Colorado Actuarial Risk Assessment Scale (CARAS Version 5, 2008)
Parole Guidelines
C.R.S. 17-22.5-404.5(b)(d)(e)(f)

Background

The Division of Criminal Justice, pursuant to C.R.S. 17-22.5-404.5(b)(d)(e)(f), is required to develop and validate a risk assessment protocol for parole releases. The mandate reads:

> "…the Division of Criminal Justice…shall develop objective parole criteria which shall also be used by the state board of parole in evaluating inmates for parole…. "…objective parole criteria" means the criteria which statistically have been shown to be good predictors of risk to society of release on parole."

The Division of Criminal Justice's (DCJ) Office of Research and Statistics (ORS) first developed and validated actuarial risk scales for the Parole Board in the mid-1980s. Since that time, four revisions have been made. This document describes Version 5 of the Colorado Actuarial Risk Assessment Scale (CARAS).

The Division contracted with Marshall Costantino of *Analysis, Research & Design, Inc.* to assist in the development of this instrument. CARAS version 5 predicts:

- Rearrest for any crime
- Rearrest for violent crime
- New court filing

In addition, the current version of the CARAS applies to female offenders and sex offenders, whereas prior versions did not apply to these populations.

Actuarial Risk Prediction

The Theory Behind Statistical Risk Prediction

Statistical predictions of behavior sort offenders into subgroups that have different rates of future offending probabilities. This work in criminology is identical to research conducted by insurance companies that results in premium differentials across groups of drivers or patients. To obtain insurance probability estimates, research identifies *groups* of people with certain characteristics (driving and accident history, age, use of seat belts, etc.) who are statistically more likely to make an accident claim. Actuarial risk prediction of offenders works the same way: offenders with certain characteristics are more likely to reoffend and therefore may be poor candidates for parole (research also shows that interventions specifically targeted to an individual's service needs at the time of parole can help offenders stay crime free). A recent study by DCJ's Office of Research and Statistics found that individuals released onto parole after serving time in a halfway house placement (transition community corrections) were significantly more likely to stay crime-free in the following 24 months than individuals released

from transition community corrections without parole supervision. To access to this report visit our website at http://dcj.state.co.us/ors/pdf/docs/2002COMCOREPORT.pdf.

Like insurance actuarial tables, *individual behavior* is not predicted. Rather an individual's *membership in a subgroup* is correlated with future offending. Thus, those who statistically fall into a high-risk group may be considered dangerous, whether or not the person actually re-offends upon release.

Actuarial Risk Research

Risk prediction findings vary greatly across studies for many reasons, usually related to differences in study design. One reason is the range of definitions used for *recidivism* including rearrest for any crime, rearrest for certain crimes (i.e., violent, felonies, etc.), court filing for a new crime or a new conviction, new conviction for certain crimes, and recommitment to prison. In the development and validation of CARAS Version 5, recidivism was defined as a new district court case filing.

Other reasons study findings may vary include the use of different samples and the availability and accuracy of the data important to the study. Finally, the *at-risk* outcome period, that is, the opportunity to commit a new crime or to obtain a new district court filing, varies across studies. The longer is the at-risk outcome period, the greater the opportunity, or likelihood, of failure. For these reasons, risk instruments vary across time and jurisdictions. The majority of recidivism studies at-risk periods range from one to five years. This development had a 36-month at-risk outcome period, meaning that recidivism data were examined for the 36 month period following prison release.

Instructions

The Colorado Actuarial Risk Assessment Scale (CARAS) Version 5 is a 9-item instrument (See following page). The instrument has been automated so that the items are automatically populated from DCIS. This process allows for a more complicated scoring scheme, reduces the potential of error in completing and totaling the form, and reduces staff time in completing the instrument. The scale's predictive accuracy requires that all nine items be used. Selective use of individual items will not predict recidivism accurately.

The scale produces a score ranging from 1 to 79, which is delineated into 5 risk groups: very low, low, medium, high and very high. For each increasing risk category, risk for:

- Any new arrest increases 81%
- Any new violent arrest increases 30%

The Colorado Actuarial Risk Assessment Scale (CARAS) Version 5			
Item	**Description**	**Response**	**Points**
1. NUMBER OF CURRENT CONVICTION CHARGES	**The total number of criminal conviction charges associated with the current incarceration**	**1** **2** **3 to 4** **Missing & 5 or More**	**12** **21** **23** **33**
2. NUMBER OF COPD VIOLATION CONVICTIONS	**The total number of COPD infractions the offender has been convicted of (this as well as prior incarcerations)**	**0 (None)** **1 to 3** **4 to 9** **10 or More**	**6** **8** **9** **12**
3. LSI TOTAL SCORE	**The total of the 54 Level of Supervision Inventory (LSI) items**	**20 or Lower** **21 to 29** **Missing & 30 to 38** **39 or More**	**6** **10** **12** **15**
4. ARRESTED UNDER AGE 16	**Offender was arrested for criminal activity before age 16, according to the LSI instrument**	**Missing & No** **Yes**	**11** **17**
5. CURRENT AGE	**Age of the offender at the time of this Assessment**	**47 or Older** **40 to 46** **Missing & 39 or Younger**	**9** **18** **23**
6. ASSESSED CUSTODY LEVEL	**Offender is assessed to require minimum or minimum restrictive custody level supervision**	**Yes** **Missing & No**	**5** **8**
7. PRIOR PAROLE RETURN ON NEW CRIME	**Offender has been returned to prison from a prior parole as the result of a new crime. Does not include returns for technical violations.**	**Missing & No** **Yes**	**4** **6**
8. INCARCERATION NUMBER	**The number of prison incarcerations resulting from new court commitments offender has experienced. This does not include returns to prison for parole violations.**	**Missing & 1** **2** **3 or More**	**23** **30** **35**
9. SUBSTANCE ABUSE NEED LEVEL	**The DOC case management level of need for substance abuse treatment determined during the initial needs assessment**	**Missing & 1 or 2** **3 or More** **Constant**	**13** **18** **-88**

The CARAS risk group, scale ranges, and the recidivism rates determined for that group are outlined in Table 1 below.

Table 1. CARAS Risk Groups by Outcome

Risk Group	Scale Value		Outcome Measure (recidivism rates)		
	Low	High	New Filing or NC return*	New Violent Arrest	Any New Arrest
Very Low	1	23	17.2%	8.8%	32.7%
Low	24	31	23.0%	18.5%	50.6%
Medium	32	36	32.4%	25.2%	63.3%
High	37	43	45.6%	29.7%	71.8%
Very High	44	79	76.1%	33.6%	82.1%

* NC return: Return to prison for a new crime.

- About 1/3 of the 2002 releases were very high risk, with 76% recidivating (3 out of 4).
- The very low risk groups recidivates at less than half the rate of the entire sample, at about 23% (about 1:5), demonstrating that the scale discriminates among risk groups very well.
- The scores range from 1-79.
    - This large score range significantly increases the precision of the instrument, and would be impossible to implement (with confidence that it would be consistently scored and added correctly) if the CARAS had to be hand-completed.
    - The instrument is self-populating in by the Department of Corrections Information System.
- The average score for men is 38.1 and for women is 38.5 (no statistically significant difference).
- The scale can be used at various decision points in the release process, and can provide risk assessment information to the parole board, community corrections boards, and parole officers in the community.

Additional information about those in the risk categories:

- There is no real difference in gender across risk categories
- There is no real difference in ethnicity across risk categories
- There is no difference in mental health scores (P code), but those with high medical needs are about twice as likely to be low/lower risk
- There is no difference in risk level across incoming crime type. The categories for this analysis were violent, drug, escape, property, other nonviolent
- Those with NO escape charges or 1 escape charge are in the lower risk/med risk categories

- Those in the lower/low risk categories tend to have good attitudes, good companions, OK employment and substance abuse histories

Lower risk groups

- Nearly everyone in the low and lowest risk categories were classified as a "new court commitment" or a parole return/no new crime (DOC "most recent prison admission type")
- Half of the lower/low offenders have a Felony Class 1 or 2 index crime (there were only 51 among the 2002 releases, about 1 percent of all those released on parole)
- The lower risk group is slightly more likely to be comprised of F6s
- Many of the low risk folks have very high vocational needs
- Many had poor family support on the LSI

High risk groups

- Those in the high risk group are much more likely to have anger problems
- Those in the high risk categories are likely to be serving a sentence for multiple drug counts
- Those with multiple violent index crimes are about twice as likely to fall in the very high risk category
- Those with MULTIPLE counts of escape are in the very high risk category
- Those in the very high risk category tend to have a bad attitude
- Those in the very high risk category are likely to be in medium and close custody

Research Design

Sample Description

A sample of 5,850 DOC offenders who were released from inmate status (including in prison, ISP, and community corrections) between July 1, 2001 and June 30, 2002 (FY 2002) were selected for this study. The sample comprised 611 women and 4769 men.

This includes releases to parole and sentence discharges. Only those released to interstate parole were excluded from the study because information concerning recidivism was unavailable. If an offender was released multiple times during the time frame specified, the last release was selected. All data elements were extracted from the Department of Corrections Information System (DCIS) and provided to DCJ by the DOC.

Variables examined/included:

Incarceration number
Prison admit and release dates
Prison admit and release types
Age
Sex
Ethnicity
IQ
Needs assessment data
Assessed and Final Custody levels
TABE total and subscores
LSI item scores
Employment data
SSI Scores
Alcohol and Drug Use Questionnaire scores
Adult Substance Use Survey subscale scores
Prior CARAS item data
Prior parole returns
COPD violations
Prior absconds
Conviction crime types and felony class

Recidivism Data

Inmate release data were matched to new district court filings and returns to prison resulting from a new crime as the measure of recidivism. Two, three, four and five year outcomes were analyzed separately to determine the optimal outcome timeframe. It was determined that a three-year at-risk period provided the greatest degree of accuracy in predicting recidivism. Since technical violators who were returned to prison were not at risk of committing a new crime, they were temporarily held out of the analysis, pending the determination of the final CARAS predictors.

Table 2 below shows that the maximum correct classification rates are achieved at the 3 year outcome timeframe duration for the Overall and the Successful groups. The maximum Failure correct classification rate is achieved at the 5 year outcome timeframe duration because (1) more parolees become repeat offenders the longer we observe their performance and (2) the longer we observe them the easier it is to identify them correctly. However, note that the Overall and the Good correct classification rates decline in tandem after the 3 year outcome timeframe duration. This suggests that the 3 year outcome timeframe is the optimum.

Table 2. Classification outcome by timeframe

Duration	Success	Failure	Overall
2 Years	86.0%	65.2%	77.0%
3 Years	**86.4%**	69.4%	**77.7%**
4 Years	83.0%	73.2%	77.4%
5 Years	80.0%	**74.6%**	76.7%

Scale Development Process

The following outlines the steps undertaken in the development of the scale:

The FY 2002 sample was randomly split such that two-thirds went into a development sample and one-third was held out as a validation sample. Offenders serving a sentence for a current sex crime conviction and the technical violators returned to prison were held out of analysis until it was appropriate to include them.

Preliminary statistical diagnostics were generated to reduce the initial 175 potential predictors to a manageable number (20 – 30). The survivors of this process were reviewed for stability and viability. Several did not pass this review and statistically based substitutions were made.

Stepwise discriminant function analysis was performed to determine the final nine trial scale predictor variables. A multivariate logit regression was used to calculate a trial scale total score, empirically weighting the nine final survivors.

To determine whether to classify technical violators as recidivists or non-recidivists, the trial scale was tested on a group of offenders with technical violations who had not committed a new felony, but were returned to prison. Two-thirds were found to exhibit profiles similar to non-recidivists. These were reclassified as non-recidivists in deriving the final scale. One-third was found to have profiles similar to recidivists. This group was reclassified with the recidivists in deriving the final scale. As a result, the technical violators were neither all Successes nor all Failures, but were a combination of the two multivariate profiles.

Final score weights were calculated using the original Successes, Failures and reclassified technical violators, and diagnostic statistics were developed to determine cut points to define the risk groups.

The hold-out validation sample was configured to match the development sample. Recidivists and non-recidivists were scored to compare the new scale's performance to its performance on the development sample. The new scale performed well on the validation sample, with all diagnostic distributions matching their counterparts derived on the development sample. Risk group cut points were found to be the same in both samples.

Table 3 outlines the CARAS scale cutpoints defining the risk categories, the proportion of the total sample falling into each of these risk categories, the number of recidivists and non-recidivists in each category, the associated recidivism rates, and the increase in the risk of recidivism for each group compared to the "very low risk" offenders.

Table 3. CARAS Version 5 Development Sample: 2002 Prison Releases

Risk Group	Scale Value		Total	Percent of Total	Non-Recidivists	Recidivists	Recidivism Rate	Odds Ratio*
	Low	High						
Very Low	1	23	574	10.7%	472	102	17.8%	1.00
Low	24	31	941	17.5%	716	225	23.9%	1.35
Medium	32	36	826	15.4%	554	272	32.9%	1.85
High	37	43	1,244	23.1%	680	564	45.3%	2.55
Very High	44	79	1,795	33.4%	421	1,374	76.6%	4.31
Overall	1	79	5,380	100%	2,843	2,537	47.2%	

* Incremental increase in risk of recidivism compared to the very low risk group.

Scale Validation

The scale has been validated on multiple samples: females, the hold-out sample described above, sex offenders and violent offenders.

Females

Analysis was conducted to ensure the new scale can be used on both male and female offenders. The female sample numbered only 611 offenders. The analysis determined that there was no statistically significant difference between males and females in the Total Scale Value and in each of the nine final predictors. Also, the risk group cut points were found to be the same for males and for females.

Sex Offenders

The final scale was validated on the group of sex offenders originally excluded from the sample to ensure it could be used to assess this group as well. CARAS version 5 performed well on sex offenders and it was determined that the scale could be used to assess their recidivism risk as well.

Below is a summary table (Table 4) that compares the overall scale development sample and the sex offender sample divergences and maximum separations.

Table 4. Validation statistics by sample

Overall	2002 Development Sample (n=5380)	2002 Sex Offender Sample (n = 470)	
CARAS Divergence	.9718	.7428	(24% lower)
CARAS Maximum Separation	41.52%	36.31%	(13% lower)

The distribution of the sex offender sample is almost in reverse proportion to the development sample with 62% of the sex offenders in the Very Low and Low Risk categories. This is 2.2 times the proportion of Very Low and Low Risk offenders in the development sample (see Table 5).

Table 5. Distribution proportions by sample and risk category

Risk Category		2002 Development Sample (n=5380)	2002 Sex Offender Sample (n = 470)
Very Low	(1 - 23)	11%	35%
Low	(24 - 31)	17%	27%
Medium	(32 - 36)	15%	14%
High	(37 - 43)	23%	13%
Very High	(44+)	34%	11%
	Total	100%	100%

Analyses showed that the cut-points for the risk groups are the same for the sex offender sample as for the development sample. The CARAS version 5 segments the extremes of the risk spectrum on the sex offenders in a manner similar to that of the development sample. Table 6 below shows how the development and the sex offender recidivism rates are clustered.

Table 6. Recidivism rates by sample and risk category

Risk Category		2002 Development Sample (n=5380)	2002 Sex Offender Sample (n = 470)
Lowest	(1 - 23)	18%	15%
Low	(24 - 31)	24%	16%
Medium	(32 - 36)	33%	26%
High	(37 - 43)	45%	51%
Very High	(44+)	77%	62%
Overall		**47%**	**27%**

The power of the predictors was not compromised severely when comparing the sex offenders with the development sample. Table 7 below summarizes the range by displaying the highest and lowest individual predictor divergences resident in the development and in the sex offender samples. The combined divergence statistic across all items was presented in Table 4.

Table 7. Highest and lowest divergence statistics by sample

Predictor Item	2002 Development Sample (n=5380)	2002 Sex Offender Sample (n = 470)	
Highest divergence	.4191	.3089	(26% lower)
Lowest divergence	.0416	.0452	(9% higher)

Table 8 outlines the CARAS scale cutpoints defining the risk categories for the sample of sex offenders only. The table also contains the proportion of the total sample falling into each of these risk categories, the number of recidivists and non-recidivists in each category, the associated recidivism rates, and the increase in the risk of recidivism for each group compared to the “very low risk” offenders. Table 9 gives the same information for the combined sex offender and development samples.

Table 8. CARAS Version 5 Sex Offender Sample: 2002 Prison Releases

Risk Group	Scale Value		Total	Percent of Total	Non-Recidivists	Recidivists	Recidivism Rate	Odds Ratio*
	Low	High						
Very Low	1	23	163	34.7%	138	25	15.3%	1.00
Low	24	31	125	26.6%	105	20	16.0%	1.04
Medium	32	36	68	14.5%	50	18	26.5%	1.73
High	37	43	61	12.0%	30	31	50.8%	3.31
Very High	44	79	53	11.3%	20	33	62.3%	4.06
Overall	1	79	470	100%	343	127	27.0%	

* Incremental increase in risk of recidivism compared to the very low risk group.

Table 9. CARAS Version 5 Sex Offender and Development Sample Combined: 2002 Prison Releases

Risk Group	Scale Value		Total	Percent of Total	Non-Recidivists	Recidivists	Recidivism Rate	Odds Ratio*
	Low	High						
Very Low	1	23	737	12.6%	610	127	17.2%	1.00
Low	24	31	1,066	18.2%	821	245	23.0%	1.33
Medium	32	36	894	15.3%	604	290	32.4%	1.88
High	37	43	1,305	22.3%	710	595	45.6%	2.65
Very High	44	79	1,848	31.6%	441	1,407	76.1%	4.42
Overall	1	79	5,850	100%	3,186	2,664	45.5%	

* Incremental increase in risk of recidivism compared to the very low risk group.

Violent Offenders

For the purposes of this analysis, violent offenders are comprised of offenders convicted of person- and weapons-related felony crimes. Offenders who were missing index crime data were categorized as non-violent. Missing index crime offenders comprised 2.1% of the development sample. There were 1,910 violent offenders out of the 5,850 offenders contained in the development sample plus the independent sex offender sample. This represents approximately one-third of the population.

Similar to the sex offenders, the violent offenders tended to drift into the Very Low and Low Risk Groups, as seen in Table 10.

Table 10. Percentages of violent and non-violent samples within risk category

Risk Group	Non-Violent Sub-Sample	Violent Sub-Sample	Violent Differential
Very Low + Low	28.5%	35.3%	+7.0%
Medium	15.8%	14.3%	-1.5%
High + Very High	55.7%	50.2%	-5.5%
Total	100%	100%	

CARAS Version 5 rank orders risk to public safety monotonically on both the violent and the non-violent offender groups (See Table 11.). However, the overall recidivism rate is lower for the violent offenders than for the non-violent offenders. The recidivism rates by risk group are similar to those found in the aforementioned sex offender validation, as shown below. The recidivism rates for both groups show similar absolute levels for the Medium, High and Very High Risk Groups, despite the shift of violent offenders into the Very Low and Low categories. The recidivism rates in the middle and upper risk levels indicate that there is little difference between the two groups where the danger to public safety is concerned.

Table 11. Recidivism rate of violent and non-violent samples by risk category

Risk Group	Non-Violent Sub-Sample Recidivism Rate	Violent Sub-Sample Recidivism Rate
Very Low	21.38%	12.12%
Low	26.64%	15.47%
Medium	33.49%	30.04%
High	45.69%	45.39%
Very High	77.19%	73.63%
Overall	**48.20%**	**40.05%**