Law and Human Behavior

Criminogenic Factors, Psychotic Symptoms, and Incident Arrests Among People With Serious Mental Illnesses Under Intensive Outpatient Treatment

Seth J. Prins, Jennifer L. Skeem, Christine Mauro, and Bruce G. Link

Online First Publication, August 18, 2014. http://dx.doi.org/10.1037/lhb0000104

Law and Human Behavior

0147-7307/14/$12.00 http://dx.doi.org/10.1037/lhb0000104

Criminogenic Factors, Psychotic Symptoms, and Incident Arrests Among People With Serious Mental Illnesses Under Intensive Outpatient Treatment

Seth J. Prins
Columbia University

Jennifer L. Skeem
University of California, Berkeley

Christine Mauro and Bruce G. Link
Columbia University

Although research robustly indicates that general or "criminogenic" factors predict various measures of recidivism, there is controversy about the extent to which these factors, versus untreated symptoms, lead to justice involvement for people with mental illnesses. Based on a sample of 183 people in intensive outpatient treatment followed for an average period of 34.5 months, the present study tested whether criminogenic factors (i.e., factor-analytically derived proxies of some of the "Central Eight"; Andrews & Bonta, 2010) and psychotic symptoms were independently associated with arrest. The study also compared the predictive utility of these domains. In the fully adjusted model, the antisocial subscale and male sex were associated with *increased* arrest rates, whereas psychosis and age were associated with *decreased* arrest rates. Criminogenic factors and psychotic symptoms had comparable predictive utility. We conclude that criminogenic factors—chiefly arrest history—and psychotic symptoms predict arrest rates. Both sets of variables appear useful for assessing risk of arrest among people with mental illnesses who are not under current correctional supervision.

Keywords: crime, mental illness, risk assessment, arrest, psychosis

A large body of research suggests that "criminogenic" risk factors (i.e., major changeable risk factors for criminal behavior that do not include symptoms of mental illnesses: Monahan & Skeem, 2014) robustly predict various measures of recidivism and are useful targets for intervention to reduce rearrest among people under correctional supervision (Andrews, 2011; Bonta et al., 2011). Increasingly, with the support of such agencies as the National Institute of Corrections and the Bureau of Justice Assistance, policy initiatives have called for a focus on these general risk factors for justice-involved people with mental illnesses (Osher, D'Amora, Plotkin, Jarrett, & Eggleston, 2012). However, there is debate among researchers and practitioners about the extent to which the involvement of people with mental illness in the justice system is maintained by criminogenic risk factors, which are shared among all justice-involved people, or by untreated symptoms, which are specific to people with mental illness (for a review, see Skeem, Manchak, & Peterson, 2011). The present study directly tests whether certain criminogenic risk factors and psychotic symptoms are independently associated with arrest in a sample of people with mental illnesses serious enough to be mandated to intensive outpatient treatment or "assisted outpatient treatment" (AOT).

Until recently, correctional policy for individuals with mental illnesses was premised on the belief that symptoms caused arrest: a lack of (or inadequate) treatment brought deviant, symptomatic behavior to the attention of law enforcement (Council of State Governments, 2002; Skeem et al., 2011; Teplin, 1984). As such, the primary policy goal was to connect this group to treatment (e.g., Assertive Community Treatment), often under the supervision of courts or community corrections agencies (Case, Steadman, Dupuis, & Morris, 2009; Osher, Steadman, & Barr, 2003; Steadman & Naples, 2005; Steadman, Redlich, Griffin, Petrila, & Monahan, 2005). However, empirical support for higher arrest rates among people with mental illnesses is mixed (e.g., Engel & Silver, 2001) and depends on definitions of mental illness and policies governing officer decision-making in certain arrest situations (Schwarzfeld, Reuland, & Plotkin, 2008). Furthermore, evidence that treatment-centered programs reduce recidivism is also mixed, and there has been no indication that symptom reduction is the reason why individuals who succeed in such programs do not recidivate (Morgan et al., 2012; Skeem et al., 2011). There have been numerous calls to redirect efforts toward adapting evidence-based correctional principles and programs to fit this subgroup, including the principle that effective interventions target crimino-

Seth J. Prins, Department of Epidemiology, Columbia University; Jennifer L. Skeem, School of Social Welfare and Goldman School of Public Policy, University of California, Berkeley; Christine Mauro, Department of Biostatistics, Columbia University; Bruce G. Link, Department of Epidemiology, Columbia University.

This work was supported by the National Institute of Mental Health (5-T32-MH-13043).

Correspondence concerning this article should be addressed to Seth J. Prins, Department of Epidemiology, Columbia University, Mailman School of Public Health, 722 W 168th Street, 7th Floor, New York, NY 10032. E-mail: sjp2154@columbia.edu

genic or changeable risk factors rather than variables—such as symptoms of mental illness—that may be less relevant to criminal behavior or arrest (e.g., Bonta, Blais, & Wilson, 2014).

Assessing individual differences in these risk factors is a centerpiece of evidence-based practice for corrections agencies. The goal is to identify relatively high-risk individuals, prioritize them for intensive intervention services that target these criminogenic factors, and thereby meaningfully reduce recidivism (Andrews et al., 1990; Lowenkamp, Latessa, & Smith, 2006). Research suggests that four risk factors consistently predict criminal conduct in almost any justice-involved sample: history of antisocial behavior, antisocial personality pattern, antisocial cognition, and antisocial associates (Andrews & Bonta, 2010).

There is evidence that justice-involved people with mental illnesses have levels of these risk factors—as measured by the Level of Services/Case Management Inventory (LS/CMI; Andrews, Bonta, & Wormith, 2004)—that are comparable with those of justice-involved people without mental illnesses. In a matched sample of individuals on parole, those with mental illnesses scored significantly but modestly higher on the LS/CMI than those without (Skeem, Winter, Kennealy, Eno Louden, & Tatar, 2014). Likewise, in a sample of individuals on probation, those with mental health problems scored higher on a version of the LSI than those without (Girard & Wormith, 2004). There is also evidence that the LSI predicts recidivism just as well for individuals under community corrections supervision with and without mental illnesses (Andrews & Bonta, 2010; Bonta, Law, & Hanson, 1998; Girard & Wormith, 2004; Skeem, Steadman, & Manchak, 2014).

Relatively little research has been conducted among a subgroup of individuals for whom untreated symptoms may more directly cause justice system involvement, including defendants who have been acquitted of a crime as not guilty by reason of insanity (NGRI). Still, criminogenic variables seem to predict revocation in this subgroup, as well. In a multistate study, Callahan and Silver (1998) found that individuals with substance abuse history and a prior arrest history were relatively likely to have their conditional release revoked. Similarly, Vitacco and colleagues (2013) found that revocation among NGRI acquitees was uniquely associated with treatment nonadherence and prior revocation.

There is growing evidence that roughly 8% of justice-involved people with mental illnesses have an arrest or pattern of arrests that are directly attributable to symptoms of psychosis (Junginger, Claypoole, Laygo, & Crisanti, 2006; Peterson, Skeem, Kennealy, Bray, & Zvonkovic, 2014; Peterson, Skeem, Hart, Vidal, & Keith, 2010). It is possible that this subgroup would be larger among samples of individuals *not* under current correctional supervision, given evidence that the study sample (clinical vs. forensic or correctional) can influence the strength of the relationship between symptoms and criminal behavior.

Specifically, in a meta-analysis of studies on the association between psychosis and violence, Douglas, Guy, and Hart (2009) found that effects varied by sampling frame and comparison group. Studies with community samples produced much larger positive associations between psychosis and violence than correctional or civil psychiatric settings, though there were still modest effects in the latter settings (Douglas et al., 2009). The association was stronger when individuals with psychosis were compared with those without any mental illnesses, than when individuals with psychosis were compared with those with nonpsychotic mental illnesses. Perhaps most relevant to the present analysis, psychosis appeared to be *protective* against violence when the comparison group was individuals with externalizing disorders (Douglas et al., 2009).

To our knowledge, there has been no direct test of the role of criminogenic risk factors on arrests independent of symptoms in clinical (rather than correctional or forensic) samples. Thus, we chose the present AOT sample to explore the independent associations and predictive utility of certain criminogenic risk factors and psychiatric symptoms on incident arrests (i.e., new arrests that occurred during follow-up). From the perspective of policy and programming, at issue is whether risk assessment and targeted risk reduction as a general model is applicable in criminal justice and mental health collaborations or whether it requires theoretical or methodological adaptation.

Method

Sample

The longitudinal New York State Community Outcomes of Assisted Outpatient Treatment evaluation sample has been described in depth elsewhere (Link, Epperson, Perron, Castille, & Yang, 2011; Phelan et al., 2010). There were 183 participants (see Table 1) with serious mental illness, aged 18 to 64, recruited in treatment facilities in the Bronx and Queens. Eighty-nine had been assigned to AOT at some point in their lives, and a comparison group of 94 had been recently discharged from a psychiatric hospital and were attending the same outpatient facilities as the AOT group. Of the 183 participants, 109 (59.6%) had ever been arrested before the study. Nine participants were on probation or parole at baseline, or roughly 8.4% of those who had ever been arrested and for whom data were available. Follow-up began on the day of participants' first interview, so that we could use

Table 1
Demographic and Clinical Characteristics of the Sample

Characteristic	*N*	%
Male	110	61
Ancestry		
Black non-Latino	98	53.5
Latino	53	28.9
White	14	7.7
Other	18	9.8
Primary diagnosis		
Bipolar	32	18.2
Major depressive	13	7.4
Schizoaffective	57	32.4
Schizophrenia spectrum	71	43
Substance-induced	3	1.7
Ever on AOT[a]	89	48.6
Completed high school	111	67
Ever arrested	109	59.6
Currently on probation or parole	9	8.4[b]
Age (mean ± *SD*)	41 ± 11.2	
Arrestees during follow-up	31	16.9
Arrests during follow-up (mean, maximum)	64 (0.35, 8)	
Months of follow-up [mean (minimum–maximum)]	34.5 (21–55)	

[a] Assisted outpatient treatment. [b] Of those with prior arrests for whom data were available.

baseline clinical, criminogenic, and demographic data to predict forward with official arrest records.

After a complete description of the study, written informed consent was obtained from participants, including consent to conduct searches of records. Institutional review board approval was obtained from the New York State Psychiatric Institute, Bronx Psychiatric Center, Creedmoor Psychiatric Center, Bronx-Lebanon Medical Center, and the New York State Office of Mental Health (NYS OMH).

Specific legal criteria are required for assignment to AOT, including a judgment based on a history of treatment noncompliance (Link et al., 2011). That said, AOT and comparison participants were very similar on demographic and clinical factors; the AOT group had somewhat more men, individuals with psychotic disorders, and people of color than the comparison group (see Table 1 of Link et al., 2011). As criminogenic risk is the focal construct in the present study, AOT status was regarded as a control variable (ever or never).

Dependent Variable

We created arrest counts by summing each subject's arrests during follow-up (see Table 1). Official arrest records were available for participants from age 18 until the year 2007. The average length of follow-up was 34.5 months.

Independent Variables

Criminogenic factors. The AOT interview was not designed to assess criminogenic risk factors; nevertheless, it contains extensive information on relevant constructs (e.g., antisocial personality pattern). We selected ~60 items from scales in the AOT interview that measured such constructs. Our goal was to develop a proxy for criminogenic risk by creating a scale that predicted past arrests, and then use the scale to predict future arrests during follow-up. To remain consistent with past research (where "criminal history" is one of the "big four" risk factors), we included arrest history in our scale.

The 60 items were drawn from the Composite International Diagnostic Interview (CIDI; Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998), the Reactive-Proactive Aggression Questionnaire (Raine et al., 2006), the Novaco Anger Scale (Novaco, 2003), and scales measuring community violence norms and quality of life (see Appendix Table A.1). We conducted appropriate bivariate tests of the relationship between each item and arrest history. We kept items that were associated with past arrest at a p value of less than 0.1 or with effect sizes greater than or equal to an odds ratio of 1.5. Community violence norms and quality of life items were neither associated with arrest history, nor with our outcome (arrest as a count or dichotomy) and were dropped.

We conducted exploratory factor analyses (see Appendix Table A.2) on the 30 remaining items in addition to arrest history and DSM-diagnosed substance use disorder, which we included for consistency with criminogenic screening instruments such as the LS/CMI. We identified a three-factor model, which we determined based on existing theory of criminogenic risks and by examining a scree plot of the items (a graphical aid for choosing the number of factors). The first dimension ("history of antisocial behavior/personality") corresponded to CIDI items for conduct disorder in addition to arrest history and substance use disorder (Cronbach's $\alpha = .86$). The second dimension ("current anger/aggression") corresponded to the remaining Reactive-Proactive Aggression Questionnaire and Novaco Anger Scale items (Cronbach's $\alpha = .81$). The third dimension ("past violence") corresponded to two CIDI items regarding setting fires and sexual violence (Cronbach's $\alpha = .75$). We treated each of these factors as separate subscales of criminogenic risk in subsequent models. See Appendix Table A.1 for a complete list of included items.

Psychotic symptom scale. We selected 12 measures of delusions (paranoid, persecutory, control, thought broadcasting, bizarre, somatic, grandiose, and other) and hallucinations (auditory, visual, tactile, and other) from the Structured Clinical Interview for DSM Diagnoses (SCID; First, Spitzer, Gibbon, & Williams, 2002). These symptoms were identified by trained SCID interviewers. Exploratory factor analysis (see Appendix Table A.3) yielded a one-factor model ("psychosis") based on examination of scree plots and theoretical relevance. We treated this factor as a single scale in subsequent models (Cronbach's $\alpha = .83$).

To visualize the relationships among our criminogenic factors and between our criminogenic and symptom factors, we constructed a correlation heat map of all retained items (see Figure 1). A heat map is a graphical summary of a correlation matrix, wherein numeric values are represented by colors or shadings. This visual display emphasizes the structure of the data.

Statistical Analysis

Poisson regression for rates. We fit Poisson regression models to assess the effects of criminogenic factors and psychotic symptoms on incident arrest rate. The incident arrest rate is the occurrence of new arrests during follow-up per unit of person-time. Poisson regression is a technique for modeling outcomes in terms of counts, but when these events occur over time, it is more relevant to model the outcome in terms of rates (Agresti, 2002). This is accomplished by including an offset in the model; the offset is a covariate for time with a coefficient of 1 (Agresti, 2002). The offset also accounts for unequal observation times among participants. Exponentiated coefficients in such models can be interpreted as incidence rate ratios. A rate ratio is an effect measure comparing the rate of arrest under one condition relative to the rate of arrest under another condition. Rate ratios greater than 1 indicate an increase in arrest rate relative to the reference condition, whereas rate ratios less than 1 indicate a decrease in arrest rate relative to the reference condition. We accounted for time not at risk of arrest by excluding periods of hospitalization or incarceration during follow-up, obtained from official records.

We began with bivariate analyses by regressing incident arrests on each criminogenic subscale, the psychotic symptom scale, and known demographic predictors of arrest that we viewed as potential confounders (see Table 2). We next regressed incident arrests on all three criminogenic subscales (Table 3, Model 1), the psychotic symptom scale (Table 3, Model 2), all criminogenic subscales and the psychotic symptom scale (Table 3, Model 3), and finally, on all relevant independent variables (Table 3, Model 4). We controlled for AOT status in all multivariable models. Participant ancestry was not related to any of our criminogenic subscales, psychotic symptoms, or incident arrests, and was not included in our models.

Logistic regression for predictive utility. To directly compare the predictive utility of criminogenic factors and symptom factors on arrest, that is, the predicted probability of arrest versus an individual's observed arrest status, we constructed receiver operating characteristic (ROC) curves. ROC curves plot the true positive rate

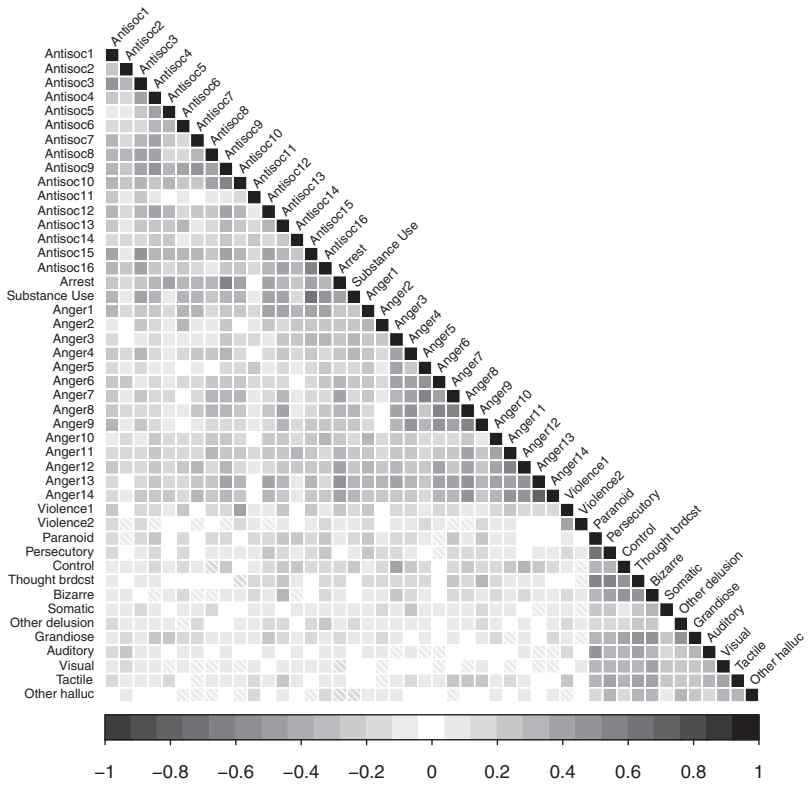

Figure 1. Correlation heat map of criminogenic and symptom items. A heat map is a graphical summary of a correlation matrix, wherein numeric values are represented by colors or shading. Shading darkens as correlations strengthen. White diagonal lines indicate negative correlations. This visual display emphasizes the structure of data.

(sensitivity) against the false positive rate (1-specificity) of a dichotomous classification scheme. The area under the ROC curve (AUC) is a summary statistic that gives the discriminative effectiveness of the classification system (Erdreich & Lee, 1981; Schisterman, Faraggi, Reiser, & Trevisan, 2001), or in this case the probability that our criminogenic subscales and psychosis scale will correctly rank as higher-risk those individuals in our sample who were arrested (0.5 is no better than chance, 1.0 is perfect prediction).

Exploratory factor analyses were conducted in MPlus and R package "psych" (Revelle, 2014). Assessment of predictive utility was conducted in R package "Epi" (Carstensen, Plummer, Hills, & Laara, 2013). All other analyses were conducted in R 3.0.2 or SAS 9.3.

Results

Demographic and Bivariate Findings

Table 1 presents descriptive statistics for the sample's demographic, clinical, and criminal justice characteristics. The incident arrest rate during follow-up was 0.12/person-year. AOT treatment

Table 2
Bivariate Models of the Relationship Between Arrest Rate and Criminogenic Subscales, Psychotic Symptoms, and Other Independent Variables

Independent variable	Rate ratio	95% CI	*p*
Antisocial subscale	1.11	(1.03, 1.18)	.003
. . . without past arrest and substance abuse	1.05	(.99, 1.12)	.11
Past arrest only	1.69	(1.36, 2.10)	<.001
Past substance use only	1.91	(.97, 3.75)	.061
Anger or aggression subscale	1.0	(.95, 1.06)	.881
Violence subscale	.19	(.03, 1.33)	.095
Psychosis	.76	(.67, .87)	<.001
Ever on AOT	1.11	(.68, 1.81)	.682
Sex (male)	19.72	(4.82, 80.6)	<.001
Age	.92	(.89, .95)	<.001

Table 3
Adjusted Models of the Relationship Between Arrest Rate and Criminogenic Subscales, Psychotic Symptoms, and Other Independent Variables

Parameter	Model 1			Model 2			Model 3			Model 4		
	Rate ratio	95% CI	*p*	Rate ratio	95% CI	*p*	Rate ratio	95% CI	*p*	Rate ratio	95% CI	*p*
Antisocial subscale	1.17	(1.08, 1.26)	<.001				1.15	(1.06, 1.24)	<.001	1.08	(.99, 1.17)	.078
Anger or aggression subscale	.96	(.9, 1.02)	.223				.96	(.91, 1.03)	.261	.96	(.9, 1.02)	.186
Violence subscale	.13	(.02, .97)	.046				.22	(.04, 1.31)	.096	.17	(.02, 1.12)	.066
Ever on AOT	.85	(.51, 1.43)	.543	1.16	(.71, 1.89)	.55	.89	(.53, 1.50)	.668	.79	(.47, 1.32)	.364
Symptom scale				.76	(.67, .87)	<.001	.78	(.68, .89)	<.001	.84	(.74, .96)	.013
Sex (male)										14.1	(3.35, 59.23)	<.001
Age										.94	(.91, .97)	<.001

status was not associated with incident arrests. In general, criminogenic factors were more highly correlated with each other than with psychotic symptoms, and vice versa (see Figure 1). For example, substance use showed modest to strong positive correlations with antisociality whereas thought broadcasting showed weak positive and negative correlations with antisociality (see Appendix A.1 for the items that correspond to heat map labels).

The antisocial subscale and male sex were each associated with an increased rate of incident arrests (see Table 2). The psychotic symptom scale and age were each associated with a decreased rate of incident arrests (see Table 2). There was a strong effect of arrest history on incident arrests.

Independent Associations Between Criminogenic Factors and Psychotic Symptoms

Independent of psychotic symptoms, AOT status, and other criminogenic subscales, the arrest incidence rate ratio was 1.15, 95% CI [1.06, 1.24], $p < .001$ for each unit increase in the antisocial subscale (Table 3, Model 3). This corresponds to a person with the highest observed score on the scale having 5.58, 95% CI [2.17, 14.34] times the rate of arrest as a person with the lowest observed score. The anger or aggression and past violence subscales were not significantly associated with the incidence rate of arrest. Independent of criminogenic subscales and AOT status, the arrest incidence rate ratio was 0.78, 95% CI [0.68, 0.89], $p < .001$ for each unit increase in the psychotic symptoms scale, corresponding to an incident rate ratio of 0.06, 95% CI [0.01, 0.27] comparing the highest observed score to the lowest observed score on this scale—in other words, a 94% lower incidence rate of arrest.

In the fully adjusted model (Table 3, Model 4), sex and age confounded the effects of antisocial behavior or personality and psychotic symptoms. Comparing maximum observed scores to minimum observed scores, the incidence arrest rate ratios were 2.49, 95% CI [0.9, 6.84] for antisocial behavior or personality and 0.15, 95% CI [0.03, 0.67] for psychotic symptoms. Men had a rate of arrest 14.1, 95% CI [3.35, 59.23] times higher than women, $p < .001$. Arrest rates were 0.94, 95% CI [0.91, 0.97] times lower for each additional year of age, $p < .001$.

Because bivariate models suggested a strong association between arrest history and arrest rate, we constructed a second fully adjusted model (not shown) in which we removed past arrest from the antisocial personality or behavior subscale. This resulted in a rate ratio for the subscale that was not significantly different than null: 1.04, 95% CI [0.96, 1.11] $p = .35$. In other words, criminal history alone accounted for the observed association with increased risk of arrest.

Comparative Predictive Utility of Criminogenic Factors and Psychotic Symptoms

Figure 2 shows the results of four predictive models. All four models are adjusted for AOT status. Plot *a* is the ROC curve (AUC: 0.71) for the logistic model regressing incident arrest (yes/no) on the three criminogenic risk subscales: history of antisocial behavior or personality, current anger or aggression, and past violence. Plot *b* is the ROC curve (AUC: 0.69) for the logistic model regressing incident arrest on psychotic symptoms. Plot *c* is the ROC curve (AUC: 0.71) regressing incident arrest on past arrest (yes/no). Plot *d* is the ROC

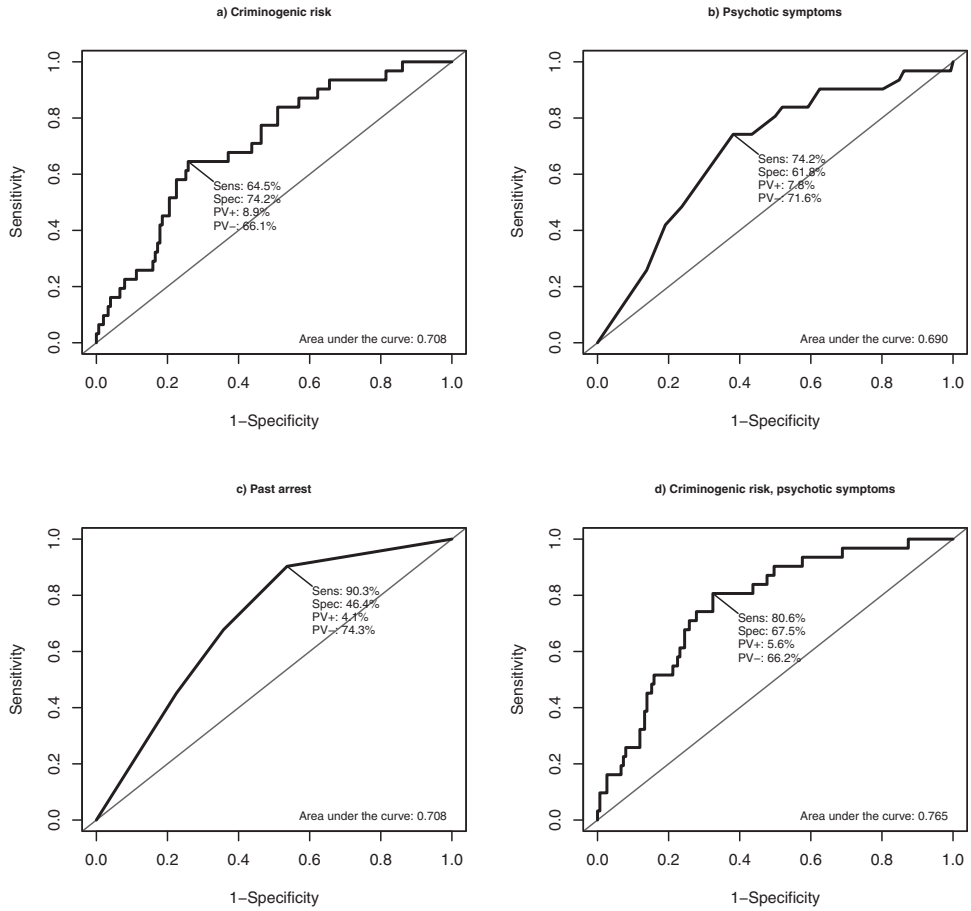

Figure 2. Receiver operating characteristic curves for (a) criminogenic risk factors, (b) psychotic symptoms, (c) past arrests, and (d) criminogenic risk factors and psychotic symptoms. All models control for AOT status.

curve (AUC: 0.77) regressing incident arrest on the criminogenic constructs and psychotic symptoms. In terms of AUC statistics, models *a*–*c* are very similar, whereas the model with criminogenic constructs and psychotic symptoms represents a roughly 6% improvement over either criminogenic or psychotic variables alone. Taking the point along each ROC curve that optimizes sensitivity and specificity, the criminogenic risk model had the lowest sensitivity but the highest specificity, whereas the past arrest model had the highest sensitivity and lowest specificity. Age and sex increased the predictive utility of all models (see Appendix Figure A.1).

Discussion

This study identified the associations between certain criminogenic factors and psychotic symptoms on the arrest rate of individuals with serious mental illnesses under intensive outpatient treatment. The study also explored the predictive utility of these factors on incident arrests. We examined these questions in a unique treatment sample of individuals with serious mental illnesses; although the majority had an arrest history, very few were currently under correctional supervision. Our findings provide initial evidence that criminogenic factors and psychotic symptoms are both associated with the rate of arrest. Certain criminogenic factors—chiefly arrest history—were associated with an increased rate of arrests. Psychotic symptoms were associated with a decreased rate of arrests. Both factors (criminogenic and psychotic symptoms) had similar effect sizes, though their directions were opposing. Criminogenic factors and psychotic symptoms had comparable predictive utility. As explained below, these findings warrant cautious interpretation.

There are at least two competing perspectives on the causes of criminal behavior or arrest among individuals with mental illnesses. The first posits that untreated psychiatric symptoms cause arrest directly by drawing the attention of law enforcement officials or indirectly by resulting in circumstances that subsequently result in criminal behavior or arrest. We found that psychotic symptoms and arrest had the opposite association in our sample. The second perspective posits that criminal history and a subset of variable risk factors—changeable behaviors, attitudes, and personality characteristics proximate to crime (i.e., "the immediate situation")—maintain recidivism (Andrews, Bonta, & Wormith, 2006). We found that such factors were associated with arrest, but arrest history, a static risk factor, was more operative than proximate changeable factors.

There are several potential explanations for the inverse association between psychotic symptoms and arrest. One speculation is that involvement in intensive outpatient treatment, whether under AOT or the comparison condition, prevented criminal behavior or arrest. This is consistent with prior findings that AOT reduced the risk of arrest

(Link et al., 2011), but inconsistent with findings that mental health treatments such as Assertive Community Treatment have little or no effect on arrest (for a review, see Skeem et al., 2011). This finding is also distinct from the "treater-turned-monitor dilemma," wherein intensive mental health case management for individuals under community corrections supervision results in *more* reincarceration, because clinicians observe and report technical violations of release terms (Solomon, 1999; Solomon & Draine, 1995). The fact that the vast majority of our sample was not under community corrections supervision may have protected them from this phenomenon. Another speculation is that individuals with psychotic symptoms were simply too ill to engage in criminal behavior. This is consistent with past research (e.g., Douglas et al., 2009; Monahan et al., 2001) indicating that symptoms of psychosis tend to protect against violence, when compared with symptoms of mood disorders or externalizing disorders.

With respect to specific criminogenic factors, in contrast with much past research on psychiatric patients (e.g., Bonta, Law, & Hanson, 1998), there was no association between antisocial personality or behavior and incident arrests in this sample when past arrest was omitted. Arrest history, however, is a prototypic component of antisocial personality disorder (that emphasizes overt rule violations), and our finding may merely underscore the importance of past arrest to this construct. Alternatively, because some of our criminogenic items measured youthful characteristics, attitudes, and behaviors, it is possible that past arrests mediate the relationship between prior criminogenic constructs and incident arrests; that is, youthful antisocial factors cause initial justice involvement, which then causes future justice involvement. There was also no association between recent anger or aggressive personality characteristics and incident arrests. Although research on psychiatric patients has shown these characteristics to be associated with violence (Monahan et al., 2000) only a fifth of arrests during follow-up in our sample were for violent offenses. However, anger also appears relevant to nonviolent offenses, given meta-analytic evidence that correctional programs are most effective in reducing general offending when they include an anger control component (Landenberger & Lipsey, 2005). Alternatively, it is possible that intensive treatment helped reduce anger or aggressiveness. There was also a weak association between past violence and incident arrests.

One possibility for the weak and null relationship between the anger or aggression and past violence subscales, respectively, and a limitation of our study more broadly, is that our scales are imperfect proxies for certain criminogenic risk factors. Although we used items from validated instruments that have been shown to predict violence in other samples (e.g., the Novaco Anger Scale; Monahan et al., 2000), and selected items to approximate validated measures of criminogenic risk like the LS/CMI, there was undoubtedly some measurement error. For example, we could not test interrater reliability for interview-based instruments. To the extent that imperfect measurement is an issue, our findings probably underestimate the utility of criminogenic risk factors. In addition to these potential measurement issues, this study is limited by small sample size and relative racial/ethnic homogeneity (e.g., no Whites were arrested during follow-up).

More fundamental methodological issues may also be at play. Most studies of the predictive utility of criminogenic risk factors are conducted among samples already under corrections supervision, whereas we attempted to apply these constructs to a noncorrectional sample comprising many individuals with no prior justice system contact. Regardless of whether one is concerned with predictive or explanatory modeling, some underlying data structure must be "transportable" for associations found in one type of sample to hold in another (i.e., the distribution of all effect modifiers, mediators, "versions of treatment," and interference patterns cannot be meaningfully different in the samples: Hernán & VanderWeele, 2011). Purely predictive transportability, which is required for generalizable risk assessment (vs. causal transportability, which is required for generalizable risk *reduction*), may be even more difficult to obtain, because even a highly predictive model would additionally require that the distribution of confounders in one sample is the same in another.

The strengths of this study, including the use of validated symptom instruments and participants' noncorrectional-supervision status, provide insights regarding recent policy and programmatic shifts toward risk assessment and reduction among people with mental illnesses. First, and given limitations discussed above, the predictors of arrest were neither exclusively criminogenic nor psychosis-related: regarding the former, it appears that the past predicts the future, and regarding the latter, it appears that psychotic symptoms are protective. Second, although there is little or no empirical support for the common assumption that psychiatric symptoms lead directly to arrest, it seems premature to focus policy exclusively on general risk factors (for a review, see Skeem, Steadman, & Manchak, 2014). Finally, jurisprudential and ethical caution is paramount if criminogenic risk assessment is to be applied to individuals not currently involved in the criminal justice system, that is, if there is any possibility of criminal sanction or restriction of freedom for people who have not yet committed a crime.

From an epidemiologic perspective concerned primarily with identifying and explaining causal effects, the role of criminogenic constructs in the risk of arrest requires further investigation that explicitly tests different potential causal pathways. From an actuarial perspective, the independent predictive utility of criminogenic risk factors appears contingent on whether the goal is primarily prediction or intervention; that is, if the goal is merely to predict arrest, fixed markers like arrest history may be sufficient, but if the goal is to reduce risk, identifying changeable risk factors to target in treatment is essential. That said, used in conjunction with symptom and demographic information, criminal risk factors will improve prediction of arrest for individuals with serious mental illnesses not under current correctional supervision.

References

Agresti, A. (2002). *Categorical data analysis* (2nd ed.). Hoboken, NJ: Wiley-Interscience, Wiley. doi:10.1002/0471249688

Andrews, D. (2011). The Risk-Need-Responsivity (RNR) model of correctional assessment and treatment. In J. Dvoskin, J. L. Skeem, R. W. Novaco, & K. Douglas (Eds.), *Using social science to reduce violent offending* (p. 127–156). New York, NY: Oxford University Press.

Andrews, D. A., & Bonta, J. (2010). *The psychology of criminal conduct* (5th ed., p. 630). New Providence, NJ: LexisNexis Matthew Bender.

Andrews, D. A., Bonta, J., & Wormith, J. S. (2004). *The Level of Service/Case Management Inventory (LS/CMI*). User's manual, Toronto: Multi-Health Systems.

Andrews, D. A., Bonta, J., & Wormith, J. S. (2006). The recent past and near future of risk and/or need assessment. *Crime & Delinquency, 52,* 7–27. doi:10.1177/0011128705281756

Andrews, D. A., Zinger, I., Hoge, R. D., Bonta, J., Gendreau, P., & Cullen, F. T. (1990). Does correctional treatment work? A clinically relevant and

psychologically informed meta-analysis. *Criminology, 28,* 369–404. doi:10.1111/j.1745-9125.1990.tb01330.x

Bonta, J., Blais, J., & Wilson, H. A. (2014). A theoretically informed meta-analysis of the risk for general and violent recidivism for mentally disordered offenders. *Aggression and Violent Behavior, 19,* 278–287. doi:10.1016/j.avb.2014.04.014

Bonta, J., Bourgon, G., Rugge, T., Scott, T. L., Yessine, A. K., Gutierrez, L., & Li, J. (2011). An experimental demonstration of training probation officers in evidence-based community supervision. *Criminal Justice and Behavior, 38,* 1127–1148. doi:10.1177/0093854811420678

Bonta, J., Law, M., & Hanson, K. (1998). The prediction of criminal and violent recidivism among mentally disordered offenders: A meta-analysis. *Psychological Bulletin, 123,* 123–142. doi:10.1037/0033-2909.123.2.123

Callahan, L. A., & Silver, E. (1998). Revocation of conditional release: A comparison of individual and program characteristics across four U.S. states. *International Journal of Law and Psychiatry, 21,* 177–186. doi:10.1016/S0160-2527(98)00011-9

Carstensen, B., Plummer, M., Hills, M., & Laara, E. (2013). *Epi: A package for statistical analysis in epidemiology, R package version 1.1.49*. Retrieved from http://CRAN.R-project.org/package=Epi

Case, B., Steadman, H. J., Dupuis, S. A., & Morris, L. S. (2009). Who succeeds in jail diversion programs for persons with mental illness? A multi-site study. *Behavioral Sciences & the Law, 27,* 661–674. doi:10.1002/bsl.883

Council of State Governments. (2002). *Criminal justice/mental health consensus project*. New York, NY: Council of State Governments.

Douglas, K. S., Guy, L. S., & Hart, S. D. (2009). Psychosis as a risk factor for violence to others: A meta-analysis. *Psychological Bulletin, 135,* 679–706. doi:10.1037/a0016311

Engel, R. S., & Silver, E. (2001). Policing mentally disordered suspects: A reexamination of the criminalization hypothesis. *Criminology, 39,* 225–252. doi:10.1111/j.1745-9125.2001.tb00922.x

Erdreich, L. S., & Lee, E. T. (1981). Use of relative operating characteristic analysis in epidemiology. A method for dealing with subjective judgement. *American Journal of Epidemiology, 114,* 649–662.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. (2002). *Structured clinical interview for DSM–IV–TR Axis I disorders, research version, patient edition. (SCID-I/P)*. New York, NY: Biometrics Research, New York State Psychiatric Institute.

Girard, L., & Wormith, J. S. (2004). The predictive validity of the level of service inventory-Ontario revision on general and violent recidivism among various offender groups. *Criminal Justice and Behavior, 31,* 150–181. doi:10.1177/0093854803261335

Hernán, M. A., & VanderWeele, T. J. (2011). Compound treatments and transportability of causal inference. *Epidemiology, 22,* 368–377. doi:10.1097/EDE.0b013e3182109296

Junginger, J., Claypoole, K., Laygo, R., & Crisanti, A. (2006). Effects of serious mental illness and substance abuse on criminal offenses. *Psychiatric Services, 57,* 879–882. doi:10.1176/appi.ps.57.6.879

Kessler, R. C., Andrews, G., Mroczek, D., Ustun, B., & Wittchen, H. U. (1998). The World Health Organization Composite International Diagnostic Interview short-form (CIDI-SF). *International Journal of Methods in Psychiatric Research, 7,* 171–185. doi:10.1002/mpr.47

Landenberger, N. A., & Lipsey, M. W. (2005). The positive effects of cognitive–behavioral programs for offenders: A meta-analysis of factors associated with effective treatment. *Journal of Experimental Criminology, 1,* 451–476. doi:10.1007/s11292-005-3541-7

Link, B. G., Epperson, M. W., Perron, B. E., Castille, D. M., & Yang, L. H. (2011). Arrest outcomes associated with outpatient commitment in New York State. *Psychiatric Services, 62,* 504–508. doi:10.1176/appi.ps.62.5.504

Lowenkamp, C. T., Latessa, E. J., & Smith, P. (2006). Does correctional program quality really matter? The impact of adhering to the principles of effective intervention. *Criminology & Public Policy, 5,* 575–594. doi:10.1111/j.1745-9133.2006.00388.x

Monahan, J., & Skeem, J. L. (2014). Risk redux: The resurgence of risk assessment in criminal sanctioning. *Federal Sentencing Reporter, 26,* 158–166. doi:10.1525/fsr.2014.26.3.158.158

Monahan, J., Steadman, H. J., Robbins, P. C., Silver, E., Appelbaum, P. S., Grisso, T., . . . Roth, L. H. (2000). Developing a clinically useful actuarial tool for assessing violence risk. *The British Journal of Psychiatry, 176,* 312–319. doi:10.1192/bjp.176.4.312

Monahan, J., Steadman, H., Silver, E., Appelbaum, P., Robbins, P., Mulvey, E., . . . Banks, S. (2001). *Rethinking risk assessment: The MacArthur study of mental disorder and violence*. New York, NY: Oxford University Press.

Morgan, R. D., Flora, D. B., Kroner, D. G., Mills, J. F., Varghese, F., & Steffan, J. S. (2012). Treating offenders with mental illness: A research synthesis. *Law and Human Behavior, 36,* 37–50. doi:10.1037/h0093964

Novaco, R. W. (2003). *The Novaco Anger Scale and Provocation Inventory (NAS-PI)*. Los Angeles, CA: Western Psychological Services.

Osher, F. C., D'Amora, D. A., Plotkin, M., Jarrett, N., & Eggleston, A. (2012). *Adults with behavioral health needs under correctional supervision: A shared framework for reducing recidivism and promoting recovery*. New York, NY: Council of State Governments Justice Center.

Osher, F., Steadman, H. J., & Barr, H. (2003). A best practice approach to community reentry from jails for inmates with co-occurring disorders: The APIC model. *Crime & Delinquency, 49,* 79–96. doi:10.1177/0011128702239237

Peterson, J., Skeem, J. L., Hart, E., Vidal, S., & Keith, F. (2010). Analyzing offense patterns as a function of mental illness to test the criminalization hypothesis. *Psychiatric Services, 61,* 1217–1222. doi:10.1176/appi.ps.61.12.1217

Peterson, J. K., Skeem, J. L., Kennealy, P., Bray, B., & Zvonkovic, A. (2014). How often and how consistently do symptoms directly precede criminal behavior among offenders with mental illness? *Law and Human Behavior*. doi:10.1037/lhb0000075

Phelan, J. C., Sinkewicz, M., Castille, D. M., Huz, S., Muenzenmaier, K., & Link, B. G. (2010). Effectiveness and outcomes of assisted outpatient treatment in New York State. *Psychiatric Services, 61,* 137–143. doi:10.1176/appi.ps.61.2.137

Raine, A., Dodge, K., Loeber, R., Gatzke-Kopp, L., Lynam, D., Reynolds, C., . . . Liu, J. (2006). The Reactive-Proactive Aggression Questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. *Aggressive Behavior, 32,* 159–171. doi:10.1002/ab.20115

Revelle, W. (2014). *Psych: Procedures for personality and psychological 1.4.5*. Retrieved from http://CRAN.R-project.org/package=psych

Schisterman, E. F., Faraggi, D., Reiser, B., & Trevisan, M. (2001). Statistical inference for the area under the receiver operating characteristic curve in the presence of random measurement error. *American Journal of Epidemiology, 154,* 174–179. doi:10.1093/aje/154.2.174

Schwarzfeld, M., Reuland, M., & Plotkin, M. (2008). *Improving responses to people with mental illnesses: The essential elements of a specialized law enforcement-based program*. New York, NY: Council of State Governments Justice Center.

Skeem, J. L., Manchak, S., & Peterson, J. K. (2011). Correctional policy for offenders with mental illness: Creating a new paradigm for recidivism reduction. *Law and Human Behavior, 35,* 110–126. doi:10.1007/s10979-010-9223-7

Skeem, J. L., Steadham, H. J., & Manchak, S. (2014). *Testing the validity of the Risk-Need-Responsivity model for justice-involved persons with mental illness*. Manuscript submitted for publication.

Skeem, J. L., Winter, E., Kennealy, P. J., Eno Louden, J., & Tatar, J. R. (2014). Offenders with mental illness have criminogenic needs, too: Toward recidivism reduction. *Law and Human Behavior, 38,* 212–224. doi:10.1037/lhb0000054

Solomon, P. (1999). Response to "A model program for the treatment of mentally ill offenders in the community." *Community Mental Health Journal, 35,* 473–475. doi:10.1023/A:1018742730423

Solomon, P., & Draine, J. (1995). One-year outcomes of a randomized trial of case management with seriously mentally ill clients leaving jail. *Evaluation Review, 19,* 256–273. doi:10.1177/0193841X9501900302

Steadman, H. J., & Naples, M. (2005). Assessing the effectiveness of jail diversion programs for persons with serious mental illness and co-occurring substance use disorders. *Behavioral Sciences & the Law, 23,* 163–170. doi:10.1002/bsl.640

Steadman, H. J., Redlich, A. D., Griffin, P., Petrila, J., & Monahan, J. (2005). From referral to disposition: Case processing in seven mental health courts. *Behavioral Sciences & the Law, 23,* 215–226. doi:10.1002/bsl.641

Teplin, L. A. (1984). Criminalizing mental disorder. The comparative arrest rate of the mentally ill. *The American Psychologist, 39,* 794–803. doi:10.1037/0003-066X.39.7.794

Vitacco, M. J., Vauter, R., Erickson, S. K., & Ragatz, L. (2013). Evaluating conditional release in not guilty by reason of insanity acquittees: A prospective follow-up study in Virginia. *Law and Human Behavior*. doi:10.1037/lhb0000071

Appendix

Age- and sex-adjusted ROC models and supplementary materials on criminogenic and symptom item selection

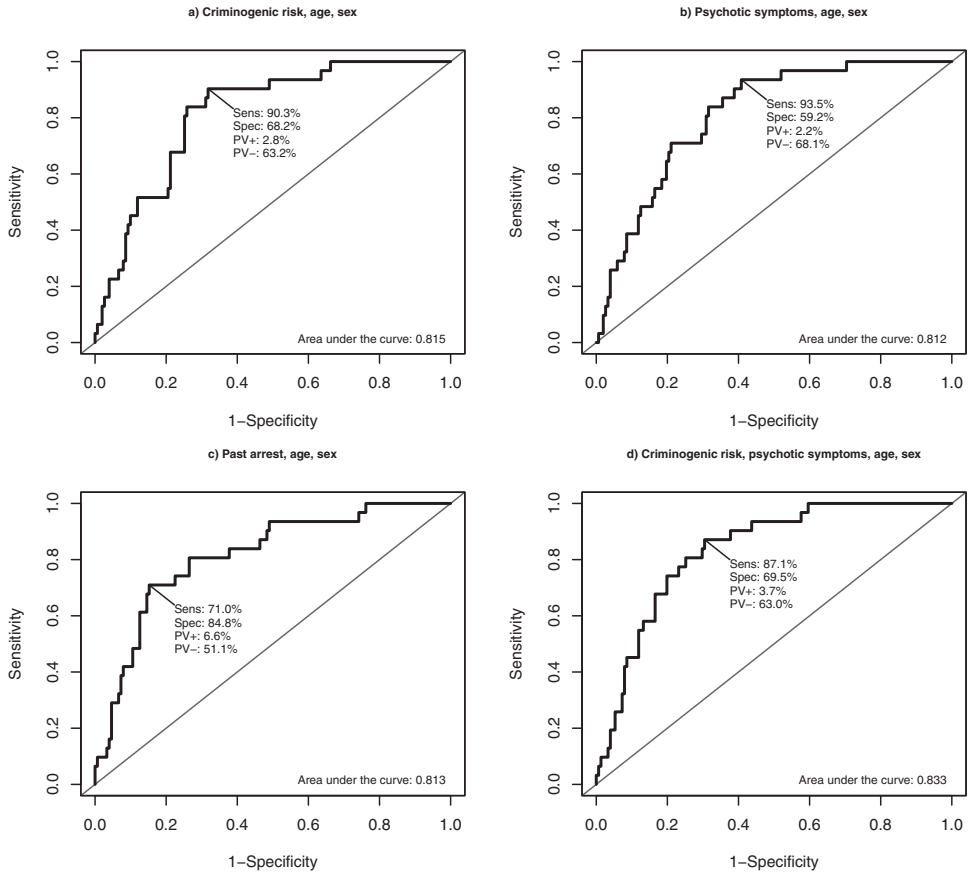

Figure A1. Receiver operating characteristic curves for (a) criminogenic risk factors, (b) psychotic symptoms, (c) past arrests, and (d) criminogenic risk factors and psychotic symptoms. All models control for AOT status, age, and sex.

(*Appendix continues*)

Table A.1
New York State Community Outcomes of Assisted Outpatient Treatment Evaluation Interview Proxies for History of Antisocial Behavior, Antisocial Personality Pattern, Antisocial Cognition, School/Work Satisfaction, Substance Abuse, and Violence

EFA[a] criminogenic factor	Scale	Scoring	Included in models?	Items	Correlation matrix label
History of antisocial behavior or personality	Composite International Diagnostic Interview	Yes/no	Yes	Before you were 15 . . .	
				. . . did you play hooky (skip school) a lot?	Antisoc 1
				. . . did you run away from home overnight more than once?	Antisoc 2
				. . . did you tell a lot of lies?	Antisoc 3
				. . . did you more than once steal things from someone you know?	Antisoc 4
				. . . did you physically hurt animals on a number of occasions?	Antisoc 5
				. . . did you often start physical fights?	Antisoc 6
				. . . did you physically hurt other people a number of times?	Antisoc 7
				. . . did you rob or mug someone?	Antisoc 8
				Since turning 15. . .	
				. . . have you repeatedly failed to meet financial obligations such as debts, or failed to provide support for children or other dependents on a regular basis?	Antisoc 9
				. . . was there ever a time when you got into a number of physical fights?	Antisoc 10
				. . . did you ever participate in illegal activities, like stealing or destroying property?	Antisoc 11
				. . . was there ever a period when you drifted around or had no regular place to live?	Antisoc 12
				. . . was there a time when you lied a lot or used a false name?	Antisoc 13
				. . . was there a time when you were unreliable on your job, could not hold a job, quit several jobs without having another one lined up, or simply decided not to work when you were expected to be working?	Antisoc 14
				. . . have you ever had a time when you did bad things to other people without feeling guilty?	Antisoc 15
				. . . have you had a time in your life when you did reckless things like driving while drinking or speeding a lot?	Antisoc 16
Current anger or aggression	Proactive and Reactive Aggression Scale	0–4 (never–very often)	Yes	In the past 12 months, how often have you. . .	
				. . . taken things from others	Anger 1
				. . . gotten angry when frustrated	Anger 2
				. . . vandalized or damaged something for fun	Anger 3
				. . . damaged things because you felt mad	Anger 4
				. . . carried a weapon to use in a fight	Anger 5
				. . . gotten angry or mad or hit others when provoked	Anger 6
				. . . become angry or mad when you don't get your way	Anger 7
	Novaco Anger Scale	1–3 (almost never–almost always)	Yes	I have had to be rough with people who bothered me	Anger 8
				If someone bothers me, I react first and think later	Anger 9
				When I get mad, I can easily hit someone	Anger 10
				I have a fiery temper that arises in an instant	Anger 11
				When I get angry, I fly off the handle before I know it	Anger 12
Past violence	Composite International Diagnostic Interview	Yes/no	No	Before you were 15. . .	
				. . . did you deliberately start a fire?	Violence 1
				. . . did you force someone to have sex with you?	Violence 2
Antisocial attitudes	Community violence norms	0–4 (strongly disagree–strongly agree)	No	It's okay to hit someone who repeatedly insults you.	
				Sometimes the only way to get even is to hit someone really hard	
				It's okay to hit someone if you know they are about to hit you.	
				Sometimes the only way to get respect is to show people that you are tougher than they are	
				If someone hits you, the best thing to do is to hit them back twice as hard	
				People will respect you if they know you can hurt them really badly	
Quality of life	Quality of life	1–4 (excellent–poor)	No	Overall, how would you rate your involvement in work, employment?	
				. . . your level of education?	
				. . . your social life?	
				. . . your participation in community activities (leisure, sports, church, volunteer work)?	
				. . . your ability to have fun and relax?	

[a] Exploratory factor analysis.

(*Appendix continues*)

Table A.2
Exploratory Factor Analysis of Criminogenic Risk Constructs

Item	Item description	Parameters[a]		
		Factor 1	Factor 2	Factor 3
Antisoc 1	Play hooky a lot	**0.609**	−0.051	0.266
Antisoc 2	Run away from home	**0.563**	0.046	−0.402
Antisoc 3	Tell a lot of lies?	**0.781**	−0.063	−0.038
Antisoc 4	More than once steal things?	**0.760**	−0.056	0.118
Antisoc 5	Physically hurt animals?	**0.771**	−0.041	−0.334
Antisoc 6	Often start physical fights?	**0.557**	0.296	−0.509
Antisoc 7	Physically hurt other people?	**0.753**	0.262	−0.148
Antisoc 8	You rob or mug someone?	**0.708**	0.084	0.335
Antisoc 9	Failed to meet financial obligations?	0.192	0.058	0.197
Antisoc 10	Got into a number of physical fights?	**0.757**	0.033	−0.003
Antisoc 11	Ever participate in illegal activities?	**0.624**	0.003	0.365
Antisoc 12	Drifted around/no place to live?	**0.533**	−0.134	0.219
Antisoc 13	A time when you lied a lot?	**0.859**	−0.066	0.174
Antisoc 14	Unreliable, could not hold a job	**0.650**	0.027	**0.415**
Antisoc 15	Did bad things without feeling guilty?	**0.613**	0.367	−0.004
Antisoc 16	Did reckless things?	**0.753**	0.008	0.242
Arrest	Past arrest	**0.657**	−0.012	0.233
SUD	Substance use disorder	**0.453**	0.153	−0.420
Violence 1	Did you deliberately start a fire?	0.334	0.078	**0.629**
Violence 2	Force someone to have sex with you?	0.038	0.125	**0.948**
Anger 1	Taken things from others	0.084	**0.529**	0.387
Anger 2	Gotten angry when frustrated	0.070	**0.611**	0.171
Anger 3	Vandalized or damaged something for fun	−0.127	**0.643**	0.336
Anger 4	Damaged things because you felt mad	−0.048	**0.841**	0.031
Anger 5	Carried a weapon to use in a fight	0.014	**0.820**	0.164
Anger 6	Gotten angry or mad or hit others when provoked	−0.008	**0.855**	0.094
Anger 7	Angry or mad when you don't get your way	−0.060	**0.618**	0.314
Anger 8	I have had to be rough with people who bothered me	0.186	**0.475**	−0.006
Anger 9	If someone bothers me, I react first and think later	0.269	**0.511**	−0.062
Anger 10	When I get mad, I can easily hit someone	0.315	**0.538**	−0.034
Anger 11	I have a fiery temper that arises in an instant	0.206	**0.705**	−0.070
Anger 12	When I get angry, I fly off the handle before I know it	0.328	**0.587**	−0.040
Test statistics				
χ^2	23807.02			
p-value	<0.0001			
df	403			
RMSEA	0.539			

[a] All factor loadings greater than 0.40 are bolded for interpretation.

(*Appendix continues*)

Table A.3
Exploratory Factor Analysis of Symptom Items

Item	Parameters[a] Factor 1
Delusions	
Paranoid	**0.726**
Persecutory	**0.729**
Control	**0.631**
Thought broadcast	**0.839**
Bizarre	**0.784**
Somatic	**0.507**
Other delusion	**0.563**
Hallucinations	
Grandiose	**0.607**
Auditory	**0.514**
Visual	**0.663**
Tactile	**0.803**
Other hallucinations	**0.681**
Test statistics	
χ^2	1531.41
p-value	<0.0001
df	54
RMSEA	0.236

[a] All factor loadings greater than 0.40 are bolded for interpretation.

Received April 7, 2014
Revision received June 27, 2014
Accepted July 1, 2014 ■