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## Predicting and understanding risk of re-offending: the Prisoner Cohort Study

Jeremy Coid, Min Yang, Simone Ullrich, Tianqiang Zhang, Amanda Roberts, Colin Roberts, Robert Rogers, David Farrington

Risk assessment and risk management are key components of the Government's proposals to detain and treat individuals with Dangerous and Severe Personality Disorder (DSPD). Accuracy in risk assessment plays a major role in identification of the small group of individuals thought to pose a very high risk of harm to society and in monitoring their level of risk during and after treatment (Douglas et al., 2005). The Prisoner Cohort Study was a research project originally commissioned by the Home Office as part of the DSPD programme to evaluate the predictive accuracy of a range of currently available risk assessment instruments for future violent and sexual re-offending. The main aims of the study were to test the accuracy in a UK population of the risk assessment devices and instruments currently being piloted for use in the DSPD centres in predicting serious re-offending, and to identify the best instruments in terms of their accuracy in prediction. Most risk assessment instruments included in this study were previously validated on US/Canadian male prisoners or forensic patients without further differentiation. The study also examined the prevalence of offenders potentially classifiable as having DSPD on the basis of the currently available risk instruments and personality assessments, and their dangerousness in terms of re-offending after release into the community. This report focuses on male offenders and violent re-offending. Data collection for sexual re-offending and for female offenders was ongoing at the time of the preparation of this report. Findings are therefore presented for men serving determinate sentences for violent or sexual index offences interviewed in the first phase of the study (N=1396).

### Key Points

- The findings are based on a sample of 1396 adult male offenders (the prisoner cohort) serving determinate sentences of a minimum of two years for sexual or violent offences.

### *Offenders with Dangerous and Severe Personality Disorder*

- Fifteen per cent of the prisoner cohort (212 of the 1396) fulfilled criteria for DSPD. This is the first time such a benchmark has been identified, albeit provisionally.
- Comparison between DSPD and non-DSPD offenders in the cohort revealed statistically significant differences in age, ethnicity, socio-economic class, and marital status.
- Statistically significantly more DSPD offenders were reconvicted after release into the community. They accounted for statistically significantly more major violent and acquisitive convictions.
- The risk of violent and acquisitive reconviction statistically associated with DSPD is considerable. Successful treatment or management of the link between recidivism and DSPD could therefore lead to a significant reduction in the number of reconvictions in the DSPD group, and hence in an offender population with similar characteristics to the prisoner cohort.

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- There was a significant overlap of offenders classifiable as DSPD and those potentially qualifying for extended/indeterminate sentencing according to the Criminal Justice Act 2003, Sections 225 and 227. This has implications for the targeting of interventions.

#### *Comparison of the predictive accuracy of risk assessment instruments*

- All instruments predicted reconvictions for violence, theft and drug-related offences, and for a combined category of any offence. The level of predictive accuracy at the individual level (measured by the area under the ROC curve, or AUC) was moderately high for all instruments and statistically better than chance, even though not all the instruments were intended for individual prediction.
- Multivariate regression analysis was conducted to rank the instruments according to their predictive power. Analyses consistently demonstrated that the Offender Group Reconviction Scale (OGRS-2) ranked as the most accurate for all outcomes of reconviction. The predictive accuracy for the Risk Matrix 2000/Violence Scale (RM2000(V)) was comparable to that of OGRS-2 for the outcome of robbery.
- The Offender Group Reconviction Scale – Sexual and Violent (OGRS-SV) was not found to be superior to the OGRS-2 in predicting reconvictions for violence in this cohort.
- The Violence Risk Appraisal Guide (VRAG), RM2000(V) and HCR-20 Historical Items fell in the next rank below the OGRS in their predictive power.
- The Psychopathy Checklist – Revised (PCL-R) was in the third ranking of predictive power, with the HCR-20 Risk Management Items in the fourth ranking.

#### *Risk prediction at item level*

- Analysis of prediction at the item level showed that the power of each instrument to predict reconviction was often concentrated in a subset of items, amongst which static variables predominated. OGRS-2 was not analysed in this way owing to its scaling model.
- Few items in the PCL-R demonstrated independent predictive power. These were mainly features of the anti-social and impulsive components of psychopathy.
- The independently predictive items in the VRAG were: a high PCL-R total score; diagnosis of a personality disorder according to DSM-IV; young age at index offence; living with both parents up to the age of 16; failure on prior conditional release; less severity of victim injury; a history of alcohol problems; and a male victim.
- Most historical items of the HCR-20 demonstrated predictive power for future re-offending. Clinical items identified as predictive for recidivism were: 'negative attitudes' and 'impulsivity'. Predictive items in the Risk Management scale included: 'plans lack feasibility', 'exposure to destabilisers' and 'non-compliance with remediation attempts'.
- All items of the RM2000(V) demonstrated statistically significant power in predicting future offending.
- A combination of actuarial and clinical assessment is highly recommended in formulating risk for any given individual. Future research should be aimed at investigating further the predictive properties of static items in risk instruments and their relationship with violent offending, and at identifying additional dynamic factors which are powerful predictors. This could help to improve the management of dangerous offenders for public protection.

## Method

This report is the first to emerge from the Prisoner Cohort study. It focuses on a large sample of adult male offenders, and primarily on reconvictions for violence. Future publications from the study will focus on reconviction for sexual offences and on female offenders.

Offenders suitable for inclusion in the study were identified using the Prison Service Inmate Information System if they fulfilled the following criteria:

- serving a prison sentence of two years or more for a violent or sexual principal offence (excluding life sentence prisoners);
- minimum age of 18 years;
- one year of the sentence left to serve.

The methodological note describes the structure of the sample in further detail. According to the proposed stratified random sample, 1933 individuals should have been interviewed. To achieve this goal, a total of 3264 eligible prisoners were considered. The refusal rate was 19 per cent. However, due to a variety of other reasons such as discharges (28%), parole (3%), transfer (3%) etc., first phase interviews were completed by 1470 prisoners, of whom 1396 were males. The mean age of this male cohort was 30.8 years (SD=11.4) with a maximum age of 75 years. The majority were of White ethnic origin (79%). Fifteen per cent were Black, three per cent of Asian origin and three per cent from other ethnic groups. The most prevalent index offence was robbery (45%), followed by major violent offences (24%), major sexual offences (23%), and minor violence (18%).

Interviews were carried out by Research Assistants trained in the use of the research instruments, who were under close supervision throughout the study. The interviews collected information on the criminal history and the nature of the offence for which the person was imprisoned in order to determine whether instruments designed primarily for violent or sexual offences had to be administered (the latter are not discussed here). Personality disorders were assessed using the Structured Clinical Interview for DSM-IV Personality Disorders (SCID II) and the Psychopathy Checklist Revised (PCL-R) was used as a measurement of psychopathy.

Risk assessments for violence involve probability estimates of the chances of violence occurring and represent a major progression from earlier attempts to predict 'dangerousness', which tended to imply certainty. These estimates are derived by considering 'risk factors' (variables identified through research as being associated with violence) to determine the likelihood of 'harm'. The benefits of these assessments are that they subsequently allow the physician or another professional to weight the impact of a range of factors that may affect an individual's propensity for violent behaviour over a varying time period. This may then lead to better matching of appropriate interventions to individuals (Ferris *et al.*, 1997).

Most risk assessments include 'static' items in that they are based on past or historical factors which cannot be changed. In contrast, dynamic factors can change and when changed may result in a corresponding increase or decrease in the risk of recidivism or violence. Certain authors have argued that dynamic risk factors can predict recidivism as well as, or better than, static variables (Gendreau *et al.*, 1996).

Risk instruments included in the study and discussed in this report comprised the following.

### *Risk of Serious/Violent Offending*

- Violence Risk Appraisal Guide (VRAG).
- The Historical (H) Items, Clinical (C) Items and Risk Management (R) Items from the HCR-20<sup>1</sup>.
- Risk Matrix 2000/Violence Scale (RM2000(V)).

### *Reconviction risk*

- Offender Group Reconviction Scale (OGRS-2).
- Offender Group Reconviction Scale – Sexual and Violent (OGRS-SV).

In addition to these various risk scales, participants completed a battery of self-report questionnaires and neuropsychological testing, comprising intelligence, emotional recognition and decision-making. Further putative risk factors, selected on the basis of a review of the literature, were included in the interview. These additional assessments will be the subject of future publications.

<sup>1</sup> The HCR-20 is an instrument for structuring clinical judgments. However, the scales have been tested here for their predictive accuracy as actuarial instruments.

Re-offending after release into the community was represented in this study by reconvictions data<sup>2</sup>, obtained from the Police National Computer (PNC). In most of the analyses, outcome measures were classified in broad categories (violence, robbery, theft, drug-related and a general category of any re-offending).

## Offender characteristics and re-offending after release into the community

The follow-up time after release from custody to the PNC database search (15 October 2005) ranged from six days to 2.91 years, with a mean follow-up time of 1.97 years. The great variance in follow-up was due to the different release dates of the prisoners. The PNC search provided information for each prisoner about any reconviction during the time of follow-up. A minority of 43 prisoners from the original cohort were still in prison at the end of the follow-up period, and these have therefore been excluded from reconviction analyses.

Out of a total remaining male sample of 1353 offenders, sexual offenders against children (index offence) were the oldest participants in the study

(N=206, M=47.1, SD=12.9), followed by sexual offenders against adults (N=119, M=34.5, SD=11.5). The youngest participants were robbery offenders against persons (N=373, M=25.2, SD=6.9).

Altogether, 41 per cent of the weighted sample (see methodological note) were reconvicted after release over a mean of 1.97 years. As can be seen in Table 1, individuals originally convicted of index sexual offences against children were least likely to be reconvicted for any offence within this timescale (as is typically found), contrasting with those who had committed robberies against persons (the group most likely to be reconvicted). The prevalence of recidivism after release was highest among those previously convicted of robbery.

The most common offence following release was breach (19%) and theft/receiving (17%), followed by driving (12%), minor violence (8%), and drug-related offences (8%), burglary (6%), public order/harassment (5%), obstructing justice/perjury (5%), criminal damage (4%), and robbery (4%).

Time to re-conviction was shortest for theft (M=2.4 years), followed by violence (M=2.64 years), drug-related offences (M=2.71 years), robbery (M=2.81 years), and sexual offences (M=2.91 years).

2 Not all offending leads to a conviction, and there is also a time delay between an offence and any related conviction. This affects the interpretation of results from the study; for example, reconviction rates are likely to under-represent actual re-offending.

**Table 1** Weighted prevalence of reconvictions by index offence (interview data)

Offender category (index offence)	Mean time (years) to first reconviction	Offence committed after release into the community											
		Violence		Sexual		Robbery		Theft		Drugs		Any	
		N	%	N	%	N	%	N	%	N	%	N	%
Violence (N=547)	1.9	82	14.9	3	0.5	15	2.7	106	19.3	41	7.5	235	42.7
Sexual offences													
Against adults (N=119)	2.4	5	3.5	4	2.8	2	1.4	8	5.7	3	2.1	29	20.7
Against children (N=206)	2.6	1	0.4	1	0.4	1	0.4	8	2.8	3	1.1	31	11.0
Robbery													
Premises (N=640)	1.6	92	15.6	1	0.2	53	9.0	195	33.1	79	13.4	346	58.7
Persons (N=373)	1.5	60	17.2	1	0.3	42	12.0	128	36.7	47	13.5	224	64.4
Any offence (N=1350)	1.9	161	11.5	7	0.5	61	4.4	280	20.1	114	8.2	571	41.0

Notes: (1) Weighted totals and proportions used (2) K-M estimator used for survival time

## Predictive accuracy of current available risk assessment instruments

### Accuracy at scale level

All the instruments demonstrated predictive power that was better than chance. Area Under the Curve values (AUC – see methodological note) are reported in Table 2. However, the HCR-20 total score, the C and R scales, and PCL-R failed to predict reconvictions for robbery with statistical significance.

To establish a hierarchy of the risk instruments in their discriminative predictive abilities, a multivariate regression model was fitted (see methodological note). This established whether one instrument predicted statistically significantly better than another. The rankings can be found in Table 3.

The OGRS-2 outperformed the other risk instruments for all offence categories. When compared with the sexual/violent reconviction

scale OGRS-SV, the general reconviction scale OGRS-2 demonstrated marginally better results in the prediction of reconvictions for violence as well as significantly better for theft and drug-related reconvictions after release. The R scale of the HCR-20 consistently received the lowest rank when compared to other measures of risk.

### Accuracy at item level

Subsequent logistic regression analyses examined the independent effects of individual items in terms of prediction. All findings reported are statistically significant.

**PCL-R.** ‘Stimulation/boredom’ positively predicted reconvictions for robbery and any offence. Reconviction for violent offences was negatively predicted by the ‘conning/manipulative’ item. This did, however, positively predict theft after release. ‘Parasitic lifestyle’ predicted theft as did ‘early behavioural problems’, which were also related to robbery. Theft and reconviction for any offence

**Table 2** Comparison of Area Under the Curve (AUC)

Instrument	AUC values				
	Violence	Robbery	Theft	Drugs	Any
OGRS-2	0.724 ***	0.690 ***	0.756 ***	0.685 ***	0.769 ***
VRAG	0.700 ***	0.623 ***	0.713 ***	0.655 ***	0.719 ***
HCR20-total	0.638 ***	0.565	0.667 ***	0.577 **	0.630 ***
HCR20-H	0.676 ***	0.617 **	0.709 ***	0.611 ***	0.695 ***
HCR20-C	0.643 ***	0.527	0.634 ***	0.604 ***	0.615 ***
HCR20-R	0.592 ***	0.535	0.611 ***	0.597 ***	0.580 ***
PCL-R	0.639 ***	0.570	0.662 ***	0.596 ***	0.646 ***
RM2000(V)	0.687 ***	0.677 ***	0.699 ***	0.649 ***	0.712 ***

Note: Null hypothesis: true area = 0.5. \*P≤0.05; \*\* P≤0.01, \*\*\* p≤0.001

**Table 3** Discriminate effects of the instruments with regard to categories of re-offending

Instrument	Violence		Robbery		Theft		Drugs		Any	
	β	Rank	β	Rank	β	Rank	β	Rank	β	Rank
OGRS-2	0.76***	1	0.66***	1	0.86***	1	0.65***	1	0.94***	1
VRAG	0.68***	2	0.48**	2	0.74***	2	0.54***	1	0.81***	2
RM2000(V)	0.64***	2	0.65***	1	0.69***	2	0.51***	1	0.79***	2
HCR-20-H	0.61***	2	0.43**	2	0.73***	2	0.40***	2	0.71***	2
PCL-R	0.50***	3	0.26*	3	0.56***	3	0.33***	2	0.53***	3
HCR-20-C	0.48***	3	0.08	3	0.45***	4	0.34***	2	0.40***	4
HCR-20-R	0.33***	4	0.13	3	0.40***	4	0.35***	2	0.29***	4

Note: \*p≤0.05; \*\*p≤0.01; \*\*\*p≤0.001

were predicted by 'revocation of conditional release' and 'criminal versatility'. The latter was positively associated with violent recidivism.

**VRAG.** 'PCL-R score', as an item included in the VRAG, positively predicted reconviction for violence. 'Diagnosis of DSM-IV personality disorder' positively predicted robbery, theft and any offence. A 'younger age at index offence' was positively related to reconvictions for violence, drug-related offences, theft, and any offence. Theft and any offence were also predicted by 'lived with both parents until the age of 16' and 'failure on prior conditional release'. A 'non-violent offence score' positively predicted reconvictions for violence, theft, drug-related offences and any offence. 'Less severity of victim injury' was related to reconvictions for drug-related offences, theft and any offence. A 'history of alcohol problems' positively predicted reconviction for violence and demonstrated a negative association with robbery. A 'non-female victim' positively predicted reconvictions for violence, drug-related offences and any offence.

**HCR-20 Historical Items.** 'Previous violence' negatively predicted drug-related reconviction, whereas 'young age at first violence' positively predicted reconvictions for violence, theft, drug-related offences and any offence. 'Relationship instability' negatively predicted robbery and 'employment problems' were positively associated with theft and any offence. 'Substance use problems' positively predicted reconvictions for violence, theft, drug-related offences and any offence, whereas 'major mental problems' showed an inverse association with theft. 'Early maladjustment' was positively associated with violence and any reconviction, 'personality disorder' predicted robbery and any reconviction, and 'prior supervision failure' predicted all offence categories apart from drug-related recidivism.

**HCR-20 Clinical Items.** Violence, theft and any reconviction were positively predicted by 'negative attitudes' and 'impulsivity'; the latter was also predictive for drug-related offences.

**HCR-20 Risk Management Items.** 'Plans lack feasibility' demonstrated a positive association

with any reconviction after release, 'exposure to destabilizers' positively predicted theft and any offence, and 'non-compliance with remediation attempts' showed predictive power for theft.

**RM2000(V).** All items of the RM2000(V) demonstrated predictive power for all the offence categories. 'Age of commencement of risk' and 'any burglaries' were related to reconvictions with regard to all the offence categories whereas 'violent appearances' positively predicted violence and any reconviction.

The presence in a violence risk assessment of items that fail to discriminate between violent recidivists and non-recidivists has implications for the validity of the scale. However, specific recommendations would be premature at this stage. Different samples might produce a different selection of items.

**OGRS-2** was not amenable to this type of analysis owing to the manner in which some of the items are scored and converted into a measurement scale.

## Offenders with Dangerous and Severe Personality Disorder

The Home Office developed an operational definition of DSPD that applies for admission to a unit in a High Secure setting. Severe Personality Disorder (SPD) is defined by either: at least two personality disorders (PDs) and a PCL-R score below 25; at least one PD other than Antisocial PD and a PCL-R score ranging from 25 to 29; or a PCL-R score of 30 and above. The criterion of a greater than 50 per cent risk of committing a serious offence is (for the purposes of this study) met when an individual falls into the *very high risk* category of RM2000(V) and is coded seven, eight or nine in the VRAG<sup>3</sup>.

Application of the algorithm for definition of DSPD resulted in a subsample of 212 (15%) of the 1396 male prisoners in the entire cohort potentially fulfilling the criteria for DSPD. (In practice, a

<sup>3</sup> For sexual offenders, the high risk criterion is fulfilled when an individual scores *very high* using the Static-99 and in the *very high risk* group of the RM2000(Sexual scale).

subgroup might be excluded on clinical grounds, following full clinical assessment<sup>4</sup>.)

When compared to the 1184 non-DSPD offenders, the DSPD group were statistically significantly younger (28.9 vs. 34.4 years), more often White (88% vs. 80%), of lower socio-economic class (62% vs. 46%), and were more often single (61% vs. 47%).

The DSPD offenders released into the community accounted for 27 per cent of all reconvictions following release, 25 per cent of violent crimes, 19 per cent of robbery, 29 per cent of forgery, burglary and theft, and 24 per cent of drug-related offences committed after release into the community. None of the individuals classified as DSPD was reconvicted for sexual offences after release (but the reconviction rate for sexual offences was very low for the entire sample).

Taking into consideration the statistically significant demographic differences, comparison of the prevalence rates for recidivists within each group demonstrated that significantly more DSPD offenders, compared with non-DSPD individuals, were reconvicted of any offence (58% vs. 38%), major violent offences (4% vs. 1%) and forgery, burglary and theft (33% vs. 18%) after release into the community. The probability of reconviction statistically associated with the condition DSPD within the DSPD group, once the effect of other demographic variables was taken into account, was 34 per cent for any reconviction, 71 per cent for major violence and 47 per cent for forgery, burglary and theft. It is not currently possible to predict how successful treatment and management of these offenders might potentially be. In the most optimistic

4 Assessment in DSPD units includes a full clinical assessment, of which various instruments form part. There will not therefore be an exact correspondence between those classified here as DSPD and those who would be selected for treatment in one of the High Secure units.

case, where the influence of DSPD on offending could be completely negated, these findings suggest the potential to reduce the number of recidivists across this kind of cohort by up to 7 per cent for any reconviction, up to 27 per cent for major violent crimes, and up to 12 per cent for forgery, burglary and theft.

*DSPD and Extended/Indeterminate Sentencing*

According to Section 225 of the Criminal Justice Act (CJA) 2003, for Schedule 15 offences that carry a life sentence, offenders deemed at high risk must receive a life sentence. For Schedule 15 offences that carry a sentence of ten years or more, offenders deemed at high risk must receive an indeterminate sentence. According to Section 227, for Schedule 15 offences that carry a sentence of less than ten years, offenders deemed at high risk must receive an extended sentence. The extended sentence comprises a custodial term and a period of supervision under licence (a maximum of five years for violent, and a maximum of eight years for sexual offences). The total sentence, however, must not exceed the maximum term permitted for the offence.

If the 2003 Act had been in force at the time of the data collection in the first phase of the Prisoner Cohort Study, a proportion of the participants would have been detainable under indeterminate or extended sentencing.

As can be seen in Table 4, the majority of prisoners classifying for DSPD criteria (70%) were also likely to fulfil the criteria for Section 225 of the CJA 2003. A further 13 per cent would have been eligible for extended sentencing according to Section 227 of the Act. In contrast, almost 90 per cent of the non-DSPD offenders did not qualify for extended or indeterminate sentencing according to the Criminal Justice Act.

**Table 4 DSPD and Schedule 15 offending**

	DSPD		Non-DSPD	
	N	%	N	%
No Schedule 15 offence	37	17.9	1004	87.2
Section 225 offence	144	69.6	134	11.6
Section 227 offence	26	12.6	13	1.1

## Conclusions

The sample interviewed in the study comprised a random stratified sample of adult men serving determinate sentences of two or more years for violent or sexual offending. Offenders with Dangerous and Severe Personality Disorder are thought to constitute a small minority of this population, who also pose a very high level of risk of serious violent and sexual re-offending.

The study demonstrated convincing support that one of the main goals of DSPD services could potentially be achieved: the reduction of serious violent recidivism. It is clear that the therapeutic effectiveness of these services has yet to be demonstrated. However, if therapeutic interventions ultimately proved to be sufficiently beneficial, there is the potential to reduce the risk of serious violence attributable to DSPD within the group of DSPD offenders, and consequently at the population level among offenders with similar characteristics to the prisoner cohort. Examination of extended or indeterminate sentencing according to the CJA 2003, Section 225 and 227, demonstrated that the majority of DSPD offenders would probably have been eligible, particularly for indeterminate sentencing. This further indicates that these offenders demonstrate more serious offending behaviour than prisoners who are not classified as DSPD.

Comparison of currently available and established risk instruments demonstrated that the OGRS-2 consistently outperformed other scales for all outcome measures, including reconvictions for violence, theft, robbery, drug-related offences and a combined category of any offence. The superiority of a simple actuarial scale designed to measure general, primarily acquisitive, reconviction may at first appear surprising, especially when considering the resources invested in training researchers and clinicians in the use of instruments such as the PCL-R and the HCR-20. However, this finding should not detract from the clinical usefulness of these latter instruments as compared with unstructured clinical approaches. Actuarial instruments are based on aggregate data and, therefore, provide only a probabilistic prediction for any individual case. Furthermore, clinical risk

factors will always be fundamental to the task of clinical risk assessment and particularly to risk management. A combination of actuarial and clinical assessment is highly recommended in formulating risk for any given individual.

This study confirmed that the most predictive items for future offending were static or historical items. Although helpful in the identification of risk, they may be less useful in clinical risk management. Risk management is the most important component in reducing the subsequent level of risk and the probability of another serious offence. However, only dynamic measures are changeable. Future research should be aimed at investigating further the predictive properties of static items in risk instruments and their relationship with violent offending, and at identifying additional dynamic factors which are powerful predictors. This could help to improve the management of dangerous offenders for public protection.

## Methodological notes

### Sample

According to the Prison Service database (IIS), 7878 prisoners in England and Wales met the sentence criteria for the study and were expected to be released in the 12 months from June 2001. Of these, ten per cent were estimated as being at high risk for committing a further sexual or violent offence on release, based on their OGRS score. A sampling frame was drawn up with the intention of over-sampling high-risk offenders, females and those from non-White ethnic groups. The available, planned and achieved samples are shown in Table 5.

Compared with the available sample of eligible prisoners, the resulting overall sample includes a small over-representation of high-OGRS offenders and an under-representation of White males under 21 years of age. Non-White males under 21 years are over-represented, but their overall number is small. No attempt was made to stratify the sample according to offence group. This resulted in oversampling of robbers, and so to take into account the resulting potential bias, weighted data were used throughout most statistical analyses.

**Table 5** The prisoner cohort sample characteristics

	Available		Planned		Achieved	
	N	(%)	N	(%)	N	(%)
All high-risk individuals (OGRS top 10%)	788	(10)	788	(41)	219	(15)
All other females	143	(2)	143	(7)	68	(5)
All other non-White males aged 18-20 years	177	(2)	177	(9)	62	(4)
25% of all other non-White males aged over 21 years	865	(11)	216	(11)	209	(14)
20% of all other White males aged 18-20 years	1004	(13)	201	(10)	91	(6)
1 in 12 of all other White males aged over 21 years	4902	(62)	408	(21)	812	(56)
Total	7879	(100)	1933	(100)	1461	(100)

NOTE: OGRS scores were unavailable for 9 subjects (these are additional to the 1461 cases in the table)

**Analysis**

Due to the high interrelations of the risk assessment instruments on both the scale and item levels, independent effects were established by controlling for these interrelations in multiple regression models.

Receiver Operating Characteristic (ROC) curves are commonly used to measure the accuracy of risk instruments in discriminating re-offenders and non re-offenders. The area under the ROC curve (AUC) is a summary statistic and is constructed in such a way that the probability for correctly identifying re-offenders and non re-offenders can be measured.

Values ranging between 0.5 and 1.0 indicate the probability of accuracy of discrimination from zero to 100 per cent. The size of the AUC is affected by the base rate of re-offending and size of the sample, but not by the score values of instruments.

To conclude whether the individual instruments were significantly better than one another, multivariate regression analysis was applied (see Table 3). The greater the  $\beta$  value, the greater the discriminant power of the scale when comparing different instruments. This approach allows the ranking of the instruments in groups according to their predictive power.

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