Most serious current offense	Number of prior delinquency adjudications	Past delinquency adjudications	Legal status/current court contact	Prior delinquency adjudications
Additional current offenses	Most severe prior adjudication	Current case status (case pending/probation/not active)	Prior delinquency adjudications	Petitions currently pending
Prior delinquency adjudications in last 12 months	Number of warrants for FTA	Number of petitions pending adjudication	Mitigating factors	Supervision status
Petitions currently pending	Current involvement in a detention alternative	Current involvement in detention alternative	Aggravating factors	History of FTA
Current court contact/supervision	Any prior flight from a residential delinquency placement			History of runaway
History of court contact/supervision in last 12 months				
History of FTA in last 12 months				
Source				
(this study)	(Maloney & Miller 2015)	(Steinhart 2006)	(Steinhart 2006)	(Steinhart 2006; Chappell, et al. 2013)

Notes: "Offense" indicates an alleged offense or charge. "FTA" indicates failure to appear to court.

This study is the first to analyze implementation of a pretrial juvenile detention RAI in the state of Tennessee. In Tennessee, while the use of a risk and needs assessment has been mandated at disposition, the use of a pretrial detention RAI has not been the subject of formal legislation. The same two principles that guide juvenile detention in most states – risk of danger to the community and risk of flight – guide the detention decision in Tennessee. *See* TENN. CODE ANN. § 37–1–114(c)(7). Furthermore, while the rate of detention varies considerably across states, Tennessee is close to the national average. Tennessee detains roughly 44 juveniles per 100,000 youth aged 10 to 18, which is closer to the national average of 49 than most other states – only 14 states had rates between 39 and 59 per 100,000 (Hockenberry 2020). Another 17 states plus the District of Columbia had detention rates over 59 per 100,000, and 19 states had detention rates less than 39 per 100,000. These features make county-level variation in detention policy in Tennessee an excellent candidate for examining the effects of RAI implementation.

1.2.2 Risk Assessment Instruments

Tools for algorithmic risk assessment have grown exponentially in popularity over the last two decades in the adult criminal justice context. As one scholar has put it: "It is an understatement to refer to risk assessment as a criminal justice trend. Rather, we are already in the risk assessment era." (Starr 2015, p. 205). Broadly speaking, a risk assessment instrument ("RAI") is a statistical tool – often a checklist or small spreadsheet – that compiles information about a case and offers a recommendation to decision-makers about a specific outcome (Stevenson & Doleac 2022; Slobogin 2021; Garrett & Monahan 2020). RAIs can be used at detention, sentencing, and parole hearings to determine a number of outcomes, including whether someone should be detained pending trial, how lengthy a sentence should be given after conviction, whether a sentence should be carceral or not, what probation conditions should be assigned, and whether an inmate should be released early (Slobogin 2021; Garrett & Monahan 2020; Viljoen, et al. 2019; Albright 2019; Berk 2017). Some

scholars have even proposed introducing risk assessment tools to police stop-and-frisk decisions (Goel, et al. 2016).

Based on how they are developed, risk assessment instruments can be divided into two broad categories: consensus-based tools and empirically based tools (Steinhart 2006). *Consensus-based tools* are developed through meetings with juvenile justice stakeholders, such as judges, attorneys, probation officers, and law enforcement. The stakeholders then borrow risk factors found to be predictive in the literature and choose weights and cut-off scores according to their own notions of which youth ought to be detained. For example, the Berks County, Pennsylvania RAI evaluated by Steinhart (2008), like most JDAI sites, is a consensus-based tool. Berks County juvenile court staff weighted each possible question response such that the tool has a possible score of 52, and set the threshold at which detention would be recommended at 15. While not driven by local data, consensus-based tools are feasible for local jurisdictions to create, incorporate feedback from officials who are already making detention decisions, and provide objective criteria to make a detention recommendation. The downside, of course, is that the risk score generated by a consensus-based tool does not indicate the probability of any outcome. *Empirically based tools*, on the other hand, are developed through statistical analysis of samples of actual cases. These types of tools select risk factors that are predictive of recidivism or failure-to-appear and assign weights to the risk factors to produce a score that correlates with the probability an arrestee will reoffend. For example, New York City's RAI, evaluated by Fratello, et al. (2011), began with a survey of stakeholders for risk factors they perceived were important, but then collected data on all proposed risk factors and followed the cases of actual youth on whom data was collected. The results were used to narrow the risk factors used in the final RAI to only those predictive of rearrest or failure to appear. Because the instrument was calibrated with data from actual cases, it is an empirically based tool.

Based on how they are operated in practice, RAIs can further be divided into three types: unstructured clinical assessment, strictly actuarial, and structured professional judgment (Slobogin 2021; Morelli 2019; Stevenson 2018; Slobogin 2018; Slobogin 2013; Vincent, et al. 2012). *Unstructured clinical assessments* allow the most freedom to evaluators by permitting the clinician to decide which risk factors to assess (and how much weight each one should be given) in a case. These tools may be as simple as a checklist that a decision-maker must get through before making a preordained decision (Maloney & Miller 2015). *Strictly actuarial tools* use historical data on a sample of offenders to build statistical algorithms with regression analysis or machine learning, which are then used to make a probability estimate of an offender's short-term recidivism of failure to appear. In the juvenile justice context, one example of an actuarial tool is the Youth Level of Service/Case Management Inventory 2.0, which uses a number of different factors to estimate a youth's risk and needs level, and has been statistically validated in several studies (Hoge 2017). *Structured professional judgment tools* provide a fixed set of risk factors that must be assessed by an evaluator, with predetermined weights for scoring, but do not dictate the outcome for the decision-maker. Instead, structured professional judgment tools provide specific information to aid the decision-making process. Examples of structured professional judgment tools in the juvenile justice context include the Early Assessment Risk Lists for Boys (EARL-20B) and Girls (EARL-21G) and the Structured Assessment of Violence Risk in Youth (SAVRY); both use a list of risk factors developed from scientific research and associated with a score in the set {0, 1, 2} or {"Low," "Moderate," "High"} by the evaluator across risk domains (Augimeri, et al. 2017; Borum, et al. 2017).

Regardless of their classification, one leading scholar has repeatedly emphasized that, from both legal and scientific perspectives, all RAIs should satisfy three main principles: fit, validity, and fairness (E.g., Slobogin 2021; Slobogin 2018; Slobogin 2017; Slobogin 2013). RAIs should "fit" the question presented; they should be designed to address the precise legal question at issue in the

decision. RAIs should be "valid," in that they make accurate statistical predictions about the outcomes they are supposed to predict for the population over which they are supposed to make the prediction. And RAIs should be "fair," in that they do not consider membership in protected classes or other immutable characteristics as risk factors and can be challenged through the traditional adversarial process.

While the focus of much previous scholarship has been on the rise of RAIs in the adult criminal justice context, the juvenile justice system has witnessed a concurrent rise in the use of RAIs (Morelli 2019; Berk 2019; Slobogin 2013; Chappell, et al. 2013). Many of the uses, costs, and benefits of RAIs in the juvenile justice context are the same as those in the adult criminal justice context (Stark 2022; Berk 2019). One distinction between juvenile and adult RAI implementation, however, is the maturity and cognitive development of youth. In the U.S. Supreme Court's own words, youth possess "a lack of maturity and an underdeveloped sense of responsibility"; they are "more vulnerable or susceptible to negative influences and outside pressures, including peer pressure"; and their character (and personality traits) are "not as well formed as that of an adult." *Roper v. Simmons*, 543 U.S. 551, 569–70 (2005). Thus, our society does not subject them to the death penalty, *Roper*, 543 U.S. at 578, life imprisonment without parole for non-homicide offenses, *Graham v. Florida*, 560 U.S. 48 (2010), or mandatory minimum sentences of life imprisonment without parole, *Miller v. Alabama*, 567 U.S. 460 (2012). On the other hand, we also know that people age out of committing crime — that is, many more crimes are committed by people aged 18 to 25 than those aged 50 to 54.[6] This creates a legal and social tension — a "double-edged sword" — in the sentencing of youthful offenders: legally, our jurisprudence views youth with leniency, but empirically, any RAI trained on recidivism views youth as an aggravating risk factor (Stevenson &

[6] *See* U.S. Dept. of Justice, 2019 Crime in the United States, https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/topic-pages/tables/table-39.

Slobogin 2018). The comparably fluid characteristics of youth thus adds a challenge to the development of RAIs in juvenile justice (Slobogin 2013; Slobogin & Fondacaro 2011).

Despite their growing popularity, empirical research on the effect of implementing juvenile pretrial detention RAIs is sparse. Viljoen, et al. (2019) conducted a meta-analysis on the effect of RAI implementation on rates of pretrial detention and postconviction placement. The authors analyzed 22 studies of both adult and juvenile RAIs, the majority of which used a simple pre-post design. The principal results were that RAIs decrease carceral placements and did not increase recidivism, but that these outcomes were also statistically weak. Furthermore, the authors concluded that, because of study results pointing in opposite directions, "research is insufficient to offer conclusions" with respect to the effect on racial/ethnic disparities from RAI implementation (Viljoen, et al. 2019, p. 410).

What research does exist often does not include rigorous empirical analysis, relying instead on basic pre-post designs like those reported in Viljoen, et al. (2019). For example, Puzzanchera, et al. (2012), Fratello, et al. (2011), Steinhart (2008), Withrow (2003), and Feyerherm (2000) all examine the effects of adopting a pretrial juvenile detention RAI created by a local jurisdiction, and all rely on before-and-after data or simple descriptive statistics to support their results. Casey Foundation (2016) also reports before-and-after results for JDAI sites across the United States. Generally, these pre-post studies have found that implementation of RAIs is associated with reduced use of detention and lower rates of recidivism. However, no studies analyze the predictive accuracy of the RAI under review.

Feyerherm (2000) analyzed the impact of a juvenile pretrial detention RAI implemented in Portland, Oregon as part of the Casey Foundation's JDAI. Comparing two samples of almost 10,000 cases before and after implementation of the RAI, the study found a significant decline in the rate at which all youth were detained. The use of detention decreased from 18% of cases to

8.7% of cases. And while the number of delinquency cases increased, the average monthly number of youth in detention decreased by almost 40%. Furthermore, the rate at which non-white youth were detained decreased more than the rate at which white youth were detained, indicating racial and ethnic disparities in use of detention between white and non-white youth decreased.

Withrow (2003) evaluated the predictive accuracy of a juvenile detention RAI implemented in Sedgwick County, Kansas, using a sample of just over 1,000 youth who were arrested during a one-year research window. The tool had only four criteria on which it based the detention recommendation: most serious instant offense, legal status, aggravating factors, and mitigating factors. Each factor was scored, and those youth who scored above threshold were recommended for detention. The study analyzed the recidivism rate, defined as contact with the juvenile court in the following two years, among both detained and released youth. Of those youth who were released, 46% reoffended within two years; of those youth who were detained, 68% reoffended within two years. A chi-square analysis also indicated there was a statistically significant difference between the detained and released groups with respect to their rate of recidivism. However, because released youth were rearrested at a similar rate to released youth who were not rearrested, the study concluded that the Sedgwick County instrument "in its present format is at best moderately useful at differentiating between suspected juvenile offenders with respect to their risk of reoffending." (Withrow 2003, p. 4).

In 2006, New York City created its own juvenile detention RAI in partnership with the Vera Institute of Justice. To create the instrument, researchers surveyed local juvenile justice stakeholders for risk factors that were perceived relevant to predicting a youth's rearrest or failure to appear. Then, the research team followed the cases of all youth who were arrested during a pilot phase. A probation officer completed the battery of questions for all youth, and Vera researchers analyzed the data for risk factors that were relevant to the pretrial detention decision. Using the

results of the analysis, a pretrial detention RAI was developed and statistically weighted. Fratello, et al. (2011) report on the impact on detention use and recidivism in the years following implementation of both the new RAI and community-based alternatives to detention. After implementation, juvenile rearrest rates decreased from 26% of cases to only 18% of cases. In addition to a reduction in recidivism, use of detention dropped from an average of 32% of cases to 24% of cases. Youth in the low-risk group saw the use of detention decrease the most, dropping from 24% to 9%. Youth in the highest-risk group, however, saw detention rates increase from 49% to 72%.

Berks County, Pennsylvania also developed its own juvenile detention RAI, modeled after those used at JDAI sites. Under the Berks County instrument, youth could trigger a "mandatory hold" criteria, such as a serious offense or arrest warrant requirement. Those who did not trigger a mandatory hold were assessed with the instrument, which provided one of three possible recommendations: (1) secure detention, (2) detention alternative (such as a community-based program or electronic monitoring), or (3) release. Steinhart (2008) reports descriptive statistics from an analysis of 323 referrals for a detention decision. The overall detention rate was 80% of all referrals. However, this was driven in large part by the automatic detention criteria in the instrument – more than half of all detentions were due to mandatory holds. Furthermore, of cases recommended for release or a detention alternative, 40% received an override to detention. With respect to race and ethnicity, the Berks County RAI recommended detention at similar rates for white, black, and hispanic youth; however, non-white youth accounted for a disproportionate share of referrals to the detention center by local law enforcement, when compared to the Berks County population.

An instrument modeled after the Berks County RAI was then developed and implemented in Allegheny County, Pennsylvania. Descriptive analyses on a sample of 2,098 detention screening

assessments (consisting of 1,940 individual youth) were performed by Puzzanchera, et al. (2012). Overall, 74% of cases resulted in detention. Like the Berks County RAI, a majority of all detentions (55%) came from "mandatory holds," and, of those youth who were assessed and recommended for a less-restrictive alternative or release, 40% of cases were overridden to detention. On the other hand, overrides down to less restrictive alternatives or even release occurred in 23% of cases. Thus, detention rates overall only marginally decreased after implementation of the RAI. With respect to race and ethnicity, the instrument recommended detention for white, black, and Hispanic youth at roughly the same rate, indicating little to no evidence of disproportionate minority confinement as a result of the instrument. However, like in Berks County, the rate at which non-white youth were referred to the detention center was largely disproportionate to the percent of non-white youth in the county population.

Finally, in its report on the 25th anniversary of the JDAI, the Annie E. Casey Foundation published results showing decreases in average daily population of 43% and an average decrease in annual admissions of 49% after local jurisdictions adopted JDAI practices (Casey Foundation 2016). Jurisdictions also saw declines in measures of juvenile offending. The number of felony petitions fell by an average of 39% and the number of delinquency petitions fell 31% following adoption of JDAI practices. Further, jurisdictions witnessed a 57% average decrease in the number of juvenile arrests and a 47% decrease in referrals to local detention centers.

In sum, little empirical work has rigorously examined the effect of implementing a juvenile pretrial detention RAI – most empirical studies evaluate limited outcomes and use basic statistical approaches. Because of limited data availability and policies that differ at the local level, prior researchers have concluded that "this type of research is challenging to conduct." (Viljoen, et al. 2019, p. 410). This chapter contributes to the literature by using more sophisticated econometric

techniques to examine not only the predictive accuracy of an RAI, but also the effect that implementation of an RAI had on arrest rates overall.

1.3 The Davidson County JDRA

1.3.1 Tennessee Law on Juvenile Pretrial Detention

Under Tennessee law, not every arrested juvenile is eligible for detention. Only those who meet certain criteria may be detained pending adjudication. *See* TENN. CODE ANN. § 37–1–114. For example, a juvenile may be detained if there is probable cause supporting a crime against a person resulting in, or involving the likelihood of, serious injury or death to the victim. Similarly, if a juvenile is already on probation or has current court cases, the youth may be detained if charged with "any other delinquent offense involving the likelihood of serious physical injury or death." § 37–1–114(c)(2). A juvenile may also be detained for "unlawful possession of a handgun or carrying of a weapon," or for escaping a secure juvenile detention facility. Finally, to detain a juvenile, in addition to satisfying one of the offense conditions, there must be "no less restrictive alternative that will reduce the risk of flight or of serious physical harm to the child or to others." § 37–1–114(c)(7). This requirement – similar to the standards governing adult pretrial detention – is common to all arrested juveniles, regardless of the offense charged.

Assessing a juvenile's risk of reoffending and risk of flight were the two central goals of Davidson County when developing the JDRA, and they remain the instrument's primary purpose today. These two outcomes are the focus of virtually every pretrial detention RAI, whether for adults or juveniles (Hamilton 2022; Stark 2022; Slobogin 2021; Viljoen, et al. 2019; Kleinberg, et al. 2018; Berk, et al. 2016; Chappell, et al. 2013). The focus of this study, however, is limited to assessing the accuracy of the JDRA in predicting rearrests, because Davidson County did not collect individual-level data on failures to appear.

1.3.2 Development of the Tool

The Davidson County JDRA was developed through a partnership with the Crime and Justice Institute, a division of Community Resources for Justice. The process began with forming an implementation team, which consisted of Juvenile Court and detention staff, magistrates, public defenders, and prosecutors. The combined team of stakeholders used a consensus-based model to develop the tool:

> The implementation team initiated development of the tool in October 2018. The initial phase of the process included examination of the local detention population through a review of 50 random, recent cases of youth who were eligible for secure detention prior to adjudication. Once the cases were selected, there was discussion of which elements relating to those cases would be considered when making a detention decision under existing practice. The elements included: current offense information, prior adjudications and petitions, current and prior court contact or supervision, and incidences of failures to appear or escapes. The elements that were agreed to be important to the detention decision were then converted to questions for the JDRA. (Crime and Justice Institute 2019, p. 3).

Like other consensus-based tools, the JDRA implementation team "assigned a number of points based on the perceived severity of the element," and chose an arbitrary threshold score based on those point assignments. The instrument was piloted from April to June 2019, and it was fully implemented in July 2019.[7] No formal statistical validation has been performed on the JDRA.

1.3.3 How the JDRA Works

The JDRA is administered by detention center staff when a juvenile has been arrested and has just arrived at intake (typically within hours of arrest). The instrument has two sub-parts. Part A is comprised of five "screening" questions, any one of which can result in the automatic detention of the youth with no further inquiry, i.e., a "mandatory hold." These include whether the youth resides in Davidson County (to trigger inquiry about fugitive/runaway status), whether the youth

[7] The piloting program mainly included training detention staff how to use the excel spreadsheet that would record JDRA reports, test the systems, and generate enough data to observe variation in JDRA inputs and detention recommendations. No substantive changes were made to the JDRA during this time period, and no robust statistical analysis could be performed because of the small sample size. (Crime and Justice Institute 2019).

was arrested on a warrant where the judge has ordered detention, whether the youth has been found incompetent to stand trial or is currently on strict home detention, and whether the current charge involves a felony against a person or weapon possession. Part B is comprised of eight "assessment" questions, each of which is multiple choice and has a score associated with each possible answer. These questions inquire about the youth's most serious current charge, delinquent history, current court contact, and history of escape, runaway or failure to appear.

If a youth is not automatically detained under Part A, the assessment proceeds to Part B. Once Part B is completed, the instrument tallies the total score and makes a recommendation of either "Release" or "Secure Detention." Neither the youth nor the detention staff ever learns what the youth's score was or the number of points associated with any risk factor. This is accomplished through locking and hiding cells and formulae in the Excel spreadsheet used to administer the JDRA. The detention officer places an "X" next to the multiple-choice response selected for each risk factor. Then, a hidden formula sums the scores associated with each answer choice and a logic function displays whether the score is above or below a pre-determined threshold. The only result the detention officer sees is whether the youth must be automatically detained, and if not, whether release or detention is recommended. This limits any manipulation of the instrument or of responses entered.

The JDRA's recommendation is then the presumptive detention decision. It can be overridden only by the district attorney general or a magistrate judge. The district attorney can override by releasing a youth for whom the JDRA recommends secure detention. A magistrate judge can override a recommendation of either release or secure detention. The JDRA recommendation can be overridden irrespective of whether the decision was made under Part A or if the assessment proceeded through Part B.

Prior to the JDRA's implementation, every youth who was charged with a detention-eligible offense under TENN. CODE ANN. § 37−1−114 was detained in Davidson County, pending a detention hearing to determine (1) probable cause and (2) no less restrictive alternative to ensure a low risk of recidivating and a low risk of flight. After the JDRA's implementation, only those youth who trigger one of the criteria in Part A of the assessment are automatically detained pending a full detention hearing. Those youth who proceed to Part B and score above threshold on the JDRA are detained pending a full detention hearing. However, those youth who score below threshold are presumed not to be at risk of recidivating or at risk of flight. Because one of those risks is a necessary element of detaining a juvenile, these youth are immediately released. Thus, the JDRA, by design, should have the effect of releasing youth who would have remained in detention.

Compared to other juvenile detention RAIs, the Davidson County JDRA tracks closely the tools developed at JDAI sites. As shown in Table 1, these tools rely mainly on information available about the juvenile at detention intake and are thus more rudimentary than RAIs such as the EARL-20B and the SAVRY. Given the JDRA's similarity to pretrial juvenile detention RAIs that have been implemented elsewhere in the country, this research will contribute to the relatively small literature on the effect of implementing these shorter RAIs (Maloney & Miller 2015; Chappell, et al. 2013; Puzzanchera, et al. 2012; Fratello, et al. 2011; Steinhart 2008).

1.4 Data & Methodology

To answer the research questions in this chapter, I will draw on three different sources of data. The first – the JDRA data – is comprised of risk assessments completed on arrested juveniles at the Davidson County Juvenile Detention Center. It contains information on each risk factor considered by the JDRA, the youth's risk score, and whether the decision was overridden by the prosecutor or a magistrate. The second – Tennessee Incident Based Reporting System ("TIBRS") data – is a publicly available dataset on statewide arrests. It contains the aggregate number of

arrests per county-month, reported by offense type and characteristics of offenders, such as age, race and gender. The third – Davidson County Juvenile Detention Center ("DCJDC") data – contains facility-level information, by month, reported by the private contractor who managed the Davidson County Juvenile Detention Center during the time period in this study. It is a hand-coded dataset with the number of monthly intakes and releases, as well as the race, age and gender composition of the detention population.

1.4.1 JDRA Data

The JDRA data contain each risk assessment completed at the Davidson County Juvenile Detention Center on arrested youth from July 2019 to April 2022. During that period, 974 individual juveniles were arrested and a total of 1,414 assessments were completed (some juveniles were rearrested one or more times).

Of the 1,414 risk assessments completed, 62% (879) resulted in automatic detention of the youth under Part A of the JDRA. I refer to this sub-sample as "auto-detained" youth. The remaining 38% (535) of assessments proceeded to Part B of the JDRA, meaning the youth had some chance of release. I refer to this sub-sample as "assessed" youth. Table 2 shows the distribution of these sub-samples, and further reports on the JDRA recommendation, any overrides, and the actual detention decisions made for each sub-sample.

The distinction between auto-detained youth and assessed youth is not only important for identifying the statistically "treated" youth, but also because it delineates the amount of information in the dataset for each sub-sample. For auto-detained youth, only Part A risk information is available because, once an automatic detention condition is triggered, the remainder of the assessment is not completed. Thus, the JDRA Data contains the full panoply of risk factors only for the 535 assessed youth. In addition to the questions asked in the JDRA, this dataset also contains the date the juvenile was arrested and assessed, along with the juvenile's age and unique

juvenile court ID. Unfortunately, the JDRA does not contain the juvenile's gender, race, or specific charge under the Tennessee code.

The overall detention rate in the sample was 67.8% (959 of 1,414), and the rate at which the JDRA recommended detention was slightly higher at 69.7% (985 of 1,414). The discrepancy is the result of overrides down from detention to release outweighing overrides up. The overall detention rate was driven in large part by the high number of automatic detentions from Part A of the JDRA – 88% (844 of 959) of all detentions were from mandatory holds. Thus, among youth who were assessed with the JDRA and eligible for release, 19.8% (106 of 535) were recommended for detention and 21.5% (115 of 535) were actually detained. The relatively low detention rates among assessed youth are a testament to the JDRA's goal of releasing youth who receive a low risk assessment, and the adherence of the Juvenile Court to the JDRA's detention criteria.

The slight difference between actual and recommended detention decisions is the result of overrides. A small number of cases – 4.1% (58 of 1,414) – were overridden by the district attorney or a magistrate. Davidson County's goal was to keep this figure below 20%, and that goal was successfully achieved. More cases received an override down to release (42) than cases that received an override up to detention (16). Among automatic detentions, 35 were overridden to release, and 7 of the 106 detention recommendations among assessed youth were overridden to release. This is typically the result of a less restrictive alternative that is discovered shortly after the child is arrested, such as a relative willing to keep the child on strict home detention for the duration of the case. Thus, of all detention recommendations from the tool, 4.3% (42 of 985) received an override. Of all release recommendations from the tool, 3.7% (16 of 429) received an override. The low incidence of overrides indicates that Davidson County decision makers largely adhered to the instrument.

TABLE 1-2. JDRA Recommendations & Actual Decisions in Sample

	Assessed	*Auto-Detained*	*All*
Detention Recommended	106	879	985
Release Recommended	429	N/A	429
Total	535	879	1,414
Override (Detain to Release)	7	35	42
Override (Release to Detain)	16	N/A	16
Total	23	35	58
Actual Detentions	115	844	959
Actual Releases	420	35	455
Total	535	879	1,414

Notes: All JDRA assessments from Davidson County, July 2019 through April 2022. Youth who meet dispositive threshold criteria and are automatically detained without further inquiry are labeled "Auto-Detained." Youth who are not automatically detained, who proceed to Part B of the JDRA, are labeled "Assessed." The top panel represents the recommendation of the JDRA as to release or secure detention. The middle panel presents a count of "override" cases in which either the prosecutor or a magistrate reverses the recommendation of the JDRA. The bottom panel presents the resulting actual detention decisions.

Table 3 shows the number of juveniles in the sample, broken down by the number of times the youth was arrested. For example, the last row indicates 4 juveniles were arrested a total of 6 times in the sample time-period (these 4 juveniles are thus associated with 24 completed risk assessments). Because 269 youth were rearrested at least once, statistical analysis of the recidivism rate in the sample can be performed.

TABLE 1-3. Sample of Juveniles & Arrests

No. of Arrests	No. of Juveniles	
1	705	72.4%
2	162	16.6%
3	64	6.6%
4	26	2.7%
5	13	1.3%
6	4	0.4%
Total	974	100.0%

Notes: Count of unique juveniles in JDRA dataset, per total number of arrests. For example, 13 juveniles were arrested a total of 5 times during the time period captured by the dataset.

The distribution of assessments by month in the sample is presented in Figure 1. The number of assessments (i.e. the number of arrestees brought to the juvenile detention center) drops precipitously with the onset of the Covid-19 pandemic. This is likely due to pandemic-related shut-downs and increased parental supervision when both parents and children were forced to stay home. Furthermore, because adolescents have a heightened sensitivity to peer pressure and often commit offenses in groups, the relative isolation from the pandemic may have led to lower overall rates of offending, and thus lower overall rates of referral to the juvenile detention center (Buchanan, et al. 2020). The significant decline in assessments, however, appears to lag behind the onset of the Covid pandemic between March and June of 2020. This may be due to the initial freedom youth felt when schools shut down but had not yet reconvened online, or due to lags between school responses and employer responses decreasing parental oversight in the short run. Further, the delay may be the result of Tennessee's slow pandemic response, as Tennessee was a state that emphasized individual freedoms (like choosing to wear a mask), and its governor never implemented a stay-at-home order. For example, Abrams (2021) links overall declines in crime for both juveniles and adults to stay-at-home orders in large metropolitan areas, and finds significant declines in crime in the week or two preceding the stay-at-home order that persist after the orders went into effect.

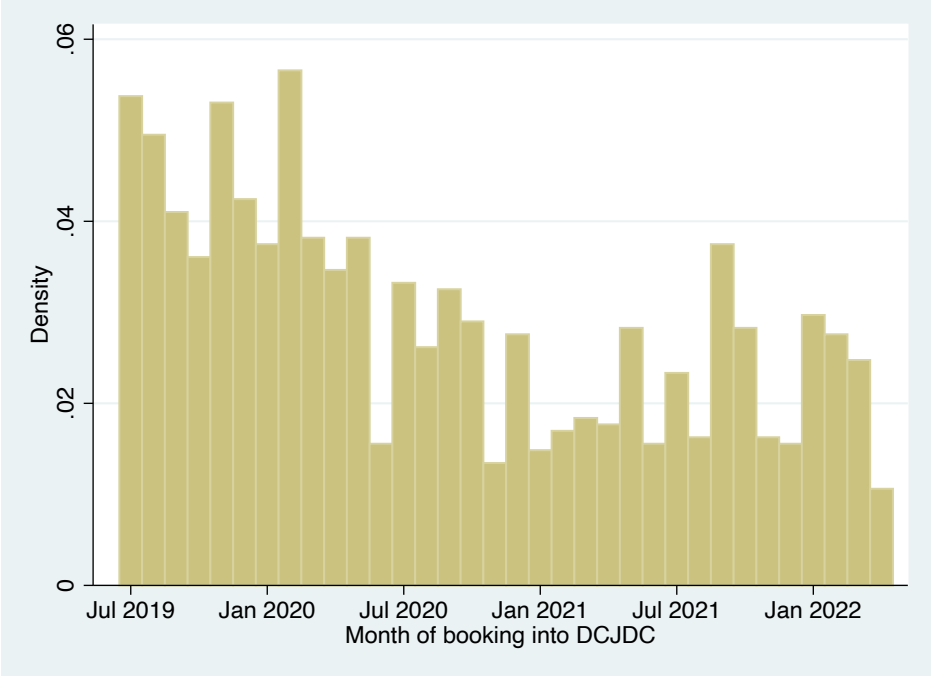

FIGURE 1-1. Distribution of Monthly Assessments

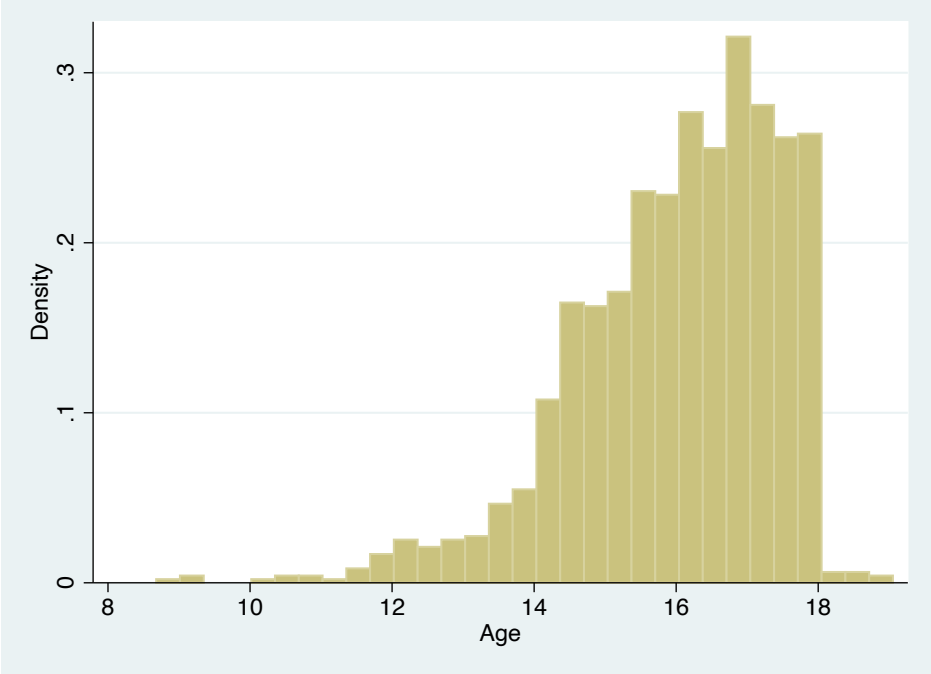

FIGURE 1-2. Age Distribution [8]

[8] Some mass exists above age 18 because juvenile court jurisdiction can extend to age 19 in Tennessee. *See* T.C.A. §§ 37-1-131(a)(4); 37-1-102(b)(4).

Figure 2 depicts the age distribution among all assessments in the sample. The average age in the sample is 16, though the majority of arrestees are between 16 and 18. This distribution is consistent with studies of other juvenile detention RAIs. For example, Steinhart (2008) and Puzzanchera, et al. (2012) both report that 75% of detention referrals were between ages 15 and 17. Stevenson (2017) reports an average age in juvenile facilities of 16.5 and Chappell, et al. (2013) reports an average age in juvenile detention of 15.4.

To evaluate the predictive validity of the JDRA, I will calculate the area under the receiver operating characteristics curve ("AUC"), the statistic traditionally used in the risk assessment literature (E.g., Stevenson & Doleac 2022; Slobogin 2018; Augimeri, et al. 2017). I will also calculate the positive predictive value ("PPV") and negative predictive value ("NPV"), which measure predictive accuracy.

The AUC indicates the probability that a randomly selected recidivist receives a higher risk classification than a randomly selected non-recidivist (Slobogin 2021; Singh 2013). In the binary case (such as where only one score cutoff is used), the AUC can be expressed mathematically as follows:

$$AUC = \frac{1}{2}\left(\frac{TP}{TP + FN} + \frac{TN}{FP + TN}\right)$$

The RAI literature generally considers an AUC between 0.55 and 0.63 as "fair," between 0.64 and 0.7 as "good," and over 0.71 as "excellent" (DeMichele, et al. 2023; Slobogin 2021; Desmarais, et al. 2016).

The PPV indicates the proportion of arrestees predicted to recidivate and who did so. Similarly, the NPV indicates the proportion of arrestees predicted not to recidivate and in fact did not do so. Thus, the PPV and NPV can be thought of as measures of the "correctness" of the instrument.

Mathematically, the PPV and NPV are given as follows:

$$PPV = \frac{TP}{TP + FP}$$

$$NPV = \frac{TN}{TN + FN}$$

In the specifications above, *TP* stands for "true positive," *FP* stands for "false positive," *TN* stands for "true negative," and *FN* stands for "false negative." In the pretrial risk assessment context, the literature considers a "true positive" an offender who was predicted to recidivate and who did. Similarly, a "false positive" would be an offender who was predicted to recidivate but did not. A "true negative" would be an offender who was predicted *not* to recidivate and who did not; and a "false negative" would be an offender who was predicted *not* to recidivate but who did.

In my analysis, I code any new arrest (observed as a new contact with the detention center) for any new offense, felony or misdemeanor, as recidivism. I code in this manner because the data do not contain information on specific charges for each juvenile. I do not observe if the arrest is for an offense against a person, property, or society. Thus, insofar as recidivism risk varies by categorization of offenses, I am unable to discern that risk due to data limitations. This is a limitation because it may be desirable to predict recidivism risk for only a subset of offenses. For example, as discussed in Chapter 2, the Public Safety Assessment calculates a separate risk score for violent and general recidivism.

I code a JDRA recommendation of secure detention as a prediction of recidivism and a JDRA recommendation of release as a prediction of no recidivism. Unfortunately, this method of coding JDRA recommendations, while mathematically necessary, is short-sighted. As Slobogin (2021) points out, RAIs are not designed to make an exact prediction of recidivism (or not). RAIs are designed to make a risk classification and provide information about the probability of recidivism for a class of offenders with similar scores. This makes the AUC an imperfect measure

of RAI accuracy because it misconstrues the meaning of an RAI prediction. Further, AUCs measure only how well a tool discriminates between discrete outcomes (for example, rearrest or not). The measure is entirely independent of the base rate of offending (Singh 2013).

Next, to test how well the JDRA score correlates to predictions of recidivism, I implement a regression discontinuity design. This approach compares the recidivism rate of youth with scores above the cutoff to youth with scores below the cutoff (the discontinuity). The identifying assumption is that youth with JDRA scores close to the cutoff are similar along unobservable characteristics that contribute to their propensity for reoffending. Thus, regression discontinuity estimates are most accurate for youth just above or below the cutoff and can become biased as the bandwidth around the cutoff grows.

Because of overrides, not all youth who score above threshold are detained and not all youth who score below threshold are released. I therefore use a "fuzzy" regression discontinuity design, where the probability of detention, given a JDRA score, is used to instrument for a sharp discontinuity at the JDRA score threshold. The specification for the fuzzy regression discontinuity design is given by

$$y_i = \beta \Pr\left(Detained_i | JDRAscore_i\right) + f\left(JDRAscore_i\right) + \epsilon_i$$

where y_i is an indicator variable equal to 1 if juvenile i is rearrested, $f\left(JDRAscore_i\right)$ is a polynomial function of the JDRA score, ϵ_i is a random error term, and $\Pr\left(Detained_i | JDRAscore_i\right)$ is the estimated probability a youth is detained, given the JDRA score. The first stage equation used to estimate this probability is given by

$$\Pr\left(Detained_i | JDRAscore_i\right) = \gamma C_i + g\left(JDRAscore_i\right) + u_i$$

where C_i is an indicator variable equal to one if juvenile i scored above the cutoff threshold,[9] $g(JDRAscore_i)$ is a polynomial function of the JDRA score, and u_i is a random error term. Substituting this first stage equation into the fuzzy regression discontinuity specification above yields the following reduced form:

$$y_i = \beta(\gamma C_i + g(JDRAscore_i) + u_i) + f(JDRAscore_i) + \epsilon_i$$

$$= \beta\gamma C_i + \beta g(JDRAscore_i) + f(JDRAscore_i) + \beta u_i + \epsilon_i$$

In the reduced form, the product $\beta\gamma$ is reported as a single coefficient and represents the treatment effect at the discontinuity (the score cutoff).

1.4.2 TIBRS Data

The Tennessee Incident Based Reporting System reports information on arrests made by local law enforcement agencies throughout the state. The data are aggregated at the county level and reported by categories of information about the offense or offender. For example, TIBRS reports the number of arrests for murder, assault, and robbery, but not individual cases of murder, assault, and robbery. Similarly, TIBRS reports the aggregate number of arrests by race, ethnicity, and gender, but not demographics on any individual case. I extracted monthly data at the county level for all arrests (both felony and misdemeanor) between January 2016 and December 2022 for Davidson County and the twelve eligible next most populous counties: Blount, Bradley, Carter, Hamilton, Knox, Montgomery, Rutherford, Sullivan, Sumner, Washington, Williamson, and Wilson.[10] Only Davidson County implemented a juvenile pretrial detention RAI during this period.

[9] The JDRA scores and cutoffs are not reported for confidentiality purposes, but a redacted histogram of JDRA scores (the running variable) with the cutoff score marked is presented in Appendix Figure 2. No bunching of the running variable occurs around the cutoff.

[10] Shelby County (Memphis) was omitted from the analysis because a Department of Justice investigation and consent decree altered detention practices already based on some sort of risk assessment, and then-Attorney General Jeff Sessions terminated all civil rights consent decrees, including the one with Shelby County Juvenile Court, when the

The main dependent variable in the TIBRS data is the county-month juvenile arrest rate, which I calculate as the number of juvenile arrests per 10,000 residents using population estimates from TIBRS. In addition to offenses, TIBRS reports the arrest rate by race (American Indian, Asian, Black, Pacific Islander, White), ethnicity (Hispanic, Not Hispanic), gender (Male, Female), and age (in years). While only aggregate arrest counts are reported by each demographic characteristic per county-month, I repeat the analysis for each offense group, specific offense, and demographic characteristic to compare results.

To assess the effect of RAI implementation on arrest rates, I use a two-way fixed effect difference-in-differences model, given by

$$y_{it} = \alpha + \beta RAI_{it} + \gamma_i + \delta_t + \epsilon_{it}$$

where y_{it} represents the arrest rate across categorical groups, RAI_{it} is a dummy variable equal to one in Davidson County when the JDRA was implemented, γ_i and δ_t capture county and month fixed effects, respectively, and ϵ_{it} is a random error term. The identifying assumption for this difference-in-difference model is that the control counties and Davidson County (the treated county) would have followed parallel trends in the arrest rate but for the treatment (RAI implementation). If this assumption does not hold, coefficient estimates will be biased and will not represent a causal effect of the treatment.

TIBRS reports arrests by offense for its own offense definitions, which do not necessarily track the elements of each offense under the Tennessee code. For example, TIBRS makes no distinction between felonies and misdemeanors, and the charge in TIBRS may not be the charge a prosecutor eventually pursues. TIBRS reports offenses in four main offense groups: crimes

Trump administration took office right at the beginning of this dataset. This made Shelby County a poor comparison county for statistical purposes.

against persons, crimes against property, crimes against society, and "group B" offenses. Crimes against persons include murder and manslaughter, assault offenses, human trafficking offenses, kidnapping/abduction, and sex offenses. Crimes against property include arson, burglary, counterfeiting/forgery, embezzlement, extortion, fraud offenses, theft offenses, and robbery. Crimes against society include drug/narcotic offenses, gambling offenses, pornography and prostitution, and weapon law violations. Group B offenses include curfew/loitering/vagrancy violations, disorderly conduct, DUI, drunkenness, and liquor law violations. Individual offenses analyzed in this study include murder, negligent manslaughter, aggravated assault, simple assault, burglary, robbery, motor vehicle theft, drug/narcotics violations, drug/narcotic equipment violations, and weapon law violations.[11] No Group B offenses are analyzed individually because none should have been affected by JDRA implementation, and, as discussed below, likely weren't.

Table 4 reports the number of arrests in the TIBRS sample by demographic characteristic and offense group. Across offense groups, white arrestees make up 50% to 60% of all arrests, black arrestees comprise 38% of 49% of all arrests, and Hispanic arrestees account for 6% to 10% of all arrests. Because so few arrests are made of Pacific Islanders, native Americans, and Asians, these groups are not reported in the analyses that follow. As might be expected, the number of male juvenile arrestees outnumber females by two-to-one, and the bulk of juvenile arrestees are 16 to 17 years old.

[11] Aggravated assault is defined as "an unlawful attack by one person upon another wherein the offender uses a weapon or displays it in a threatening manner, or the victim suffers obvious severe or aggravated bodily injury involving apparent broken bones, loss of teeth, possible internal injury, severe laceration, or loss of consciousness." (TIBRS Manual, p. 59). Simple assault is defined as "an unlawful physical attack by one person upon another where neither the offender displays a weapon, nor the victim suffers obvious severe or aggravated bodily injury involving apparent broken bones, loss of teeth, possible internal injury, severe laceration, or loss of consciousness." (TIBRS Manual, p. 60). Burglary is defined as "the unlawful entry into a building or other structure with the intent to commit a felony or a theft." (TIBRS Manual, p. 68). Robbery is defined as "the taking, or attempting to take, anything of value under confrontational circumstances from the control, custody, or care of another person by force or threat of force or violence and/or by putting the victim in fear of immediate harm." (TIBRS Manual, p. 78). Drug/narcotic violations are defined as "the unlawful cultivation, manufacture, distribution, sale, purchase, use, possession, transportation, or importation of any controlled drug or narcotic substance." (TIBRS Manual, p. 81). Drug equipment violations are defined as "the unlawful manufacture sale, purchase, possession, or transportation of equipment or devices utilized in preparing and/or using drugs or narcotics." (TIBRS Manual, p. 81). Weapon law violations are defined as "the violation of laws or ordinances prohibiting the manufacture, sale, purchase, transportation, possession, concealment, or use of firearms, cutting instruments, explosives, incendiary devices, or other deadly weapons." (TIBRS Manual, p. 83).

TABLE 1-4. Number of Juvenile Arrests by Demographics, TIBRS Data 2016–2022

	Crimes Against Persons		Crimes Against Property		Crimes Against Society		Group B Offenses	
White	7,166	(55.4%)	6,845	(50.1%)	6,450	(60.2%)	383	(50.8%)
Black	5,669	(43.8%)	6,699	(49.0%)	4,118	(38.4%)	364	(48.3%)
Pacific Islander	13	(0.1%)	12	(0.1%)	17	(0.2%)	1	(0.1%)
Native American	15	(0.1%)	18	(0.1%)	17	(0.2%)	0	(0.0%)
Asian	78	(0.6%)	94	(0.7%)	111	(1.0%)	6	(0.8%)
Hispanic	915	(7.1%)	878	(6.4%)	1,084	(10.1%)	70	(9.3%)
Not Hispanic	12,026	(92.9%)	12,790	(93.6%)	9,629	(89.9%)	684	(90.7%)
Female	4,655	(36.0%)	4,264	(31.2%)	2,576	(24.0%)	260	(34.5%)
Male	8,286	(64.0%)	9,404	(68.8%)	8,137	(76.0%)	494	(65.5%)
Age 12-13	2,616	(20.2%)	1,672	(12.2%)	702	(6.6%)	107	(14.2%)
Age 14-15	4,890	(37.8%)	4,752	(34.8%)	2,748	(25.7%)	279	(37.0%)
Age 16-17	5,435	(42.0%)	7,244	(53.0%)	7,263	(67.8%)	368	(48.8%)

Notes: Number of arrests summed across all counties in sample.

Table 5 displays the average monthly juvenile arrest rate in the sample by demographics and offense groups. Davidson County tends to have a higher juvenile arrest rate than control counties during this time period, except for group B offenses. The average number of monthly arrests per 10,000 residents is also higher across all offense groups for white youth than for black or hispanic youth. As compared to the raw arrest numbers in Table 4, however, white youth are arrested at roughly twice that of black youth. This indicates a majority of arrests of black youth occur in high population counties. With respect to age and gender, males are arrested at a rate approximately double that of females, and older youth are arrested at higher rates than younger youth.

TABLE 1-5. Average Monthly Juvenile Arrest Rate, TIBRS Data 2016–2022

	Crimes Against Persons	Crimes Against Property	Crimes Against Society	Group B Offenses
Davidson County	0.5066	0.6065	0.5267	0.0179
Control Counties	0.4792	0.4696	0.3578	0.0296
White	0.3136	0.2924	0.2579	0.0166
Black	0.1644	0.1841	0.1086	0.0118
Hispanic	0.0308	0.0275	0.0311	0.0024
Female	0.1646	0.1465	0.0937	0.0100
Male	0.3167	0.3336	0.2771	0.0186
Age 12-13	0.1001	0.0591	0.0270	0.0041
Age 14-15	0.1820	0.1670	0.0987	0.0103
Age 16-17	0.1993	0.2540	0.2451	0.0143

Notes: Arrest Rate calculated as number of arrests per 10,000 residents. "Control Counties" include Blount, Bradley, Carter, Hamilton, Knox, Montgomery, Rutherford, Sullivan, Sumner, Washington, Williamson, and Wilson counties. Detailed arrest rate for all counties reported in Appendix Table 1.

1.4.3 DCJDC Data

The DCJDC data is a hand-coded dataset of facility-level information reported monthly by the private contractor managing the Davidson County Detention Center. The data contain the number of intakes and releases, and general race, ethnicity, and age information about detainees. Because the dataset is quite small ($N = 47$) and aggregated at the facility-month level, no plausibly exogenous variation exists for causal inference. Thus, I plan to use a simple pre-post model to evaluate changes in the composition of the detention center, accounting for the period in which Covid-19 pandemic emerged. Finally, because of missing data for months in which the private contractor failed to submit reports to the Juvenile Court, coupled with the small sample size, some caution should be taken when interpreting this data.

1.5 Results

1.5.1 Accuracy of the JDRA

As it is currently implemented, the JDRA performs marginally better than a coin-flip in predicting recidivism among juvenile offenders. This is borne out by examining both the PPV and AUC values of the instrument's predictions.

Table 6 shows the number of rearrests for both 90- and 30-day time horizons, broken down by the arrestee's previous JDRA recommendation and actual detention decision. Among all rearrests within 90 days of assessment, a majority previously had detention recommended (62.9%) and were actually detained (61.1%). Among all rearrests within 30 days of assessment, a slightly smaller majority had detention recommended (53.7%) and were actually detained (55.2%). This indicates the JDRA is performing at least somewhat well – more often than not, those who are rearrested were correctly recommended for detention previously. However, when arrestees are divided between those who were actually assessed by the JDRA and those who were automatically detained, it becomes apparent that the slight majority of previously detained rearrestees is driven primarily by automatic detention.

As previously stated, 985 assessments resulted in a recommendation of detention, 879 of which were automatic and 106 of which were score-based (i.e., assessed youth). Assuming that any detention recommendation is a prediction of recidivism, this indicates the JDRA has a PPV of 11.17% (110/985) on a 90-day time horizon, and 3.65% (36/985) on a 30-day time horizon. When only assessed youth are considered, the JDRA has a PPV of 21.7% (23/106) on a 90-day time horizon, and 6.6% (7/106) on a 30-day time horizon. These results indicate that when the JDRA recommends detention, it correctly predicts recidivism for, at most, 21.7% of youth. This figure drops by almost half when an automatic detention is considered as a prediction. Accordingly, the JDRA's low PPV's indicate the instrument does not make recidivism predictions well. This result

may also be the result of policymakers setting a cutoff score too low. If the threshold for a detention recommendation were increased, more youth would be released. The highest risk youth would remain detained, and the PPV value would increase if the average recidivism rate among the newly released youth is lower than the original PPV (Slobogin 2021). On the other hand, the JDRA appears to make *non*-recidivism predictions fairly well, as measured by its NPV. Because the NPV is so high, raising the cutoff score for a detention recommendation may only modestly affect the measure.

The JDRA recommended release for 429 of the 535 assessed youth. Of those 429 release recommendations, 65 resulted in rearrest within 90 days and 31 resulted in rearrest within 30 days. The JDRA's NPV is thus 84.85% ((429 − 65)/429) on a 90-day time horizon, and 92.77% ((429 − 31)/429) on a 30-day time horizon. Importantly, only assessed youth can be used in this calculation, as only youth who receive a score are eligible for release.

The substantial difference between the PPV and NPV for the JDRA is especially important if one considers a false positive − detaining a youth who will not reoffend − as the worst possible outcome. Given the potentially harmful effects of juvenile detention, one might consider detaining a youth who will not recidivate as normatively worse than releasing a youth who will recidivate. From this perspective, the JDRA's relatively high NPV is encouraging, and when compared to a low PPV, indicates more youth should be released.

TABLE 1-6. Number of Rearrests in JDRA Sample

	Assessed		*Auto-Detained*		*Overall*	
Panel A: Rearrest within 90 Days						
Detention Recommended	23	(26.1%)	87		110	(62.9%)
Release Recommended	65	(73.9%)	N/A		65	(37.1%)
Total	88		87		175	
Actual Detentions	25	(28.4%)	82	(94.3%)	107	(61.1%)
Actual Releases	63	(71.6%)	5	(5.7%)	68	(38.9%)
Total	88		87		175	
Panel B: Rearrest within 30 Days						
Detention Recommended	7	(18.4%)	29		36	(53.7%)
Release Recommended	31	(81.6%)	N/A		31	(46.3%)
Total	38		29		67	
Actual Detentions	9	(23.7%)	28	(96.6%)	37	(55.2%)
Actual Releases	29	(76.3%)	1	(3.4%)	30	(44.8%)
Total	38		29		67	

Notes: Days to rearrest calculated from date of last assessment, i.e. last arrest. Youth who meet dispositive threshold criteria and are automatically detained without further inquiry are labeled "Auto-Detained." Youth who are not automatically detained, who proceed to Part B of the JDRA, are labeled "Assessed."

Table 7 reports the AUC values for the JDRA, again for both 90- and 30-day time horizons. The AUC was calculated on both the entire sample and for the subsample of assessed youth who were eligible for release. The principal result that emerges is that the 95% confidence interval for almost every calculation includes 0.5. As previously discussed, an AUC value of 0.5 indicates the RAI performs no better than a coin-flip. When examining all youth in the sample, the JDRA appears to have an AUC *below* 0.5, meaning it actually performs *worse* than a coin-flip at predicting recidivism. Among all youth, the AUC of the JDRA is between 0.4164 and 0.4619, which indicates non-recidivists receive a detention recommendation more often than recidivists. This is likely due to the large amount of youth who were automatically detained (879), the vast majority of whom

were not rearrested within 90 days (792). Like the PPV, the accuracy of the JDRA improves when examining only assessed youth. Among these youth, the AUC of the JDRA is between 0.4925 and 0.5414, which indicates the instrument performs slightly better than chance. However, the hypothesis that the AUC is equal to 0.5 cannot be rejected at the 5% level.

TABLE 1-7. Area Under the Curve

	Assessed Youth (N = 535)	*All Youth (N = 1,414)*
Panel A: Rearrested within 90 Days		
Recommended Decision	0.5378	0.4612
	[0.48828, 0.58741]	[0.42311, 0.49925]
Actual Decision	0.5414	0.4619
	[0.49047, 0.59228]	[0.42344, 0.50033]
Panel B: Rearrested within 30 Days		
Recommended Decision	0.4925	0.4164
	[0.42763, 0.55739]	[0.35502, 0.47776]
Actual Decision	0.5118	0.4339
	[0.44096, 0.58261]	[0.37262, 0.49513]

Notes: "Recommended Decision" reflects only whether JDRA score was above or below threshold. "Actual Decision" includes overrides. "Assessed Youth" are those who were not automatically detained and proceeded to part B of the JDRA. "All Youth" includes youth who were automatically detained. 95% Confidence Intervals reported in brackets.

Taken together, the results from the PPV and AUC calculations indicate the JDRA performs slightly better than chance when predicting recidivism, and only among those youth who are not automatically detained. These results suggest that the JDRA's automatic detention criteria may be over-inclusive and should be refined to limit the number of youth automatically detained. This conclusion is reinforced by the JDRA's relatively high NPV, which indicates the JDRA's prediction of non-recidivism is correct roughly 85% of the time.

Furthermore, regression discontinuity results indicate that the relatively low recidivism rate among detained youth is not likely due to an incapacitation effect (whereby youth who are detained cannot reoffend because they are physically in detention). Table 8 presents regression discontinuity results for the effect of being just above or below the score threshold for a detention recommendation on the probability of rearrest within either 90 or 30 days. Three specifications are reported. First, the optimal bandwidth around the score cutoff, computed with the method developed by Calonico, et al. (2014), is used with a linear function in the regression discontinuity specification. Second, the regression discontinuity specification is estimated again with a quadratic polynomial. Third, to investigate changes in the coefficients as the bandwidth around the cutoff narrows, the regression discontinuity specification is estimated again as linear but with half the optimal bandwidth.

TABLE 1-8. Regression Discontinuity Results

	Rearrested within:	
Model Specification	30 Days	90 Days
Optimal bandwidth, Linear function	-0.225	-0.191
(Effective $N = 211$)	(0.146)	(0.164)
Optimal bandwidth, Quadratic function	-0.448	-0.456
(Effective $N = 211$)	(0.276)	(0.336)
Half optimal bandwidth, Linear function	-0.523*	-0.419
(Effective $N = 115$)	(0.297)	(0.307)

Notes: $N = 535$ in all specifications. "Effective N" reports sample size within the bandwidth used for estimation. Standard errors reported in parentheses. Optimal bandwidth calculated using procedure by Calonico, et al. (2014). Statistical significance: * ($p<0.1$).

The estimates are large and imprecise, and do not appear robust to the multiple specifications tested. All estimates are negative, indicating that scoring above threshold (i.e. a detention recommendation) is associated with a lower probability of rearrest – an incapacitation

effect of detention. The estimated coefficients are quite large in magnitude, but they also have large standard errors (although one estimate is significant at the 10 percent level). This combination suggests that the incapacitation effect may be imprecisely estimated, and the magnitude of the point estimates should be cautiously interpreted. Still, the sign of the estimated coefficients remain consistently negative, suggesting the incapacitation effect is real, although perhaps not as strong as the point estimates in Table 8 suggest.

A weak incapacitation effect is further bolstered by examining the average time to rearrest between youth who were detained and youth who were released, as shown in Table 9. While the average time to rearrest among detained youth is roughly 5 days longer than released youth, this difference is only significant for the 30-day time horizon. The average time to rearrest within 90 days is not significantly different for detained youth than for released youth, meaning any incapacitation effect from being detained seems to vanish by 90 days.

TABLE 1-9. Average Days to Rearrest in JDRA Sample

	Rearrested within 30 Days	Rearrested within 90 Days	Rearrested Ever
Actually Released Youth	14.5	39.0	207.4
Actually Detained Youth	19.4**	44.7	201.8
All Youth	17.2	42.5	203.6

Notes: Days to rearrest calculated from date of last assessment, i.e. last arrest. Significant difference between rows 1 and 2 reported as * (*p<0.10*), ** (*p<0.05*), and *** (*p<0.01*).

1.5.2 Effect of JDRA Implementation on Arrest Rates by Offense

Overall, JDRA implementation in Davidson County is associated with a decline in the rate at which juveniles are arrested. This result must be tempered, however, by pre-existing trends in the Davidson County juvenile arrest rate. If juvenile arrests in Davidson County were already trending downward, as compared to control counties, the results from the TIBRS data will

overestimate the effect of JDRA implementation. Thus, further investigation of pre-existing trends in Davidson County arrest rates is warranted.

Table 10 presents the average monthly arrest rate among juveniles for the four main aggregate offense groups reported by TIBRS and ten individual offenses. Baseline arrest rates prior to RAI implementation are reported in the "Pre-RAI" column for Davidson County, and the baseline rate is averaged across all control counties in the "Controls" column. For example, on average, 0.725 juvenile arrests per 10,000 residents were made per month in Davidson County, prior to RAI implementation, for crimes against persons. After the JDRA was implemented in Davidson County, this figure dropped to an average of 0.2883 juvenile arrests per 10,000 residents per month. In fact, a simple pre/post comparison reveals that juvenile arrest rates for all offenses decreased after Davidson County's implementation of the JDRA. However, juvenile arrest rates also decreased on average for the control counties, indicating a difference-in-differences approach is necessary to control for arrest rate trends that exist outside the presence of an RAI. This is explored using OLS regressions.

Difference-in-difference estimates for the four main TIBRS offense groups are reported in Table 11 and for individual offenses in Table 12. Trends of the arrest rate by county are presented for each offense group in Appendix Figure 1, and for each individual offense in Appendix Figure 2. Controlling for changes in the juvenile arrest rate across other counties, RAI implementation is associated with a decrease in the juvenile arrest rate for all major offense groups except Group B Offenses, a result significant at the 1% level. Crimes against persons saw a drop of 0.426 juvenile arrests per 10,000 residents, a decrease of 58.8% from baseline. Crimes against property saw a drop of 0.320 juvenile arrests per 10,000 residents, a decrease of 36.4% from baseline. And crimes against society saw a drop of 0.502 juvenile arrests per 10,000 residents, a decrease of 61.5% from baseline. Group B offenses did not see a statistically significant decline in juvenile arrest rates, likely

because juveniles cannot be detained for group B offenses under Tennessee law, and thus these offenses should not be affected by the JDRA. The fact that group B offenses were left unaffected by JDRA implementation bolsters the reliability of the TIBRS data, as a statistically significant change in group B offenses would have indicated a known false effect. This did not occur.

TABLE 1-10. Monthly Juvenile Arrest Rate Before and After RAI Implementation

	Pre-RAI		*Post-RAI*	
	Controls	Davidson	Controls	Davidson
Offense Groups				
Crimes Against Persons	0.4847	0.7250	0.4737	0.2883
Crimes Against Property	0.5825	0.8796	0.3566	0.3334
Crimes Against Society	0.3965	0.8165	0.3191	0.2370
Group B Offenses	0.0308	0.0192	0.0283	0.0167
Specific Offenses				
Aggravated Assault	0.0690	0.2479	0.0663	0.0731
Burglary	0.0544	0.0461	0.0324	0.0208
Drug Equipment Violations	0.0455	0.1741	0.0261	0.0340
Drug/Narcotic Violations	0.3104	0.5166	0.2480	0.1121
Motor Vehicle Theft	0.0473	0.0755	0.0540	0.0646
Murder	0.0015	0.0109	0.0013	0.0068
Negligent Manslaughter	0.0002	0.0007	0.0000	0.0000
Robbery	0.0193	0.0713	0.0144	0.0354
Simple Assault	0.3625	0.2568	0.3530	0.1183
Weapon Law Violations	0.0333	0.1154	0.0341	0.0895

Notes: Arrest Rate calculated as number of arrests per 10,000 residents, using TIBRS data, 2016–2022. "Controls" include Blount, Bradley, Carter, Hamilton, Knox, Montgomery, Rutherford, Sullivan, Sumner, Washington, Williamson, and Wilson counties.

These results, while large in magnitude, are similar to those reported in Casey Foundation (2016), where JDAI sites saw an average decline in arrests of 57% in the number of juvenile arrests following adoption of JDAI practices. Importantly, adopting JDAI practices included taking steps in addition to implementing a juvenile pretrial detention RAI, such as developing community-

based detention alternatives such as diversion programs. Thus, the large decline in arrests may be only partially the result of RAI implementation. There is some evidence to believe the same effects occurred in Davidson County. In 2014, Davidson County elected a new Juvenile Court Judge who prioritized development of diversion programs, which did not occur in control counties. While diversion programming did not coincide exactly with the treatment timing of RAI implementation, the difference-in-difference estimates may be affected by the development of diversion programs. For example, as shown in Appendix Figure 1, arrest rates were already trending downward in Davidson County prior to RAI implementation for crimes against persons, crimes against property, and crimes against society.

TABLE 1-11. Effect of RAI Implementation by Offense Group

	Crimes Against Persons	Crimes Against Property	Crimes Against Society	Group B Offenses
RAI	-0.426***	-0.320***	-0.502***	-0.0006
	(0.046)	(0.044)	(0.044)	(0.007)
N	1,092	1,092	1,092	1,092
R^2	0.470	0.372	0.488	0.218

Notes: Dependent variable is Arrest Rate for specified offense group. Difference-in-difference estimates based on regressions using county-month level data from TIBRS, 2016–2022. All specifications include county and month fixed effects. Robust standard errors in parentheses. Statistical significance denoted * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

As shown in Table 12, the offenses that saw a statistically significant decline in the juvenile arrest rate were aggravated assault, simple assault, robbery, weapon law violations, and drug-related offenses. The juvenile arrest rate for simple assault decreased by 0.129 arrests per 10,000 residents, a reduction of 50% from baseline. This offense should be the most affected by the JDRA, as it is classified as a misdemeanor under Tennessee law and therefore a juvenile arrestee would be eligible for release under the JDRA (but automatically detained prior to JDRA implementation). However, other offenses like aggravated assault and robbery – both of which are felonies against

persons under Tennessee law and would be automatically detained under the JDRA – also had reductions in the arrest rate associated with implementation of the JDRA. The arrest rate for aggravated assault decreased by 0.172 arrests per 10,000 residents, a reduction of 69.4% from baseline, and robbery arrests decreased by 0.031 per 10,000 residents, a reduction of 43.5% from baseline. Similarly, weapon law violations were automatically detained before and after JDRA implementation, but curiously saw a decline in the arrest rate. Arrests for weapon law violations declined by 0.027 arrests per 10,000 residents, a decrease of 23.4% from baseline.

Several mechanisms may explain these results. First, the reductions in the juvenile arrest rate for aggravated assault, robbery, and weapon law violations are supported by a criminogenic theory of detention, wherein contact with other offenders in a confined space yields more offending – and escalated offending. The time spent with more "dangerous" peers in detention, the theory posits, is time to learn behaviors that are more aggressive. For example, Walker & Herting (2020) find that pretrial detention is associated with increases in both felony and misdemeanor recidivism, and Stevenson (2017) finds that peer influence in juvenile jails leads to increases in crime and aggressive behaviors. By sending most youth who received an assessed JDRA score back to their communities, Davidson County cut off those criminogenic effects. Thus, youth who would have previously been automatically detained may have refrained from learning more aggressive behaviors from more aggressive peers, and reductions in aggravated assault, robbery, and weapon law violations followed.

TABLE 1-12. Effect of RAI Implementation by Specific Offense

	Murder	Negligent Mansl'r	Agg. Assault	Simple Assault	Burglary	Robbery	Motor Vehicle Theft	Drug/ Narcotics Violation	Drug Equip. Violation	Weapon Law Violation
RAI	-0.004	-0.001	-0.172***	-0.129***	-0.003	-0.031***	-0.018	-0.342***	-0.121***	-0.027***
	(0.003)	(0.001)	(0.018)	(0.030)	(0.011)	(0.009)	(0.012)	(0.035)	(0.012)	(0.010)
N	1,092	1,092	1,092	1,092	1,092	1,092	1,092	1,092	1,092	1,092
R^2	0.138	0.085	0.308	0.427	0.132	0.181	0.203	0.428	0.360	0.309

Notes: Dependent variable is the juvenile arrest rate for specified offense. Difference-in-difference estimates based on regressions using county-month level data from TIBRS, 2016–2022. All specifications include county and month fixed effects. Robust standard errors in parentheses. Statistical significance denoted * (*p<0.10*), ** (*p<0.05*), *** (*p<0.01*).

Second, because youth with lower-level offenses were released under the JDRA, more Juvenile Court and detention resources were available for those youth who were detained for higher-level offenses. These youth may have benefitted from smaller staff-to-detainee ratios, increased engagement in mentoring programs, and more individualized attention from teachers. With relatively more resources available for detained youth, these juveniles may be at a lower risk for reoffending, lowering the arrest rate for aggravated assault, robbery, and weapon law violations.

Third, diversion programming that affected juveniles overall may have further reduced the same criminogenic effects mentioned above, resulting in mitigated antisocial behaviors and fewer aggravated assaults, robberies, and weapon law violations. For example, diversion programs may have curbed involvement in gang activities associated with aggravated assaults, robberies, and carrying weapons.

Notably, the strength of these results must be tempered by the fact that (1) aggravated assault, drug equipment violations, and drug/narcotic violations were already on the decline in Davidson County, as shown in Appendix Figure 2, and (2) other changes in the juvenile justice system occurred at a similar time in Davidson County. Thus, the magnitude of the coefficient estimates for the effects of JDRA implementation may be overstated and should be interpreted with some caution.

Drug-related offenses also saw statistically significant decreases in the juvenile arrest rate. Implementation of the JDRA was associated with an average decrease of 0.342 juvenile arrests per 10,000 residents for drug and narcotics violations, a drop of 66% from baseline. This impact may have come through probation violations. While a drug-related probation violation resulted in automatic detention prior to JDRA implementation, youth with only a misdemeanor charge and probation violation were eligible for release under the JDRA. Sending these offenders home also likely resulted in several of the effects discussed above.

Finally, no statistically significant effect of JDRA implementation appears for murder, negligent manslaughter, burglary, or motor vehicle theft. This is likely because these offenses were handled the same before and after the JDRA was implemented – murder and manslaughter arrestees were automatically detained, and burglary and motor vehicle theft arrestees were automatically released as nondetainable offenses.[12] These results provide some validation that the estimated effects since JDRA implementation should not have affected the results for these crimes, and they, in fact, do not.

1.5.3 Effect of JDRA Implementation on Arrest Rates by Demographics

Table 13 presents the average monthly arrest rate per 10,000 residents, before and after implementation of the JDRA, for the demographic groups reported by TIBRS. Like Table 10, baseline arrest rates for the Pre-RAI period in Davidson County are reported in the second column of each panel.

Difference-in-difference estimates from the associated regressions are reported in Tables 14 through 16. All demographic groups saw a statistically significant reduction in juvenile arrests for crimes against persons, property, and society, but not for group B offenses. No demographic group saw a statistically significant difference in arrests for group B offenses.

Table 14 presents difference-in-difference estimates by race and ethnicity. For crimes against persons, arrests of white youth fell a statistically significant 0.093 arrests per 10,000 residents, for a decrease of 48.7% from baseline; arrests of black youth fell by 0.326 arrests per 10,000 residents, 61.9% from baseline; and arrests of Hispanic youth fell by 0.033 arrests per 10,000 residents, 52.9% from baseline. For crimes against property, only black and Hispanic youth

[12] While TENN. CODE ANN. § 37–1–114 was amended in 2021 to allow for the detention of youth charged with burglary and motor vehicle theft, the JDRA was not altered in any way and the detention policies at the Davidson County Juvenile Court remained the same.

saw a statistically significant decrease in the juvenile arrest rate. Arrests of black youth fell by 0.337 arrests per 10,000 residents, or 52.5% from baseline. Arrests of Hispanic youth fell by 0.030 arrests per 10,000 residents, or 43.1% from baseline. For crimes against society, arrests of white youth declined by 0.181 arrests per 10,000 residents, for a decrease of 54.8% from baseline. Arrests of black youth decreased by 0.314 arrests per 10,000, or 66.3% from baseline, and arrests of Hispanic youth decreased by 0.087, or 71.3% from baseline. Thus, for all offense groups, arrests among black and Hispanic youth declined by a larger magnitude than arrests of white youth.

TABLE 1-13. Average Monthly Arrest Rate Before and After RAI Implementation by Demographics

	CRIMES AGAINST PERSONS				CRIMES AGAINST PROPERTY			
	Pre-RAI		*Post-RAI*		*Pre-RAI*		*Post-RAI*	
	Controls	Davidson	Controls	Davidson	Controls	Davidson	Controls	Davidson
White	0.3377	0.1908	0.3192	0.0796	0.3906	0.2266	0.2176	0.0779
Black	0.1435	0.5266	0.1514	0.2080	0.1882	0.6424	0.1360	0.2529
Hispanic	0.0277	0.0624	0.0311	0.0333	0.0274	0.0696	0.0233	0.0357
Female	0.1590	0.3037	0.1633	0.1091	0.1904	0.3209	0.0919	0.0992
Male	0.3257	0.4213	0.3104	0.1792	0.3921	0.5587	0.2647	0.2342
Age 12-13	0.0931	0.1568	0.1064	0.0510	0.0633	0.1215	0.0516	0.0377
Age 14-15	0.1800	0.2638	0.1830	0.1101	0.1945	0.3157	0.1305	0.1261
Age 16-17	0.2116	0.3043	0.1843	0.1271	0.3247	0.4425	0.1745	0.1696

	CRIMES AGAINST SOCIETY				GROUP B OFFENSES			
	Pre-RAI		*Post-RAI*		*Pre-RAI*		*Post-RAI*	
	Controls	Davidson	Controls	Davidson	Controls	Davidson	Controls	Davidson
White	0.3002	0.3305	0.2247	0.0744	0.0172	0.0075	0.0177	0.0044
Black	0.0915	0.4737	0.0910	0.1588	0.0133	0.0116	0.0103	0.0122
Hispanic	0.0275	0.1221	0.0267	0.0343	0.0021	0.0034	0.0027	0.0027
Female	0.1025	0.1839	0.0825	0.0333	0.0102	0.0086	0.0104	0.0048
Male	0.2941	0.6326	0.2365	0.2037	0.0206	0.0106	0.0179	0.0119
Age 12-13	0.0280	0.0313	0.0272	0.0092	0.0036	0.0031	0.0050	0.0010
Age 14-15	0.0924	0.1749	0.1019	0.0595	0.0103	0.0062	0.0108	0.0071
Age 16-17	0.2761	0.6103	0.1900	0.1683	0.0168	0.0099	0.0126	0.0085

Notes: Arrest Rate calculations and control counties same as Table 10.

TABLE 1-14. Effect of RAI Implementation by Race and Ethnicity

	CRIMES AGAINST PERSONS			CRIMES AGAINST PROPERTY		
	White	Black	Hispanic	White	Black	Hispanic
RAI	-0.093***	-0.326***	-0.033***	0.024	-0.337***	-0.030***
	(0.025)	(0.030)	(0.007)	(0.028)	(0.033)	(0.008)
N	1,092	1,092	1,092	1,092	1,092	1,092
R^2	0.459	0.535	0.218	0.353	0.495	0.218
	CRIMES AGAINST SOCIETY			GROUP B OFFENSES		
	White	Black	Hispanic	White	Black	Hispanic
RAI	-0.181***	-0.314***	-0.087***	-0.004	0.004	-0.001
	(0.029)	(0.027)	(0.010)	(0.005)	(0.004)	(0.002)
N	1,092	1,092	1,092	1,092	1,092	1,092
R^2	0.416	0.583	0.356	0.171	0.194	0.101

Notes: Dependent variable is Arrest Rate for specified offense and demographic group. Difference-in-difference estimates based on regressions using county-month level data from TIBRS, 2016–2022. All specifications include county and month fixed effects. Robust standard errors in parentheses. Statistical significance denoted * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

Table 15 presents difference-in-difference estimates by age group. For crimes against persons, arrests decreased by 0.119 per 10,000 residents for juveniles aged 12 to 13, a decline of 75.9% from baseline. Arrests among 14- and 15-year-olds fell by 0.157 arrests per 10,000 residents, or 59.5% from baseline, and for 16- and 17-year-olds, arrests fell 0.150 per 10,000 residents, or 49.3% from baseline. For crimes against property, youth aged 12 to 13 saw a decline in arrests by 0.072 per 10,000, a decrease of 59.3% from baseline. Youth aged 14 to 15 saw a decline of 0.126 arrests per 10,000 residents, or 39.9% from baseline, and youth aged 16 to 17 saw a decline of 0.123 arrests per 10,000 residents, or 27.8% from baseline. For crimes against society, arrests among 12- and 13-year-olds fell by 0.021 arrests per 10,000 residents, a decrease of 67.1% from baseline. Arrests among 14- and 15-year-olds declined by 0.125 per 10,000 residents, or 71.5% from baseline, and arrests among 16- and 17-year-olds fell by 0.356 per 10,000, or 58.3% from

baseline. Overall, arrests declined more for younger age groups than older age groups. This result is not surprising, as the JDRA relies on criminal history in the preceding 12 months, and younger juveniles will not have as many prior offenses or failures to appear simply because they are younger.

TABLE 1-15. Effect of RAI Implementation by Age Group

	CRIMES AGAINST PERSONS			CRIMES AGAINST PROPERTY		
	Age 12-13	Age 14-15	Age 16-17	Age 12-13	Age 14-15	Age 16-17
RAI	-0.119***	-0.157***	-0.150***	-0.072***	-0.126***	-0.123***
	(0.016)	(0.021)	(0.020)	(0.011)	(0.026)	(0.024)
N	1,092	1,092	1,092	1,092	1,092	1,092
R^2	0.370	0.355	0.324	0.205	0.219	0.345
	CRIMES AGAINST SOCIETY			GROUP B OFFENSES		
	Age 12-13	Age 14-15	Age 16-17	Age 12-13	Age 14-15	Age 16-17
RAI	-0.021***	-0.125***	-0.356***	-0.003	0.001	0.003
	(0.006)	(0.015)	(0.034)	(0.002)	(0.003)	(0.004)
N	1,092	1,092	1,092	1,092	1,092	1,092
R^2	0.220	0.289	0.472	0.110	0.176	0.183

Notes: Dependent variable is Arrest Rate for specified offense and demographic group. Difference-in-difference estimates based on regressions using county-month level data from TIBRS, 2016–2022. All specifications include county and month fixed effects. Robust standard errors in parentheses. Statistical significance denoted * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

Table 16 presents difference-in-difference estimates by gender. For crimes against persons, females saw a decline in arrests of 0.199 per 10,000 residents, for a reduction of 65.5% from baseline. Males saw a decrease of 0.227 arrests per 10,000 residents, or 53.9% from baseline. For crimes against property, arrests among females declined by 0.123 per 10,000 residents, or 38.4% from baseline, and arrests among males declined by 0.197 per 10,000 residents, or 35.3% from baseline. For crimes against society, arrests decreased by 0.131 per 10,000 residents for females, a reduction of 71.2% from baseline, and arrests decreased by 0.371 per 10,000 residents for males,

a reduction of 58.7% from baseline. Across all offense groups, females saw larger declines in the arrest rate than males did.

TABLE 1-16. Effect of RAI Implementation by Gender

	CRIMES AGAINST PERSONS		CRIMES AGAINST PROPERTY	
	Female	Male	Female	Male
RAI	-0.199***	-0.227***	-0.123***	-0.197***
	(0.023)	(0.031)	(0.022)	(0.036)
N	1,092	1,092	1,092	1,092
R^2	0.368	0.407	0.367	0.268
	CRIMES AGAINST SOCIETY		GROUP B OFFENSES	
	Female	Male	Female	Male
RAI	-0.131***	-0.371***	-0.004	0.004
	(0.016)	(0.035)	(0.004)	(0.005)
N	1,092	1,092	1,092	1,092
R^2	0.340	0.448	0.157	0.194

Notes: Dependent variable is Arrest Rate for specified offense and demographic group. Difference-in-difference estimates based on regressions using county-month level data from TIBRS, 2016–2022. All specifications include county and month fixed effects. Robust standard errors in parentheses. Statistical significance denoted * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

The results from tables 14, 15, and 16 indicate that JDRA implementation was not associated with disproportionate benefits for one demographic over others. If anything, with respect to race and ethnicity, it appears arrests of black and Hispanic youth decreased more than arrests of white youth, lowering disparities in police referrals to Juvenile Court. Similarly, with respect to gender, JDRA implementation does not appear to disadvantage females. These results are reassuring to RAI advocates, as bias and fairness of RAIs are heavily debated in the literature. (E.g., DeMichele 2023; Burdeen & Shang 2021; Berk 2019). These results are also bolstered by data from the local detention center, as discussed in the following section.

1.5.4 Impact on Detention Center Composition

Similar to the demographic results presented in the previous section, implementing the JDRA was associated with a significant decrease in the number of intakes, but not a significant change in the demographic composition of Davidson County's juvenile detention center. The average number of daily intakes to the detention center dropped by roughly 50%, a result significant at the 1% level. This is to be expected with many youth being released as a result of JDRA implementation. The distribution of detainees by race/ethnicity, gender, and age group, however, did not significantly change until the Covid-19 pandemic set in. At that time, the share of black detainees increased relative to white detainees, the share of male detainees increased relative to female detainees, and the share of older detainees increased relative to younger detainees.

TABLE 1-17. Davidson County Juvenile Detention Center Composition, 2017–2021

	(1) Pre-JDRA, Pre-Covid	(2) Post-JDRA, Pre-Covid	(3) Post-JDRA, Post-Covid
Intakes (*N=52*)	84.79	39.25***	38.00***
Avg. Daily Pop. (*N=58*)	40.89	46.97**	30.41***^^^
White (*N=47*)	12.8%	11.0%	5.8%***^^^
Black (*N=47*)	77.8%	75.2%	82.9%***^^^
Hispanic (*N=47*)	8.6%	12.5%*	11.0%
Males (*N=47*)	81.7%	78.1%	85.3%*^^^
Females (*N=47*)	18.3%	21.8%	14.7%*^^^
Age 13 or less (*N=47*)	9.7%	6.8%**	3.3%***^^^
Age 14-15 (*N=47*)	30.5%	33.9%	28.4%^^
Age 16-17 (*N=47*)	57.8%	56.1%	64.6%***^^^

Notes: Statistical significance calculated pairwise using Bonferroni multiple comparison test. Significant difference from Column (1) denoted with * (*p<0.10*), ** (*p<0.05*), and *** (*p<0.01*). Significant difference from Column (2) denoted with ^ (*p<0.10*), ^^ (*p<0.05*), and ^^^ (*p<0.01*). Sample size varies because of missing reports. Source: author's calculations based on hand-coded dataset of monthly reports submitted by private detention contractor.

These results are positive for the JDRA. First, the tool worked as anticipated – it released many youth and lowered the average number of monthly intakes to detention. Second, the tool did not significantly alter the demographic composition of the detention center. I find no evidence of disproportionate minority contact as a result of JDRA implementation, a result consistent with the literature (Puzzanchera, et al. 2012; Steinhart 2008; Feyerherm 2000). While the share of Hispanic youth does increase with statistical significance at the 10% level, the increase is small in magnitude. Similarly, it appears the share of the youngest youth decreased by a statistically significant amount, but the change was small. Finally, the most significant changes occurred only after the onset of the Covid-19 pandemic. The exact mechanism for these changes is not immediately apparent, and, while beyond the scope of this study, warrants further investigation.

1.6 Discussion & Conclusion

This chapter provides supportive evidence that implementation of a juvenile pretrial detention RAI, which released youth who would have otherwise been detained, did not adversely affect public safety. While the JDRA is far from being perfectly accurate, it performs better than chance at predicting recidivism outcomes. Moreover, following implementation of the JDRA, juvenile arrest rates decreased or showed no statistically significant change overall. With respect to racial and ethnic disproportionality, I find no evidence that the JDRA change the demographic composition of the juvenile detention center. If anything, it appears arrests of non-white youth decreased by a larger magnitude than arrests of white youth following JDRA implementation.

For Davidson County, implementing the JDRA can be considered at least a mild success story. To be sure, the JDRA is not perfect – it has AUC values near 0.5 and a PPV of at most 21.7%. I attribute this to the fact that it is a consensus-based tool that was not empirically developed with historical data. It was essentially developed with no data at all, and despite this, made predictions better than chance. Given that "probable cause," the standard used in detention

hearings, is usually quantified around 51% certainty, the JDRA roughly satisfies this criterion. Furthermore, it represents the collaboration of multiple juvenile justice stakeholders, and the final tool incorporated viewpoints of the Juvenile Court, the prosecutor's office, and the public defender's office. Thus, while the JDRA still needs statistical validation and leaves room for improvement, it is a step toward risk assessment in juvenile pretrial detention.

The simple checklist format of the JDRA, and adhering to its recommendations, also came with benefits. It does not require a trained clinician to administer, unlike more robust structured professional judgment RAIs. Each arrested youth is assessed within hours of arrest by a youth services officer in the detention center. Often, the JDRA's recommendation is the final detention decision – overrides accounted for only 4% of all assessments. This not only means released youth had less system contact, but also that magistrate judges had fewer overall detention hearings and could reallocate their time to other matters.

Perhaps most importantly, juvenile arrests did not increase, as would be expected if released youth were committing additional crimes when they would otherwise be in detention. This is corroborated by regression discontinuity results showing little incapacitation effect from short-term pretrial juvenile detention. In fact, I find evidence that juvenile arrests actually decreased for assault offenses, drug offenses, and weapon law violations. Notably, the decline in juvenile arrests occurred in the face of releasing 455 youth who would have otherwise been detained. These effects may be driven by released youth who do not learn aggressive behaviors in the criminogenic atmosphere of detention, or by a reallocation of resources to higher risk youth, who do get detained but benefit from more resources per capita in detention. These results must be interpreted cautiously, however, as there is some evidence that Davidson County was not on an arrest rate trend parallel to that of the control counties. If this is the case, the difference-in-difference coefficients overestimate the effect of RAI implementation, as arrest rates were trending

downward prior to RAI implementation (the treatment). This is because the control counties look less like the treated county before the treatment, and therefore must be different after the treatment, which biases estimates of the treatment effect.

Finally, I find no evidence that the JDRA resulted in disproportionate minority contact. The available data from the Davidson County Detention Center indicate that the share of white and black youth in the detention center did not change after implementing the JDRA, while the share of hispanic youth increased with statistical significance only at the 10% level. Moreover, juvenile arrest rates among black and hispanic youth decreased by a larger magnitude than did arrests of white youth. Together, these results indicate the JDRA did not adversely affect disproportionate minority contact, and may have even improved the disproportionate rate at which non-white youth are arrested and referred to the detention center.

In sum, the JDRA worked reasonably well as implemented. It made predictions slightly better than chance, its implementation did not increase arrest rates (and in most instances decreased them), and its implementation did not cause disproportionate minority contact in the detention center.

Notably, this study has some limitations. The JDRA data do not contain information about a juvenile's charges, and I was therefore unable to draw any inferences about specific offenses, such as those involving violence or drugs. Further, the TIBRS data is not at the individual level and does not have identifiable information about offenders. Analyzing recidivism in the arrest data, the most common outcome of interest in risk assessment research, was therefore impossible. Future studies should utilize richer data at the individual level, such as including indicators for specific charges, length of stay in detention, and whether the juvenile ultimately accepted a plea deal.

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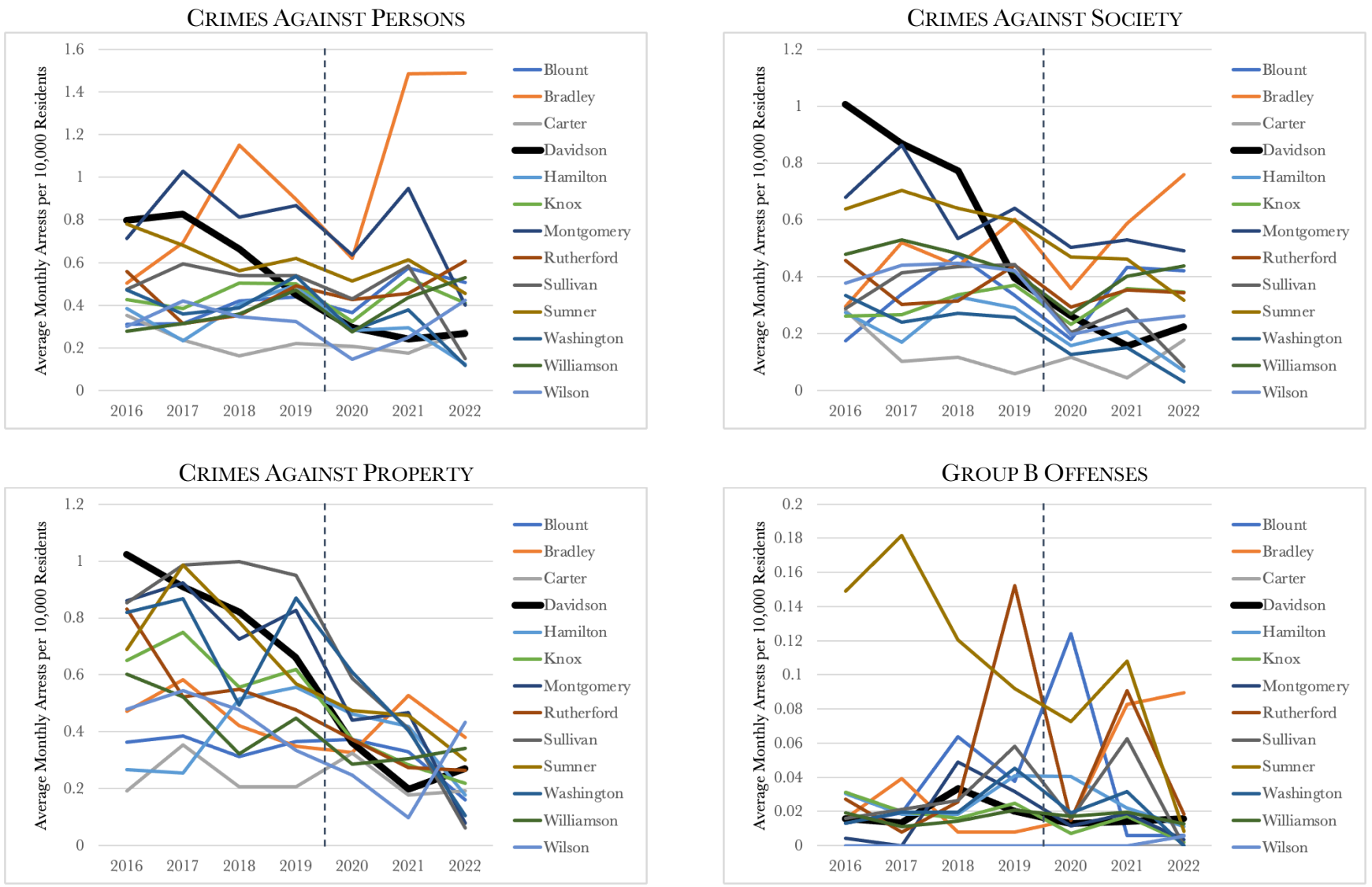
APPENDIX

APPENDIX TABLE 1-1. Average Monthly Arrest Rate, TIBRS Data 2016–2022

	Crimes Against Persons	Crimes Against Property	Crimes Against Society	Group B Offenses
Blount	0.4189	0.3269	0.3374	0.0386
Bradley	0.9767	0.4373	0.5091	0.0369
Carter	0.2345	0.2366	0.1289	0.0000
Davidson	0.5066	0.6065	0.5267	0.0179
Hamilton	0.3166	0.3793	0.2143	0.0259
Knox	0.4391	0.4930	0.3108	0.0168
Montgomery	0.7721	0.6175	0.6062	0.0170
Rutherford	0.4573	0.4706	0.3579	0.0481
Sullivan	0.4733	0.6928	0.3078	0.0286
Sumner	0.6037	0.6086	0.5474	0.1045
Washington	0.3618	0.5953	0.2023	0.0212
Williamson	0.3802	0.4038	0.4307	0.0164
Wilson	0.3160	0.3731	0.3407	0.0008

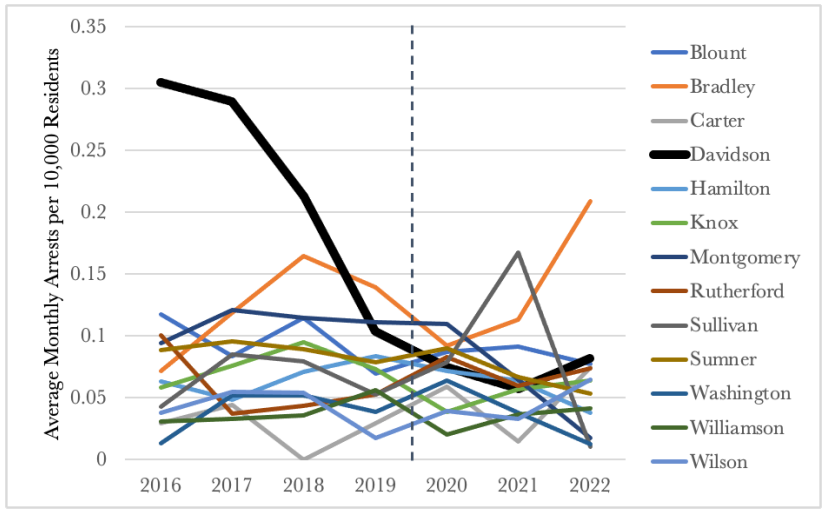
Notes: Arrest Rate calculated as number of arrests per 10,000 residents.

APPENDIX FIGURE 1. Juvenile Arrest Rate Trends by Offense Group and County

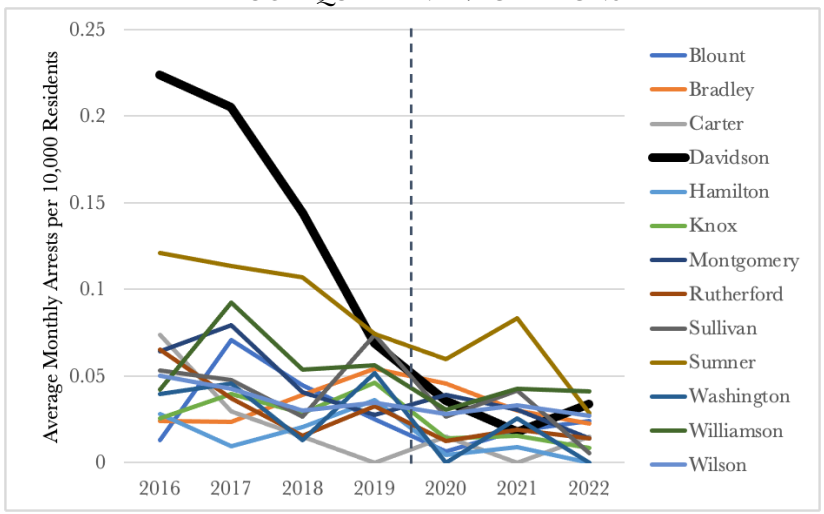


APPENDIX FIGURE 2. Juvenile Arrest Rate Trends by Specific Offense and County

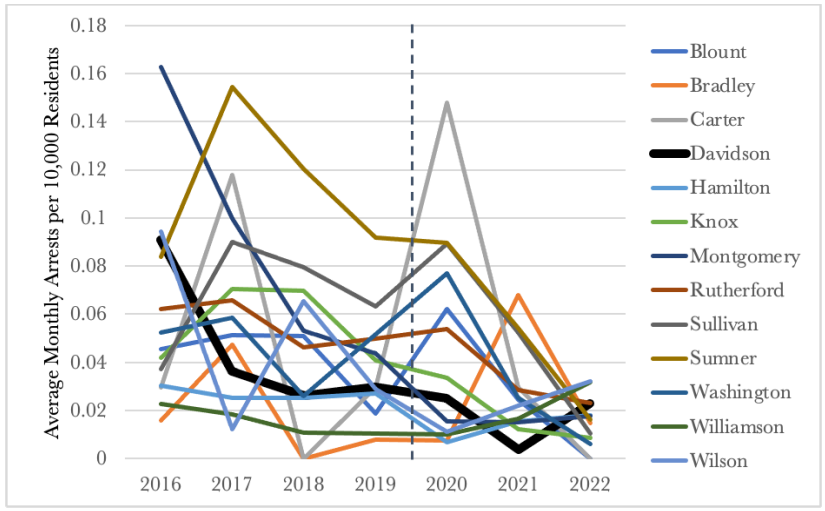
AGGRAVATED ASSAULT



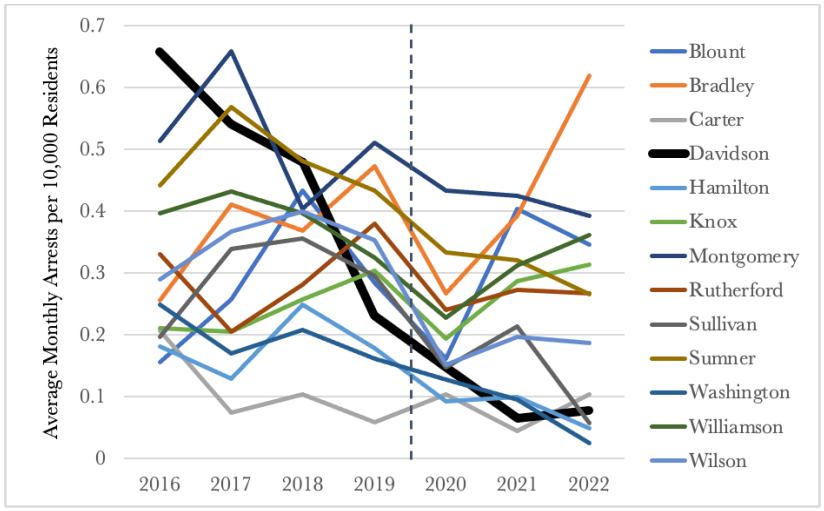
DRUG EQUIPMENT VIOLATIONS



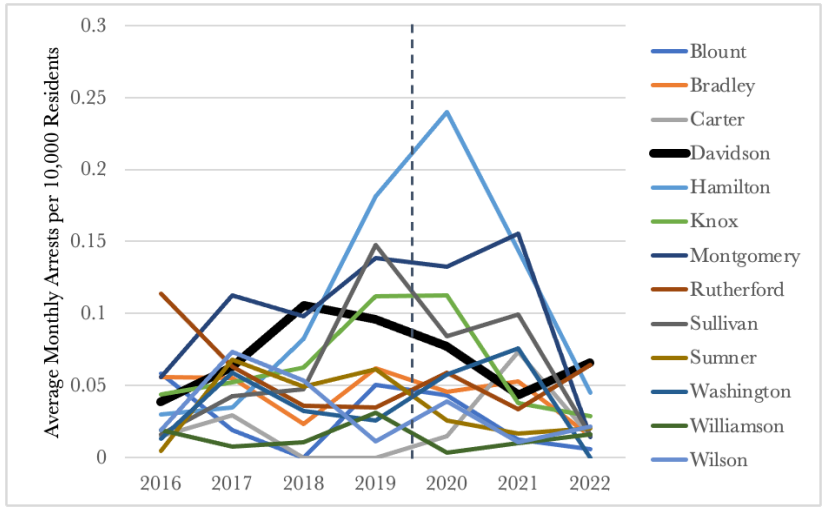
BURGLARY



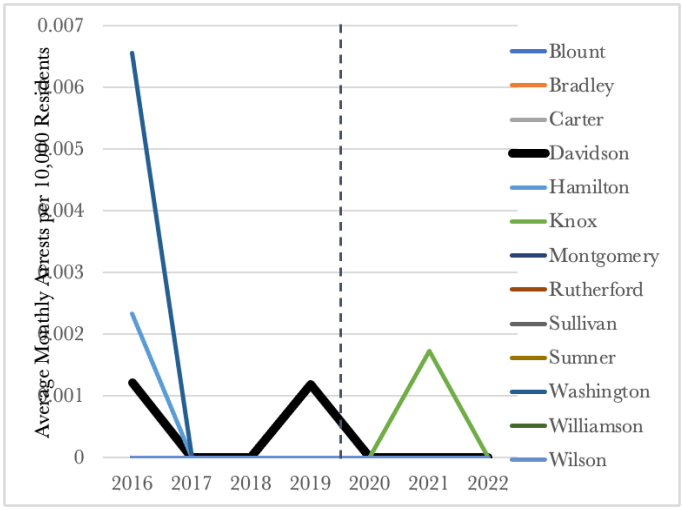
DRUG/NARCOTIC VIOLATIONS



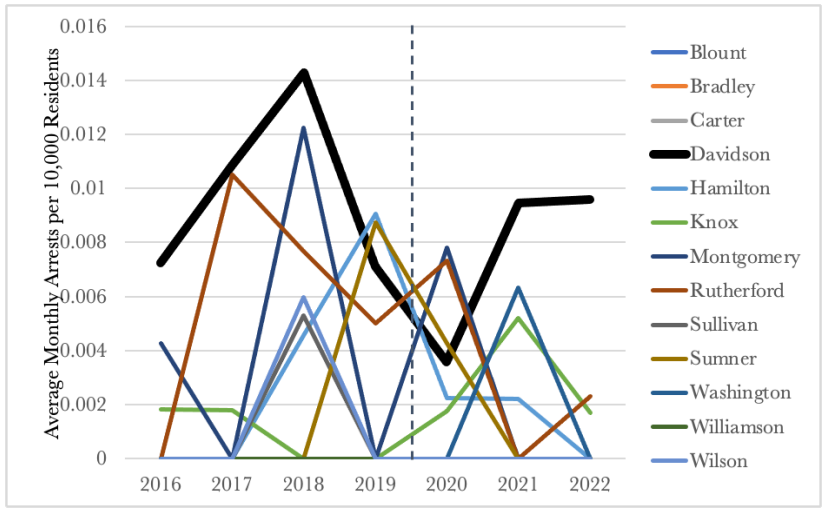
Motor Vehicle Theft



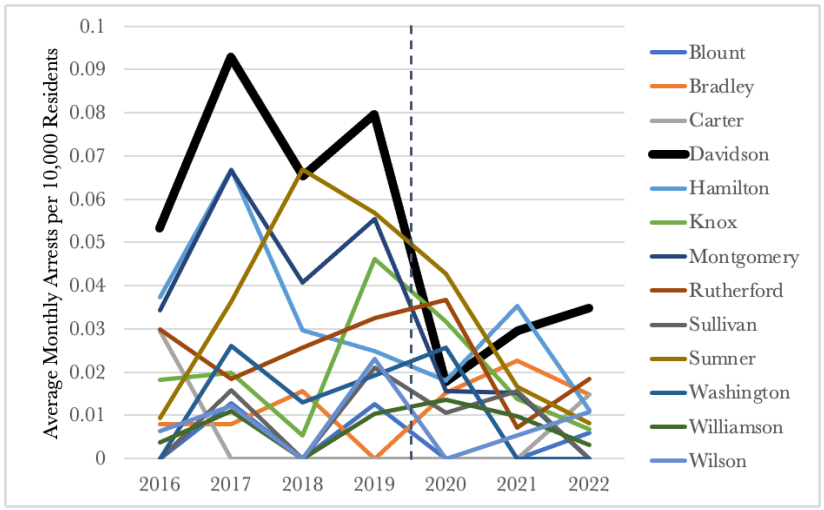
Negligent Manslaughter

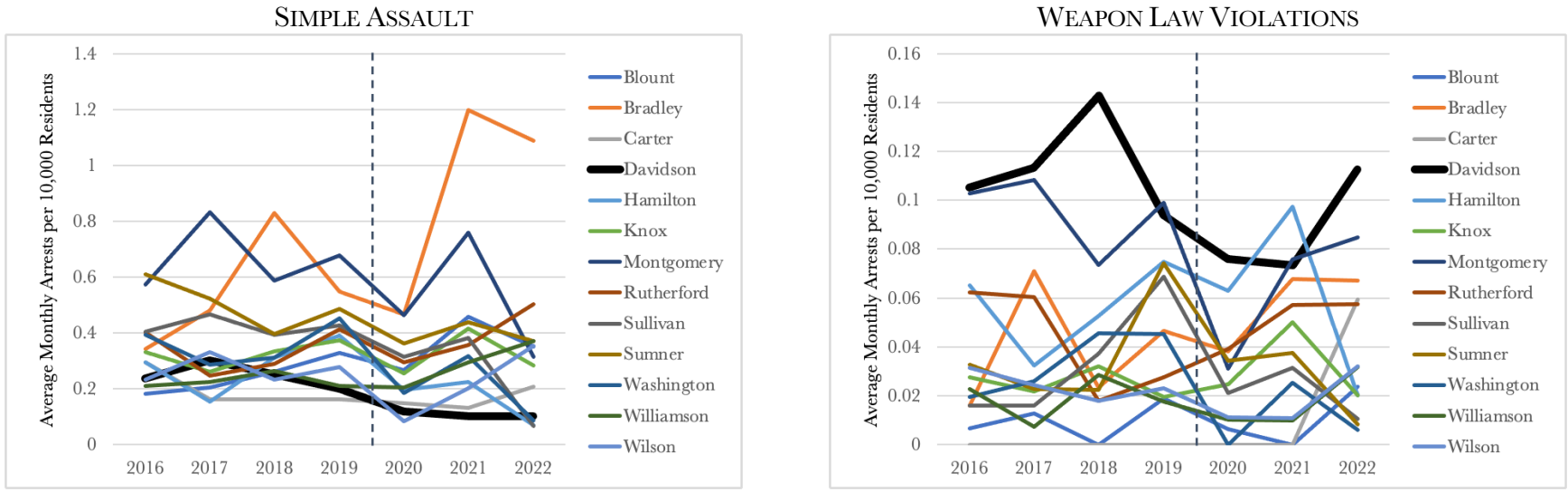


Murder

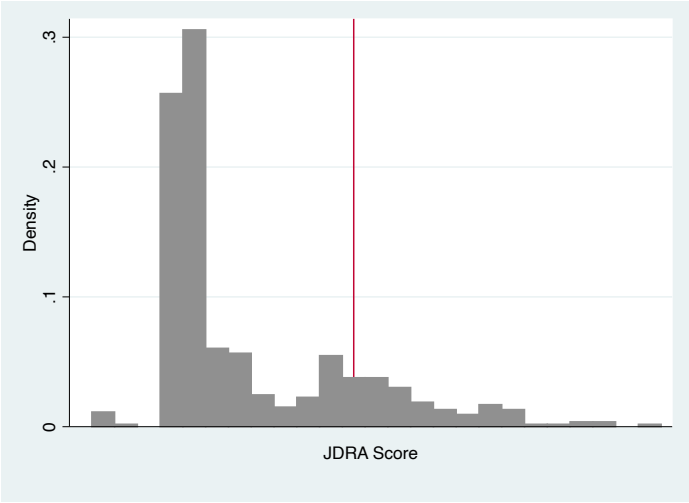


Robbery





APPENDIX FIGURE 2. JDRA Score and Cutoff for Detention Recommendation



Notes: Actual JDRA scores omitted for confidentiality purposes. Red line represents cutoff score for detention recommendation. Bunching occurs at scores for commonly present risk factors, but no bunching occurs at the cutoff.

2 COMPARING PRETRIAL RISK ASSESSMENT FOR ADULT AND YOUTH OFFENDERS: AN APPLICATION OF THE PUBLIC SAFETY ASSESSMENT TO JUVENILE PRETRIAL DETENTION

2.1 Introduction

Pretrial reform efforts, especially those aimed at reducing reliance on monetary bail, have swept across the nation in recent years (Gouldin 2020). Prompted by overcrowded jails, the cost of detention, and concerns regarding inequity in a system based on who can afford release, these reforms have targeted reducing pretrial incarcerated populations. According to the National Conference of State Legislatures, between 2012 and 2018, every state in the union enacted legislation addressing pretrial detention policy.[13] Many states limited reliance on financial conditions of release and several eliminated monetary bail entirely. Additional legislation promoted the use of diversion courts early in the pretrial phase, expanded the number of offenses eligible for pretrial release, or altered the factors judges should consider at detention hearings.

An important tool that has facilitated changes in pretrial practice has been the use of risk assessment instruments (Desmarais, et al. 2021; Gouldin 2020; Stevenson 2018). In the pretrial context, a risk assessment instrument ("RAI") is a document, typically a checklist or spreadsheet, that collects information on a predetermined set of risk factors about an offender and attempts to quantify the risk that offender will commit a new offense or flee the jurisdiction while on pretrial release (Desmarais & Lowder 2019). Based on large datasets of criminal cases, empirically based RAIs can offer objective, evidence-based criteria for efficiently making detention decisions.

Use of RAIs has been a contentious issue among policymakers, scholars, and other stakeholders. Proponents argue that risk assessment tools can provide accuracy, objectivity, and

[13] National Conference of State Legislatures, *Trends in Pretrial Release: State Legislation Update* (April 2018) https://docs.legis.wisconsin.gov/misc/lc/study/2018/1783/010_august_16_2018_meeting_10_00_a_m_lc_conference_room/aug16_enactments.

consistency across judges and cases, in what has traditionally been a subjective human decision (Desmarais, et al. 2022). Critics, on the other hand, contend that risk assessment tools exacerbate pre-existing racial inequalities deeply rooted in the criminal justice system, do not decrease reliance on incarceration, and make inaccurate predictions (Burdeen & Shang 2021). Some studies have compared humans with algorithms, with inconsistent results. For example, prior studies have found evidence that humans make superior predictions to algorithms (Dressel & Farid 2018), algorithms make superior predictions to humans (Lin, et al. 2020), algorithms may be ignored by human decisionmakers (Stevenson & Doleac 2022), and algorithms can work well together with human predictions (Bhatt, et al. 2023).

Despite criticisms and potential drawbacks, the use of RAIs in pretrial detention has gained considerable prevalence in recent years. While many empirical pretrial RAIs have been developed in the adult criminal legal system, most juvenile courts have not enjoyed the same data-driven approach to risk assessment. Instead, most juvenile pretrial RAIs use risk factors that, while gleaned from empirical studies, are not scored or weighted using any statistical technique to predict the probability of any outcome.

As jurisdictions look to implement risk assessment in pretrial juvenile detention, but don't have the historical data or available resources to develop an empirically based RAI, one relevant question is whether empirically based adult pretrial RAIs can be effectively used in juvenile populations. Most existing RAIs have been developed for use in adult populations. However, no prior study has analyzed the performance of an adult tool in a juvenile population. This chapter sheds light on that question by assessing the predictive accuracy of a well-known, validated adult pretrial RAI when used with juvenile offenders. Specifically, this chapter compares the performance of the Public Safety Assessment with the performance of an RAI developed for juveniles in a large U.S. city.

Using data from risk assessments completed on youth arrested in Nashville, Tennessee, I construct risk scores and detention recommendations for each youth using the risk factors and scoring guide of a publicly available adult pretrial RAI. Then, I calculate performance metrics of the adult tool and compare its counterfactual detention decisions to the recommendations actually made by the tool implemented by Nashville's juvenile court.

I find that the juvenile tool, while not empirically based on historical case data, performs somewhat better than the adult tool at predicting recidivism among assessed youth. Recidivism among youth recommended for release by the adult tool would likely be higher than among those recommended for release by the juvenile tool. Further, the performance metrics of the adult tool calculated using juvenile data are much worse than those reported from adult samples in other studies. The results indicate that even widely validated adult pretrial RAIs should not be directly applied to juveniles, and that, until a national empirically based pretrial RAI can be developed with juvenile data, jurisdictions may be better off developing their own RAI with stakeholder input and risk factors well established in the literature.

2.2 Background & Literature

Use of pretrial RAIs has proliferated at the state and local level in the United States. As of 2022, legislation addressing (and sometimes mandating) the use of pretrial RAIs had been enacted in 26 states.[14] Some laws require use of a specific RAI, while others simply promote the use of any statistically validated RAI if it is available. And in all states, judges still make the final detention decision – the RAI only provides information. Several pretrial RAIs have been developed for adult populations (Desmarais, et al. 2021; Desmarais & Lowder 2019). Some were developed by state agencies and are state-specific, such as the Colorado Pretrial Assessment Tool and the Virginia

[14] National Conference of State Legislatures, *Pretrial Release: Risk Assessment Tools* (June 2022) https://www.ncsl.org/civil-and-criminal-justice/pretrial-release-risk-assessment-tools.

Pretrial Risk Assessment Instrument. Other tools, such as the Correctional Offender Management Profile for Alternative Sanctions–Pretrial Release Risk Scale, have been developed by private companies. Although many RAIs exist, the most widely used RAI nationwide remains the Public Safety Assessment ("PSA"), which was developed by a non-profit organization, the Laura and John Arnold Foundation (now Arnold Ventures) (Hamilton 2022; Stevenson 2018).

The PSA is used statewide in Arizona, Kentucky, New Jersey, and Utah. It has also been adopted for use by local jurisdictions in another 20 states, including major metropolitan areas such as Atlanta, Chicago, Dallas, Houston, Los Angeles, and Memphis.[15] The tool was developed with a national sample of criminal cases, and it is available for free to any jurisdiction that wishes to implement it. Further, Arnold Ventures provides online implementation guides that not only inform localities how to implement the PSA but also provide transparency on the risk factors and scoring used by the tool. These features have contributed to the PSA's popularity.

While the PSA has emerged as a frontrunner of adult pretrial RAIs, no analogous empirically based tool has been developed for juvenile populations. The closest juvenile analogue to the PSA is a set of exemplar tools produced at test sites for the Annie E. Casey Foundation's Juvenile Detention Alternatives Initiative ("JDAI"). Since its inception in 1993, the initiative has promoted the use of community-based alternatives to detention and touted the use of pretrial RAIs to make objective detention decisions, as parts of its toolkit for reducing the use of juvenile detention.

> [As of 2006], local detention risk assessment instruments have been implemented at JDAI sites in more than 15 states. These RAIs are not clones of one another. Each one is tailored to fit state and local laws, policies, and procedures. They have different names and formats. But they are all grounded in the principles of

[15] Advancing Pretrial Policy & Research, *About the Public Safety Assessment: Public Safety Assessment Sites* (accessed Nov. 2023) https://advancingpretrial.org/psa/psa-map/.

> objectivity, uniformity, and risk assessment . . . , and they incorporate other common design elements (Steinhart 2006, p. 8).

By 2016, over 300 local jurisdictions from 39 states and the District of Columbia, containing roughly 30% of the nation's youth, had implemented a pretrial detention risk assessment (Casey Foundation 2016). Most tools at JDAI sites incorporate the youth's most serious current offense, prior delinquency findings in the last 12 months, other currently pending charges, and history of failure to appear or runaway. However, as Stark (2022) points out, the pretrial RAIs used at JDAI sites are mostly consensus-based, not empirically based, tools. Consensus-based tools use risk factors that have been identified in the literature but are not based on a dataset of previous cases. The points allocated to each risk factor are assigned by a group of local juvenile system stakeholders, and the total score on an instrument does not correlate to the statistical probability of any outcome. Thus, Stark (2022) proposes developing a national empirically based pretrial RAI, like the PSA, for juvenile populations. So far, however, no such empirically based pretrial RAI for juveniles exists at the national level.

Before constructing a new RAI from scratch, however, one natural question that emerges is how well the PSA, an adult pretrial RAI, can be directly transferred to juvenile populations. Nonetheless, while the PSA has been the subject of several studies using data from the adult system, no empirical work has examined the PSA's performance using data from the juvenile system. Indeed, no study in general has compared a juvenile pretrial RAI to any adult tool. This chapter fills a gap in the literature by constructing PSA scores with data collected by a metropolitan juvenile court, analyzing the PSA's performance among juveniles, and comparing the PSA to the pretrial RAI that was actually implemented by the local juvenile court.

2.2.1 Development of the PSA

The goal of PSA developers was to create an RAI that would not require an interview with the arrestee and that could be used in the pretrial setting, when limited information about an arrestee is available (Arnold Foundation 2013; VanNostrand & Lowenkamp 2013). The purpose of creating the PSA was to promote efficiency in detention decisions and the allocation of judicial resources: "switching from a system based solely on instinct and experience to one in which judges have access to scientific, objective risk assessment tools could further our central goals of increasing public safety, reducing crime, and making the most effective, fair, and efficient use of public resources." (Arnold Foundation 2013, p. 2).

At the time, no risk assessment was based on a national dataset, could be administered without a defendant interview, and provided separate risk scores for failure to appear, new criminal activity, and new violent criminal activity. To begin developing such a tool, researchers started with an existing interview-based RAI used in Kentucky, which consisted of 12 risk factors. Some factors were interview-based, others could be gleaned from only the defendant's criminal history. When the interview-based risk factors were omitted, the criminal history risk factors alone were found to be just as predictive as the entire instrument in a sample of Kentucky cases. Thus, researchers at the Arnold Foundation formed a nationwide dataset of pretrial criminal cases and began a study to build a pretrial RAI based solely on a defendant's criminal history.

> The study identified and tested hundreds of risk factors, which fell into broad categories, including prior arrests and convictions, prior failures to appear, drug and alcohol use, mental health, family situation, employment, residence, and more. The researchers identified nine factors that were the most predictive – across jurisdictions – for new crime, new violence, and failure to appear. These factors were drawn from the existing case (e.g., whether or not the current offense is violent) and from the defendant's prior criminal history. The researchers looked at numerous interview- based factors, including employment, drug use, and residence, and found that, when the nine administrative data factors were present, none of the interview-based factors improved the predictive analytics of the risk assessment. In other words, for all three categories – new criminal activity, new violent crime, or

> failure to appear – the addition of interview-dependent variables did not improve the risk assessment's performance. (Arnold Foundation 2013, pp. 3–4).

The final result was a new RAI based on those nine factors: the PSA. The tool was first piloted in Kentucky, which has perennially been at the forefront of pretrial detention reform, and it was eventually adopted statewide. Arnold Ventures continues to offer the PSA for free, and offers implementation guides, example documents, and other resources for any jurisdiction that wishes to implement it.

2.2.2 How the PSA Works

The PSA is an empirically based risk assessment instrument that uses nine risk factors (split into 11 questions) to generate three separate risk scores – one each for failure to appear ("FTA"), new criminal activity ("NCA"), and new violent criminal activity ("NVCA"). Table 1 presents the PSA risk factors, possible responses, and the number of points assigned to each possible response. Each individual PSA score – for FTA, NCA, and NVCA – is calculated using only a subset of all risk factors, and the risk factors are weighted differently for each risk score. In Table 1, where a risk factor is not used in calculating the PSA score associated with a column, the points for the risk factor are left blank in the table. For example, the FTA score is calculated using only the pending charge at the time of arrest, the presence of any prior conviction, and the number of prior failures to appear. As summarized by Table 1, the FTA score is calculated using risk factors 3, 5A, 7, and 8; the NCA score is calculated using risk factors 1, 3, 4, 5, 6, 7, and 9; and the NVCA is calculated using risk factors 2, 2A, 3, 5A, and 6.

Once all responses are recorded, the points for each risk factor are summed and converted to a scaled score of one through six. Table 2 shows the total number of points associated with each

possible scaled score for each of the three PSA scores.[16] According to Advancing Pretrial Policy & Research, the arm of Arnold Ventures that oversees the PSA, each scaled score was also associated with the success rates presented in the third column of Table 2. The rate of successful court appearances or remaining arrest-free shown in the table is the average across PSA pilot sites. The group of individuals with a scaled FTA score of six, for example, had an average appearance rate of 65%, while the group of individuals with a scaled FTA score of one had an average appearance rate of 89%. Importantly, the success rate for each PSA outcome declines as the associated scale risk score increases. Put another way, the rate of failure to appear and rate of recidivism increase as the associated scale risk scores increases. This pattern should be expected if the PSA sorts arrestees according to their true risk for each PSA outcome, and the pattern in fact emerges in numerous studies validating the PSA. (E.g., DeMichele, et al. 2023b, 2023c, and 2023d; Brittain, et al. 2021).

DeMichele, et al. 2023b, 2023c, and 2023d validate the PSA in Fulton County, Georgia, Pierce County, Washington, and Thurston County, Washington, respectively. Brittain, et al. 2021 validates the PSA in Volusia County, Florida. With little exception, in each study, the rate of new criminal activity among defendants with the same PSA score strictly increases as the PSA score increases. Thus, the PSA appears to sort adult defendants fairly well according to their risk of reoffending, indicating that the PSA is a precise instrument when used as a pretrial RAI.

[16] Additionally, the NVCA score is used to determine whether an arrestee will receive a "flag" for NVCA, which occurs if the arrestee receives a scaled score of four or more on the NVCA scale.

TABLE 2-1. PSA Risk Factors and Scoring

		FTA Points	NCA Points	NVCA Points
1. Age at current arrest	22 or younger		2	
	23 or older		0	
2. Current violent offense	Yes			2
	No			0
2A. Current violent offense and age 20 or younger	Yes			1
	No			0
3. Pending charge at time of arrest	Yes	1	3	1
	No	0	0	0
4. Prior misdemeanor conviction	Yes		1	
	No		0	
5. Prior felony conviction	Yes		1	
	No		0	
5A. Prior conviction (misdemeanor or felony)	Yes	1		1
	No	0		0
6. Prior violent conviction	≥ 3		2	2
	1 or 2		1	1
	None		0	0
7. Prior FTA in past 2 years	≥ 2	4	2	
	1	2	1	
	None	0	0	
8. Prior FTA older than 2 years	Yes	1		
	No	0		
9. Prior sentence to incarceration	Yes		2	
	No		0	
Total Points Possible		7	13	7

Notes: "FTA" = Failure to Appear; "NCA" = New Criminal Activity; "NVCA" = New Violent Criminal Activity. Empty cells indicate the risk factor (row) is not used in calculating the corresponding PSA score (column). *Source*: Advancing Pretrial Policy and Research, *Guide 6F. PSA Points and Scores*, https://advancingpretrial.org/guide/guide-to-first-team-meeting/.

TABLE 2-2. PSA Scaled Scores and Validated Success Rates

Total FTA Points	Scaled FTA Score	Appearance Rate
0	1	89%
1	2	85%
2	3	81%
3–4	4	73%
5–6	5	69%
7	6	65%

Total NCA Points	Scaled NCA Score	Arrest-Free Rate
0	1	91%
1–2	2	85%
3–4	3	78%
5–6	4	68%
7–8	5	55%
9–13	6	47%

Total NVCA Points	Scaled NVCA Score	Violent Arrest-Free Rate
0–1	1	98%
2	2	97%
3	3	96%
4	4	95%
5	5	93%
6–7	6	90%

Notes: "FTA" = Failure to Appear; "NCA" = New Criminal Activity; "NVCA" = New Violent Criminal Activity. Appearance Rate, Arrest-Free Rate, and Violent Arrest-Free Rate based on average across jurisdictions using the PSA. Sources: Advancing Pretrial Policy and Research, *Guide 6F. PSA Points and Scores*, https://advancingpretrial.org/guide/guide-to-first-team-meeting/; Advancing Pretrial Policy and Research, *Guide 12. Guide to the Pretrial Assessment Report*, https://advancingpretrial.org/guide/guide-to-the-psa-report/.

2.2.3 PSA Performance

As discussed in the prior section, the PSA has been statistically validated in numerous jurisdictions (E.g., DeMichele, et al. 2023b, 2023c, 2023d; Brittain, et al. 2021; Greiner, et al. 2021, 2020a, 2020b). Validation helps ensure that the tool performs as expected and makes accurate predictions. Each validation study on the PSA has confirmed that failure rates (for failure to appear and new criminal activity) increase as the scaled PSA score increases for each associated outcome.

Further, across samples, the PSA has been shown to have acceptable levels of predictive accuracy, as measured by the area under the receiver operating characteristic curve, a common metric in the RAI literature discussed in more detail below.

Moreover, implementation of the PSA has been consistently shown to reduce pretrial detention rates (E.g., Hamilton 2022; Anderson, et al. 2019; Redcross, et al. 2019; Stevenson 2018). In a study of cases in Cook County, IL, Hamilton (2022) reports that the overall share of defendants detained fell from 29% to 19% following adoption of the PSA. Decreases in the use of detention are primarily driven by releasing defendants on their own recognizance who would have previously been given a low cash bond (Hamilton 2022; Redcross, et al. 2019; Stevenson 2018) or probationary conditions of release (Anderson, et al. 2019). Thus, PSA implementation is often associated with a slight increase or no change in the share of defendants given higher bonds or more stringent release conditions. For example, Hamilton (2022) finds a small increase in the share of defendants given "no-bond" detention. Similarly, Redcross, et al. (2019) finds a small decrease in the number of defendants jailed for one or two days, but no change in the number of defendants jailed for 30 or more days. These findings indicate that the PSA prompted judges to release low-risk defendants and that high-risk defendants were already detained.

Several studies have also addressed race and gender disparities in *who* gets released, as racial and gender bias concerns are prevalent in the RAI literature. With respect to race, studies of the PSA have consistently found no racial bias attributable to the instrument. A leading study analyzing racial bias in the PSA, DeMichele, et al. (2020), found that the instrument has similar predictive validity for both white and black defendants with respect to NCA and NVCA scores, but that the FTA score is more predictive for white defendants than black defendants. Similarly, using a moderated regression approach – which tests the statistical significance of an interaction term between race and RAI score at predicting failure to appear or new criminal activity – the study

found that NCA and NVCA scores were not moderated by race and that FTA scores were moderated by race such that black defendants are actually *underpredicted* to fail to appear. Similar results are also reported in local validation studies, which show that FTA and NCA rates associated with each possible PSA score do not differ between white and non-white defendants. (DeMichele, et al. 2023b, 2023c, 2023d). Stevenson (2018) and Albright (2019) both analyzed statewide samples in Kentucky. Both studies found that white defendants were more likely to be granted non-financial release than black defendants, but that the disparity was driven by judicial and geographic effects rather than the PSA itself. Using a randomized controlled trial, Imai, et al. (2023) found that providing PSA results to judges did not differentially impact detention decisions by race. These findings suggest that any racial disparity in pretrial detention decisions is principally driven by human decisionmakers, not the PSA itself.

With respect to gender, Imai, et al. (2023) found that providing PSA reports to judges may have increased disparities in detention decisions between males and females, with females being treated more leniently. Hamilton (2022) also finds that, controlling for case information and PSA score, males are statistically significantly more likely to be detained by judges. In contrast, DeMichele, et al. (2023a) demonstrates that the PSA itself (as opposed to judicial decisionmaking) has similar predictive validity for males and females on both the FTA and NVCA scores, though the instrument is slightly more accurate on NCA scores for males. Further, the study found that FTA and NCA scores were not moderated by gender and that the PSA has equal error rates across gender. Overall, results tend to indicate that the PSA has similar performance among males and females, and that, where different, males may be the gender disadvantaged.

Given the literature demonstrating that the PSA performs fairly well at classifying defendants according to their risk of reoffending, and the robust set of support resources Arnold Ventures offers to jurisdictions wishing to implement the tool, the PSA could be an attractive option

for juvenile courts that wish to institute a pretrial RAI without expending resources to develop their own. However, no study has analyzed the efficacy of the PSA in the juvenile detention context. This chapter thus contributes to the literature by providing an empirical analysis of the PSA using data from juvenile cases.

2.3 Data & Methodology

To assess the PSA's predictions and its performance in juvenile populations, I construct PSA scores using information from risk assessments completed on youth in Davidson County, Tennessee. In 2019, the Davidson County Juvenile Court developed and implemented its own pretrial RAI for juvenile arrestees: the Juvenile Detention Risk Assessment ("JDRA"). I use all 535 JDRA assessments completed on youth who were not automatically detained between July 2019 and April 2022 to compare the JDRA's performance to the counterfactual performance of the PSA. The JDRA is comprised of two sections. The first section is a list of dispositive criteria that results in the automatic detention of a juvenile arrestee. The second section contains eight multiple choice risk factors and proceeds only if an automatic detention criterion is not triggered in the first section. If a juvenile is not automatically detained and proceeds to the second section, a risk score is generated based on responses to the risk factors in the second section. If the score is below a pre-determined threshold, the youth is recommended for release; if the score is above threshold, the youth is recommended for detention.[17] Between July 2019 and April 2022, 1,414 arrests were assessed with the JDRA. Of all arrests, 879 were automatically detained by threshold criteria in the first section and 535 proceeded to the second section. Because the complete battery of JDRA risk factors is available only for youth who proceed to the second section, the analysis here focuses

[17] There is an option for either the prosecutor or a magistrate judge to override the JDRA's recommendation, but overrides are not included in the analysis here because the JDRA's stand-alone performance is the proper standard for comparison to a counterfactual PSA regime. Moreover, overrides occurred rarely in this sample, as shown in Chapter 1.

on the 535 assessed youth.[18] Of these 535 juveniles, 106 (19.8%) were recommended for detention and 429 (80.2%) were recommended for release. Finally, because the Davidson County Juvenile Court did not record data on failures to appear, my analysis is limited to evaluating new criminal activity, or recidivism. Thus, the NCA risk factors and scoring of the PSA are the focus of the remainder of this study.

Most of the PSA factors can be drawn directly from JDRA data, although the second section of the JDRA contains slightly fewer risk factors than the PSA. Additionally, two PSA risk factors do not map onto the JDRA data. First, the age threshold at which points are assigned in the PSA is 23. Because all youth in the JDRA sample are under age 23, I modify the threshold at which points are assigned to age 16, the average age in the sample. For robustness, I repeat all analyses with age thresholds at 15 and 17, with results reported in the Appendix. Second, the JDRA does not report prior violent convictions – it records only whether a youth had a prior felony or misdemeanor. To accommodate this discrepancy, I use two alternate specifications: one in which the prior violent conviction risk factor is omitted entirely, and one in which the risk factor is substituted with any prior felonies or a charge for a felony against a person pending adjudication at the time of arrest. When I substitute the prior violent conviction risk factor, I also reduce the threshold to receive the highest number of points from three instances to two instances due to the sample distribution and the fact that juveniles are younger (and therefore have less time to accumulate charges). While missing a risk factor for prior violent convictions is a limitation because it is not a perfect comparison to the PSA, the analysis does distinguish between youth who have both a pending charge for a felony against a person and a prior felony from those who have only

[18] The automatic detention criteria are triggered if a youth is from another jurisdiction, has previously been found incompetent to stand trial, is on strict home detention as part of another charge, or has a serious current charge for a felony against a person or weapon possession. While excluding these youth may impact the sample because these youth would likely have higher risk scores, concerns about bias in the results of comparing the PSA and JDRA are mediated by the fact that the PSA does not consider the seriousness, or gravity, of the current charge in making risk predictions.

one or the other. In this sense, the imperfect proxy still captures some increase in risk score with more (violent) criminal history.

I generate the remaining risk factors directly from responses to the JDRA. I code youth as having a pending charge at the time of arrest if they had any petition pending adjudication for a felony, misdemeanor, or violation of probation or aftercare. I calculate risk factors for prior felony or misdemeanor convictions based on whether a juvenile had prior adjudications for felonies or misdemeanors. I calculate whether the youth had a prior failure to appear in the past two years based on whether the youth had a history of failing to appear, running away, or had previous warrants for failure to appear. Finally, I calculate whether the youth had a prior sentence to incarceration if the youth had a current or prior placement with the Juvenile Justice division of the Department of Children's Services, which is akin to a carceral sentence.

Table 3 presents descriptive statistics for the PSA risk factors created from the sample of Davidson County youth assessed with the JDRA. Roughly half the sample is age 16 or over, with the remaining half age 15 or younger. Almost 24% of youth in the sample have another pending charge at the time of arrest, while far fewer have a prior adjudication for a felony (8.6%) or misdemeanor (1.9%). Moreover, 68 (12.7%) youth have any prior felony or pending charge for a felony against a person. The vast majority of youth (96.8%) have no prior failures to appear in court. Finally, 6.4% of assessed youth have a prior sentence to the juvenile justice division of the Tennessee Department of Children's Services (akin to incarceration). Notably, with the exception of having a pending charge at the time of arrest and age at current arrest, the proportion of the sample with any other risk factor present is quite low, as compared to the distribution in adult populations (E.g., DeMichele, et al. 2023b, 2023c, and 2023d) or only released adult arrestees (E.g., DeMichele 2020 and 2023a). In both the released and overall adult population, each risk factor is typically present in at least 20% of the population. In the juvenile population in this study, by

contrast, each risk factor is present in less than 9% of the population.[19] The discrepancy in the risk factor distributions between adult and juvenile populations provides some early indicia that the PSA may not be well suited to assess youth.

To compare the performance of the PSA to the JDRA, I calculate the positive predictive value ("PPV") and negative predictive value ("NPV") for the detention recommendations of each instrument. I also calculate the area under the receiver operating characteristics curve ("AUC") for each instrument, the statistic traditionally used in the risk assessment literature to evaluate predictive validity (E.g., DeMichele, et al. 2023b, 2023c, and 2023d; Desmarais, et al. 2021; Slobogin 2021; Brittain, et al. 2021).

The PPV indicates the proportion of arrestees predicted to recidivate and who did so. Similarly, the NPV indicates the proportion of arrestees predicted not to recidivate and in fact did not do so. Thus, the PPV and NPV can be thought of as measures of the "correctness" of the instrument. Mathematically, the PPV and NPV are given as follows:

$$PPV = \frac{TP}{TP + FP}$$

$$NPV = \frac{TN}{TN + FN}$$

The AUC indicates the probability that a randomly selected recidivist receives a higher risk classification than a randomly selected non-recidivist (Slobogin 2021; Singh 2013). In the binary case (such as where only one score cutoff is used), the AUC can be expressed mathematically as follows:

$$AUC = \frac{1}{2}\left(\frac{TP}{TP + FN} + \frac{TN}{FP + TN}\right)$$

[19] If only released youth are considered, as shown in Appendix Table 1, each risk factor is present in an even smaller percentage of the sample (as might be expected given those with higher risk scores were detained).

The RAI literature generally considers an AUC between 0.55 and 0.63 as "fair," between 0.64 and 0.7 as "good," and over 0.71 as "excellent" (DeMichele, et al. 2023a; Slobogin 2021; Desmarais, et al. 2021).

TABLE 2-3. Sample Distribution of NCA Risk Factors Among Assessed Youth

		N	Freq.
Age at current arrest	15 or younger	271	50.65%
	16 or older	264	49.35%
Pending charge at time of arrest	Yes	127	23.74%
	No	408	76.26%
Prior misdemeanor conviction	Yes	10	1.87%
	No	525	98.13%
Prior felony conviction	Yes	46	8.60%
	No	489	91.40%
Any prior felony or pending felony against person	≥ 2	22	4.11%
	1	46	8.60%
	None	467	87.29%
Prior FTA in past 2 years	≥ 2	2	0.37%
	1	15	2.80%
	None	518	96.82%
Prior sentence to incarceration	Yes	34	6.36%
	No	501	93.64%

Notes: Any prior felony or pending felony against a person substituted for prior violent conviction risk factor. Age threshold adjusted for juvenile population.

In the specifications above, *TP* stands for "true positive," *FP* stands for "false positive," *TN* stands for "true negative," and *FN* stands for "false negative." In the pretrial risk assessment context, the literature considers a "true positive" an offender who was predicted to recidivate and who did. Similarly, a "false positive" would be an offender who was predicted to recidivate but did

not. A "true negative" would be an offender who was predicted *not* to recidivate and who did not; and a "false negative" would be an offender who was predicted *not* to recidivate but who did.

In my analysis, I code any new arrest (observed as a new contact with the detention center) as recidivism. I code a JDRA or PSA recommendation of secure detention as a prediction of recidivism and a recommendation of release as a prediction of no recidivism. I code a scaled PSA score of four or more as a recommendation of detention. Admittedly, this method of coding detention recommendations, while mathematically necessary, may be short-sighted. As Slobogin (2021) points out, RAIs are not designed to make an exact prediction of recidivism (or not). RAIs are designed to make a risk classification and provide information about the probability of recidivism for a class of offenders with similar scores. Although this fact renders the AUC an imperfect measure of RAI accuracy, the AUC does offer some measure of an RAI's precision.

2.4 Results

Overall, the PSA is slightly less precise than the JDRA, as measured by its predictions of recidivism. This is borne out by examining the recidivism trend across PSA scaled risk scores, and the PPV, NPV, and AUC values for each of the instruments. While the JDRA and PSA often have similar performance metrics, where the two instruments differ, the JDRA is consistently superior by a small but notable margin.

Table 4 displays the sample distribution and measures of recidivism by NCA score. The sample shows a large amount of youth – approximately 70% – with a scaled risk score of one or two, after which it tapers off as the scaled risk score increases. Roughly 95% to 98.5% of the sample has a scaled risk score of four or less. While adult populations also tend to have relatively few arrestees with a score of five or six, the adult population typically is more spread among the lower risk scores. Hamilton (2022), for example, reports that 30.4% of the sample had a "low" risk score, 54.1% had a "medium" risk score, and 15.4% had a "high" risk score. Similarly, Ferguson, et al.

(2019) reports that 34% of the sample had an NCA score of one or two, 46% had a score of three or four, and 20% had a score of five or six. Similar distributions are also reported in DeMichele, et al. (2023b, 2023c, and 2023d). This is likely because no juveniles who were automatically detained, who should have higher risk scores, were in the sample.

TABLE 2-4. NCA Score Distribution and Measures of Recidivism

		Rearrested within:			
	N	90 Days		30 Days	
Panel A: Violent Conviction Risk Factor Omitted					
1	190	24	12.63%	13	6.84%
2	190	33	17.37%	12	6.32%
3	72	18	25.00%	8	11.11%
4	75	13	17.33%	5	6.67%
5	6	0	0.00%	0	0.00%
6	2	0	0.00%	0	0.00%
Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor					
1	190	24	12.63%	13	6.84%
2	186	31	16.67%	11	5.91%
3	63	15	23.81%	8	12.70%
4	71	14	19.72%	6	8.45%
5	21	4	19.05%	0	0.00%
6	4	0	0.00%	0	0.00%

Notes: New Criminal Activity ("NCA") score based on scale in Table 2. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

If the PSA does well at sorting youth according to their risk of engaging in new criminal activity, the rate of recidivism among those with high risk scores should be greater than those with low risk scores. That is, the incidence of new criminal activity (recidivism) among arrestees with the same risk score should increase as the NCA score increases. (E.g., DeMichele, et al. 2020, 2023b, 2023c, and 2023d; Brittain, et al. 2021; Ferguson, et al. 2019). This, however, does not appear to be the case among the youth in the sample. Both the 90- and 30-day recidivism rates fluctuate, often with the highest recidivism rate among youth with scaled risk score of three. This

result holds both when the violent conviction risk factor is omitted and when it is substituted with prior felonies and pending charges for felonies against persons. The result also holds when the age threshold used to calculate the age risk factor is changed to 17 years old (Appendix Table 2) or 15 years old (Appendix Table 3).

The above findings seem to indicate the PSA does not perform well among youth. Although these findings could be consistent with the small sample size of youth with high scaled risk scores or an incapacitation effect, other evidence suggests these factors are less responsible for the results. When the sample is restricted to only youth who were released by the JDRA, as shown in Table 5, the rearrest rate increases at first, but then decreases or plateaus at higher risk scores. Additionally, the average time to rearrest is roughly the same among detained and release youth, as shown in Chapter 1, suggesting that incapacitation alone cannot be responsible.

TABLE 2-5. NCA Score Distribution and Measures of Recidivism of Released Youth

		Rearrested within:			
	N	90 Days		30 Days	
Panel A: Violent Conviction Risk Factor Omitted					
1	185	24	12.97%	13	7.03%
2	180	29	16.11%	11	6.11%
3	32	8	25.00%	3	9.38%
4	21	2	9.52%	2	9.52%
5	2	0	0.00%	0	0.00%
6	0	0	0.00%	0	0.00%
Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor					
1	185	24	12.97%	13	7.03%
2	180	29	16.11%	11	6.11%
3	31	7	22.58%	3	9.68%
4	21	3	14.29%	2	9.52%
5	3	0	0.00%	0	0.00%
6	0	0	0.00%	0	0.00%

Notes: New Criminal Activity ("NCA") score based on scale in Table 2. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

Table 6 presents a comparison of the detention recommendations of the PSA and JDRA, along with recidivism rates for each subsample. The PSA would have recommended release for more youth than the JDRA did, both when the violent conviction risk factor is omitted and when it is substituted with prior felonies and pending charges for felonies against persons. This remains true when the age threshold for the age risk factor is adjusted to 17 years old (Appendix Table 4), but not when the age risk factor threshold is adjusted to 15 years old (Appendix Table 5).

Nevertheless, it does not appear that the greater number of releases by the PSA would have had social welfare improving effects. While the PSA recommended release for more youth than the JDRA, the rate of recidivism among recommended releases under the PSA was slightly higher than releases under the JDRA. Furthermore, it is likely the recidivism rate among those recommended for release by the PSA is understated, as some youth who would have been recommended for release under the PSA were actually detained by the JDRA, and therefore could not recidivate at least for a short time (via an incapacitation effect). That is, the true counterfactual recidivism rate under a PSA regime is likely even greater than the rate reported in Table 6. Admittedly, while the recidivism rate among recommended releases by the PSA is likely understated in Table 6 due to an incapacitation effect, the magnitude of this difference may be small because only a mild incapacitation effect was seen in this sample, as shown in Chapter 1. Additionally, as shown in Tables 4 and 5, the recidivism rate decreases at scaled scores of four or more (the threshold for a detention recommendation), indicating the PSA might misclassify higher-risk youth at the margin.

TABLE 2-6. Detention Recommendations and Recidivism under the JDRA and PSA

Panel A: Violent Conviction Risk Factor Omitted

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
	Release	*(N = 410)*		*(N = 19)*		*(N = 429)*	
	Rearrested within 90 Days	63	15.37%	2	10.53%	65	15.15%
	Rearrested within 30 Days	29	7.07%	2	10.53%	31	7.23%
	Detain	*(N = 42)*		*(N = 64)*		*(N = 106)*	
	Rearrested within 90 Days	12	28.57%	11	17.19%	23	21.70%
	Rearrested within 30 Days	4	9.52%	3	4.69%	7	6.60%
	Overall	*(N = 452)*		*(N = 83)*			
	Rearrested within 90 Days	75	16.59%	13	15.66%		
	Rearrested within 30 Days	33	7.30%	5	6.02%		

Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
	Release	*(N = 409)*		*(N = 20)*		*(N = 429)*	
	Rearrested within 90 Days	63	15.40%	2	10.00%	65	15.15%
	Rearrested within 30 Days	29	7.09%	2	10.00%	31	7.23%
	Detain	*(N = 30)*		*(N = 76)*		*(N = 106)*	
	Rearrested within 90 Days	7	23.33%	16	21.05%	23	21.70%
	Rearrested within 30 Days	3	10.00%	4	5.26%	7	6.60%
	Overall	*(N = 439)*		*(N = 96)*			
	Rearrested within 90 Days	70	15.95%	18	18.75%		
	Rearrested within 30 Days	32	7.29%	6	6.25%		

Notes: Detention recommended with a PSA Score of 4 or more. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

The 90-day recidivism rate among youth recommended for release by the PSA (16.59% and 15.95%) is almost a percentage point greater than the recidivism rate among youth recommended for release by the JDRA (15.15%), making the true counterfactual rate even greater. This result indicates there is a tradeoff between releasing additional youth under the PSA and new criminal activity. Importantly, the results suggest that the juveniles on the margins who the PSA would release, but the JDRA would not, are ones who are likely to recidivate. This finding is significant because it implies using the PSA over the JDRA would tend to increase offending. Moreover, because the tools have similar but distinct performance metrics, as discussed below, even a small difference in performance at the margins can significantly impact a tool's efficacy overall.

Further, the 90-day recidivism rate among those recommended for detention by the PSA is lower than among those recommended for detention by the JDRA. If the PSA performs better than the JDRA at identifying youth at high risk of recidivating, the opposite result should emerge. Taken together, these results indicate that the PSA is a less precise RAI when applied to juveniles, as compared to the JDRA. The PSA would have released more youth who would have recidivated more often and would have detained youth who would not go on to engage in new criminal activity.

This conclusion finds further support by examining the PPV and NPV of the PSA. When I omit the violent conviction risk factor, as shown in Panel A of Table 6, the PPV of the PSA is 15.66% (13/83) on the 90-day time horizon and 6.02% (5/83) on the 30-day time horizon. When I substitute the violent conviction risk factor with any prior felony or a pending felony against a person, as shown in Panel B of Table 6, the PPV of the PSA is 18.75% (18/96) on the 90-day time horizon and 6.25% (6/96) on the 30-day time horizon. This means the PSA correctly predicts recidivism in at most 15.66% to 18.75% of youth. By comparison, the PPV of the JDRA is 21.7% (23/106) on the 90-day time horizon and 6.6% (7/106) on the 30-day time horizon. These results

indicate the JDRA makes correct recidivism predictions on the 90-day time horizon more frequently than the PSA would, regardless of the specification used to construct the PSA score, and the JDRA correctly predicts recidivism on the 30-day time horizon about as often as the PSA would.

Similarly, when I omit the violent conviction risk factor, as shown in Panel A of Table 6, the NPV of the PSA is 83.41% ((452 − 75)/452) on the 90-day time horizon and 92.7% ((452 − 33)/452) on the 30-day time horizon. When I substitute the violent conviction risk factor with any prior felony or a pending felony against a person, as shown in Panel B of Table 6, the NPV of the PSA is 84.05% ((439 − 70)/439) on the 90-day time horizon and 92.71% ((439 − 32)/439) on the 30-day time horizon. This means the PSA would have correctly predicted non-recidivism roughly 84% to 93% of the time. By comparison, the NPV of the JDRA is 84.85% ((429 − 65)/429) on the 90-day time horizon and 92.77% ((429 − 31)/429) on the 30-day time horizon. Thus, the JDRA makes correct non-recidivism predictions about as frequently as the PSA would. While the PSA and JDRA had similar NPV values and similar PPV values on the 30-day time horizon, the JDRA had a PPV that was three to six percentage points higher than the PSA on the 90-day time horizon. This indicates the JDRA is weakly more precise than the PSA.

Finally, the AUC values of the PSA confirm its lower precision. Table 7 shows the AUC values for the PSA and JDRA on both 90- and 30-day time horizons. In the sample, the AUC for the PSA ranges from 0.487 to 0.515. By contrast, in adult-aged validation samples, the PSA typically has AUC values from 0.6 to 0.65 (E.g. DeMichele, et al. 2023b, 2023c, 2023d; Demarais, et al. 2021; Brittain, et al. 2021). The AUC for both PSA specifications is less than the AUC for the JDRA's recommendation, though all calculations are near 0.5. This suggests the JDRA somewhat out-performs the PSA when sorting high risk and low risk youth. The result also

continues to hold when the age threshold for the age risk factor is adjusted to 17 years old (Appendix Table 6) and 15 years old (Appendix Table 7).

TABLE 2-7. Area Under the Curve for JDRA and PSA Detention Recommendations

	Rearrested within:	
	90 Days	30 Days
JDRA Recommendation	0.5378 [0.4883, 0.5874]	0.4925 [0.4276, 0.5574]
PSA Recommendation *(Violent Conviction Risk Factor Omitted)*	0.4956 [0.4547, 0.5365]	0.4873 [0.4306, 0.5441]
PSA Recommendation *(Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor)*	0.5150 [0.4691, 0.5609]	0.4884 [0.4273, 0.5496]

Notes: $N = 535$ for all calculations. Detention recommended with a PSA Score of 4 or more.

In sum, the PSA appears to be less precise than the JDRA when making detention recommendations based on the risk of new criminal activity. The distribution of scaled risk scores among youth in the sample is concentrated among scores of one or two, and, as the scaled risk score increases, the recidivism rate first increases but later declines. In adult samples, the distribution of scaled risk scores shows more spread, and the rate of recidivism among those with the same risk score increases as the scaled risk score grows. Additionally, while more youth would have been released under a counterfactual PSA regime, recidivism among those youth would likely also have been greater. The greater relative precision of the JDRA is further bolstered by examining the PPV, NPV, and AUC values of each instrument. While the PSA and JDRA had similar NPV calculations, the JDRA had a higher PPV on the 90-day time horizon and greater AUC values on both the 90- and 30-day time horizons. Overall, where the two instruments differed in performance metrics, the JDRA was consistently superior.

2.5 Discussion & Conclusion

Risk assessment for pretrial detention has proliferated in the adult criminal legal system, largely as part of reform efforts designed to decrease the use of monetary bail and reduce the size of pretrial jail populations. While several pretrial RAIs have been developed and implemented across the United States, the PSA has been adopted in more jurisdictions than any other pretrial RAI. Unlike other pretrial RAIs, the PSA was developed using data from a national sample of criminal cases, remains free to use, and provides transparent scoring on its risk factors. These characteristics have contributed not only to the popularity but also the success of the PSA. The tool has been validated in multiple localities and has been shown to accurately predict risk of failure to appear and recidivism for adults.

Efforts to reduce the use of pretrial detention through RAI implementation have also emerged in the juvenile justice system. Much like its adult counterpart, juvenile detention can lower educational attainment, increase recidivism and criminality, affect aggression and other behavior, and compound trauma exposure (Baron, et al. 2022; Walker & Herting 2020; Trejos-Castillo 2020; Stevenson 2017). However, there is no consistent, nationally validated RAI for pretrial juvenile detention analogous to the PSA for adults. Given the success the PSA has realized, one natural question is how well the PSA performs among youth and whether it provides a good model for juvenile detention risk assessment. This study is the first to address that question.

There are reasons to think a validated adult pretrial RAI can be transplanted to juvenile populations, but there are also reasons to think not. On one hand, the criteria by which judges make detention decisions – assessing an offender's risk of flight and risk of recidivism while on pretrial release – are the same in both adult and juvenile courts. Thus, the risks that need assessing are identical in the youth and adult contexts. Further, because pretrial risk assessment occurs early in the criminal legal process, the same limited amount of information is available at the time

assessment takes place in both the adult and juvenile systems. These commonalities tend to indicate that adult pretrial RAIs can be used in juvenile populations. On the other hand, by virtue of their age, juveniles have a shorter time horizon in which they can accumulate criminal histories, which is primarily what the PSA relies on to assess risk. Additionally, differences in neurobiological development between adolescents and adults has been linked to heightened impulsivity and risky behaviors among juveniles.[20] These differences suggest that the scoring of risk factors (or the risk factors themselves) should be different for adults and youth.

This chapter provides evidence that juvenile criminal behavior *is* sufficiently distinct from adult criminal behavior that the PSA is not a good model for pretrial RAIs in juvenile detention. Using data from youth assessed with a consensus-based pretrial RAI implemented at a metropolitan juvenile court (the JDRA), I find that higher PSA scores do not always correlate to higher risk of recidivism. By comparing the detention recommendations of the JDRA and the PSA, I find that recidivism would likely have been higher under a PSA regime. Further, the predictive accuracy of the PSA, as measured by its AUC value, is lower than that of the JDRA. The AUC of the PSA applied to juveniles in this study is also significantly lower than the AUC of the PSA applied to adult populations in other studies. (E.g., DeMichele, et al. 2023b, 2023c, 2023d; Brittain, et al. 2021). These results indicate that the PSA, an empirically based tool, is less precise than the JDRA, a consensus-based tool developed by a local juvenile court.

Although no jurisdiction has implemented the PSA in its juvenile court, there remains no national empirical model for juvenile detention risk assessment. The closest juvenile analogue to the PSA comes from model tools developed as part of the Casey Foundation's JDAI, but these tools

[20] During adolescence, developmental changes in the brain's reward circuitry outpace the maturation of cognitive control regions, namely the prefrontal cortex, resulting in impulsive decision-making (Somerville, et al. 2010; Steinberg 2010). Juveniles' relative neurobiological immaturity has also been cited by the U.S. Supreme Court as a reason juveniles have less culpability than adults. *See, e.g.*, *Miller v. Alabama*, 567 U.S. 460 (2012).

are not based on historical data gathered by individual jurisdictions. The pretrial RAIs developed at JDAI sites are specific to each site and created using a consensus-based approach without empirical analysis of juvenile case data. Thus, they lack several of the strengths of the PSA. The results of this study, however, suggest that the PSA may not be a superior tool for juvenile populations. Jurisdictions seeking to implement pretrial juvenile detention risk assessment should not implement the PSA itself or even use the PSA scoring weights. Until a national empirically based tool can be developed, as proposed by Stark (2022), jurisdictions seeking to implement a pretrial RAI that makes precise recommendations for juvenile detention must continue to devote significant local resources to the development of their own instrument. One model for other jurisdictions is New York City, which first convened local juvenile justice stakeholders to use a consensus-based approach to develop a list of proposed risk factors, and then empirically tested the set of proposed risk factors to create a final RAI (Fratello, et al. 2011). Thus, the final result combined stakeholder input with empirical analysis to yield the best possible pretrial RAI.

While New York City's approach appears ideal, realistically not all jurisdictions may be able to devote the same amount of personnel and financial resources to developing a juvenile pretrial RAI. In such cases, jurisdictions should establish working groups, or implementation teams, including judges, attorneys, and court staff, and charge them with developing a tool for the juvenile court – much like Nashville's juvenile court did in conjunction with the Crime and Justice Institute. Implementation teams should begin by gathering the most current literature on juvenile pretrial RAIs, examples of existing tools, and implementation guides, such as the Casey Foundation's practice guide, *Juvenile Detention Risk Assessment* (Steinhart 2006) and Models for Change's guidebook, *Risk Assessment in Juvenile Justice: A Guidebook for Implementation* (Vincent, et al. 2012). Guided by existing instruments, current studies, and applicable law, implementation teams

should then develop a set of risk factors that stakeholders deem relevant to the juvenile pretrial detention decision.

Next, implementation teams must assess local data and information constraints – such as limitations due to technology infrastructure, the timing of data entry, or database maintenance – to determine which risk factors are feasible to include in the instrument. Finally, stakeholders on implementation teams must find consensus on how each risk factor will be weighted or scored, and which thresholds will be used to trigger detention or release recommendations. Stakeholders must also determine when it will be appropriate for a human decisionmaker to override the tool's recommendation. Following implementation, jurisdictions should collect data on assessments and outcomes, and use the information gathered to improve the tool's accuracy or, if the tool is not reaching intended objectives, make adjustments to its risk factors and scoring. While this process requires the dedication of juvenile court resources, it results in an objective tool that can be used across juveniles without the need for historical data collection and empirical research as part of RAI development.

Such an approach to RAI development was taken in Allegheny County, Pennsylvania, where the juvenile detention center serves Pittsburgh and the surrounding areas (Puzzanchera, et al. 2012). Juvenile justice stakeholders in Allegheny County developed a pretrial juvenile detention RAI based on an instrument developed in Berks County, Pennsylvania, which is near Philadelphia. The Berks County RAI was developed as part of the Casey Foundation's JDAI, and, while not statistically validated, it provided a useful starting point for the Allegheny County implementation team. Modifications to the Berks County tool included slight changes to the criteria that would trigger a "mandatory hold" (automatic detention) and adaptations to the set of aggravating and mitigating factors that could authorize an override of the tool's recommendation. Both Allegheny and Berks County tools made three possible recommendations: release outright, detention

alternative, or detain outright. Similarly, the Allegheny County tool borrowed the scoring used by the Berks County tool with only a minor tweak. Early analysis showed that the overall detention rate was 74%, with just over half of all detentions resulting from mandatory holds, and that overrides "up" to detention (from either a recommendation of release or detention alternative) occurred in roughly 46% of cases (Puzzanchera, et al. 2012). Nevertheless, the overall use of juvenile detention continued to follow a decreasing trend throughout RAI implementation. These figures indicate the Allegheny County tool may need to be modified, as mandatory hold criteria may be overinclusive and most aggravating overrides were the result of a single aggravating factor – the unavailability of parents. Further, no data were collected on outcomes (such as recidivism or failure to appear) and thus no validation study could be performed. Overall, Allegheny County's experience demonstrates that RAI implementation can be carried out without the need for empirical analysis, but that continued research and monitoring is necessary to ensure the tool's efficacy.

Neither the JDRA nor the PSA is a perfect tool. This study corroborates the notion that there is no silver bullet to pretrial risk assessment, and an RAI's performance is highly context dependent. What works in one population may not work in another. As pretrial RAIs continue to play a large and growing role in juvenile detention, continuing statistical analysis on existing tools, including Davidson County's JDRA, is necessary to make improvements and ensure RAIs perform as intended on their target populations.

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APPENDIX

APPENDIX TABLE 2-1. Sample Distribution of NCA Risk Factors Among Released Youth

		N	Freq.
Age at current arrest	15 or younger	210	50.00%
	16 or older	210	50.00%
Pending charge at time of arrest	Yes	39	9.29%
	No	381	90.71%
Prior misdemeanor conviction	Yes	3	0.71%
	No	417	99.29%
Prior felony conviction	Yes	8	1.90%
	No	412	98.10%
Any prior felony or pending felony against person	≥ 2	2	0.48%
	1	9	2.14%
	None	409	97.38%
Prior FTA in past 2 years	≥ 2	1	0.24%
	1	4	0.95%
	None	415	98.81%
Prior sentence to incarceration	Yes	14	3.33%
	No	406	96.67%

Notes: Prior violent conviction risk factor imputed as 1 if youth had any prior felony or another pending charge for a felony against a person at the time of arrest. Age threshold adjusted for juvenile population.

APPENDIX TABLE 2-2. NCA Score Distribution and Measures of Recidivism, Age Risk Factor Threshold at 17

		Rearrested within:			
	N	90 Days		30 Days	
Panel A: Violent Conviction Risk Factor Omitted					
1	280	34	12.14%	17	6.07%
2	110	26	23.64%	10	9.09%
3	96	21	21.88%	9	9.38%
4	43	7	16.28%	2	4.65%
5	5	0	0.00%	0	0.00%
6	1	0	0.00%	0	0.00%
Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor					
1	280	34	12.14%	17	6.07%
2	106	24	22.64%	9	8.49%
3	80	16	20.00%	9	11.25%
4	51	12	23.53%	3	5.88%
5	17	2	11.76%	0	0.00%
6	1	0	0.00%	0	0.00%

Notes: Age risk factor threshold adjusted to 17 years old. New Criminal Activity ("NCA") score based on scale in Table 2. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

APPENDIX TABLE 2-3. NCA Score Distribution and Measures of Recidivism, Age Risk Factor Threshold at 15

		Rearrested within:			
	N	90 Days		30 Days	
Panel A: Violent Conviction Risk Factor Omitted					
1	116	14	12.07%	6	5.17%
2	258	41	15.89%	18	6.98%
3	52	13	25.00%	7	13.46%
4	96	18	18.75%	7	7.29%
5	11	2	18.18%	0	0.00%
6	2	0	0.00%	0	0.00%
Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor					
1	116	14	12.07%	6	5.17%
2	255	39	15.29%	17	6.67%
3	45	11	24.44%	7	15.56%
4	86	18	20.93%	8	9.30%
5	28	5	17.86%	0	0.00%
6	5	1	20.00%	0	0.00%

Notes: Age risk factor threshold adjusted to 15 years old. New Criminal Activity ("NCA") score based on scale in Table 2. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

APPENDIX TABLE 2-4. Detention Recommendation and Recidivism under the JDRA and PSA, Age Risk Factor Threshold at 17

Panel A: Violent Conviction Risk Factor Omitted

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
Release		*(N = 417)*		*(N = 12)*		*(N = 429)*	
	Rearrested within 90 Days	63	15.11%	2	16.67%	65	15.15%
	Rearrested within 30 Days	29	6.95%	2	16.67%	31	7.23%
Detain		*(N = 69)*		*(N = 37)*		*(N = 106)*	
	Rearrested within 90 Days	18	26.09%	5	13.51%	23	21.70%
	Rearrested within 30 Days	7	10.14%	0	0.00%	7	6.60%
Overall		*(N = 486)*		*(N = 49)*			
	Rearrested within 90 Days	81	16.67%	7	14.29%		
	Rearrested within 30 Days	36	7.41%	2	4.08%		

Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
Release		*(N = 416)*		*(N = 13)*		*(N = 429)*	
	Rearrested within 90 Days	63	15.14%	2	15.38%	65	15.15%
	Rearrested within 30 Days	29	6.97%	2	15.38%	31	7.23%
Detain		*(N = 50)*		*(N = 56)*		*(N = 106)*	
	Rearrested within 90 Days	11	22.00%	12	21.43%	23	21.70%
	Rearrested within 30 Days	6	12.00%	1	1.79%	7	6.60%
Overall		*(N = 466)*		*(N = 69)*			
	Rearrested within 90 Days	74	15.88%	14	20.29%		
	Rearrested within 30 Days	35	7.51%	3	4.35%		

Notes: Age risk factor threshold adjusted to 17 years old. Detention recommended with a PSA Score of 4 or more. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

APPENDIX TABLE 2-5. Detention Recommendation and Recidivism under the JDRA and PSA, Age Risk Factor Threshold at 15

Panel A: Violent Conviction Risk Factor Omitted

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
Release		*(N = 400)*		*(N = 29)*		*(N = 429)*	
	Rearrested within 90 Days	59	14.75%	6	20.69%	65	15.15%
	Rearrested within 30 Days	28	7.00%	3	10.34%	31	7.23%
Detain		*(N = 26)*		*(N = 80)*		*(N = 106)*	
	Rearrested within 90 Days	9	34.62%	14	17.50%	23	21.70%
	Rearrested within 30 Days	3	11.54%	4	5.00%	7	6.60%
Overall		*(N = 426)*		*(N = 109)*			
	Rearrested within 90 Days	68	15.96%	20	18.35%		
	Rearrested within 30 Days	31	7.28%	7	6.42%		

Panel B: Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor

JDRA Recommendation		PSA Recommendation: Release		PSA Recommendation: Detain		Overall	
Release		*(N = 399)*		*(N = 30)*		*(N = 429)*	
	Rearrested within 90 Days	59	14.79%	6	20.00%	65	15.15%
	Rearrested within 30 Days	28	7.02%	3	10.00%	31	7.23%
Detain		*(N = 17)*		*(N = 89)*		*(N = 106)*	
	Rearrested within 90 Days	5	29.41%	18	20.22%	23	21.70%
	Rearrested within 30 Days	2	11.76%	5	5.62%	7	6.60%
Overall		*(N = 416)*		*(N = 119)*			
	Rearrested within 90 Days	64	15.38%	24	20.17%		
	Rearrested within 30 Days	30	7.21%	8	6.72%		

Notes: Age risk factor threshold adjusted to 15 years old. Detention recommended with a PSA Score of 4 or more. Panel A omits prior violent conviction as a risk factor in calculating total NCA points; Panel B uses any prior felony or pending felony against a person to substitute for the prior violent conviction risk factor.

APPENDIX TABLE 2-6. Area Under the Curve PSA Detention Recommendations, Age Risk Factor Threshold at 17

	Rearrested within:	
	90 Days	30 Days
PSA Recommendation *(Violent Conviction Risk Factor Omitted)*	0.4928 [0.4613, 0.5243]	0.4790 [0.44082, 0.51724]
PSA Recommendation *(Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor)*	0.5180 [0.4767, 0.5594]	0.4731 [0.4271, 0.5190]

Notes: $N = 535$ for all calculations. Detention recommended with a PSA Score of 4 or more.

APPENDIX TABLE 2-7. Area Under the Curve PSA Detention Recommendations, Age Risk Factor Threshold at 15

	Rearrested within:	
	90 Days	30 Days
PSA Recommendation *(Violent Conviction Risk Factor Omitted)*	0.5141 [0.4663, 0.5619]	0.4895 [0.4246, 0.5544]
PSA Recommendation *(Any Prior Felony or Pending Felony Against Person Substituted for Violent Conviction Risk Factor)*	0.5301 [0.4796, 0.5806]	0.4936 [0.4254, 0.5618]

Notes: $N = 535$ for all calculations. Detention recommended with a PSA Score of 4 or more.

3 WHICH RISK FACTORS REALLY MATTER OF JUVENILE PRETRIAL DETENTION DECISIONS? QUANTITATIVE AND QUALITATIVE EVIDENCE FROM DAVIDSON COUNTY, TENNESSEE

3.1 Introduction

The decision whether to release or detain a juvenile who has just been arrested and accused of committing a delinquent offense can have major repercussions in the life of a child. A movement toward using risk assessment instruments to aid in the pretrial detention decision has thus taken place in the juvenile justice system for the past two decades. A risk assessment instrument (RAI) is a structured tool designed to evaluate and quantify the likelihood of specific outcomes, such as pretrial misconduct or reoffending, based on various risk factors associated with an individual defendant. As seen in Chapters 1 and 2, RAIs can employ objective measures for use across a wide array of defendants and cases to provide valuable information to decision-makers. But which objective measures really matter?

Empirical studies of juvenile justice RAIs in both the pre- and post-adjudication settings have found that the most significant predictors of recidivism are delinquency history and supervision status. No prior study of juvenile pretrial detention RAIs, however, has used both quantitative and qualitative evidence to examine which risk factors are important in the detention decision and should therefore be included in a risk assessment tool. The choice of risk factors in RAI development is critical not only because it determines quantitative measures of the tool's performance, but also because it can affect the tool's efficacy by impacting buy-in and fidelity from stakeholders. Therefore, incorporating stakeholder input is a valuable, but often overlooked, component of juvenile risk assessment research.

This chapter fills that gap in the literature by combining stakeholder perspectives with empirical analysis. In Chapter 1, I found that a pretrial detention RAI developed and implemented

by a metropolitan juvenile court, overall, performed better than chance at predicting rearrest. By comparison, results in Chapter 2 indicated that a validated adult pretrial detention RAI would perform worse than the Chapter 1 RAI, and perhaps even worse than chance. Given that neither RAI evaluated in Chapters 1 and 2 perform particularly well, in this chapter, I work towards developing a better RAI for juveniles. I examine which risk factors are important in making pretrial juvenile detention decisions using both quantitative and qualitative evidence. To examine quantitative importance, I use the same risk assessment data from previous chapters to estimate the effect of individual risk factors in predicting recidivism. I then augment these quantitative results using interviews with juvenile justice stakeholders from the same jurisdiction to ascertain qualitative perceptions of risk factors that matter in pretrial juvenile detention decisions.

Empirical results indicate that three risk factors are statistically significant predictors of rearrest: whether the juvenile has prior adjudications of guilt, whether the juvenile is completing an active disposition (such as probation), and whether the arrest is the juvenile's first contact with the juvenile court. Other factors – including the seriousness of the charge, age, prior dispositions to secure custody, the presence of other pending charges, and any history of running away from home or failing to appear for court – do not appear to contribute to a juvenile's probability of rearrest. Qualitative results, on the other hand, indicate that juvenile justice stakeholders find a slightly broader set of risk factors important. In addition to a youth's prior adjudications, supervision status, and experience with juvenile court, interview participants regarded the seriousness of the current charge, mental health status, and presence of adult supervision at home as very important factors.

Taken together with empirical results in the literature, the quantitative and qualitative results in this chapter suggest that future juvenile pretrial detention RAIs should include measures for a youth's prior adjudications, current supervision status, first court contact, most serious current

charge, history of runaway, history of failure to appear, and current school attendance. Risk factors for age and previous dispositions tend to have weak support, both quantitatively and qualitatively, and probably do not need to be included in future tools. Finally, risk factors for mental health status and home life are likely infeasible to include in tools used at the pretrial stage.

3.2 Background & Literature

3.2.1 Choosing Risk Factors and Developing an RAI

In the development of an RAI, determining which risk factors to include (and the weight each should receive) is of paramount importance. The choice of risk factors establishes the information on which an RAI relies, and the choice of scoring specifies how that information is used. These choices, in turn, directly determine measures of the tool's performance, such as its predictive and discriminant validity – not to mention the real-life impact on defendants the tool is used to assess.

Risk factors are typically operationalized as multiple-choice questions used to code information about an offender, generate a risk score using an algorithm, and make a recommendation as to detention or sentencing. Depending on whether they can change over time, risk factors are considered either "static" or "dynamic," (Slobogin 2021; Vincent, et al. 2012). Static risk factors refer to unchangeable characteristics or factors of an individual that are typically historical and do not change over time, such as prior criminal history or age at first offense. Dynamic risk factors, in contrast, encompass variables that can fluctuate or be influenced by intervention or life circumstances, including substance abuse, employment status, or social support networks. While static factors provide valuable insight into an individual's past behavior and patterns, dynamic factors offer opportunities for intervention and rehabilitation by identifying areas where change is possible, thus informing targeted strategies for risk management and reduction.

As described in Chapter 1, two general methods have been employed in developing juvenile justice RAIs: the consensus-based method and the empirically based method. The consensus-based method involves the collaborative input of experts and professionals in the field who use their collective judgment to identify and prioritize risk factors associated with juvenile delinquency. This process typically relies on qualitative data, expert opinion, and discussions to reach a consensus on which factors are relevant and how they should be weighted in assessing risk. In contrast, the empirically based method utilizes statistical analysis and historical data to identify risk factors and their predictive value. This approach involves gathering large amounts of data on past juvenile offenders, analyzing the relationships between various risk factors and recidivism, and using mathematical algorithms to calculate an individual's risk score based on their profile. Both methods are cabined by constraints, such as the availability of a defendant interview and the accessibility of information systems. In the pretrial setting, the choice of risk factors is further constrained by the fact that the case is at its inception, so less information about the defendant is available overall.

The primary benefit of a consensus-based method, of course, is not the empirical precision with which a tool makes predictions but the input from stakeholders that makes a tool more meaningful to the people who use it. On the one hand, limiting human involvement through an empirically based method removes subjectivity and focuses on predicting the probability of a certain outcome. On the other hand, incorporating input from stakeholders gives the assessment tool legitimacy among the people who will use it. That legitimacy comes from buy-in and fidelity to risk assessment, mechanisms that can be affected by the choice of risk factors to include in an instrument.

3.2.1.1 Buy-In

An RAI's buy-in refers to the support it has from practitioners who use the tool. Buy-in can be affected by factors such as the level of input that stakeholders are able to contribute to

implementing or developing the tool, or the amount of training provided to practitioners who will administer the tool or interpret its results. One indicator of an RAI's buy-in is the perception among stakeholders of the RAI's usefulness in decision-making. For example, in one study, stakeholders generally reported positive attitudes about the RAI they used, but reported some concern with the risk factors and scoring in it (Terranova, et al. 2020).[21] The most prominent concern was the "face validity" of the assessment's risk factors. That is, how important stakeholders perceived individual risk factors in making pretrial detention decisions. Thus, the study concluded, "[r]isk items that make up a risk assessment tool may be better trusted if they are consistent with the indicators that pretrial decision makers consider most often when assessing the risk of pretrial failure." (Terranova, et al. 2020, p. 939). Practitioners may not trust the overall recommendations of tools if they believe certain risk factors should be considered more, less, or not at all.

In a similar study, Miller & Maloney (2013) administered questionnaires to 1,087 probation and parole officers who were required to use structured risk/needs assessment tools in their jobs. The focus of the study was the compliance of practitioners with risk assessment processes, such as how careless practitioners administer an RAI, whether the practitioner fills out an instrument completely, or even whether a practitioner manipulates inputs to achieve a desired recommendation from the tool. Results indicated that confidence in RAIs (both in general and in the specific RAI respondents used), monitoring of the tool's use, and training provided to practitioners significantly differentiated subjects according to their compliance with the risk

[21] Terranova, et al. (2020) surveyed 381 criminal justice stakeholders, including pretrial officers, judges, defense attorneys, and prosecutors, from seven counties in a Midwestern state. Respondents were asked directly, "how valuable are risk assessment tools to your job?" On a scale from 1 (not helpful at all) to 10 (extremely helpful), the average response among stakeholders was 7.13, and roughly 25% of stakeholders answered with the highest rating of 10. In open-ended follow-up questions, a majority of subjects "reported a favorable perception of pretrial risk assessment, positively citing it as an efficient way to review information about a defendant, appreciating its ease of use, and valuing that it is evidence based" (Terranova, et al. 2020, p. 935). While a majority viewed RAIs positively, stakeholders also voiced concerns with the RAIs they used.

assessment procedure. These studies suggest stakeholder buy-in can negatively impact an RAI's performance simply through exacerbating the propensity for human error in completing the tool.

3.2.1.2 Fidelity

Fidelity to an RAI refers to following a tool's protocol and adhering to its recommendations. Fidelity can be affected by the availability of overrides, the ease with which decisionmakers *can* override the tool's recommendation, and whether the RAI makes a presumptive determination or merely offers probative information to a final decisionmaker. As Stevenson (2018) points out:

> While it might seem futuristic to use artificial intelligence to determine someone's freedom, the impacts of risk assessment depend on the same good-old-fashioned factors that have helped and hindered reform for centuries: context, incentives, and details of implementation. Behind risk assessments are people and design choices. (p. 306)

When there are few restrictions on adherence to the recommendation of an RAI, decision-makers may simply disregard it and override the tool. In most pretrial risk assessment settings in adult criminal courts, the RAI is completed and presented to a judge who then uses the information in arriving at a final detention decision. At sentencing, a tool may recommend a carceral or non-carceral sentence, or a length of time. In either situation, decisionmakers have the option of adhering to a tool's recommendation or overriding it. Stevenson (2018) analyzed such a setting using data from Kentucky, where judges were required to consider, but not necessarily follow, the recommendations of a pretrial detention RAI adopted statewide. Results showed a striking pattern. When the RAI was adopted for statewide use, the share of defendants granted non-financial release increased sharply (as policymakers expected). However, in the months and years following implementation, judges gradually reverted to previous rates of detention. This demonstrates that adherence to an RAI may decrease over time. Stevenson (2018) found that RAI implementation did not result in efficiency gains and argued that human discretion played a major role in that outcome. Stevenson & Doleac (2022) analyzed a sentencing RAI implemented in Virginia and

found a similar result. While case diversion and sentence recommendations were largely followed initially, in the years following implementation, judges began to ignore RAI recommendations.

In policy simulations, however, studies have indicated that adherence to RAI recommendations would lead to gains in efficiency. Stevenson & Doleac (2022) showed that strict adherence to the Virginia sentencing RAI would have resulted in a significantly lower incarceration rate, coupled with a slight increase in the recidivism rate. Using data from New York City, Kleinberg, et al. (2018) built a pretrial detention RAI and showed that strict adherence to it could result in either a lower jailing rate without any increase in crime or a significant reduction in crime with no change in the jailing rate. Thus, efficiency gains might be realized if overriding an RAI recommendation was difficult. Slobogin (2023) argues, for example, that pretrial detention RAIs should make presumptively dispositive detention decisions, where judges would be *required* to follow RAI recommendations absent unusual circumstances.

In summary, the choice of risk factors to include in an RAI can impact the tool's performance directly, by determining which information will be used and how it will be scored, and indirectly, by influencing how human decision-makers perceive the tool's usefulness and how they ultimately use it. While using a strictly empirical method to RAI development promotes the predictive accuracy of the instrument, using consensus-based approaches that incorporate stakeholder input can affect the RAI's performance through channels like buy-in and fidelity. Employing a mixed methods approach using both quantitative and qualitative evidence can therefore be particularly useful in analyzing which risk factors should be included in an RAI.

3.2.2 Important Factors in Predicting Recidivism

A number of empirical studies have analyzed factors pertinent to predicting juvenile offending, with a particular focus on recidivism. Most studies, however, focus on post-adjudication decisions, such as determining a level of probation or what services should be provided. These tools

tend to be based on the risk-needs-responsivity model, which combines risk factors for reoffending with criminogenic needs to assess what interventions or services a youth should receive (Bonta & Andrews 2007; Vincent, et al. 2012). Relatively few studies focus on pre-adjudication decisions like pretrial detention. Similarly, while many adult pretrial detention RAIs have been developed and statistically validated, juvenile pretrial detention RAIs have received far less attention. This chapter thus contributes to the literature by focusing on an understudied area.

Table 1 presents a summary of empirical studies analyzing the risk factors used in juvenile justice. With respect to statistical methods, studies use a combination of correlation coefficients, pairwise AUC calculations, and regression models to analyze which risk factors significantly contribute to predictions of recidivism. Pairwise AUC calculations estimate the area under the receiver operating characteristic curve using each risk factor as a predictor of recidivism. Studies also make use of both logistic regressions and Cox proportional hazard regressions. Logistic regressions estimate the effect of covariates on predicting a binary outcome, such as whether a defendant commits a new offense.[22] Cox proportional hazard regressions estimate the effect of covariates on predicting a survival time to an outcome, such as the time to reoffense, if any.[23] Importantly, statistical analysis is not used for causal inference in most studies, as enhancing predictive power is often the primary objective.

[22] Logistic regression models use the functional form $y_i = [1 + \exp(-X_i\beta)]^{-1}$

[23] Cox regression models use the functional form $h(t) = h_0(t)\exp(X_i\beta)$

TABLE 3-1. Empirical Studies of Risk Factors in Juvenile Justice RAIs

	Factors Found Significant	*Factors Not Found Significant*
Panel A: Pre-Adjudication Tools		
Fratello, et al. (2011) *Tool*: Custom *Jurisdiction*: New York, NY *N* = 1,053	• Prior arrest(s) at time of probation intake • Prior arrest(s) for a felony at time of probation intake • Prior juvenile delinquency adjudication(s) • Prior adjudications for a felony • Currently on probation for previous adjudication • 80% of greater school attendance in last full semester of school year	• Current charge type • Current charge severity • Prior juvenile delinquency placement • Parent not willing to supervise • No adult arrived at precinct immediately following arrest • Victim of charged offense lives in juvenile's home • Other open/pending petitions • Previous sentence to probation from a prior adjudication • Past automatic transfer to adult court • Being in foster care
Dedel & Davies (2007) *Tool*: Custom *Jurisdiction*: Portland, OR *N* = 1,394	• Currently under supervision • Most serious pending offense (chosen by prosecutor) • School and employment status • First referral at age 16+ • Instant offense is first contact • History of runaway	• Most serious instant charge (chosen by arresting officer) •Any additional charges in the current offense • Whether the youth previously committed an offense involving a violent felony, assault, domestic violence, or a firearm • Most serious offense already pending • Whether the juvenile is on conditional release • Any history of warrants • Prior sustained offenses • Whether a responsible adult is present to care for the juvenile • Whether the youth had had any referrals to juvenile court in the last year • Whether the juvenile has any FTA/warrant history • The youth's community ties • Possession of a firearm • Whether the offense involved multiple victims • Whether the youth made threats to the victim(s) or witness(es).

Panel B: Post-Adjudication Tools

Papp, et al. (2019) *Tool*: YLS/CMI *Jurisdiction*: Unidentified county in US Midwest *N* = 2,436	• Offense history • Peer effects	• Personality • Attitudes • Education • Parenting • Substance abuse • Leisure
Baglivio (2009) *Tool*: PACT *Jurisdiction*: Florida *N* = 8,132	• History of school suspensions/expulsions • History of running away • Inconsistent/inadequate supervision • Higher prevalence of antisocial peers • Fewer relationships with pro-social, non-relative adults	• History of physical abuse • History of sexual abuse • History of alcohol abuse • History of drug use • Presence of teachers/coaches the youth feels comfortable with
Grieger & Hosser (2014) *Tool*: LSI-R *Jurisdiction*: Germany *N* = 589	• History of antisocial behavior • Antisocial associates • Substance abuse history • School environment • Antisocial cognition	• Antisocial personality pattern • Family environment • Leisure and recreation
McGrath & Thompson (2012) *Tool*: YLS/CMI *Jurisdiction*: Australia *N* = 3,568	• Prior and current offenses • Education and employment • Peer relations • Substance abuse • Attitudes and beliefs	• Family and living • Leisure and recreation • Personality and behavior
Olver, et al. (2012) *Tool*: YLS/CMI *Jurisdiction*: Canada *N* = 167	• Prior offenses • Education and employment • Peer effects • Drug/alcohol use • Personality and behavior • Attitudes and orientation	• Family and parenting • Leisure and recreation

Notes: "YLS/CMI" = Youth Level of Service/Case Management Inventory; "PACT" = Positive Achievement Change Tool; "LSI-R" = Level of Service Inventory-Revised.

3.2.2.1 Pre-Adjudication RAIs

The risk factors for only two juvenile detention pretrial RAIs have been statistically examined for significance (Fratello, et al. 2011; Dedel & Davies 2007). In studies of both tools, factors for prior offenses, current probation status, and school attendance were found most predictive for recidivism. Higher rates of recidivism were associated with having a prior offense, being on probation, and having lower school attendance. Other significant factors included whether the arrest was a juvenile's first court contact, arrest history, runaway history, and whether the juveniles age at first referral to juvenile court was 16 or greater.

Fratello, et al. (2011) used correlation coefficients to assess the statistical significance of a set of risk factors gathered by surveying juvenile justice stakeholders in New York City. Probation officers completed the full battery of questions on arrested youth during a pilot phase, and researchers examined the correlation of each risk factor with rearrest while on pretrial release using a sample of 1,053 cases. The study found that the following risk factors were highly correlated with rearrest while a case is pending:

- Prior arrest(s) at time of probation intake
- Prior arrest(s) for a felony at time of probation intake
- Prior juvenile delinquency adjudication(s)
- Prior juvenile delinquency adjudication(s) for a felony
- Currently on probation for previous adjudication
- 80% or greater school attendance in most recent full semester of school year

In contrast, the following tested risk factors were *not* correlated with rearrest:

- Current charge type (i.e., offenses against persons, property, or society)
- Current charge severity (i.e., felony or misdemeanor)
- Prior juvenile delinquency out-of-home placement (not necessarily secure detention)
- Parent made a definitive statement that they are not willing to supervise the child
- No adult arrived at precinct immediately following arrest
- Victim of charged offense lives in juvenile's home
- Other open/pending petitions
- Previous sentence to probation from a prior adjudication

- Past automatic transfer to adult court
- Being in foster care under supervision of Administration for Children's Services

Accordingly, the resulting RAI developed for New York City focused on the six factors associated with risks of rearrest. The final instrument also included a second domain for factors correlated with risks of failure to appear.

Dedel & Davies (2007) statistically validated the juvenile pretrial detention RAI implemented in Portland, Oregon. The study employed multivariate hazard analyses to estimate the significance and validity of risk factors using a sample of 1,394 cases. Of the 21 risk factors tested in the study, only six were found necessary to make valid predictions: (1) whether the youth is currently on probation; (2) the most serious pending offense chosen by the prosecutor; (3) school and employment status; (4) whether the youth's first referral to juvenile court was at age 16 or greater; (5) whether the instant offense is the youth's first contact with juvenile court; and (6) any history of running away from home. These results are similar to those found in Fratello, et al. (2011). Both studies find significant correlation with prior offenses, current probation status, and school attendance. Fratello, et al. (2011) did not test the significance of employment status, whether the instant offense is the youth's first contact with juvenile court, and whether the youth's first referral to juvenile court occurred at age 16 or greater. Both studies also found that the current charge, as chosen by the arresting police officer, does not correlate with a youth's likelihood of rearrest.

3.2.2.2 Post-Adjudication RAIs

Other studies analyzing the incremental validity, or relative predictive validity, of individual risk factors in juvenile justice RAIs focus on post-adjudication tools. These instruments often recommend which services should be provided to the youth or the level of probation

supervision a youth should receive. They also often use some measure of recidivism as the outcome variable of interest, but typically on a longer time horizon than pre-adjudication tools.

The "Central Eight" risk factors for criminal offending, espoused by Andrews and Bonta (2010), have been explored in juvenile populations (Papp, et al. 2019; Grieger & Hosser 2014). The Central Eight risk factors are based on the risk-needs-responsivity model and are further subdivided between the "Big Four" and the "Moderate Four," with the Big Four hypothesized to be stronger predictors of recidivism than the Moderate Four. The Big Four risk factors include an offender's history of antisocial behavior, antisocial personality pattern, antisocial cognition, and antisocial associates. The Moderate Four risk factors include an offender's family and marital circumstances, school or work environment, leisure and recreation activities, and substance abuse. An offender's history of antisocial behavior is generally considered a static risk factor, while the remaining seven risk factors are considered dynamic.

Papp, et al. (2019) studied the incremental validity of the Big Four, as compared to the Moderate Four, in predicting recidivism among a sample of 2,436 cases from a juvenile county court in the midwestern United States. The study operationalized the Central Eight using the Youth Level of Service/Case Management Inventory (YLS/CMI) as the assessment tool, and used any new petition filed within two years of the juvenile's initial offense as the binary dependent variable in AUC analysis and logistic regression models. The AUC calculation based on only the Big Four (0.60) was nearly identical to the AUC with all eight factors (0.59). Similarly, the chi-square statistic and R^2 were nearly identical between logistic regressions models including the Moderate Four and those omitting the Moderate Four. This led the authors to conclude that "including the Moderate Four in the calculation of the YLS/CMI total score did not significantly change the predictive validity of the tool" (Papp, et al. 2019, p. 863). With respect to individual risk factors, only two emerged as statistically significant in logistic regression models: offense history

and peer effects. Measures of a juvenile's personality, attitude, education, parenting, leisure, and substance abuse were not found statistically significant.

The Positive Achievement Change Tool ("PACT"),[24] a risk and needs assessment tool implemented by the Florida Department of Juvenile Justice, was empirically examined by Baglivio (2009). While determining the relative predictive validity of each individual risk factor was beyond the scope of the study, Baglivio (2009) reported on the statistical significance of several risk factors in predicting recidivism using logistic regression analysis on a sample of 8,132 Florida youth. The dependent variable was whether the youth committed a new offense within 12 months of assessment. Results indicated that five risk factors were statistically significant predictors of reoffense for both males and females, at least at the 10% level: history of school suspensions/expulsion, history of running away, inconsistent or inadequate supervision, higher prevalence of antisocial peers, and fewer relationships with pro-social, non-relative adults. The other tested factors did not emerge as statistically significant, including history of physical abuse, history of sexual abuse, history of alcohol abuse, history of drug use, and the presence of teachers or coaches with whom the youth feels comfortable. (Only these ten risk factors were tested in the study because they were hypothesized to be associated with female offending.)

Outside of the United States, Grieger & Hosser (2014) examined the relative predictive validity of each of the Central Eight risk factors in a sample of 589 German youth. The study operationalized the Central Eight using the Level of Service Inventory – Revised (LSI-R) as the assessment tool. Recidivism was defined as any custodial sentence following release from prison, and the study employed pairwise AUC analysis, correlation coefficients, and Cox regressions to analyze statistical significance. Across all statistical methods, the study found that school enrollment

[24] The PACT was modeled after the Youth Assessment Screening Inventory ("YASI") and the Washington State Juvenile Court Assessment, "Back on Track!"

was the most predictive risk factor, followed by a juvenile's criminal history and peer effects. Correlation coefficients suggested that significant risk factors included a juvenile's history of antisocial behavior, antisocial cognition, antisocial associates, school environment, and substance abuse history. In contrast, a juvenile's antisocial personality pattern, family environment, or leisure and recreation activities were not significant risk factors. Pairwise AUC analysis indicated juvenile's history of antisocial behavior, antisocial cognition, antisocial associates, school environment, substance abuse history, and juvenile's antisocial personality pattern were significant predictors of recidivism. Finally, Cox proportional hazard regressions showed that not all risk factors were needed for valid predictions of recidivism. Significant risk factors in the Cox regression models were a juvenile's history of antisocial behavior, antisocial associates, school environment, and substance abuse history. Risk factors measuring a juvenile's antisocial personality, antisocial cognition, family environment, and leisure and recreation activities did not emerge as statistically significant. Moreover, "the inclusion of the whole set of the Central Eight risk factors did not improve the prediction of recidivism" over inclusion of only the four risk significant factors from the Cox regressions (p. 629). This result is similar to Papp, et al. (2019) in that it demonstrates that not all risk factors are necessary to make valid predictions.

McGrath & Thompson (2012) analyzed the YLS/CMI in a sample of 3,568 Australian youth. Using correlation coefficients and logistic regression, the study investigated the relative statistical contribution of eight domains – one static and seven dynamic. The static risk factor captured prior and current offenses. The seven dynamic risk factors included family and living situation, education and employment status, peer relations, substance abuse, leisure/recreation activities, personality and behavior, and attitudes and beliefs. For a dependent variable, statistical models used the binary outcome of whether a juvenile was convicted for a reoffense within one year of assessment. The study found that the prior and current offenses domain "was, on its own,

a significant predictor of recidivism and accounted for an estimated 6.5% of variance." McGrath & Thompson (2012, p. 259). Moreover, only four of the seven dynamic factors were significant predictors of reoffense: education and employment status, peer relations, substance abuse and attitudes and beliefs.

> In essence, the current study showed that individually, the static domain and a linear combination of the seven dynamic domains both predicted recidivism. A linear combination of all static and dynamic domains resulted in a significant improvement in prediction. The same degree of prediction, though, could be obtained from a linear combination of the static and four of the dynamic domains. (p. 259)

A similar study was conducted by Olver, et al. (2012), which analyzed the YLS/CMI in a sample of 167 Canadian youth. Pairwise AUC analyses found that the most important predictor of recidivism is a youth's prior offense history. Behind this risk factor, the AUC calculations showed that education and employment status, companions (peer effects), drug and alcohol use, personality and behavior, and attitudes/orientation were moderate predictors of recidivism, and that family and parenting environment and leisure/recreation activities were the weakest predictors. Cox regression analysis, using time-to-reoffense as the dependent variable, indicated that factors pertaining to criminogenic needs made incremental contributions beyond prior offense history alone in predicting reoffense. This result held for males but not females.

In summary, only two previous studies have examined the empirical significance of individual risk factors in the juvenile pretrial detention setting. Most studies that analyze juvenile justice RAIs occur in the post-adjudication setting. Results tend to be mixed, in that risk factors found significant in one study may not be in another, but there is generally a consensus in the literature that criminal or antisocial history is the most important predictor of recidivism. Further, studies of juvenile justice risk factors tend to subscribe either to statistical estimation or a consensus-based view. No previous study has combined both quantitative and qualitative evidence on the

importance of individual risk factors in juvenile pretrial detention decisions from the same jurisdiction. This chapter thus contributes to the literature by integrating human perspectives to offer insight into a critical component of RAI development – choosing which risk factors an instrument will include. To do so, I draw on data from a metropolitan juvenile court's pretrial detention RAI and interviews with local stakeholders.

3.2.3 The Davidson County Juvenile Detention Risk Assessment

As discussed in Chapters 1 and 2, the Davidson County Juvenile Court in Nashville, Tennessee, implemented a pretrial RAI in 2019 known as the Juvenile Detention Risk Assessment (JDRA). As previously described in Chapter 1, the JDRA is administered by detention center staff when a juvenile has been arrested and has just arrived at intake (typically within hours of arrest). The instrument has two sub-parts. Part A is comprised of five "screening" questions, any one of which can result in the automatic detention of the youth with no further inquiry, i.e., a "mandatory hold." These include whether the youth resides in Davidson County, whether the youth was arrested on a warrant where the judge has ordered detention, whether the youth has been found incompetent to stand trial or is currently on strict home detention, and whether the current charge involves a felony against a person or weapon possession. Triggering any one of these conditions results in a detention recommendation.

If a juvenile is not automatically detained under Part A, the assessment proceeds to Part B. Part B is comprised of eight questions, or risk factors, that are compiled by the tool to determine whether the juvenile should be detained or released. Table 2 presents the eight JDRA risk factors used for assessment in Part B, along with the associated question and answer choices used in the instrument.

TABLE 3-2. JDRA Risk Factors

Risk Factor	JDRA Question	JDRA Answer Choices
Felony Charge	Select the most serious alleged current offense	a. Any other felony (i.e. NOT against a person) b. Underlying misdemeanor with a Failure to Appear
Multiple Charges	Are there multiple charges in current offense?	a. ≥ 1 additional felony b. ≥ 1 additional felony & ≥ 1 additional misdemeanor or violation of probation/aftercare c. ≥ 1 additional misdemeanor or violation of probation/aftercare d. No additional delinquency charges
Prior Adjudications	Any prior adjudications of guilt within last 12 months?	a. ≥ 2 prior felonies b. 1 prior felony c. ≥ 2 prior misdemeanors d. ≥ 2 prior violations of probation/aftercare e. 1 prior misdemeanor or violation of probation/aftercare f. No prior adjudications
Other Open Petitions	Any other current petitions pending adjudication?	a. ≥ 1 Petition for a felony against a person b. ≥ 1 Petition for a felony against property c. ≥ 2 Petitions for a misdemeanor or violation of probation/aftercare d. 1 Petition for a misdemeanor or violation of probation/aftercare e. No Petitions pending adjudication

Completing Active Disposition	Any current court contact or supervision?	a. Department of Children's Services Custody b. Probation or Aftercare c. Diversion d. Informal Adjustment e. No current contact or supervision
Previous Disposition Completed	Any history of court contact or supervision in last 12 months?	a. Department of Children's Services Custody b. Probation or Aftercare c. Diversion d. Informal Adjustment e. No history of contact or supervision
History of Failure to Appear	Any history of failure to appear charges in last 12 months?	a. ≥ 2 Warrants or Orders for Failure to Appear b. 1 Warrant or Order for Failure to Appear c. No history of Failure to Appear
History of Runaway	Any history of runaway/escape in last 12 months?	a. ≥ 1 Escape(s) b. ≥ 1 Runaway(s) c. No history of escape/runaway

Notes: "Department of Children's Services Custody" is akin to a carceral sentence. "Aftercare" is akin to a post-custody parole. Other felony charges assessed in Part A of the JDRA.

Here, the term felony charge indicates the youth's current most serious charge for the arrest is a felony and not a misdemeanor. The variable does not include felonies against a person, however, because that charge would result in a mandatory hold under Part A. The term multiple charges indicates the youth's current arrest involves more than one charge. Prior adjudications indicates a youth had a previous adjudication of delinquency, whether felony, misdemeanor, or a violation of probation. Other open petition indicates the youth has other active cases in juvenile court that have not yet been adjudicated. The term completing active disposition indicates the youth is currently completing a disposition (sentence) from another case, such as in-custody, probation, or diversion. The term previous disposition completed indicates the youth had a previous disposition (sentence) from another case that has been completed. History of failure to appear indicates the youth has previously failed to appear for court. History of runaway indicates the youth has previously run away from his or her home.

Once Part B of the JDRA is completed, the instrument tallies the total score and makes a recommendation of either release or detain. Neither the youth nor the detention staff ever learn what the youth's score was or the number of points associated with any risk factor.

3.3 Data & Methodology

I use a mixed methods approach to analyze the quantitative and qualitative significance of risk factors relied upon in juvenile pretrial detention decisions. First, I analyze data collected from completed JDRA assessments by regressing the probability of rearrest on the JDRA risk factors. Then, I use information gathered from interviews with juvenile justice stakeholders to examine the perceived importance of individual risk factors from a human perspective. Using both techniques provides a holistic view of which risk factors are important in determining which youth should be detained.

3.3.1 Risk Assessment Data

To empirically analyze the significance of individual risk factors in making juvenile pretrial detention decisions, I use data collected by the Davidson County Juvenile Court through its use of the JDRA from July 2019 to April 2022. During that period, 974 individual juveniles were arrested and assessed a total of 1,414 times. Of the 1,414 risk assessments completed, 879 resulted in automatic detention of the youth under Part A of the JDRA. The remaining 535 assessments proceeded to Part B, meaning the youth had some chance of release. For automatically detained youth, only Part A risk information is available because, once an automatic detention condition is triggered, the remainder of the assessment is not completed. Thus, the JDRA Data contain the full panoply of risk factors only for these 535 assessed youth. I refer to this sub-sample as "All Assessed Youth." Of the 535 assessed youth, 420 were recommended for release by the JDRA. I refer to this sub-sample as "Assessed & Released Youth." These two sub-samples are the focus of my analysis.

In my analysis, I use traditional OLS regressions to analyze the effect of JDRA risk factors on the likelihood a juvenile will be rearrested within 90 days of assessment.[25] I estimate linear probability models with the following specification:

$$Rearrested_i = \alpha + X_i\beta + \epsilon_i$$

In the model, $Rearrested_i$ is a dummy variable equal to one if the juvenile was rearrested within 90 days of the JDRA assessment, X_i is a matrix of risk factors used as covariates, and ϵ_i is a random error term. First, I estimate base regression models with only risk factors currently included in the JDRA. Then, I add covariates for the juvenile's age and whether the instant arrest is the

[25] Because failure to appear is not an outcome tracked in the JDRA data obtained from the Davidson County Juvenile Court, the analysis here focuses on recidivism as the only outcome. Future research should assess the predictive validity of the JDRA and its risk factors for predicting failure to appear.

juvenile's first contact with the juvenile court to test their significance.[26] Finally, after checking several alternative covariate combinations, I refine the regression models to those risk factors that emerge as statistically significant.

For mathematical simplicity, I code the JDRA risk factors (shown in Table 2) as dummy variables indicating whether the risk factor is present at all. While this approach has a drawback because it does not evaluate the more granular JDRA answer choices, it bolsters statistical power by ensuring coefficient estimates are not identified on only a handful of observations. For some risk factors that emerge as statistically significant, however, I do partially disaggregate the risk factors, by coding them as categorical variables according to the JDRA answer choices shown in Table 2, to explore more detailed results. By employing both approaches, I maximize the amount of inference that can be made with the data available.

Table 3 shows summary statistics for variables drawn from the JDRA data, among all youth who were assessed with the JDRA and those youth who were assessed and subsequently released. The average age in both samples is just under 16, and roughly 50% of both samples are 16 years old or greater. Thus, age 16 is both the mean and the median in both samples. For 20% of assessed and released youth, the current arrest was their first contact with the juvenile court. Finally, roughly 15% to 16% of both samples was rearrested within 90 days of receiving the JDRA at the detention center.

[26] Unfortunately, variables that capture race and gender are not collected by the JDRA and thus these variables could not be included in the analysis.

TABLE 3-3. Summary Statistics, JDRA Sample

	Assessed & Released Youth (N = 420)	All Assessed Youth (N = 535)
Age (in years)	15.78	15.83
Age 16 or Over	50.00%	50.65%
First Court Contact	20.48%	16.45%
Rearrested within 90 Days	15.00%	16.45%
Felony Charge	97.62%	97.76%
Multiple Charges	61.19%	63.55%
Prior Adjudications	2.62%	11.21%
Any Prior Misdemeanor	0.71%	2.62%
Any Prior Felony	1.90%	8.60%
1 Prior Felony	1.67%	4.86%
≥ 2 Prior Felonies	0.24%	3.74%
Other Open Petitions	9.29%	23.74%
Completing Active Disposition	8.10%	18.13%
Diversion/Informal Adjustment	4.05%	6.54%
Probation/Aftercare	0.95%	5.79%
Custody	3.10%	5.79%
Previous Disposition Completed	26.90%	35.33%
History of Failure to Appear	0.48%	0.93%
History of Runaway	0.95%	2.62%
Any History of Runaway/FTA	1.19%	3.18%

Notes: Each JDRA risk factor coded as "1" if any non-null answer choice selected. "FTA" = Failure to Appear. "Prior Adjudications" and "Completing Active Disposition" partially disaggregated, as shown.

With respect to JDRA risk factors, the incidence of any risk factor is consistently lower among assessed and released youth than among all assessed youth. This is by construction, as the all-assessed youth sub-sample includes the 115 youths recommended for detention *because* of the presence of their risk factors. Nonetheless, about 97% of both samples were arrested on felony charges, and 61% to 63% of both samples were charged with multiple offenses. Approximately 2.6% of assessed and released youth have at least one prior adjudication of guilt for a delinquent offense, of which 0.71% were misdemeanors and 1.9% were felonies. Almost 10% of assessed and released youth have other active cases pending adjudication. About 8% of assessed and released

youth are also completing an active disposition from a previous case, while almost 27% of assessed and released youth have previously completed a disposition from a prior case. Finally, very few youth have a history of failing to appear for court or running away, at just 0.48% and 0.95%, respectively, for assessed and released youth. When combined, about 1.2% of assessed and released youth have either a history of failing to appear or running away. These summary statistics demonstrate a low prevalence of each risk factor among juveniles in the sample. In turn, this means there is only a small amount of variation in the independent variables that will be used in the regression analyses, which can diminish the statistical power of the models.

3.3.2 Stakeholder Interviews

To question further the importance of individual risk factors in pretrial juvenile detention decisions, I conducted a series of interviews with judges and supervisory staff at the Davidson County Juvenile Court. The interviews included both discussion questions about risk assessment tools and a survey where participants ranked the importance of given risk factors in making juvenile pretrial detention decisions. Using structured interviews enables me to explore the perceived importance of risk factors in pretrial detention decisions among practitioners, a perspective absent in strictly empirical analysis of JDRA data. Adding this perspective is also necessary to analyze risk factors because it informs the buy-in and fidelity afforded the RAI that ultimately uses them.

Participants were recruited through emails sent by the juvenile court administrator. Juvenile court staff who are familiar with the JDRA and observe its use in practice were targeted for inclusion in the study. Specifically, I requested interviews with eleven stakeholders: the chief juvenile court judge, the court administrator, all four magistrates who hear delinquency and child welfare cases,[27] the chief probation officer, the intake supervisor, the victim services program

[27] Other magistrates who work at the juvenile court do not hear delinquency cases and have no interaction with risk assessment (their cases are entirely child support and child custody related).

manager, the detention contract monitor, and the strategic data coordinator. All desired stakeholders agreed to participate; however, due to scheduling conflicts and a family emergency, the court administrator and one magistrate judge were unable to participate. Thus, the final sample included nine respondents, for a response rate of about 82%. A high response rate mitigates some concern about selection bias in those who agreed to participate. Interviews were all in-person and took place in each participant's office at the Davidson County Juvenile Justice Center, which houses both the courthouse and detention facility. I conducted each interview, and respondents were assured anonymity and confidentiality.

The interview materials contained four modules.[28] Some modules contained general questions about risk assessment, such as whether RAIs are useful in making judicial decisions; some contained more specific questions, such as which risk factors currently used in the JDRA are most important. I intended the general questions to prime respondents to think about risk assessment, while I designed the more specific questions to probe in more detail precisely what criteria respondents thought important in the pretrial detention setting.

In the first module, I verbally asked stakeholders eight questions about RAIs. The questions were about RAIs in general, such as how they should incorporate the uniqueness of each case and the importance of adhering to their recommendations. Taking a similar approach to Terranova, et al. (2020), I asked most questions in two parts: respondents first used a five-point Likert scale to indicate the importance of a topic and then discussed their reasoning in open-ended, follow-up questions. Employing a close-ended Likert scale elicits precise, easily comparable feedback, while open-ended questions elicit additional detail and perspective.

[28] Interview materials with questions asked of participants are provided in the Appendix.

The second module contained two open-ended questions, which I also asked respondents verbally. First, I asked respondents which of the risk factors currently used in the JDRA were most important for making a pretrial detention decision. Second, I asked respondents about risk factors *not* currently used in the JDRA that they believe to be important in making a pretrial detention decision. At this stage of the interview, I additionally provided participants with a paper copy of the JDRA questions to refresh their recollection of included risk factors.

I administered the third module as a written survey. I modeled this module after DeMichele, et al. (2019), which assessed the perceived importance of individual risk factors in the adult pretrial detention setting. In that study, judges, attorneys, and pretrial staff were given a list of risk factors and then asked to rate the importance of each with a Likert scale nearly identical to the one employed here. Like DeMichele et al. (2019), I provided participants with a list of 21 risk factors that might be relevant to making a pretrial detention decision. I created the list by combining the risk factors currently used in the JDRA with risk factors from other pre- and post-adjudication RAIs. Then, I asked respondents to rate each factor's importance in making a pretrial detention decision, on the following five-point Likert scale: 1 = "Not at all important"; 2 = "Barely important"; 3 = "Somewhat important"; 4 = "Moderately important"; and 5 = "Extremely important." I report all 21 risk factors from the survey in Table 6 below.

In the fourth and final module, I asked respondents two wrap-up questions to close the interview. Specifically, I asked what suggestion, comments, or criticisms (if any) they had regarding the Davidson County Juvenile Court's use of RAIs, and whether they had any questions themselves.

3.4 Results

A moderate amount of overlap exists between risk factors found statistically significant in empirical analyses and those perceived important by stakeholders. Overall, a juvenile's delinquency history, supervision status, and most serious current charge tend to matter most in making juvenile pretrial detention decisions within both the quantitative and qualitative analyses. When empirical and perceived significance differ, it could be the result of the broader considerations of stakeholders relative to the narrow question of predicting rearrest.

Indeed, as described in the next section, three risk factors consistently emerge as statistically significant predictors of recidivism in the empirical results: (1) whether the juvenile has prior adjudications of guilt, (2) whether the juvenile is completing an active disposition, such as probation, and (3) whether the arrest is the juvenile's first contact with the juvenile court. Interviews bolster these findings, while also supplementing the results with additional risk factors valued by stakeholders.

3.4.1 Empirical Results

Empirical results indicate that risk factors related to a youth's prior experience with the juvenile legal system are the best predictors of recidivism, a result consistent with previous literature. Although a low number of observations in the JDRA introduces some power concerns into my analysis, I consistently find that whether a youth has a prior adjudication or is completing an active juvenile court disposition significantly contribute to the likelihood the youth will be rearrested. I also find some evidence showing that whether the instant arrest is the youth's first contact with the juvenile court is a significant predictor of recidivism. The youth's age, the severity of the current charge, and previous dispositions to secure custody, however, do not appear to contribute to the youth's probability of rearrest.

Table 4 shows base regressions for estimating the effect of the JDRA risk factors on predicting rearrest within 90 days of assessment. Columns (1) and (3) report estimates for the base specification with only risk factors used in the JDRA. Columns (2) and (4) report estimates for regression specifications that add the juvenile's age and an indicator for whether the arrest is the youth's first contact with juvenile court – variables that can be gleaned from the JDRA but are not currently used as risk factors. The overall F-statistic for the sample of assessed & released youth (the typical validation sample for an RAI) is very low, indicating joint significance of all model variables is tenuous—it improves only with the larger sample of all assessed youth, which includes detained youth. Thus, the hypothesis that all covariates are equal to zero cannot be rejected for the sample of assessed and released youth but can safely be rejected for the sample of all assessed youth. Throughout the analysis, I report estimates for both samples.

Across all four specifications, only two risk factors stand out as statistically significant for predicting recidivism: prior adjudications and completing an active disposition. Coefficients on most other risk factors – felony charge, multiple charges, other open petitions, and previous disposition completed – are close to zero and not statistically significant. This result indicates the risk factor neither increases nor decreases the probability a juvenile will be rearrested. The coefficients on risk factors for history of failing to appear in court or running away are large, with standard errors almost as great or greater. This indicates the coefficients are imprecisely estimated, possibly due to sample size, and they may warrant further inquiry. As shown in Table 3, very few youth have a history of failure to appear or runaway. Accordingly, as an alternative, I combine the two risk factors into a single variable to allow the regression model to identify the coefficient estimate on a slightly larger number of juveniles.

TABLE 3-4. Base Regression Results for JDRA Risk Factors

	Dependent Variable: Rearrest within 90 Days			
	Assessed & Released Youth		*All Assessed Youth*	
	(1)	(2)	(3)	(4)
Felony Charge	0.042	0.049	-0.046	-0.040
	(0.120)	(0.120)	(0.114)	(0.114)
Multiple Charges	0.009	0.005	-0.008	-0.010
	(0.036)	(0.036)	(0.033)	(0.033)
Prior Adjudications	0.201*	0.201*	0.121**	0.121**
	(0.111)	(0.111)	(0.057)	(0.057)
Other Open Petitions	0.034	0.016	0.013	0.008
	(0.062)	(0.062)	(0.041)	(0.041)
Completing Active Disposition	0.110*	0.105	0.090*	0.086*
	(0.066)	(0.067)	(0.048)	(0.048)
Previous Disposition Completed	0.003	-0.023	0.018	0.008
	(0.042)	(0.044)	(0.036)	(0.038)
History of Failure to Appear	-0.199	-0.219	-0.252	-0.255
	(0.277)	(0.277)	(0.174)	(0.175)
History of Runaway	0.152	0.137	0.015	0.019
	(0.194)	(0.194)	(0.105)	(0.105)
Age		0.012		-0.002
		(0.012)		(0.011)
First Court Contact		-0.071		-0.051
		(0.046)		(0.046)
Observations	420	420	535	535
R-squared	0.021	0.029	0.034	0.037
F-Stat	1.080	1.215	2.344	1.996
Prob > F	0.376	0.279	0.0176	0.0318

Notes: Columns (1) and (3) show base regression models with only the eight JDRA risk factors. Columns (2) and (4) add the juvenile's age and whether the arrest if the juvenile's first contact with juvenile court as regressors. F-statistic and p-value reported for joint significance of all regressors. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Because of their similarity, I conduct a joint F-test on the significance of "Prior Adjudications" and "Other Open Petitions." The hypothesis that both coefficients are equal to zero cannot be rejected among assessed and released youth ($F = 1.68$; $p = 0.1872$) and can be rejected at only the 10% level among all assessed youth ($F = 2.35$; $p = 0.0967$). Similarly, I conduct

a joint F-test on the significance of "Completing Active Disposition" and "Previous Disposition Completed" because both variables indicate experience with the juvenile delinquency system. The hypothesis that both coefficients are equal to zero cannot be rejected among assessed and released youth ($F = 1.26$; $p = 0.2855$) or all assessed youth ($F = 1.74$; $p = 0.1762$). Accordingly, I explore alternative regression specifications for prior adjudications and completing an active disposition, but I omit risk factors for felony charge, multiple charges, other open petitions, and previously completed dispositions in my refined regression models.

Somewhat surprisingly, neither the juvenile's age nor the dummy variable indicating the arrest is the juvenile's first court contact emerge as statistically significant. Coefficient estimates on both variables are also close to zero, indicating they have little effect on the probability the youth is rearrested within 90 days. Age as a risk factor may not be significant among youth because of its small variance in the juvenile population (90% of the sample is aged 14 to 17). In alternative regression specifications discussed below, I modify age to enter the model as a dummy variable equal to one if the youth is age 16 or older (the mean and median age in the sample). For the dummy variable indicating the arrest is the juvenile's first court contact, I conduct an F-test for joint significance with the variable indicating the juvenile is completing an active disposition, due to the logical relationship between the two – the presence of the latter risk factor should negate the former. The hypothesis that both coefficients are equal to zero can be rejected at the 10% level among both assessed and released youth ($F = 2.61$; $p = 0.0750$) and all assessed youth ($F = 2.37$; $p = 0.0949$). Because of its joint significance with the risk factor for completing an active disposition, I include the dummy variable for whether the arrest is the juvenile's first court contact in future regression models.

Overall, results from base regression models should also be taken with some caution, as the models show some signs of low statistical power. This may be due to the small sample size used for

the analysis or the low amount of variation in come covariates used to predict the outcome measure. Thus, I next test several alternative regression specifications by redefining several independent variables. This enables me to explore which specific information about a youth may be driving the results in Table 4 and refine my regression models to include only those measures. Results are reported in Appendix Table 1.

First, I modify the age regressor from entering linearly into the model to a dummy variable indicating whether the juvenile is 16 years of age or greater. Making this modification, however, did not meaningfully change the explanatory power of the model, and the coefficients on the age dummy variable remained close to zero and statistically insignificant. Accordingly, I do not use age in my refined regression models.

Second, because so few juveniles have a history of failing to appear in court or running away, and because both variables have large but imprecise estimates, I combine these risk factors into a single dummy variable indicating whether either risk factor is present. The magnitude of the coefficient on the combined dummy variable drops significantly – to 0.044 among assessed and released youth and -0.058 among all assessed youth – and remains statistically insignificant. These estimates suggest that having any history of failing to appear in court or running away has little to no effect on the probability a juvenile will be rearrested within 90 days. For this reason, I do not include these variables in my refined regression specifications.

Third and finally, due to the apparent significance of prior adjudications, I disaggregate this risk factor using the specific answer choices presented in the JDRA. I divide possible prior adjudications between felonies and misdemeanors, then further divide felonies by whether the juvenile has a single prior felony or two or more. Among assessed and released youth, the coefficient on prior misdemeanors is large, negative, and not statistically significant. Among all assessed youth, however, the coefficient on prior misdemeanors is large, positive, and statistically

significant at the 5% level. These estimates suggest the relatively small number of assessed and released juveniles with prior misdemeanors (0.71% of the sample) yields imprecise results in that sample. The coefficient on prior felonies among assessed and released youth is large, positive, and statistically significant at the 5% level. Among all assessed youth, however, the coefficient is small and not statistically significant. To explore this finding in greater detail, I further disaggregate prior felonies between youth who have only one and youth who have two or more. After disaggregating, the coefficient on having a single prior felony is large and statistically significant in both samples, but the coefficient on having two or more prior felonies is imprecisely estimated. Although it does not appear that two or more prior felonies significantly changes a youth's probability of rearrest, I report both methods of disaggregating prior adjudications in my refined regression models.

Table 5 displays the refined regression models, which isolate the effect of significant risk factors on the probability of rearrest within 90 days. Columns (1) and (4) present base results without any disaggregations. Columns (2), (3), (5), and (6) present models with risk factors for prior adjudications and completing an active disposition disaggregated into finer indicator variables. As compared to columns (2) and (5), columns (4) and (6) further disaggregate "Any Prior Felony" into either one prior felony or more than one prior felony. Importantly, the F-statistic in all models grew significantly from those reported in Table 4, and all models now pass a joint significance test.

TABLE 3-5. Refined Regression Specifications with Significant JDRA Risk Factors

	Dependent Variable: Rearrest within 90 Days					
	Assessed & Released Youth			*All Assessed Youth*		
	(1)	(2)	(3)	(4)	(5)	(6)
Prior Adjudications	0.194*			0.116**		
	(0.109)			(0.055)		
Any Prior Misdemeanor		-0.154	-0.154		0.152	0.151
		(0.204)	(0.204)		(0.102)	(0.102)
Any Prior Felony		0.225*			0.063	
		(0.134)			(0.067)	
1 Prior Felony			0.288**			0.099
			(0.144)			(0.081)
≥ 2 Prior Felonies			-0.154			0.015
			(0.351)			(0.092)
Completing Active Disposition	0.102			0.089*		
	(0.064)			(0.046)		
Diversion/Informal Adjustment		0.140	0.140		0.104	0.103
		(0.088)	(0.088)		(0.065)	(0.065)
Probation/Aftercare		0.484**	0.452**		0.216***	0.216***
		(0.188)	(0.190)		(0.080)	(0.080)
Custody		-0.077	-0.077		-0.012	-0.006
		(0.099)	(0.099)		(0.071)	(0.071)
First Court Contact	-0.069	-0.072*	-0.073*	-0.053	-0.055	-0.054
	(0.044)	(0.043)	(0.043)	(0.044)	(0.044)	(0.044)
Observations	420	420	420	535	535	535
R-squared	0.024	0.051	0.054	0.032	0.044	0.045
F-Stat	3.356	3.661	3.336	5.938	4.021	3.527
Prob > F	0.0189	0.00149	0.00181	0.000548	0.000598	0.00103

Notes: F-statistic and p-value reported for joint significance of all regressors. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The coefficient on having any prior adjudication is statistically significant among the sample of assessed and released youth and the sample of all assessed youth. Estimates indicate that having any prior adjudication increases the probability a youth will be rearrested by 11.6 to 19.4 percentage points. When disaggregated, the coefficients on having a prior misdemeanor are imprecisely estimated. The standard errors are large, and the coefficient estimates are negative among assessed and released youth but positive among all assessed youth. These results demonstrate the imprecision of the estimates for the coefficients on any prior misdemeanor. In contrast, the coefficients on prior felonies support slightly stronger inference. Among assessed and released youth, the coefficient on any prior felony is large and statistically significant. Further disaggregation suggests that the effect is driven mainly by having a single prior felony, but this may also be because very few juveniles in the sample have two or more prior felonies. The coefficient on having two or more prior felonies does not rise to statistical significance at any level, while the coefficient on having a single prior felony (0.288) is similar in magnitude to the coefficient on having any prior felony (0.225), both of which are statistically significant. These estimates indicate that having just a single prior felony is associated with an increased probability of rearrest within 90 days of over 20 percentage points. Among all assessed youth, however, coefficient estimates for having any prior felony, having a single prior felony, and having two or more prior felonies are all close to zero and statistically insignificant. Taken together, these results may suggest that the type of prior adjudication a juvenile has matters less than the fact that the juvenile has had any prior adjudication in juvenile court.

Like the results in Table 4 and Appendix Table 1, the coefficient on completing an active disposition rises to statistical significance among all assessed youth, but not assessed and released youth. While slightly different in statistical significance, the coefficients have similar magnitudes and indicate youth who are completing an active disposition are about nine percentage points more

likely to recidivate. When current dispositions are disaggregated by type, the only statistically significant coefficient is on current probation status. Estimates suggest that a juvenile currently on probation is 21 to 48 percentage points more likely to be rearrested than a juvenile who has no active disposition. While Dedel & Davies (2007) does not report coefficient results specifically for probation status, this result is similar to their finding that a one-point increase in a composite risk factor including current probation status makes youth 37% more likely to commit a new offense or fail to appear. Coefficients on diversion/informal adjustment are not statistically significant, nor are the coefficients on currently completing a custodial sentence. Lastly, the coefficient on the variable indicating the instant arrest is a juvenile's first contact with the juvenile court is between -0.053 and -0.073 in all specifications, but rises to statistical significance only in models (2) and (3). The coefficients suggest juveniles with no prior court contact are five to seven percentage points less likely to be rearrested than juveniles who have had at least some juvenile court contact. That all estimates are tightly grouped within two percentage points of one another also provides some indicia of robustness to alternative specifications.

3.4.2 Interview Results

Interviewed juvenile justice stakeholders indicated several risk factors are important in making juvenile detention decisions. Like the empirical results reported above, stakeholders reported a youth's current probation status and previous history with the juvenile court as very significant risk factors. In contrast to the empirical results, however, stakeholders often relayed that the seriousness of the current charged offense is even more important.

Table 6 displays the average score assigned to each given risk factor by the sample of juvenile justice stakeholders, presented in order of highest average score. The top five risk factors in order of ranked importance each received an average score of 4.4 or greater, indicating stakeholders found these risk factors to be moderately to extremely important in making a pretrial

detention decision. These risk factors included whether the current charge involves an offense against a person, the severity of the current charge, whether other charges are already pending against the juvenile, firearm involvement in the current charge, and whether the juvenile has a responsible adult to assure supervision and court appearances. While risk factors should probably differ between juveniles and adults, as discussed in Chapter 2, these results are largely consistent with DeMichele, et al. (2019). There, results from the survey of adult criminal justice stakeholders about the importance of individual risk factors indicated the top five most important factors were criminal history, pending charge(s), prior failure to appear, weapon involvement, and current charge(s). All five of these risk factors were ranked as "extremely" or "very" important by more than 75% of stakeholders. Here, those same risk factors were all rated is "moderately" or "extremely" important by at least 67% of stakeholders, as shown in Table 6.

Interestingly, in this study, all but one of the top five ranked risk factors have to do with the dangerousness of the incident that resulted in the juvenile's current arrest – namely, whether it involved an offense against a person or a firearm, the gravity or severity of the offense, and whether multiple charges stemmed from the incident. The fifth most perceived important risk factor – "whether the juvenile has a responsible adult to assure supervision and returning for court appearances" – has nothing to do with the juvenile's instant offense. While this factor pertains more to the risk a juvenile will fail to appear for court, its reported importance sheds light on the "human side" of juvenile pretrial detention decisions. Juvenile justice stakeholders repeatedly emphasized in interviews the significance of a youth's home life in predicting the likelihood the youth will reoffend or fail to appear.

TABLE 3-6. Perceived Importance of Risk Factors

Risk Factor	Mean Score	No. Rated 4 or 5
Whether the current charge involves an offense against a person*	4.67	9 (100%)
The severity/gravity of the juvenile's current charge	4.56	8 (89%)
Whether the juvenile has multiple pending charges*	4.56	9 (100%)
Whether the current charge involves a firearm*	4.56	8 (89%)
Whether the juvenile has a responsible adult to assure supervision and returning for court appearances	4.44	8 (89%)
Whether this is the juvenile's first contact with Juvenile Court	4.11	6 (67%)
Whether the juvenile is currently on probation*	4.11	7 (78%)
Whether the juvenile has prior adjudications of guilt for a felony*	4.00	6 (67%)
Whether the juvenile has received a previous sentence to DCS custody*	4.00	7 (78%)
Whether the juvenile has previously failed to appear for court hearings*	3.78	6 (67%)
Whether the juvenile has a history of running away*	3.67	4 (44%)
The juvenile's age at the time of the offense	3.44	4 (44%)
Whether the juvenile has prior adjudications of guilt for a misdemeanor*	3.00	3 (33%)
Whether the juvenile has *any* prior adjudications of guilt*	2.89	1 (11%)
Whether the juvenile has had parentage involvement	2.89	2 (22%)
Whether the current charge is drug related	2.78	2 (22%)
Whether the juvenile has a history of truancy	2.67	0 (0%)
Whether the juvenile has had prior family services involvement	2.67	0 (0%)
The state's likelihood of success on the merits	2.33	0 (0%)
Whether the juvenile maintains current steady employment	2.33	2 (22%)
Whether the juvenile's parent, non-sibling guardian, or step-parent have any history of criminal behavior	2.22	1 (11%)

Notes: $N = 9$. Results based on survey interviews with author. Participants asked to rate the importance of each risk factor in making pretrial detention decisions on the following scale: 1 ("Not at all important"); 2 ("Barely important"); 3 ("Somewhat important"); 4 ("Moderately important"); and 5 ("Extremely important"). "DCS" = Department of Children's Services. * Risk factor included in JDRA.

Results from the open-ended questions in Module 2 largely supported the survey results from Module 3. Table 7 reports risk factors mentioned by stakeholders in response to Module 2. Panel A displays results from the first question and Panel B displays results from the second. When asked what they thought were the most important risk factors for making a pretrial detention

decision that are currently used in the JDRA, multiple respondents identified the same five factors. Seven of the nine interviewed stakeholders identified whether the juvenile is currently on probation. Five respondents listed the seriousness of the current charged offense, and four respondents listed whether the juvenile has a prior felony or has other petitions pending adjudication. Three respondents listed whether the youth has a history of failing to appear. In sum, like the survey results, the risk factors perceived to be most important are the youth's current probation status, seriousness of the current charge, and whether the juvenile has prior adjudications.

When asked what they thought were the most important risk factors for making a pretrial detention decision that are *not* currently used in the JDRA, respondents indicated factors in three main domains: mental health, home environment, and social environment. Two respondents indicated a mental health screening or indication of prior diagnoses would be an important factor for determining pretrial detention. Similarly, one respondent recommended the use of an assessment for adverse childhood experiences (ACEs). Interviewed stakeholders also commonly suggested factors related to the juvenile's home environment, such as whether the youth has stable housing, who lives with the youth in the home, and whether a parent/guardian can take off work to go to court with the youth. Finally, factors related to a juvenile's social environment, such as whether the youth has a job, stable transportation, and regular school attendance, were reported as important. The common theme among these risk factors is that they provide context for a juvenile's offending, and, according to the stakeholders' perceptions, could also be contributors to *re*offending. Nonetheless, as discussed in more detail below, these measures are often difficult to measure and infeasible to ascertain in the pretrial detention setting.

TABLE 3-7. Risk Factors Identified by Stakeholders as Most Important

Panel A*: *Most Important Factors Currently Used in JDRA	No. of Respondents
Whether the youth is currently on probation	7
Most serious current charge	5
Whether the youth has a prior adjudication for a felony	4
Other pending petitions	4
History of failure to appear	3
Whether the youth is on strict home detention	1
Whether the current alleged offense involves multiple charges	1
Whether the current offense involves weapon possession	1
Whether the youth has received a prior disposition to DCS custody	1

Panel B*: *Most Important Risk Factors Not Included in JDRA	No. of Respondents
Parenting and home life	3
Mental health screening or diagnoses	2
Adverse Childhood Experiences (ACEs) screening	1
Housing stability	1
School attendance	1
Employment status	1
Parental availability to come to court	1
Whether the youth is under serious investigation for another offense that the police department has flagged	1
Include a mandatory hold for human trafficking victims	1
Include a mandatory hold for domestic violence incidents (whether juvenile is victim or aggressor)	1
Whether the youth is remorseful and acknowledges they have committed a criminal offense	1

Notes: $N = 9$. Results based on survey interviews with author. In open-ended question, stakeholders asked to report the risk factors most important to making a pretrial detention decision, among the risk factors currently used in the JDRA (Panel A) and among risk factors not currently used in the JDRA (Panel B).

3.5 Discussion & Conclusion

Deciding whether to release or detain a juvenile can have significant consequences in a child's life. Basing these decisions on objective criteria through the use of RAIs has accordingly grown in popularity in the juvenile justice system for over 20 years. As more jurisdictions look to implement juvenile pretrial detention RAIs, continued analysis of which risk factors should be included is necessary to maximize a tool's efficacy. Strictly empirical analysis can identify the predictive validity of an instrument according to statistical measures, but it overlooks stakeholder input that can affect an instrument's buy-in and fidelity, which can in turn decrease a tool's overall efficacy.

This study contributes to the risk assessment literature by providing quantitative and qualitative evidence regarding which risk factors are important in making juvenile pretrial detention decisions. Quantitatively, I estimated linear probability models on the likelihood of rearrest using risk factors collected through Davidson County's use of the JDRA. Qualitatively, I conducted structured interviews with juvenile justice stakeholders, which included both discussion questions and a written survey. Results indicate that only three risk factors are statistically significant predictors of rearrest, but that additional factors are also important to stakeholders.

From an empirical standpoint, prior lived experience with the juvenile legal system matters most for predicting recidivism. The common theme among the risk factors that emerged as statistically significant in this study – prior adjudicated offenses, current probation status, and whether the instant arrest is the juvenile's first court contact – is that they are all indicators of a youth's lived experience with the system. Most other risk factors, including the seriousness of the current offense, the youth's age, whether the instant offense involves multiple charges, and whether the juvenile has other petitions pending adjudication, were not statistically significant predictors of rearrest within 90 days. However, these factors can be valuable to making pretrial detention

decisions in the eyes of juvenile justice stakeholders, and therefore may be important to consider in developing an RAI.

Accordingly, I recommend juvenile pretrial detention RAIs include measures for a youth's prior adjudications, current supervision status, first court contact, most serious current charge, history of runaway, history of failure to appear, and current school attendance. Tools do not need to include risk factors for a youth's age, previous case disposition(s), or employment status, and likely cannot include risk factors for a youth's mental health status or home life/parenting. Table 8 summarizes the strength of the quantitative and qualitative evidence in support of including each risk factor in a juvenile pretrial detention RAI, and presents my recommendations on whether to include each risk factor in such an instrument. My summary of quantitative evidence is based not only on the results of this study, but also Fratello, et al. (2011) and Dedel & Davies (2007) (especially where I was unable to statistically analyze a risk factor here); my summary of qualitative evidence is based on the results of this study only.

A juvenile's prior adjudications for delinquent offenses has consistently been found to significantly predict recidivism (E.g., Fratello, et al. 2011; McGrath & Thompson 2012; Olver, et al. 2012). Results from this study underscore that conclusion. The indicator variable for having at least one prior adjudication was statistically significant in all regression specifications. When disaggregated for more detail, it appears that this relationship is driven primarily by felony, not misdemeanor, adjudications. Further, the number of prior felonies does not seem to have a cumulative effect – youth with two or more felonies do not appear to pose a meaningfully different risk of recidivism.

TABLE 3-8. Summary of Qualitative and Quantitative Evidence by Risk Factor

Risk Factor	Quantitative Evidence	Qualitative Evidence	Recommendation
Prior Adjudications	Strong	Moderate	Include, give substantial weight
Current Supervision Status	Strong	Moderate	Include, give substantial weight
First Court Contact	Moderate	Moderate	Include, give moderate weight
Most Serious Current Charge	Weak or None	Strong	Include, give little weight
Age	Weak or None	Weak or None	Do Not Include (not significant)
Previously Completed Disposition	Weak or None	Moderate	Do Not Include (not significant)
History of Runaway	Moderate	Moderate	Include, give moderate weight
History of Failure to Appear	Moderate	Moderate	Include, give moderate weight
School Attendance	Strong	Weak or None	Include, give moderate weight
Employment Status	Weak or None	Weak or None	Do Not Include (not significant)
Home Life and Parenting	Weak or None	Strong	Do Not Include (not feasible)
Mental Health	Weak or None	Strong	Do Not Include (not feasible)

These results were also supported by feedback from stakeholders. Interview respondents gave a juvenile's prior adjudications an average rating of 4.0 on a 5-point scale, and four stakeholders mentioned prior adjudications as one of the most important factors in making a pretrial detention decision. Together, the quantitative and qualitative evidence suggest that prior adjudications for a felony should be included in juvenile pretrial detention RAIs and that this risk factor should receive substantial weight.

Like prior adjudications, whether a juvenile is currently on probation is both a significant predictor of recidivism and an important factor to stakeholders. In this study, whether the youth was completing any active disposition was statistically significant in multiple regression models. When disaggregated for more detail, the only significant disposition was probation – whether the youth was on diversion or informal adjustment or in custody did not make a significant contribution to predicting recidivism. These results are similar to Fratello, et al. (2011) and Dedel & Davies (2007), which both found that probation status was a significant risk factor in juvenile pretrial detention risk assessment. Additionally, stakeholders viewed this risk factor as important. Whether a juvenile is on probation received an average rating of 4.11, indicating stakeholders view this factor as "moderately important" on average. Four stakeholders also reported current probation status as one of the most important risk factors to consider in making a pretrial detention decision. Again, qualitative and quantitative evidence favor including current probation status in juvenile pretrial detention RAIs and giving the risk factor substantial weight.

Whether the instant arrest is a juvenile's first contact with the juvenile court is a similar but distinct risk factor to a youth's prior adjudications and current probation status. While a youth could have no prior adjudications or current probation status if the instant arrest is his or her first court contact, the two former risk factors indicate more about the case than the latter (i.e., it was not diverted, went to adjudication or plea agreement, and received a disposition). If the instant arrest is the juvenile's first court contact, they truly have probably never set foot in juvenile court before. Thus, this risk factor may make an empirical contribution to predictions of recidivism. Although base regression models in this study did not suggest this risk factor was statistically significant on its own, joint hypothesis testing revealed it had joint significance with the variable indicating the youth was completing an active disposition. Whether the instant arrest is the juvenile's first court contact also emerged as significant by itself at the 10% level in refined

regression specifications. If the instant arrest is a juvenile's first court contact, the youth is about seven percentage points less likely to recidivate. Dedel & Davies (2007) also reported this risk factor was a significant predictor of recidivism in a juvenile detention pretrial RAI. Finally, interviewed stakeholders viewed whether the instant arrest is a youth's first court contact as at least "moderately" important, giving it an average rating of 4.11. Because this risk factor is important both quantitatively and qualitatively, and is distinct from other indicators of juvenile court experience, it is likely worth including in juvenile pretrial detention RAIs.

Including the seriousness of the offense the youth is alleged to have committed in juvenile pretrial detention risk assessment has mixed support. Empirically, the risk factor did not emerge as a significant predictor of recidivism in any regression specifications. Fratello, et al. (2011) similarly found that the seriousness of the current charge was not correlated with a youth's probability of recidivating, and Dedel & Davies (2007) reported that the charge chosen by the arresting officer did not significantly predict recidivism (although the charge eventually settled on by the prosecutor did have some statistical power). Juvenile justice stakeholders, on the other hand, consider the seriousness of the alleged offense immensely important in making pretrial detention decisions. Risk factors for "whether the current charge involves an offense against a person," "the severity/gravity of the juvenile's current charge," and "whether the current charge involves a firearm" received an average rating of 4.67, 4.56, and 4.56, respectively. All three of these factors were among the five highest average ratings of importance among stakeholders. Thus, while this risk factor does not appear to be a significant empirical predictor of recidivism, it may warrant inclusion in a juvenile pretrial detention RAI to support buy-in and fidelity to the instrument.

A youth's age at the time of arrest does not appear to meaningfully contribute to the pretrial detention decision, from both empirical and stakeholder perspectives. After all, most youth in the juvenile justice system fall into the narrow range of 14 to 17 years old, so not much variation exists

to make predictions. Although Dedel & Davies (2007) finds some predictive significance in a risk factor indicating the youth was age 16 or more at the time of their first referral to juvenile court, the study did not consider age at the time of arrest. In this study, the variable for a juvenile's age was not statistically significant in any regression specification, whether entered in the model linearly or as a dummy variable indicating the youth was age 16 or older. Coefficient estimates were also close to zero, especially for the dummy variable specification. These results suggest age is not a significant predictor of recidivism among juveniles. Interviewed stakeholders had only a slightly different perspective. The average rating of importance given to a juvenile's age was 3.44, meaning stakeholders found the risk factor "somewhat" to "moderately" important in the pretrial detention decisions. However, no stakeholder brought up the youth's age in follow-up questions on the most important risk factors to consider. Given the weak support for this risk factor, age may not be necessary to include in juvenile pretrial detention RAIs.

Whether a youth has completed any disposition from a previous case – including state custody – is not a significant predictor of recidivism. Fratello, et al. (2011) reports that neither a previous disposition to probation nor out-of-home placement was significantly correlated with rearrest. In this study, coefficient estimates on the variable indicating a youth had completed a previous disposition were not statistically significant and close to zero across all regression specifications. Stakeholders, on the other hand, assigned this risk factor an average rating of 4.0, indicating it is "moderately" important in making pretrial detention decisions. Only one stakeholder also mentioned that whether a youth previously completed a disposition was among the most important factors to consider. Accordingly, weak empirical support and only moderate qualitative support exists for including previous dispositions in juvenile pretrial detention RAIs. The risk factor may not need to be included in an instrument.

A juvenile's history of running away from home or failing to appear for court can, but do not necessarily, predict recidivism. Results on the empirical significance of these risk factors are mixed. Dedel & Davies (2007) find that a history of running away from home is associated with rearrest while on pretrial release, and Baglivio (2009) reports similar findings for predicting recidivism within a year of assessment. In this study, however, a youth's history of running away or failing to appear did not significantly predict rearrest within 90 days of assessment. Variables for these risk factors were entered into regression specifications as separate dummy variables for the presence of each factor, and together as a dummy variable indicating the presence of either factor. Across all specifications, coefficient estimates were large and imprecise, indicating the variables may be noisy predictors or variation in the sample is too small to estimate coefficients precisely. Stakeholders found these risk factors rather important. Whether a juvenile had a history of running away from home and whether the youth had a history of failing to appear for court received average ratings of 3.67 and 3.78, respectively. Three stakeholders also reported a youth's runaway or failure-to-appear history are among the most important factors that should be considered in pretrial detention decisions. Because these risk factors have support in the literature and are viewed positively by stakeholders, they may warrant inclusion in a pretrial RAI.

School attendance and employment status have been shown to be significant predictors of recidivism in studies involving both juvenile pretrial detention RAIs (Fratello, et al. 2011; Dedel & Davies 2007) and post-adjudication assessments (Grieger & Hosser 2014; McGrath & Thompson 2012; Olver, et al. 2012; Baglivio 2009). Specifically, Dedel & Davies (2007) report that school attendance and employment are statistically significant predictors of reoffending, and Fratello, et al. (2011) found that whether a juvenile had attendance of 80% or greater in the most recent academic semester was significantly correlated with rearrest while on pretrial release. In this study, empirical analysis of these risk factors unfortunately could not be performed because the necessary

information was not collected by the Davidson County JDRA. However, the factors were included in interviews of local juvenile justice stakeholders. Respondents considered these risk factors relatively less important than other information. On average, stakeholders rated the importance of "whether the juvenile has a history of truancy" as 2.67 and "whether the juvenile maintains current steady employment" as 2.33. In follow-up questions, one stakeholder mentioned school attendance as something that would likely contribute to the JDRA, but is not currently used. Given that attendance records are objective criteria, and juvenile courts often already obtain educational information about youth in their jurisdiction, school attendance seems to be a feasible addition to juvenile pretrial detention RAIs. Indeed, it is already included as a risk factor in the instruments used by New York City and Portland, Oregon. Although only weak qualitative evidence supports including school attendance as a risk factor in a juvenile pretrial RAI, overwhelming empirical evidence in the literature supports including it. With respect to employment status, qualitative evidence in support of the risk factor is virtually non-existent, and quantitative evidence in the literature comes only from studies of post-adjudication tools. Accordingly, this risk factor may not need to be included in juvenile pretrial detention RAIs.

Finally, measures of a juvenile's home life and mental health were frequently reported in interviews with juvenile justice stakeholders as important factors to consider in making a pretrial detention decision. Measures of these risk factors were not included in the empirical analysis in this study because they were not collected by the JDRA. While mental health measures may be valuable to consider in the post-adjudication setting, the need for a clinician interview often makes them infeasible to include in pretrial detention RAIs. Further, mental health measures are not easily accessible by practitioners administering an RAI shortly after arrest and they typically require a clinician interview. Measures of a youth's home life also suffer from the same informational constraints. Further, other studies have not found such measures significant predictors of

recidivism. Fratello, et al. (2011) found that risk factors indicating "parent not willing to supervise," "no adult arrived at precinct following arrest," and "being in foster care" were not correlated with rearrest while on pretrial release. Dedel & Davies (2007) also found the presence of a responsible adult was not a significant risk factor. More broadly, McGrath & Thompson (2012) and Olver, et al. (2012) both found that the family, parenting, and living domains of a youth's risk profile did not meaningfully contribute to predictions of recidivism. Finally, measures of home life can be highly correlated with race and socioeconomic status. Including such measures may, in turn, cause the developed RAI to be racially biased. While an RAI with racially disparate impact is likely to withstand constitutional challenge on equal protection grounds (unless a discriminatory *purpose* can be shown), incorporating risk factors correlated with race is highly controversial and may severely diminish stakeholder buy-in and fidelity (Slobogin 2021). Thus, these risk factors probably should not (and, in most instances, cannot) be included in juvenile pretrial detention RAIs. To the extent measures of these risk factors are included in such tools, they should probably be included only to increase buy-in and fidelity from stakeholders and receive little weight in scoring.

While including risk factors not predictive of recidivism will reduce the predictive validity of an RAI, it may also improve an instrument's overall efficacy by increasing buy-in and fidelity. If stakeholder buy-in is especially low, incorporating non-predictive factors that elevate buy-in and fidelity may promote compliance with RAI protocols. In turn, improved protocol compliance may increase the tool's overall accuracy more than the decrease in accuracy brought about by including non-predictive factors. If this is the case, including non-predictive factors in the RAI will boost overall performance. Additionally, if the non-predictive factors are given little weight in the algorithm, the reduction in predictive validity will be minimal. This approach is especially effective if the practitioners are blind to the scoring of the instrument and see only that the risk factors they find important are being used.

Ultimately, the choice of risk factors to include in any RAI is driven by answering the question, "what is the RAI supposed to do?" If the answer is simply to predict recidivism, perhaps only empirically significant risk factors should be included in risk assessment. Slobogin (2021), for example, argues that the "fit" of an RAI should be determined by the relevant legal setting.

> At a minimum, for each type of legal setting (pretrial detention, front-end sentencing, back-end release, within-prison disposition), a risk assessment should address: (1) the probability, (2) that a particular type of offense outcome, (3) will occur within a specified period of time, (4) in the absence of a specified intervention. (p. 38).

However, if other goals are desired, such as adherence to RAI recommendations through buy-in and fidelity from stakeholders, a broader set of risk factors may need to be incorporated. Statistical significance may also be less important when the goals of an RAI are simply to provide objective criteria or allocate resources. Stakeholders in this study, for example, often discussed the usefulness of RAIs simply with respect to a decision-maker's consideration of objective factors instead of a tool's prediction of the probability of a certain outcome. In discussing the usefulness of RAIs generally, several respondents in this study emphasized that RAIs "take out subjectivity" in decision-making, "help human decision-makers think outside the box," and "give a judge additional, structured insight into a case." These objectives suggest that risk factors beyond just those that are empirically significant should be included in an RAI, depending on the tool's purpose. If a tool's purpose is to make as accurate predictions as possible, then only empirically significant risk factors should be included. If, however, a tool's purpose is simply to use objective criteria weighted the same in every case or to make judges "think outside the box," then risk factors that are perceived important by stakeholders can be included.

This study is the first to use both quantitative and qualitative evidence to analyze the importance of individual risk factors in making juvenile pretrial detention decisions. While the study offered valuable insight into which risk factors should be included in future juvenile pretrial

detention RAIs, it is not without limitations. A small sample size and low variance among covariates used to predict recidivism posed some power problems for statistical inference, and data limitations precluded me from analyzing the empirical significance of risk factors for school attendance, employment status, mental health status, and family life and parenting. Furthermore, my analysis was limited to only those youth with a detention-eligible offense who were assessed by the JDRA (i.e., not automatically detained). Most juveniles who were arrested, however, were subject to a mandatory hold. Because my analysis was limited to this subset of detention-eligible youth, the results may not generalize to the entire population of detention-eligible juvenile offenders. To analyze a sample of the entire relevant population, jurisdictions such as Davidson County should consider reducing the use of mandatory holds and allow youth charged with felonies against persons a chance at release. While this approach is likely to garner criticism from the public (and even police departments), it may be the most promising to develop the most useful RAIs. As discussed in Chapter 1, such an approach may also improve measures of the JDRA's performance because so few automatically detained youth will recidivate. At the very least, jurisdictions should consider having all juvenile offenders – even the ones subject to mandatory holds – complete an RAI for data collection purposes.

In future work, larger datasets – both in terms of the number of observations and the number of risk factors capturing juvenile/case information – should be employed to focus on feasibly collectible information in the pretrial setting. No study of juvenile pretrial detention RAIs, including this one, has used data from more than one county, and no study has incorporated risk factors beyond those used by the tool being analyzed. Thus, future studies might analyze a pretrial tool adopted statewide or merge multiple datasets about the same youth to increase the amount of information available for inference. Qualitatively, future studies might also incorporate input from

more than just judicial and supervisory staff, such as incorporating all probation officers, all intake staff, prosecutors, and defense attorneys.

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APPENDIX

APPENDIX TABLE 3-1. Alternative OLS Regression Specifications, JDRA Sample

	Dependent Variable: Rearrested within 90 Days							
	Assessed & Released Youth				*All Assessed Youth*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Felony Charge	0.049	0.064	0.048	0.051	-0.039	-0.022	-0.040	-0.039
	(0.120)	(0.121)	(0.119)	(0.119)	(0.114)	(0.113)	(0.114)	(0.114)
Multiple Charges	0.005	0.007	0.008	0.004	-0.010	-0.008	-0.011	-0.011
	(0.036)	(0.036)	(0.036)	(0.036)	(0.033)	(0.033)	(0.034)	(0.033)
Prior Adjudications	0.198*	0.199*			0.122**	0.118**		
	(0.111)	(0.111)			(0.057)	(0.057)		
Any Prior Misdemeanor			-0.143	-0.141			0.207**	0.207**
			(0.208)	(0.207)			(0.105)	(0.105)
Any Prior Felony			0.330**				0.093	
			(0.129)				(0.064)	
1 Prior Felony				0.400***				0.138*
				(0.137)				(0.079)
≥ 2 Prior Felonies				-0.172				0.033
				(0.362)				(0.089)
Other Open Petitions	0.020	0.010	0.008	0.021	0.008	0.008	0.006	0.006
	(0.062)	(0.062)	(0.062)	(0.063)	(0.041)	(0.041)	(0.041)	(0.041)
Completing Active Disposition	0.102	0.107	0.096	0.090	0.084*	0.087*	0.092*	0.094*
	(0.067)	(0.066)	(0.066)	(0.066)	(0.048)	(0.048)	(0.048)	(0.048)
Previous Disposition Completed	-0.017	-0.020	-0.022	-0.020	0.012	0.010	0.007	0.006
	(0.044)	(0.044)	(0.043)	(0.044)	(0.038)	(0.038)	(0.038)	(0.038)
History of Failure to Appear	-0.211		-0.216	-0.224	-0.245		-0.289	-0.290
	(0.277)		(0.276)	(0.275)	(0.174)		(0.178)	(0.178)
History of Runaway	0.144		0.138	0.141	0.019		0.014	0.014
	(0.194)		(0.193)	(0.193)	(0.105)		(0.105)	(0.105)

Any History of Runaway/FTA		0.044				-0.058		
		(0.169)				(0.096)		
Age		0.012	0.011	0.012		-0.002	-0.001	-0.001
		(0.012)	(0.011)	(0.012)		(0.011)	(0.011)	(0.011)
Age 16 or Over	0.003				-0.039			
	(0.035)				(0.032)			
First Court Contact	-0.073	-0.07	-0.072	-0.071	-0.051	-0.050	-0.052	-0.051
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
Observations	420	420	420	420	535	535	535	535
R-squared	0.026	0.027	0.038	0.043	0.039	0.033	0.038	0.040
F-Stat	1.111	1.264	1.461	1.527	2.148	2.018	1.902	1.821
Prob > F	0.352	0.255	0.144	0.111	0.0197	0.0355	0.0367	0.0421

Notes: Columns (1) to (4) use sub-sample of Assessed & Released Youth. Columns (5) to (8) used sub-sample of All Assessed Youth. "FTA" = Failure to Appear. F-statistic and p-value reported for joint significance of all regressors. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

THE EFFICACY OF RISK ASSESSMENT INSTRUMENTS IN JUVENILE PRETRIAL DETENTION

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INTERVIEW MATERIALS

Thank you for being a part of this study. The focus of this study is the use of risk assessment instruments in juvenile pretrial detention decisions, such as the Juvenile Detention Risk Assessment used by the Davidson County Juvenile Court.

Your responses will be kept strictly confidential and will be known only to the interviewer. No identifying information about you will be revealed in any manuscript, report, or publication.

This interview consists of four (4) modules. Each module will be completed separately with the assistance of the interviewer. The modules are comprised of either interview questions or survey exercises. There are no "right" or "wrong" answers to any of the questions or exercises.

MODULE 1

1. How useful are risk assessment instruments ("RAIs") in judicial decision-making?

(1) Not at all useful

(2) Barely useful

(3) Somewhat useful

(4) Moderately useful

(5) Extremely useful

- Why? Should RAIs be used at all in judicial decision-making?

2. How important is the uniqueness of each juvenile case in the risk assessment process?

(1) Not at all important

(2) Barely important

(3) Somewhat important

(4) Moderately important

(5) Extremely important

- How should the uniqueness of each juvenile case be considered in the risk assessment process?

3. How important is adherence to the recommendations of an RAI?

(1) Not at all important

(2) Barely important

(3) Somewhat important

(4) Moderately important

(5) Extremely important

4. Should RAIs make presumptive detention decisions themselves or should they be presented to a judge who uses information from an RAI to make a final decision?

(1) RAIs should make the presumptive decision, and overrides should be allowed only in compelling circumstances

(2) RAIs should be a presumptive guideline, where judges may deviate from the RAI for any reason stated on the record, and the decision is reviewed only for abuse of discretion

(3) RAIs should be presented to a judge as only informational, with adversarial argument from both the state and defense regarding the weight the RAI's recommendation should receive

- Explain your reasoning

5. How important are measures that ensure accountability in the use of RAIs like the JDRA?

(1) Not at all important

(2) Barely important

(3) Somewhat important

(4) Moderately important

(5) Extremely important

- In your opinion, what measures can be implemented to ensure accountability in the use of RAIs like the JDRA? (overrides, adhering to recommendations, transparency of risk factors and scoring, etc.)

6. Have you seen any negative (or positive) impacts on juveniles based on risk assessment outcomes you have seen in Davidson County?

- If so, what are they?

7. Have you seen any negative (or positive) impacts on court operations since implementation of the JDRA?

- If so, what are they?

8. Should risk factors differ between youth and adults?

- If so, how?

MODULE 2

1. Which risk factors currently used in the JDRA are most important for making a pretrial detention decision (for predicting new criminal activity and/or failure to appear)?

- _____
- _____
- _____
- _____
- _____

2. What risk factors not currently used in the JDRA would you consider important in making a pretrial detention decision and warrant inclusion in the JDRA?

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

MODULE 3

	Not at all important	Barely important	Somewhat important	Moderately important	Extremely Important
The state's likelihood of success on the merits	1	2	3	4	5
The severity/gravity of the juvenile's current charge	1	2	3	4	5
Whether the juvenile has multiple pending charges	1	2	3	4	5
Whether this is the juvenile's first contact with Juvenile Court	1	2	3	4	5
Whether the current charge involves a firearm	1	2	3	4	5
Whether the current charge involves an offense against a person	1	2	3	4	5
Whether the current charge is drug related	1	2	3	4	5
The juvenile's age at the time of the offense	1	2	3	4	5
Whether the juvenile has prior adjudications of guilt for a felony	1	2	3	4	5
Whether the juvenile has prior adjudications of guilt for a misdemeanor	1	2	3	4	5
Whether the juvenile has *any* prior adjudications of guilt	1	2	3	4	5
Whether the juvenile has received a previous sentence to DCS JJ custody	1	2	3	4	5
Whether the juvenile has previously failed to appear for court hearings	1	2	3	4	5
Whether the juvenile has a history of running away	1	2	3	4	5
Whether the juvenile is currently on probation/SIA	1	2	3	4	5
Whether the juvenile has a history of truancy	1	2	3	4	5

Whether the juvenile maintains current steady employment	1	2	3	4	5
Whether the juvenile has a responsible adult to assure supervision and returning for court appearances	1	2	3	4	5
Whether the juvenile has had prior family services involvement	1	2	3	4	5
Whether the juvenile's parent, non-sibling guardian, or step-parent have any history of criminal behavior	1	2	3	4	5
Whether the juvenile has had parentage involvement	1	2	3	4	5

MODULE 4

1. What suggestions, comments, or criticisms do you have for the Davidson County Juvenile Court regarding its use of RAIs or the JDRA specifically?

2. What questions do you have for me? Is there anything else you'd like to share with me?