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Developing the Risk of Administrative Segregation Tool (RAST) to Predict Admissions to Segregation

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Developing the Risk of Administrative Segregation Tool (RAST) to Predict Admissions to Segregation

Leslie Helmus

Sara Johnson

&

Andrew J. R. Harris

Correctional Service of Canada

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Executive Summary

Key words: *administrative segregation, risk scales, RAST, Aboriginal offenders, women offenders*

The last 15 years have witnessed considerable concern regarding the use of administrative segregation in correctional settings. Consistent with the risk principle of effective correctional practice, attempts to reduce use of segregation would benefit from the ability to identify which offenders are at greatest risk for being placed in segregation so preventative interventions can be targeted towards those most in need. The goal of the current research project was to develop an actuarial scale to assess the risk of being placed in administrative segregation.

For men, data were obtained for all Correctional Service of Canada (CSC) admissions from fiscal years 2007/2008 through 2009/2010. Women were oversampled to ensure adequate representation, using all admissions from fiscal years 1999/2000 through 2009/2010. This population (N = 16,701) was randomly divided into a development sample (N = 11,110) and a validation sample (N = 5,591). Analyses were also disaggregated by reason for administrative segregation (jeopardizing the security of the institution or for reasons of the inmate's own safety), gender, and Aboriginal ancestry.

Four hundred and thirteen potential predictor variables were examined, including items from assessment scales, demographic information, current offence information, flags/alerts/needs, and information from previous federal sentences. The outcome being predicted was whether the offender was placed in administrative segregation (for reasons of jeopardizing security or the inmate's own safety) for at least six consecutive days within two years of admission.

Approximately 24% of offenders were placed in administrative segregation for at least six days within two years of admission. Of the 413 variables examined, 86% significantly predicted segregation placements. The item pool was reduced using factor analysis to identify measured constructs, tests of unique contributions within the measured constructs, and considerations of the general utility of items (e.g., easy/reliable to score, availability of relevant information).

Several scales were developed and tested. Ultimately, no scale provided meaningful advantages over a simple scale with six static items (age, prior convictions, prior segregation placement, sentence length, criminal versatility, and prior violence). Attempts to develop scales unique for men and women and those of Aboriginal ancestry did not yield meaningfully higher accuracy. The simple static scale generalized well to the validation sample, demonstrating large effects in predicting administrative segregation placements.

The study demonstrated that it is possible to develop a simple and easy-to-use scale that is effective in identifying offenders at an elevated risk for placements to administrative segregation. Further decisions would need to be made about how to use this scale in practice, such as developing appropriate nominal risk categories and cut-off scores. Minimally, however, it is possible to identify offenders in the greatest need of support and intervention efforts to prevent and/or reduce the number of segregation placements.

Table of Contents

List of Tables

List of Figures

List of Appendices

Introduction

Administrative segregation allows correctional authorities a method to protect offenders who may be under threat, but it may also serve to socially isolate offenders, interrupt the correctional process, and interfere with rehabilitative efforts. In some circumstances, a segregation placement may be of mutual benefit to the offender and the institution. The institution may benefit through closer observation of the inmate's behaviour and limiting the offender's access to instruments of self-injury while providing staff with a venue for prompt intervention (Power, 2010). Alternately, the inmate may benefit by receiving undisturbed time to regain equilibrium and avoid getting into further trouble. Secondary and less obvious benefits to offenders could include bringing desired attention from staff and escaping to an environment that protects them from real or perceived threats. The use of segregation becomes problematic when it benefits neither party, or the adverse consequences outweigh the benefits.

There have been ongoing discussions about the use of segregation in North America. In the United States, The American Civil Liberties Union (ACLU, 2014) has expressed concern about the growing use of segregation in the U.S. and its possible negative consequences for inmates. They also describe numerous initiatives at both state and federal levels currently underway to find alternatives to segregation (ACLU, 2014). As part of this movement, the Government Accountability Office of the United States (GOA, 2013) conducted a detailed review of segregation in the Bureau of Prisons (estimating that roughly 7% of inmates are housed in some kind of segregation) and made several recommendations to improve the documenting and monitoring of segregation and to review its effects on inmates and institutional safety. In Canada, the Correctional Service of Canada (CSC) commissioned two independent reviews on the topic of segregation (Rivera, 2010; Thériault, 2010). Detailed interviews with inmates revealed that they had few complaints about the conditions of segregation. Nonetheless, the reviews had some recommendations for further improvements to segregation policies. A key recommendation from Thériault (2010) was to screen incoming offenders for their risk of segregation, in order to better target those with the highest risk for intervention and diversion efforts.

Consequently, as part of a broader and international attempt to reduce segregation placements, this study endeavoured to develop an actuarial tool to flag, at intake, inmates with an

elevated risk for a segregation placement. Flagging these inmates would allow the Correctional Service of Canada (CSC) to intervene in an attempt to prevent those "at risk of segregation" from ending up in segregation. In addition to the possible benefits for offenders, reducing and/or preventing segregation has important logistical and cost benefits given that institutions have only a finite number of segregation cells (Gobeil, Taylor, & Flight, 2008) and maintaining an inmate in segregation is more expensive than having that inmate in the general population.[1]

Segregation: Policy, Definitions, and Use

As outlined in the Corrections and Conditional Release Act (CCRA; 1992), within CSC there are two types of segregation placement: disciplinary segregation and administrative segregation. Disciplinary segregation is used to sanction inmates who have been found guilty of serious disciplinary offences within the penitentiary and may be imposed for a maximum of 30 days (CCRA, 44(*f*)). This report does not consider disciplinary segregation.

The purpose of administrative segregation is to "maintain the security of the penitentiary or the safety of any person by not allowing an inmate to associate with other inmates" (CCRA, 31. (*1*)). The Act further indicates that the inmate is to be released from segregation "at the earliest appropriate time" (CCRA, 31. (*2*)). Within CSC, as defined by Commissioner's Directive (CD) 709, "administrative segregation is for the purpose of ensuring the safety and security of the institution and those persons in the institution, the integrity of investigations, and the safety of the public. It is not a punitive measure" (p. 2).

Placement in administrative segregation may be of two forms, either voluntary or involuntary. Voluntary placement is where the inmate requests a placement in administrative segregation and the institutional authority approves the placement where that authority believes that the continued presence of that inmate in the general population might jeopardize the inmate's safety (CD 709, Sec. 13). Involuntary segregation occurs when an inmate may be segregated without their request or consent under subsection 31(3) of the CCRA. Subsection 31(3) of the CCRA states that an inmate may be placed in involuntary administrative segregation based upon three grounds: (1) where the inmate "has attempted to act or intends to act in a

[1] Costs for segregation placement were unavailable for the Correctional Service of Canada's facilities. One report from the Office of the Inspector General of California (2009) estimated that the annual correctional staff cost of a standard administrative segregation unit bed was at least $14,600 more than the cost of the equivalent general population bed. Additionally, Mears (2006) estimated that segregation can cost 2 to 3 times more to build and maintain than traditional prison accommodations.

manner that jeopardizes the security of the penitentiary or the safety of any person and allowing the inmate to associate with other inmates would jeopardize the security of the penitentiary or the safety of any person"; (2) where the continued presence of the inmate in the general population could interfere with an investigation that could lead to a criminal charge; or (3) where the presence of the inmate in the general population could jeopardize the inmate's own safety (CCRA, subsection 31(3)). When in administrative segregation, the inmate is entitled the same rights, privileges, and conditions of confinement as a general population inmate except those that cannot be afforded in association with other inmates, due to security concerns, or due to the limitations of the administrative segregation area itself (CCRA, Sec. 37).

The use of administrative segregation has fluctuated from a low of 7,508 admissions in 2009-2010 to a high of 8,323 in 2011-2012, representing an increase of 11% in that time period (Public Safety Canada, 2013). Comparatively, the population in CSC custody increased 7% (an increase of roughly 1,000 inmates) in that same time period (Corporate Reporting System, 2014). It should be noted that these are unique admissions and that individual offenders may have more than one admission in any given year. Approximately 95% of these admissions are for men and Aboriginal inmates accounted for 29% of all segregation admissions. In terms of length of stay, 41% stayed for 30 days or less, 23% stayed for between 30 and 60 days, 19% stayed for between 60 and 120 days, and 17% stayed for more than 120 days (Public Safety Canada, 2013). Most of the women (82%) stayed in administrative segregation for 30 days or less. The number of offenders who stayed for more than 120 days was lower for Aboriginal offenders (13%) compared to non-Aboriginal (18%).

Previous Research

Mental health studies. There have long been concerns that the use of segregation may have deleterious effects upon inmates (Grassian, 1983; Haney, 2003; for a summary of this area, see Gendreau & Goggin, 2013; Gendreau & Labrecque, in press). Indeed, early research, typically with small sample sizes, found that the more restrictive the environment, the greater the number of psychological/psychiatric symptoms reported (although it was not possible to determine whether the increased symptoms were apparent before being placed in more restrictive environments; Andersen et al., 2000; Miller, 1994; Miller & Young, 1997).

In contrast, studies that have compared symptomatology of segregated offenders to non-segregated offenders across multiple time points have generally found no evidence of

deterioration in psychological functioning after a segregation placement; instead, functioning tended to improve over time for both groups (O'Keefe, Klebe, Stucker, Sturm, & Leggett, 2011; Zinger & Wichmann, 1999; Zinger, Wichmann, & Andrews, 2001). In a recent review, Gendreau and Labrecque (in press) concluded that the negative effects of being in segregation are small and less important than other features of the prison environment, such as how staff treat inmates. Altogether these findings suggest that there is still substantial uncertainty as to the psychological/mental health effects of relatively short periods of time in segregation. This uncertainty is compounded by the findings that psychological coping changes over time, making it difficult to understand with single-assessment studies.

Characteristics of segregated offenders. A 1997 (Motiuk & Blanchette) comparison of inmates in administrative segregation to a randomized sample of non-segregated inmates revealed that segregated inmates were higher risk, had more prior involvement with the criminal justice system, had higher levels of criminogenic need (e.g., education/employment, substance abuse, associates), and had more often been segregated during previous penitentiary terms. Wichmann and Nafekh (2001) provided a profile of offenders in administrative segregation and found that segregated inmates tended to be largely men in their late 20s, slightly younger than the general inmate population, had long criminal histories with more violent convictions, required a higher security placement, showed more problems with institutional adjustment, had higher risk and need ratings, and were assessed as lower reintegration potential.

Women offenders in administrative segregation were profiled by Wichmann and Taylor (2004). The most common type of segregation used with women was involuntary; disciplinary segregation was used in only 7% of cases, and the average stay in administrative segregation was 10 days. The majority of women in segregation had previous contact with the criminal justice system and 70% were described as having considerable difficulty in the area of emotional and personal functioning. The study also found that segregated women were more likely to have a history of violent offences and as being higher in both risk and need indices. A recent large-scale retrospective study on women in segregation supported the Wichmann and Taylor (2004) findings that most segregation stays for women were short (less than 10 days; Thompson & Rubenfeld, in press). Additionally, women placed in segregation tended to display higher levels of risk and need and poorer institutional adjustment compared to women not placed in segregation (Thompson & Rubenfeld, in press).

These consistent findings suggest that it should be possible to develop a structured method of identifying individuals with an elevated risk for a segregation placement. Such efforts could inform attempts to divert offenders from segregation.

Risk Assessment

Given that research has shown that unstructured professional judgement is not much more accurate than chance at predicting future behaviour (Andrews & Bonta, 2010; Bonta, 1996; Menzies, Webster, McMain, Staley, & Scaglione, 1994),[2] the current study has drawn upon actuarial risk assessment for its methodology. Actuarial risk tools include empirically-supported predictors of a given outcome (e.g., young age, having a previous criminal record). These factors are scored and used to obtain a total score on the scale. Additionally, following Meehl's (1954) definition recently adopted by Hanson and Morton-Bourgon (2009), a further defining feature of actuarial scales is that total scores on the scale can be linked to empirically-derived estimates of the probability of that outcome for groups of individuals with the same score.

There are two types of risk factors that could be included in a risk scale: static risk factors and dynamic risk factors. Static risk factors are generally historical, that is, they cannot be changed by intervention. Examples are age or previous criminal convictions (Andrews & Bonta, 2010). Dynamic risk factors (Bonta, Andrews, & Motiuk, 1993; Brown & Motiuk, 2005; Hanson & Harris, 1998; Motiuk & Bonta, 1991; Motiuk, Bonta, & Andrews, 1990), however, such as learned behaviours, personal predilections, and skill deficits can be changed through retraining, interventions, and education. When the relative strength of a dynamic risk factor is altered there should be a concomitant change in the probability of the outcome of interest. Although there is a large literature on risk factors for general criminal recidivism (e.g., Andrews & Bonta, 2010), to date there has not been research on actuarial tools related to future risk for placement in segregation. This project will advance knowledge on predictors of placement in administrative segregation and propose an empirically derived actuarial risk tool.

Current Study: Purpose and Research Questions

Given the increased international interest in exploring alternatives to placing offenders in segregation, a useful initiative would be to develop a screening tool to identify offenders at risk of being placed in administrative segregation. This would be a necessary first step in efforts to

[2] Generally, the highest predictive accuracy is found among actuarial risk scales, followed by structured professional judgement, and then unstructured professional judgement (Hanson & Morton-Bourgon, 2009).

divert offenders from administrative segregation. Such an undertaking would also provide valuable information about what factors best predict segregation placements, which has been an under-researched area internationally. In the current study, the following research questions were examined:

1) Is it possible to identify predictors of segregation and combine multiple predictors into an overall scale? If so, is there a need to develop separate scales for the two primary reasons for administrative segregation (i.e., danger to the inmate and the inmate presence in the general population jeopardizes security)? Additionally, is there a need to develop separate scales for non-Aboriginal men, Aboriginal men, non-Aboriginal women, and/or Aboriginal women?

In a sample set aside to validate the risk assessment scale(s) from the development sample, the following research questions were examined:

2) What is the predictive accuracy of the scale(s) in a validation sample? How does it perform for subgroups of offenders (e.g., non-Aboriginal men, Aboriginal men, non-Aboriginal women, Aboriginal women) or different types of segregation?
3) Does the predictive accuracy of the tool vary based on the length of the observation period (i.e., time since admission)?

Method

Participants

For men, data were obtained for all admissions from fiscal years 2007/2008 through 2009/2010. To ensure adequate sample size of women, data were drawn for all admissions from 1999/2000 through 2009/2010. Examination of the data found no meaningful differences in the rates of segregation across this ten-year timeframe. Minimally, this means the findings should not be affected by cohort changes in the *rates* of segregation. It is, however, unknown whether there would be cohort effects in the *reasons* for segregation. For offenders with multiple admissions during the sampling period, the most recent admission date was used in the analyses. The sample was also restricted to offenders who were under the jurisdiction of CSC (i.e., were serving a federal sentence). The total sample size of men and women was 16,701.

From the overall population, two thirds of the offenders were randomly selected to form the development sample (N = 11,110), which would be used to explore which items predict administrative segregation and to build and compare options for assessment scales. The remaining offenders (N = 5,591) were set aside as a validation sample. In the overall population, 16% of offenders were women (n = 2,694) and 20% of offenders self-reported being of Aboriginal ancestry (n = 3,385; information unavailable for 135 cases). Table 1 presents gender and Aboriginal ancestry information for the development and validation samples. In all breakdowns, the sample consisted of 68% non-Aboriginal men, 16% Aboriginal men, 12% non-Aboriginal women, and 4% Aboriginal women.

Table 2 presents the means and standard deviations for sentence length and age at admission. For sentence length, 593 of the offenders had an indeterminate sentence (3.7%). Of those with a determinate sentence, non-Aboriginal and Aboriginal men offenders had a similar average sentence length (3.5 and 3.4 years, respectively), while women had slightly shorter average sentence lengths (3.0 years). For age, non-Aboriginal offenders (men and women) were, on average, 35 to 36 years of age, while Aboriginal offenders (men and women) were generally younger (32 years of age).

Measures/Predictor Variables

In total, 413 potential predictor variables were examined from a variety of information sources. Predictors were restricted to those that would be available at intake or shortly

Table 1

Gender and Aboriginal Ancestry (N=16,566)

	Overall		Development sample		Validation sample	
	%	*n*	%	*n*	%	*n*
Non-Aboriginal men	68	11,254	68	7,507	68	3,747
Aboriginal men	16	2,653	16	1,760	16	893
Non-Aboriginal women	12	1,927	12	1,270	12	657
Aboriginal women	4	732	4	484	4	248

Table 2

Sentence Length and Age at Admission for Overall Analyses

	Determinate sentence length (years)			Age		
	n	*M*	*SD*	*n*	*M*	*SD*
Non-Aboriginal men	10,849	3.5	2.0	11,254	35.9	11.9
Aboriginal men	2,549	3.4	2.2	2,653	32.5	10.0
Non-Aboriginal women	1,876	3.0	1.4	1,927	35.4	10.3
Aboriginal women	703	3.0	1.6	732	31.7	8.7
Total	16,108	3.4	1.9	16,701	35.1	11.4

thereafter. Items from the following assessment scales were included: the Static Factors Assessment, Dynamic Factors Intake Assessment, and the Custody Rating Scale (these scales are rated for all offenders at intake). Brief descriptions of these scales are provided below. Additional predictors included demographic information, current offence information, flags/alerts/needs that are raised by CSC staff, information on gang affiliations, and information from previous federal sentences (e.g., institutional incidents and prior admissions into segregation).

Flags, needs, and alerts refer to diverse types of information collected by CSC and are

intended to be readily accessible by CSC staff without having to conduct detailed reviews of the offender's file information. Flags identify information that may be useful for staff involved in the offender's case management, such as whether the offender was designated a dangerous offender, has a sex offence against a child, has outstanding charges, or has expressed interest in pursuing particular opportunities (e.g., for Aboriginal offenders, following a traditional healing path). Needs may identify that an offender has a cognitive impairment or physical disability that will need to be considered or accommodated by CSC staff when meeting the offender. Alerts are intended to notify CSC staff of potential risks or considerations that should be taken into account when dealing with the offender, such as prior involvement in organized crime, escapes, prior hostage-takings in institutions, or whether the offender has been considered to pose a potential security threat to the institution (e.g., if they have considerable knowledge about security systems). These flags/needs/alerts can be activated in the offender's file and can also be de-activated if they are no longer relevant. To restrict analyses to information that would be relevant and available near the offender's intake assessment, flags/needs/alerts were only considered if they were activated within one year of admission.

Information on gang affiliations was obtained from data maintained in the offender's file (more information on CSC's policies for identifying security threat groups can be found in CSC, 2013). Security Information Officers (SIOs) are responsible for gathering and recording information about affiliations with groups that may pose a threat to the security of the institution. This information indicates whether the offender is a member of the group or an associate, and whether their affiliation is active or inactive. In addition, the specific group to which the offender is affiliated is also identified (e.g., street gang, prison gang, Aboriginal gang). Before these data are entered in the offender's administrative file, the information collected by the SIO must be approved by the Institutional Head or District Director.

Static Factors Assessment (SFA). The SFA (CSC, 2012; Motiuk, 1993) is a 137-item structured professional judgement risk assessment scale. It has three subscales: Criminal History Record (38 items), Offence Severity Record (71 items), and Sex Offence History Checklist (28 items). Additionally, the items of the Criminal History Record are organized into three sections: Previous youth offences (15 items), previous adult offences (17 items), and current offences (6 items). The Offence Severity Record is organized into two main sections: previous offences (36 items) and current offences (35 items). Each item is rated as "present" or "absent." After rating

all items, the staff member forms an overall judgement of whether the static risk posed by the offender is low, moderate, or high.

Dynamic Factors Intake Assessment (DFIA). The original DFIA consisted of 197 dichotomous indicators, organized into seven need domains: employment, marital/family, associates/social interaction, substance abuse, community functioning, personal/emotional orientation, and attitude (Motiuk, 1993). Following a more recent review (Brown & Motiuk, 2005), a revised DFIA (the DFIA-R) was implemented in 2009 (CSC, 2012). It has the same domains, but the total number of indicators was reduced to 100. In both versions of the DFIA, all items are rated as "present" or "absent." Given the sampling time-frame, some offenders were scored on the original DFIA and some on the revised. For the current analyses, most DFIA-R items are identical or highly similar to an item on the original DFIA; these items were matched in the data. Some items remained unique to either the original or revised scale; these items were still examined but with a reduced sample size. After rating each item, the staff member develops a structured professional judgement rating for each domain, on a three or four-point scale (in the original DFIA, ratings could be either *no current difficulty*, *some difficulty*, or *considerable difficulty*; in the DFIA-R, ratings could be either *factor seen as asset*, *no immediate need for improvement*, *some need for improvement*, or *considerable need for improvement*; some DFIA-R domains do not have the first rating option). Lastly, guided by the item and domain ratings, the officer makes an overall judgement of the level of dynamic need (low, moderate, or high).

Custody Rating Scale (CRS). The CRS (Solicitor General Canada, 1987) is used to inform initial security classification decisions. It has 12 items grouped into two subscales: Institutional Adjustment (5 items) and Security Risk (7 items). Each item has specific coding rules and can have up to 11 response categories. For each response category, points are assigned based on the strength of that predictor in the original development sample.

Procedure

All data were obtained from the OMS, which is the computerized offender file management system maintained by CSC. If multiple assessments of predictor variables were available, the first assessment was used.

The outcome was whether the offender was placed into administrative segregation for at least six consecutive days for reasons of "inmate's own safety" (CCRA, subsection 31(3)(c)) or

"jeopardizing security of the institution" (CCRA, subsection 31(3)(a)) within two years of admission. In the results section, any reference to segregation will refer to this outcome (unless otherwise specified). Separate outcomes were also created for the two different reasons for segregation, and also for a one-year period post-admission. Other reasons for being placed in administrative segregation (e.g., interfering with an investigation) were excluded given they represented a trivial proportion of segregation incidents. Disciplinary segregation was also excluded because it is a reactive response to specific incidents, as opposed to a measure intended to prevent harm to inmates or the security of the institution. Data were not examined separately for voluntary versus involuntary segregation, as the focus was on the reason for segregation as opposed to the type of segregation. The 6-day minimum was chosen because efforts to divert offenders from segregation would primarily be targeted towards longer periods of stay. Six days as a minimum would capture offenders who were retained in segregation after the mandatory 5-day review of segregation status (CSC, 2007).

Preliminary analyses of time to first segregation placement suggested that approximately 90% of offenders who are placed in segregation are placed there within two years of admission. As such, this observation period would capture the majority of segregation incidents. Offenders who were still in segregation two years post-admission were considered part of the "segregation" group provided they had been in segregation for at least six days. Offenders released to the community prior to the end of the observation period were still included because their exclusion would disproportionately remove low-risk offenders from the sample. In other words, offenders who were released early without having been placed in administrative segregation for the prescribed period of time were considered "successes." If an offender was released to the community, re-admitted to federal custody, and subsequently admitted to segregation within two years of their initial admission, they were considered in the segregation group.

Overview of Primary Analyses

The scale was developed using logistic regression and Area Under the Curve (AUC) from receiver operating characteristic curve analyses. Validation analyses also used AUCs. Logistic regression (Hosmer & Lemeshow, 2000) is a form of regression in which the dichotomous dependent variable (segregation yes/no) is transformed into log odds. With one predictor variable, logistic regression estimates two regression coefficients (B_0 and B_1). The B_0 (i.e., intercept) is the predicted segregation rate (in log odds) for offenders who score a 0 on the

predictor (if multiple predictors are entered, it is the base rate for offenders scoring 0 on all predictors). The B_1 (i.e., slope) is an estimate of the predictive accuracy of the predictor. It estimates the average increase in segregation rates (expressed as a log odds ratio) associated with each one-score increase in the predictor. To assist interpretation, log odds ratios are transformed into odds ratios. For example, if a dichotomous predictor has an odds ratio of 2, this means the odds of being admitted to segregation are 2 times higher for offenders with that risk factor compared to offenders without it. For a continuous predictor, it would mean that the odds of segregation increases twofold for each one-point increase on the predictor. If multiple predictors are entered into one logistic regression model, the slope for a predictor is interpreted as the odds ratio after controlling for all other predictors in the model. This allows tests of the incremental accuracy of predictors (i.e., their unique predictive value). Statistical interactions can also be tested in logistic regression using the same methods as in standard regression techniques.

Model selection analyses used the backward elimination technique. This method starts by including all predictors in the overall model, and then removes predictors one at a time (starting with the predictors contributing the least to the model) and stops when removing an additional predictor would significantly reduce the accuracy of the model. Unless otherwise specified, an alpha level of .05 was used to determine significant reduction in the model's accuracy. Using this method, the final variables retained in the model would all add incrementally to the prediction of segregation.

The AUC is an effect size statistic appropriate when one variable is dichotomous (i.e., segregation or no segregation) and the other is at least ordinal (Swets, Dawes, & Monahan, 2000). The AUC values can vary between 0 and 1, with .500 indicating that the item does not predict admission to segregation. An AUC value less than .500 indicates negative predictive accuracy (i.e., higher scores are associated with lower rates of segregation), and AUC values between .500 and 1 indicate positive predictive accuracy (i.e., higher scores are associated with higher rates of segregation). As a heuristic, an AUC of .560 corresponds to a small effect size, while .640 reflects a moderate effect, and .710 reflects a large effect size, as these values roughly correspond to Cohen's *d*s of .20, .50, and .80 (see Rice & Harris, 2005). An AUC value is statistically significant if the 95% confidence interval does not include .500.

Predictor selection for the risk assessment scale was also informed by Principal Components Analysis (PCA). These analyses were intended for the purposes of data reduction

(as opposed to identifying underlying constructs in the data). As such, the details of these analyses are presented in Appendix A, and are only briefly referred to in the results section.

The study was intended to have sufficient sample size in the event that separate scales were required for different types of segregation and for different subgroups (e.g., non-Aboriginal men, Aboriginal men, non-Aboriginal women, and Aboriginal women). Consequently, analyses combining all subgroups and combining the two different types of segregation had enough statistical power to detect even very small effects. As such, interpretation of findings primarily focused on the magnitude of effect sizes (in addition to statistical significance).

For the final scale that was developed, additional statistics were provided to guide clinical decisions. These are sensitivity, specificity, positive predictive values, and negative predictive values and will be reported for each score on the scale. Sensitivity is defined as the proportion of segregated offenders that would be correctly detected by the scale if that score was used as a cut-off (i.e., if all offenders with that score or higher were predicted to be placed in segregation). Specificity is the proportion of offenders who were not transferred to segregation that would be correctly classified by the scale if that score was used as the cut-off to predict segregation. The positive predictive value indicates what proportion of all offenders would actually be placed in segregation (from all offenders predicted to be placed in segregation) if that score was used as a cut-off. Negative predictive power indicates what proportion of offenders predicted to not be in segregation would actually not be in segregation. Note that these statistics assume the scale is being used to make a dichotomous prediction that offenders either will or will not have a period of time in segregation. Although this is unlikely to match how a scale is used in practice, it provides a way to understand the trade-offs between different decision outcomes (e.g., false positive, true positive) across different score thresholds.

Results

As previously mentioned, the purpose of the analyses was to explore whether it was feasible to predict admissions to administrative segregation, and if so, to develop and validate a risk scale. Constructing the scale required several steps. Preliminarily, descriptive data for the outcome were examined. The outcome was dichotomously defined as whether the inmate was admitted to administrative segregation for at least six consecutive days duration within two years of admission, for reasons of either jeopardizing the security of the institution or for the inmate's own safety (hereafter referred to simply as 'segregation' or 'administrative segregation'). The first step in developing the scale was to identify what factors predicted segregation placements; this was done paying particular attention to whether predictive accuracy differed as a function of gender, Aboriginal ancestry, or reason for segregation. Given the large number of significant predictors that were identified, several methods were used to reduce the item pool to the most efficient and robust set of predictors. Subsequently, different scale options were developed and explored. The most promising scales were tested in the validation sample (again, paying particular attention to accuracy among offender subgroups). Final recommendations about the scale options are made. Additionally, for the recommended scale, normative data are provided and options for nominal risk category labels are offered.

Segregation Rates

In the overall population (N = 16,701), 24.4% of offenders were placed in administrative segregation for at least six consecutive days within two years of admission. For these offenders, the average length of time between admission to federal custody and their first segregation placement was 246 days (8 months; SD = 203.9 days), with a median of 200 days (6.5 months). Interestingly, 411 of the segregation cases (10%) were admitted to segregation within one week of admission, and 886 (21.8%) of the segregated offenders were placed in segregation within 60 days, when the intake assessments are typically conducted (before penitentiary placement decisions are made). Although some offenders may require immediate segregation due to security concerns, the high rate of segregation admissions during the intake assessment period highlights the need for a prediction tool that can be quickly scored at admission. Roughly 70% of the segregations occurred within the first year post-admission.

Table 3 presents the rates of segregation within two years for the overall population, as

well as the development and validation sample, separated by gender and Aboriginal ancestry. From the overall segregation rate of 24%, the rates were about 10 percentage points lower for non-Aboriginal women (13%) and about 10 percentage points higher for Aboriginal men (34%). Notably, segregation rates were similar in the development and validation samples.

Table 3

Rates of Any Segregation

	Overall population			Development sample			Validation sample		
	N	*n* Seg	%	*N*	*n* Seg	%	*N*	*n* Seg	%
Non-Aboriginal men	11,254	2,741	24.4	7,507	1,778	23.7	3,747	963	25.7
Aboriginal men	2,653	911	34.3	1,760	610	34.7	893	301	33.7
Non-Aboriginal women	1,927	253	13.1	1,270	180	14.2	657	73	11.1
Aboriginal women	732	164	22.4	484	110	22.7	248	54	21.8
Total	16,701	4,083	24.4	11,110	2,685	24.2	5,591	1,398	25.0

Note. *n* Seg refers to the sample size placed in administrative segregation.

Table 4 presents the rate of segregation separated by the two types of reasons: jeopardize security and inmate's own safety. Offenders were twice as likely to be segregated for reasons of jeopardizing security (20%) compared to for their own safety (10%). For both segregation types, rates were highest for Aboriginal men and lowest for non-Aboriginal women. Rates of segregation for the inmate's own safety were extremely low and similar for both non-Aboriginal women (3.3%) and Aboriginal women (3.6%). There was also substantial overlap among the two types of segregation. Of the 4,083 offenders who were placed in administrative segregation, 60% were placed in segregation solely for jeopardizing security (n = 2,437), 18% were segregated solely for their own safety (n = 738), and 22% were placed in both types of segregation (n = 908).

Table 4

Rates of Segregation by Reason (Overall Population)

		Jeopardize security		Inmate in danger	
	N	*n* Seg	%	*n* Seg	%
Non-Aboriginal men	11,254	2,212	19.7	1,132	10.1
Aboriginal men	2,653	736	27.7	421	15.9
Non-Aboriginal women	1,927	232	12.0	64	3.3
Aboriginal women	732	152	20.8	26	3.6
Total	16,701	3,345	20.0	1,646	9.9

Predictor Identification and Reduction

The first step in developing a risk scale was to identify which items predicted admissions to segregation. These analyses used the development sample (N = 11,110) and tested the bivariate relationships with any segregation admission (either for the inmate's own safety or for jeopardizing the security of the institution). For each potential predictor variable, a logistic regression analysis was used to test whether the item was significantly related to segregation. Additionally, a second model was analyzed to test for an interaction between the item and Aboriginal ancestry. This would indicate whether the item predicted differently based on Aboriginal ancestry. A third model tested the interaction between the item and gender to see if the item predicted differently for women compared to men. When significant interactions were found, follow-up analyses tested whether the item was a significant predictor when restricted to Aboriginal or women offenders. These analyses were repeated for each of the individual reasons for segregation (inmate in danger versus jeopardize security).[3]

In this first step, 354 of the 413 variables (86%) significantly predicted any administrative segregation placement. Results were remarkably similar across both reasons for segregation, with fewer statistically significant results for segregation for the reason of inmate in danger, typically due to lower statistical power. These analyses did not demonstrate an empirical

[3] This means that for each of the 413 potential predictors, at least nine different logistic regression analyses were run. The results of these analyses are not included in this report but are available upon request.

need to develop separate scales for the two types of segregation. Subsequent analyses, therefore, examined only the overall segregation outcome (combining the two reasons).

Of the 413 items, 80 predicted differently for Aboriginal offenders compared to non-Aboriginal offenders (note that by chance due to Type I errors, 20 interactions would be expected to reach significance). Of these 80 items, 68 of them showed significantly lower predictive accuracy for Aboriginal offenders, although 34 of them still remained statistically significant in predicting segregation among Aboriginal offenders. For interactions with gender, nearly one third of the items (129) performed significantly differently for women. For the vast majority of these differences (104), the item performed better for women. Two items had lower predictive accuracy for women but were still significant. The remaining items were either no longer significant for women, or the pattern of findings switched directions.[4]

Although 354 of the predictor variables were significant, this was too many to enter into a single stepwise selection procedure in logistic regression to produce reliable results. This abundance of predictors provided a unique opportunity to construct a scale based on additional considerations as well as empirical relationships with segregation. These additional considerations included the ease of operationalizing the variable, scoring it reliably, access to reliable information, and face validity. For example, offenders with dietary problems were significantly less likely to be placed in segregation (odds ratio = .790, 95% CI .625, .999). This item had no face validity because there is no obvious reason why this relationship would be found (it likely reflects an underlying variable that correlates with dietary problems), and it would not make sense to try and increase dietary problems in offenders to reduce segregation placements. Consequently, this variable was removed.

From the 413 variables examined in the bivariate analyses, variables were removed for several possible reasons: the item was not a significant predictor of segregation (though items were kept if they performed better and were significant for either Aboriginal or women offenders), the effect sizes were too low to be meaningful (either an odds ratio below 1.2 for dichotomous predictors, or an AUC below .525 for all variables[5]), the item would be difficult to

[4] Most of the items that were non-significant or predicted in the opposite direction for women were variables related to sexual offending. Among men, items related to sex offending reduced the risk of being in segregation, whereas for women these variables were unrelated to segregation or increased the risk of segregation.

[5] Although an AUC of .560 is generally the benchmark for a small effect size, this was considered too strict to apply to individual items. In most risk scales, individual items show small relationships to the outcome; it is by combining these items that moderate to large predictive accuracy is achieved. It is possible that an effect in the small range

code reliably, or where it was unclear what was being measured by that item (i.e., concerns about face validity). These decisions were occasionally made by consulting with colleagues in CSC operations. Admittedly, this process was subjective; however, we considered it advantageous that the large and diverse range of significant predictor variables allowed for decisions based on more than solely empirical grounds. After this step was completed, 278 items with significant relationships to segregation remained.

Of the remaining items, it was apparent that there was meaningful overlap in the constructs being measured. To further reduce the set of predictor items, Principal Components Analysis (PCA) with promax rotation was used to group items into factors[6] (more detail on these analyses is provided in Appendix A). The items were grouped into 36 factors, with each factor having between 2 and 40 items. Additionally, 23 items did not load on any factor.

Subsequently, each factor was examined in more detail to make the factor more parsimonious, thereby reducing the item pool. This involved multiple tasks. Within each factor, attempts were made to improve predictive accuracy by combining items together or testing different definitions or combinations. Continuous predictors (e.g., age at admission, number of days in administrative segregation in previous federal sentence) were made into ordinal predictors so they would be easy to score by hand and have a similar weighting system as other items (e.g., ranging from 0 to 3 points).[7]

Next, multicollinearity was examined within each factor. Items were considered redundant when the correlations exceeded .70 (this is lower than the threshold of .80 that is often used in regression analyses because correlations among dichotomous items are artificially reduced). Decisions about which item to retain among a set of redundant items were guided by the effect size, although items were also preferred if they were perceived as easier to define or measure, or if they performed better or more consistently for the subgroups (i.e., for Aboriginal and women offenders).

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could meaningfully and uniquely contribute to predicting segregation. Consequently, items were removed only if their effect was considered notably small.

[6] Technically, PCA groups items into components (not factors). However, for ease of interpretation, the terminology of "factors" is used.

[7] Generally, this process involved dividing the values of the variable into 10-20 relatively equal-sized groups (e.g., for age, values were divided into 2-3 year intervals). Then, segregation rates for each group were examined, and groups with similar rates of segregation were combined until the variable was reduced to a small number of categories. AUC values were often examined during this process to guide decisions about the optimal cut-points for these items.

After items were refined and redundant items removed, a backwards elimination model selection logistic regression analysis was performed for each factor to further reduce the item pool. From these analyses, items were removed if they did not add unique predictive value. They were also removed if the direction of the effect reversed once other items were controlled for.[8] For each factor, these elimination procedures were conducted separately five times (for the overall development sample, as well as for non-Aboriginal men, Aboriginal men, non-Aboriginal women, and Aboriginal women). This resulted in five different sets of reduced variables within each factor, each one designed for a specific subgroup as well as the overall sample. Given the smaller sample size for Aboriginal women, a more liberal alpha criterion was used in model selection ($p < .10$). Additionally, given the large sample sizes for the other subgroups, some items had significant incremental predictive accuracy even though their removal led to a trivial difference in the AUC value for that factor. Subjective decisions were made about removing incremental items when their removal was considered to make little difference in the predictive accuracy.

This attempt to make the factors more parsimonious reduced the item pool to 91 items, which was still too many to enter into a single logistic regression model selection procedure without producing unstable results. Subsequently, factors were sequentially combined together into larger chunks and the same process was repeated: items were removed that were redundant or not adding unique predictive value with analyses conducted for the overall sample as well as each of the subgroups. This process was repeated until the data had been combined into three larger factors. This led to a final set of 45 potential scale items, although not all items were retained in each subgroup analysis. This left 27 predictors for the overall sample, 26 predictors for non-Aboriginal women, 19 for Aboriginal men, 18 for non-Aboriginal women, and 18 for Aboriginal women.

Scale Development

With the predictors decreased to a smaller number to facilitate interpretable multiple logistic regression analyses, it was possible to proceed with scale construction. Backwards

[8]Items were not removed solely on the basis of the bivariate direction of their relationship to segregation (i.e., possible protective factors were included in analyses). Instead, they were removed if the relationship reversed directions after controlling for other variables. Having a bivariate relationship in one direction and a relationship in the opposite direction for the final scale was considered difficult to interpret and in violation of the principle of face validity.

stepwise selection procedures in logistic regression were used to guide scale development, but were not the sole criteria that was considered. Depending on the subgroup being analyzed, statistical power varied substantially. Consequently, each potential model was explored by adding and removing items that were nearly incremental or were incremental but had smaller odds ratios than the other items. Additionally, exploratory analyses were used to develop empirically-informed rules for each scale option regarding how many items can be missing without experiencing a meaningful drop in predictive accuracy.

In scale development, the overriding principle that was used was that the simplest option was preferred as long it did not result in a meaningful loss of predictive accuracy. This also meant that simple item weights were favoured over more complicated procedures, such as using regression weights (e.g., Duwe & Freske, 2012) or the weighting method employed by Nuffield (1982). More complicated weighting systems have not been found to meaningfully improve predictive accuracy but will contribute to greater statistical shrinkage on cross-validation (Grann & Långström, 2007). Also, given that the previous interaction analyses found that items were likely to predict segregation across all subgroups, but not necessarily with the same magnitude of effect, more precise weighting systems would likely create complications when applied across different offender subgroups. Consequently, item weights were kept as simple as possible unless the evidence strongly supported an alteration. The only alteration that was justified by the data was for the item of current sentence length (after controlling for other items, the odds ratio for this item was much larger than all other items). Exploration of the data revealed an unusually strong difference in segregation rates for the two categories with the shortest sentence length (two years compared to more than two years but less than three years). Consequently, the item weights were changed from 0, 1, 2, 3 to 0, 2, 3, 4, effectively giving more weight to the difference between the first two categories.

Several scales were tested in the development sample; however, this report will present only the most promising options. The predictive accuracy of these options is presented in Table 5. The first option was a static risk scale (referred to as "Static Scale" in the tables) that can be scored with objective and commonly available information. This scale included 6 items: age at admission, number of prior convictions, whether the offender was placed in administrative segregation in a previous federal sentence, sentence length, criminal versatility, and prior convictions for violence (full item descriptions and scoring rules are in Appendix B). Items were

worth between 1 and 4 points each; total scores on this scale can range from 0 to 13. Analyses suggested that the only item that could be missing for this scale without meaningfully degrading predictive accuracy was for prior violent convictions. Consequently, total scores were calculated following these rules (i.e., cases with missing data on any other items were not included).

This scale had a very large effect size in predicting administrative segregation within two years of admission (overall AUC = .79). Predictive accuracy was similar for non-Aboriginal men (AUC = .79), non-Aboriginal women (AUC = .80), and Aboriginal women (AUC = .79), though it was slightly lower for Aboriginal men (AUC = .76), but still large.

Examining the individual items included in the static risk scale, all items demonstrated significant predictive accuracy for all of the subgroups (see Table 6). Tests of interactions, however, revealed that the items for prior convictions, prior admission to administrative segregation, criminal versatility, and prior violence had significantly lower predictive accuracy for Aboriginal offenders. Criminal versatility and prior violence had significantly higher predictive accuracy for women.

A second scale was developed using items from the DFIA/DFIA-R (as well as items assessing related constructs). Although it is referred to as a "dynamic" scale, it is important to note that many of the DFIA indicator items are not truly dynamic/changeable in nature (e.g., mother or father absent during childhood, early age alcohol abuse, combined the use of different drugs, diagnosed as disordered in the past). In this context, the dynamic scales are best considered as scales with items that are indicators of an underlying dynamic construct, or a psychologically meaningful construct (for an explanation of how both static and dynamic indicators can represent the same construct, see Mann, Hanson, & Thornton, 2010). For example, 'has combined the use of different drugs' is a static item but is clearly an indicator of substance abuse, which is a dynamic construct.

The optimal dynamic risk scale that was developed (referred to as "Dynamic Scale" in the tables) consisted of eight items, each scored dichotomously: has many criminal friends, has combined the use of different drugs, past diagnosis of "disordered," frequently acts in aggressive manner, attitudes support instrumental/goal-oriented violence, impulsive, no employment history, and disrespects personal/public/commercial property. These items are obtained directly from the DFIA, although the final item combines two DFIA items (disrespects personal

Table 5

Scale AUCs in Development and Validation Sample

	All subgroups				Non-Aboriginal men				Aboriginal men				Non-Aboriginal women				Aboriginal women			
	N	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI	
			LL	UL			LL	UL			LL	UL			LL	UL			LL	UL
Development sample: 2 years post-admission																				
Static scale	10,935	**.794**	.785	.803	7,396	**.788**	.776	.799	1,743	**.763**	.741	.786	1,249	**.805**	.771	.839	474	**.787**	.739	.834
Dynamic scale	10,306	**.722**	.711	.733	6,922	**.718**	.704	.731	1,700	**.681**	.655	.706	1,159	**.738**	.700	.777	458	**.710**	.654	.766
Static + dynamic item	10,192	**.798**	.789	.808	6,842	**.791**	.779	.803	1,685	**.768**	.746	.791	1,149	**.816**	.782	.850	449	**.805**	.758	.853
Subgroup dynamic scale	-	**-**	-	-	6,731	**.718**	.704	.732	1,649	**.710**	.684	.735	1,151	**.777**	.738	.816	455	**.751**	.698	.803
Static + subgroup dynamic	9,879	**.802**	.792	.811	6,657	**.793**	.781	.805	1,635	**.777**	.754	.799	1,141	**.829**	.796	.862	446	**.812**	.765	.860
Validation sample: 2 years post-admission																				
Static scale	5,501	**.801**	.788	.814	3,689	**.795**	.780	.811	885	**.768**	.736	.799	644	**.852**	.808	.896	244	**.743**	.669	.818
Dynamic scale	5,235	**.722**	.707	.737	3,493	**.709**	.691	.728	866	**.708**	.673	.743	603	**.796**	.746	.846	241	**.652**	.566	.737
Static + dynamic item	5,180	**.804**	.791	.817	3,455	**.795**	.779	.811	860	**.780**	.749	.812	594	**.866**	.822	.909	239	**.748**	.670	.826
Subgroup dynamic scale	-	**-**	-	-	3,410	**.710**	.691	.729	828	**.720**	.685	.756	599	**.764**	.704	.823	239	**.672**	.592	.751
Static + subgroup dynamic	5,021	**.804**	.791	.817	3,372	**.794**	.778	.811	822	**.781**	.749	.813	590	**.860**	.812	.907	237	**.772**	.697	.846
Validation sample: 1 year post-admission																				
Static scale	5,501	**.746**	.728	.763	3,689	**.739**	.718	.761	885	**.699**	.657	.741	644	**.820**	.764	.876	244	**.762**	.691	.834
Dynamic scale	5,235	**.695**	.675	.714	3,493	**.681**	.657	.705	866	**.683**	.638	.728	603	**.775**	.715	.835	241	**.692**	.581	.803
Static + dynamic item	5,180	**.749**	.731	.767	3,455	**.740**	.718	.762	860	**.710**	.667	.754	594	**.837**	.783	.891	239	**.765**	.681	.850
Subgroup dynamic scale	-	**-**	-	-	3,410	**.686**	.662	.711	828	**.695**	.650	.740	599	**.741**	.671	.812	239	**.730**	.640	.821
Static + subgroup dynamic	5,021	**.754**	.736	.772	3,372	**.744**	.721	.766	822	**.720**	.676	.764	590	**.833**	.774	.892	237	**.791**	.721	.861

Note. All AUCs are statistically significant ($p < .05$). AUC = Area under the curve; CI = confidence interval; LL = lower limit; UL = upper limit.

Table 6

Item AUCs in Development Sample

	All subgroups				Non-Aboriginal men				Aboriginal men				Non-Aboriginal women				Aboriginal women			
	N	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI		*N*	AUC	95% CI	
			LL	UL			LL	UL			LL	UL			LL	UL			LL	UL
Static scale																				
Age at admission	11,110	**.628**	.617	.639	7,507	**.627**	.614	.640	1,760	**.628**	.603	.652	1,270	**.608**	.570	.645	484	**.603**	.550	.657
Prior convictions	11,059	**.615**	.605	.626	7,481	**.610**	.598	.623	1,759	**.547**	.526	.568	1,262	**.649**	.609	.689	483	**.586**	.535	.637
Prior administrative seg	11,110	**.591**	.582	.600	7,507	**.593**	.582	.605	1,760	**.580**	.559	.602	1,270	**.566**	.538	.594	484	**.548**	.514	.582
Sentence length	11,110	**.658**	.647	.668	7,507	**.652**	.639	.664	1,760	**.666**	.642	.691	1,270	**.658**	.623	.693	484	**.668**	.618	.718
Criminal versatility	10,958	**.654**	.643	.666	7,404	**.657**	.643	.671	1,744	**.601**	.575	.628	1,257	**.669**	.625	.713	475	**.663**	.607	.718
Prior violence	10,419	**.618**	.608	.628	7,013	**.608**	.595	.621	1,719	**.552**	.532	.572	1,160	**.665**	.626	.704	459	**.605**	.554	.656
Dynamic scale																				
Many criminal friends	10,027	**.621**	.610	.632	6,721	**.620**	.607	.634	1,637	**.618**	.594	.642	1,149	**.564**	.524	.604	456	**.605**	.552	.657
Combined different drugs	10,122	**.586**	.574	.597	6,806	**.589**	.576	.603	1,662	**.540**	.515	.565	1,144	**.607**	.566	.647	445	**.591**	.537	.644
Past diagnosis disordered	8,189	**.548**	.538	.559	5,351	**.549**	.536	.562	1,261	**.540**	.518	.563	1,099	**.602**	.562	.643	419	**.568**	.516	.621
Frequently aggressive	10,260	**.644**	.633	.654	6,883	**.637**	.624	.650	1,699	**.604**	.581	.627	1,156	**.656**	.617	.696	456	**.620**	.568	.672
Instrumental violence attitudes	10,253	**.638**	.628	.649	6,876	**.634**	.621	.647	1,700	**.610**	.586	.634	1,155	**.604**	.568	.641	454	**.614**	.560	.668
Impulsive	10,357	**.577**	.569	.585	6,958	**.577**	.567	.586	1,715	**.545**	.530	.560	1,159	**.595**	.563	.627	458	**.544**	.505	.583
No employment history	10,288	**.559**	.551	.568	6,902	**.554**	.544	.564	1,700	**.559**	.540	.579	1,159	**.571**	.538	.604	459	**.609**	.557	.660
Disregards property	10,365	**.613**	.603	.624	6,968	**.609**	.596	.622	1,712	**.603**	.580	.627	1,159	**.596**	.557	.635	459	**.562**	.512	.611

Note. All AUCs are statistically significant ($p < .05$). AUC = Area under the curve; CI = confidence interval; LL = lower limit; UL = upper limit.

belongings, and disrespects public or commercial property). Analyses suggested that up to two items could be omitted without substantially altering the predictive accuracy. As such, the total score for this scale was calculated for cases with at least six of the eight items.

The dynamic scale had a large effect size in predicting administrative segregation (overall AUC = .72; see Table 5). Predictive accuracy was similar for non-Aboriginal men (AUC = .72), non-Aboriginal women (AUC = .74), and Aboriginal women (AUC = .71), but notably lower for Aboriginal men (AUC = .68; this would be considered a moderate effect size). Despite the good performance of this risk scale, all AUCs were substantially lower than for the static risk scale. Examining the items, all dynamic items had significant predictive accuracy for all subgroups of offenders (see Table 6), although two items had significantly lower accuracy for Aboriginal offenders (combined different drugs; frequently aggressive) and one item had significantly lower accuracy for women offenders (has many criminal friends).[9]

Logistic regression analyses found that the dynamic risk scale added significant incremental predictive accuracy to the static risk scale (N = 10,192 cases with both scales). After controlling for the static risk scale, each one-point increase in the dynamic risk scale increased the odds of segregation by 1.21 times (95% CI of 1.17 to 1.25, Wald = 144.2, $p < .001$). The incremental effect of the dynamic scale was, however, considered small; in comparison, after controlling for the dynamic scale, each one-point increase in the static risk scale increased the odds of segregation by 1.65 times (95% CI of 1.60 to 1.70, Wald = 923.5, $p < .001$).

Given the incremental effect, the next scale attempted to combine the static and dynamic scales together. Simply summing the two scales degraded the accuracy of the static risk scale because it overweighted the dynamic scale relative to its predictive accuracy. Instead, a new item was created based on the dynamic scale, and this item was added to the static scale. Offenders with 0 to 1 point on the dynamic scale were scored 0 on the new dynamic need item, offenders with 2 to 4 points on the dynamic scale received a score of 1 on the dynamic item, and offenders with 5 or more points on the dynamic scale received a score of 2. This new scale (the static scale plus the dynamic risk item; referred to as "Static + Dynamic Item" in the tables) produced an overall AUC (.80) only trivially higher than the AUC for the static risk scale alone (AUC = .79; see Table 5).

[9] Tests of differences based on gender and Aboriginal ancestry were from the earlier-discussed interactions in logistic regression.

Attempts were also made to develop risk scales specifically for Aboriginal men, non-Aboriginal women, and Aboriginal women. These scales followed the same procedures described above for the overall risk scales, but using only cases from the subgroup being examined, and using the sets of predictor variables that were narrowed down for that particular subgroup. Despite the finding that some of the static items showed significant differences in predictive accuracy among the subgroups, it was not possible to create static scales specific to each group that had meaningfully different predictive accuracy compared to the overall static scale. Additionally, attempts to develop an overall scale for each group (disregarding the distinction between static and dynamic risk factors) also did not yield higher predictive accuracy than the scales previously described.

It was possible, however, to create dynamic risk scales (i.e., using indicators of dynamic domains) that had meaningfully better predictive accuracy for the subgroups. For non-Aboriginal men, the optimal dynamic risk scale contained 11 items. For Aboriginal men, it contained eight items. For non-Aboriginal women, the optimal scale contained only six items, although one item was created by combining two related items (no employment history and unstable job history) to create an item with a three-point ordinal scale. For Aboriginal women, the optimal dynamic scale included nine items. Appendix C lists the dynamic items in the overall dynamic scale (presented above) as well as the scales specifically designed for each subgroup. There is moderate overlap in the items included in each scale, and more general overlap in the domains being assessed. Of the 22 items reflected in at least one of the dynamic risk scales, all but three were significantly predictive of segregation among all subgroups (exceptions are noted in Appendix C). This means that although the logistic regression models picked slightly different combinations of items to produce the most predictive scale, few of the items were truly unique predictors for any subgroup. Similar to the overall dynamic scale, missing information was allowed for up to two items.

From Table 5, the dynamic scale specifically developed for non-Aboriginal men (referred to as "Subgroup Dynamic Scale" in the table) had the same predictive accuracy as the overall dynamic risk scale (AUC = .72 for both). For the other subgroups, however, the dynamic scales developed for them all showed non-trivial improvement in AUCs compared to the overall dynamic scale (for Aboriginal men, the AUC increased from .68 to .71; for non-Aboriginal women, the AUC increased from .74 to .78; for Aboriginal women, the AUC increased from .71

to .75). Interestingly, the dynamic scale for non-Aboriginal women had the highest AUC despite having the fewest items.

As was done with the static and dynamic scales developed based on the overall sample, the next scale option explored adding an item reflecting overall dynamic need (0 = low, 1 = moderate, and 2 = high) to the static scale. This scale option represented the same static risk scale developed for all offenders, as well as a dynamic needs item, where the particular dynamic predictors contributing to that item were scored based on the dynamic scale that was designed specifically for that subgroup.[10] This means that the scale would differ between subgroups on the dynamic needs item.

Using this option, where the dynamic item was designed to optimize accuracy for the offender based on their gender and Aboriginal ancestry, the overall AUC was .80, which was the same as the static scale with the dynamic item that was the same for all offender types, and trivially higher than the static scale alone (AUC = .79). The scale with the subgroup-specific dynamic item performed slightly better for all subgroups compared to the static scale with the generic dynamic item, though the difference was generally small.

Validation Sample

The predictive accuracy of the five scales discussed so far (static scale, overall dynamic scale, static scale with an item reflecting dynamic need, dynamic scale designed specifically for each subgroup, and static scale with an item reflecting dynamic need specific to each subgroup) were examined in the validation sample (*N* = 5,591, although sample sizes per scale varied depending on missing information). The results of these scales in the validation sample are included in Table 5 (presented previously) so they can be easily compared with the results of the development sample. For the two-year observation period, almost all AUCs exceed the criteria for a large effect size (AUC = .71). The expectation was that the predictive accuracy would show some statistical shrinkage in the validation sample. However, the AUC for the static scale was slightly higher for the overall validation sample (AUC = .80 compared to .79 in the

[10] For non-Aboriginal men, the full dynamic scale could range from scores of 0-11. Scores of 0-4 were considered low needs, 5-7 were moderate needs, and 8+ were considered high needs. For Aboriginal men, the full dynamic scale could range from scores of 0-8. Scores of 0-2 were considered low needs, 3-5 were moderate needs, and 6+ were considered high needs. For non-Aboriginal women, the full dynamic scale could range from scores of 0-7. Scores of 0-2 were considered low needs, 3-4 were moderate needs, and 5+ were considered high needs. For Aboriginal women, the full dynamic scale could range from scores of 0-9. Scores of 0-2 were considered low needs, 3-4 were moderate needs, and 5+ were considered high needs.

development sample) and for all subgroups except for Aboriginal women, where the static scale shrank from an AUC of .79 in the development sample to .74 in the validation sample. Notably, however, Aboriginal women had the smallest sample size (n = 244 in the validation sample).

In the validation sample, all AUCs for all scale options were statistically significant and were generally similar in magnitude as the development sample (see Table 5). Some interesting patterns to note were that the dynamic scale performed not quite as well for Aboriginal men in the development sample compared to other groups (AUC = .68) but did better in the validation sample (AUC = .71). Comparing the dynamic risk scales developed specifically for each subgroup to the dynamic scale developed for the overall sample, the AUCs were almost identical for each subgroup, showing no real advantage to the static scale with the unique dynamic item. Interestingly, for non-Aboriginal women, the overall dynamic scale performed better (AUC = .80) than the dynamic scale specifically designed for that subgroup (AUC = .76). When predicting segregation placements for a shorter timeframe (within one year of admission; see Table 5), AUCs were generally lower (with the exception of Aboriginal women offenders), but remained moderate to large.

The scale options were also examined for the overall sample in terms of their ability to predict the two different types of segregation: jeopardizing security and inmate-in-danger (see Table 7). Similar patterns emerged (AUCs were similar for all scales except for the dynamic scale, which was lower), although AUCs were slightly lower for predicting segregations related to inmate in danger (which were much less frequent than segregation for reasons of jeopardizing security). For example, the AUC for the static scale was .80 for predicting jeopardizing security segregation and .75 for predicting inmate in danger segregation. All AUCs in Table 7 were statistically significant.

Choosing a Risk Scale

The static scale with the subgroup-specific dynamic item represented the most comprehensive scale and was the most responsive to subgroup differences. However, given that this scale did not show meaningfully improved accuracy over the simple static scale in the validation sample, and given that its use is substantially more complex and time-consuming, the static scale was chosen as the optimal scale for applied use. This scale was also chosen for

Table 7

Scale AUCs for Types of Segregation (Validation Sample)

	N	AUC	95% CI	
			LL	UL
Jeopardize security				
Static scale	5,501	.800	.786	.813
Dynamic scale	5,235	.724	.708	.740
Static + dynamic item	5,180	.802	.788	.816
Static + subgroup dynamic	5,021	.804	.790	.818
Inmate in danger				
Static scale	5,501	.746	.726	.765
Dynamic scale	5,235	.686	.664	.707
Static + dynamic item	5,180	.749	.728	.769
Static + subgroup dynamic	5,021	.749	.729	.770

Note. All AUCs are statistically significant ($p < .05$). AUC = Area under the curve; CI = confidence interval; LL = lower limit; UL = upper limit.

practical reasons such as the early availability of all information required to score the items (i.e., it does not require waiting up to 60 days for all intake assessments to be complete). The static risk scale was titled the RAST: Risk of Administrative Segregation Tool.

The RAST: Normative Data and Risk Categories

If the RAST is used in applied assessments, it is helpful to have normative information as well as criteria to determine nominal risk categories (e.g., low risk, moderate risk, high risk). To provide these descriptive data, the development and validation samples were re-combined into an overall sample (N = 16,436 cases with scores available on the RAST). Table 8 presents the average score on the RAST for the overall sample, as well as the subgroups. The scale can range from zero to a possible total score of 13, although the highest score in this dataset was 12. The average score was 6.5 (SD = 2.0). Aboriginal men scored 1 point higher on the RAST (M = 7.5) and non-Aboriginal women scored about 1 point lower (M = 5.4). This is consistent with the earlier finding that Aboriginal men generally had segregation rates about 10 percentage points

higher (34%) than the overall base rate (24%) and non-Aboriginal women had segregation rates about 10 percentage points lower (13%).

Table 9 presents basic descriptive information on the RAST. The columns present each possible score on the scale, the number of offenders who received that score (and the accompanying percentage of the total sample), the cumulative percentage, the percentage of offenders with that score who were placed in administrative segregation within two years post-admission, and the sensitivity, specificity, positive predictive power, and negative predictive power associated with that score. A score of 8 will be described as an example of how to interpret this information. In this sample, 2,437 offenders received a score of 8, which is 15% of the overall sample. Based on the cumulative frequencies, 78% of offenders would have received a score of 8 or lower. Of those offenders with a score of 8, 36% were placed in administrative segregation within two years of admission. If a score of 8 was used as the decision cut-off (i.e., all offenders scoring 8 and above would be predicted to end up in segregation), this cut-off would correctly classify 71% of offenders who were ultimately placed in segregation (sensitivity), and would correctly classify 75% of the non-segregated offenders as not placed in segregation (specificity). Additionally, this cut-off would mean that 48% of offenders with this score or higher would be placed in segregation (positive predictive power), and 89% of offenders with a lower score would not be placed in segregation (negative predictive power).

Table 8

Descriptive Statistics on the RAST

Group	*N*	*M*	*SD*
Non-Aboriginal men	11,085	6.51	2.30
Aboriginal men	2,628	7.52	2.00
Non-Aboriginal women	1,893	5.36	2.19
Aboriginal women	718	6.61	2.04
Total	16,436	6.54	2.30

Table 9

RAST: Normative Information and Selected Options for Risk Categories

									Different ways to develop risk categories			
Total score	*N* with score	% with score	Cumulative %	Seg rate (%)	Sensitivity (%)	Specificity (%)	Positive predictive power (%)	Negative predictive power (%)	Accuracy	±1 SD	Absolute	PPP NPP
0	84	0.5	0.5	0.0	100.0	0	24.6	-	LOW	LOW	LOW	LOW
1	166	1.0	1.5	0.0	100.0	0.7	24.8	100.0	LOW	LOW	LOW	LOW
2	513	3.1	4.6	1.4	100.0	2.0	25.0	100.0	LOW	LOW	LOW	LOW
3	990	6.0	10.7	2.7	99.8	6.1	25.8	99.1	LOW	LOW	LOW	LOW
4	1,465	8.9	19.6	4.2	99.2	13.9	27.4	98.1	LOW	LOW	LOW	LOW
5	2,106	12.8	32.4	8.8	97.6	25.2	29.9	97.0	LOW	MOD	LOW	LOW
6	2,500	15.2	47.6	13.0	93.0	40.7	33.9	94.7	LOW	MOD	LOW	LOW
7	2,597	15.8	63.4	21.8	85.0	58.3	40.0	92.2	MOD	MOD	MOD	LOW
8	2,437	14.9	78.2	35.5	71.0	74.7	47.9	88.7	MOD	MOD	MOD	LOW
9	2,040	12.4	90.6	49.4	49.7	87.4	56.3	84.1	HIGH	HIGH	MOD	LOW
10	1,134	6.9	97.5	61.6	24.8	95.7	65.4	79.6	HIGH	HIGH	HIGH	HIGH
11	359	2.2	99.7	74.4	7.6	99.2	76.0	76.6	HIGH	HIGH	HIGH	HIGH
12	45	0.3	100.0	88.9	1.0	99.9	88.9	75.2	HIGH	HIGH	HIGH	HIGH
Total	16,436	100.0	100.0	24.6								
AUC									.766	.738	.686	.603

AUC = Area under the curve; PPP = positive predictive power; NPP = negative predictive power.

Total scores on risk assessment scales are commonly used to group offenders into nominal risk categories (e.g., low risk, moderate risk, high risk). Most risk scales have 3, 4, or 5 nominal risk categories. In other risk scales, the criteria for designating these risk categories have been fairly arbitrary (Babchishin & Hanson, 2009). Some scales create nominal risk categories with no justification (e.g., Static-99; Hanson & Thornton, 2000). For other scales, the justification has been as simple as creating categories based on deciles (e.g., VRAG/SORAG; Quinsey, Harris, Rice, & Cormier, 2006). Not surprisingly then, there is little consensus on what is meant by "low," "moderate," or "high" risk (Hilton, Carter, Harris, & Sharpe, 2008) and it is not uncommon for offenders to be placed in different nominal categories based on different yet similar scales (Barbaree, Langton, & Peacock, 2008; Mills & Kroner, 2006).

Clearly, there is no "correct" way to develop nominal risk categories; instead, these decisions should be guided by the way in which the tool is used in practice (e.g., if a correctional system has the resources to refer 20% of their offenders to a high-intensity treatment program, then it would make sense to define high risk as the top 20% of risk scores). It is important, therefore, to articulate how risk categories have been established, and to link them to non-arbitrary definitions. These non-arbitrary definitions could be based on criteria such as percentiles, risk ratios, or absolute risk values (e.g., greater than 50% risk of the outcome; Hanson, Lloyd, Helmus, & Thornton, 2012).

An important question is whether separate risk categories are needed for different subgroups of offenders, given that Aboriginal men had the highest risk of segregation and non-Aboriginal women had the lowest risk. Figure 1 plots the rates of segregation associated with each risk score on the RAST, separated by subgroups. For scores of 0 through 9 (which represent 91% of the total sample), the rates of segregation per risk score were remarkably similar across the four subgroups. Some differences emerged for the highest risk scores, but the sample sizes were too small (particularly in the subgroups of women) to provide meaningful estimates of segregation rates for those scores. Overall, the graph suggests that the different rates of segregation among the subgroups are adequately addressed by the risk scale, such that there is no empirical benefit for different risk category cut-offs for the different subgroups. There may, however, be policy benefits for employing different cut-offs. For example, even though women offenders are at lower risk for segregation than men, it may be desirable to offer

interventions to a similar proportion of women compared to men, which would suggest using a lower cut-off score as a threshold for offering interventions for women.

Figure 1. Rates of segregation for each score on the RAST as a function of gender and Aboriginal ancestry.

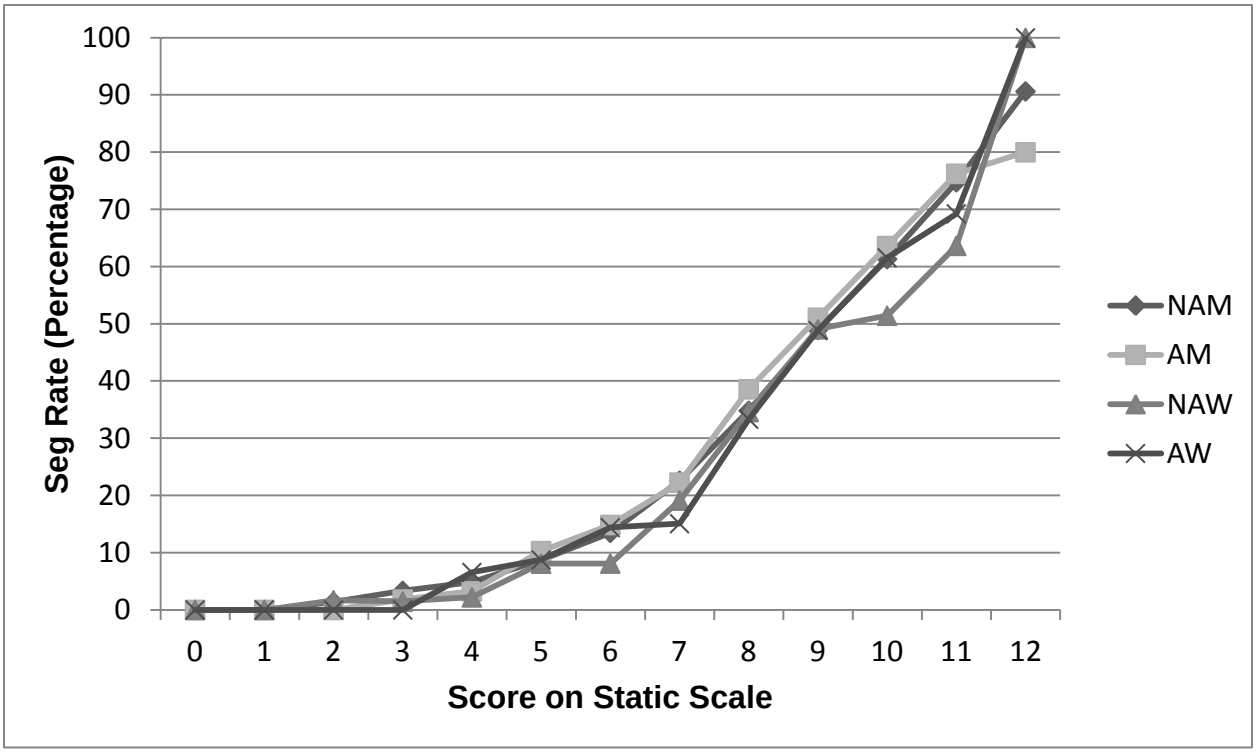

Figure Note. NAM = Non-Aboriginal men; AM = Aboriginal men; NAW = Non-Aboriginal women; AW = Aboriginal women.

The optimal risk categories for the RAST will depend on how the scale is used in applied practice. Nonetheless, some possibilities were explored using different criteria. These options and their associated AUCs (in the overall sample) are also included in Table 9. The first risk category option was developed in the same way as the risk categories for the Static-2002 (Hanson & Thornton, 2003) were developed (Helmus, 2007). Namely, risk category options were explored to maximize predictive accuracy while following the general principles that each risk category should have a sufficient minimum sample size (ideally at least 10% of the overall

sample) and the cut-points should ideally reflect large and meaningful increases in rates of segregation. This first risk category option (referred to as "Accuracy" in the table) would classify offenders with scores of 0-6 as low risk, 7-8 as moderate risk, and 9+ as high risk. The cut-point between low risk (score of 6) and moderate risk (score of 7) had two primary advantages that made it a natural cut-point with a non-arbitrary definition. Firstly, it was one of the largest relative increases in segregation rates, with the rate nearly doubling (13% of offenders with a score of 6 were placed in segregation, compared to 22% of offenders with a score of 7). Also, it meant that all scores in the low risk group were associated with segregation rates meaningfully lower than the overall sample average (24.6%). The cut-off score for high risk offenders was chosen because it represented another large, meaningful increase in segregation rates (from 36% to 49%) and it appeared to optimize predictive accuracy. This option would classify 48% of the sample as low risk, 30% as moderate risk, and 22% as high risk. This three-category distinction had an AUC of .77, which was only slightly lower than the AUC for the total score (.79).

Other risk category options were also explored. For a distinction based on percentile distributions, a criteria commonly used in medical fields is scores that are one standard deviation away from the mean (Binder, Iverson, & Brooks, 2009). Using a standard deviation to distinguish low (0-4), moderate (5-8), and high (9+) risk categories (referred to as "$\pm$1 SD" in the table) yielded an AUC of .74.

Another option was explored based on absolute risk thresholds. The same low risk category was used as the first option (scores of 0-6, reflecting offenders with segregation rates meaningfully lower than the base rate). High risk offenders were described as those more likely than not to be placed in segregation (rates higher than 50%), which included scores of 10 and above. This option had an AUC of .69.

A final option was explored with two risk categories. Having three risk categories makes sense if the scale is used to distinguish between three levels of supervision/support. For example, low risk offenders do not need any support/intervention to avoid segregation, moderate risk offenders may need some additional support, and high risk offenders may need more extensive support and interventions to reduce their risk of being placed in segregation. If, however, the scale is used to identify a group of offenders who will all receive the same level of additional support and intervention, compared to other offenders who receive nothing, then a two-category

distinction is all that is necessary. Attempting to find the best trade-off in positive and negative predictive power might lead to using a score of 10+ to designate offenders as high risk. This would identify the top 9% of offenders with more than a 60% chance of being placed in segregation. This distinction may be useful for applied practice, although the AUC decreased to .60 (not surprising given that over 90% of offenders were treated as having the same risk of segregation).

Clearly, there are several options available for designating nominal risk categories. Options can be developed with different goals or criteria in mind, and may have unique strengths or limitations. If this scale is adopted by CSC, the authors recommend that the selection of nominal risk categories should be clearly articulated and based on how the scale will be used in practice.

Discussion

The initial goal of this research was to determine the feasibility of developing a scale to identify an offender's risk of being placed in administrative segregation. The large and diverse number of variables that significantly predicted this outcome (> 350) demonstrated that this goal was feasible; moreover, it was practical (i.e., high predictive accuracy could be achieved using information that is already available for each offender). The plethora of significant predictors available allowed for the creation of a scale guided by considerations other than just statistics. Potential scale items were refined by considering overall predictive accuracy, stability of predictive accuracy among offender subgroups, face validity, practical considerations (i.e., availability of information and ease of scoring), and incremental accuracy (i.e., unique contribution over other predictors).

A simple six-item static risk scale (called the RAST) was able to predict admission to administrative segregation for at least six consecutive days for reasons of jeopardizing security or the inmate's own safety, within two years of admission, and evidenced a very large effect size. This straightforward scale showed similarly large predictive accuracy for non-Aboriginal men, Aboriginal men, non-Aboriginal women, and Aboriginal women. Furthermore, each item was also a significant predictor for each subgroup. More comprehensive assessment scales were tested but did not provide meaningfully better accuracy than the RAST. Additionally, the scale also showed large effect sizes in predicting both subtypes of segregation (jeopardize security or inmate in danger) and in predicting segregation placements within one and two years of admission. There was no evidence of statistical shrinkage in a large validation sample. Together, these findings suggest this static risk scale is robust across different groups of offenders, segregation types, and observation periods.

There are several advantages to adopting a static risk scale in practice. Simple demographic and criminal history items can be scored quickly after intake, not requiring detailed file review, offender interviews, or collateral contacts. More comprehensive scales that use information from the DFIA assessment would require waiting up to 60 days post-admission to be completed. Given that approximately 20% of offenders who will be placed in segregation are admitted within 60 days of intake, a more comprehensive scale would preclude early identification and intervention for a meaningful portion of offenders at risk. Also, it would be

ideal to have a scale that is not time-consuming to score and does not place an undue burden on staff. The current items can be scored in minutes.

The large effect sizes and robustness of the scale across different observation periods and offender subgroups may reflect the extensive analyses leading to scale development (the 6-item scale was selected from 413 candidate variables) and the use of simple item weights that guarded against overfitting. Simple item weights (e.g., 0, 1, 2) have the advantages of being easier to score by field staff (reducing the risk of calculation errors) and are more generalizable across subgroups. The analyses found that most items predicted across all offender subgroups. However, the size of the effect did show variability. For example, many items had significantly lower predictive accuracy for Aboriginal offenders, and significantly higher accuracy for women. Developing item scores based on the size of their relationship to segregation would overfit the data to non-Aboriginal men (the largest subgroup in scale development) and would reduce the applicability to other offender groups. It would also likely reduce the applicability to new samples/populations.

Attempts to develop risk scales specifically for subgroups (i.e., Aboriginal men, non-Aboriginal women, and Aboriginal women) were not particularly successful. In other words, specialized scales did not have consistent or meaningful advantages (in terms of predictive accuracy) over the overall scales that were developed. There are two possible reasons for this. The first reason is that, compared to how other risk assessment scales have been developed, the overall scales developed to predict segregation were more responsive to differences across gender and Aboriginal ancestry. Although analyses were combined for all offender groups, women were deliberately over-sampled, and initial analyses explored differences across gender and Aboriginal ancestry groups, which informed subsequent decisions about which items to retain or remove.

Another potential reason for the lack of success of the specialized scales pertains to overfitting. In the development sample, for example, it was possible to create a dynamic risk scale specifically for non-Aboriginal women that had meaningfully higher accuracy than the dynamic scale that was developed on all offenders. Upon cross-validation, however, the specialized scale had meaningfully lower predictive accuracy than the general scale. This finding suggests that attempts to develop scales specific to women reflected capitalization on chance (i.e., overfitting) rather than stable differences between subgroups. Future research on unique risk scales should consider not just whether it is possible to create scales for a specific

subgroup, but whether these scales show better performance than standard practice in new validation samples.

It was also surprising that the same sets of predictors generalized well to two seemingly different reasons for segregation placements: for the inmate's own safety and for the safety of the institution. There were trivial differences in which variables predicted these reasons for segregation and in the size of the effects. This consistency can likely be explained by the amount of overlap in the two reasons for segregation (e.g., 22% of offenders placed in segregation were placed in segregation at some point for both reasons).

This study also provided normative data on the RAST for a large sample (N > 15,000). This information is useful in communicating risk information about the scale (e.g., provides predicted rates of segregation associated with each score), and can also be used to guide decisions about creating nominal risk categories. A few options for risk categories were presented, but they are not exhaustive. Ideally, the final selection of nominal risk categories (e.g., low, moderate, high) will be clearly articulated, non-arbitrary, and linked to how the scale is used in practice. Notably, these requirements do not mean that the risk categories must be permanent. As the correctional system evolves and resources for diversion efforts increase or decrease, the optimal risk categories may change.

To our knowledge, this is the first attempt to develop a tool to predict admissions to administrative segregation. Given the limited research on factors associated with segregation placement, a large and diverse group of predictor variables were examined, most of which were significant. Not surprisingly, the variables with the largest and most robust relationships with segregation tended to fall under the general domains of the Central Eight risk factors (specifically, criminal history, procriminal personality pattern, procriminal attitudes, procriminal associates, family/marital difficulties, school/work difficulties, leisure/recreation problems, and substance abuse; Andrews & Bonta, 2010), and they also matched the findings from earlier studies profiling segregated offenders (Motiuk & Blanchette, 1997; Wichmann & Nafekh, 2001; Wichmann & Taylor, 2004). Previous meta-analytic research has found that these general risk factor domains predict a variety of outcomes, including general recidivism (for a summary of meta-analyses, see Andrews & Bonta, 2010), violent offending (Lipsey & Derzon, 1998), sexual recidivism (Hanson & Morton-Bourgon, 2004; Mann et al., 2010), and institutional misconducts (Gendreau et al., 1997). This study found the same sets of risk factors are applicable when predicting administrative segregation. This is not altogether surprising given that, similar to

other types of criminal behaviour, transfers to segregation likely reflect problems adjusting to the rules and norms of society, and specifically, the rules and norms expected in a penitentiary environment.

The primary strengths of this study include the large sample size and diverse set of predictors that were examined. This allowed for the development of a tool based on considerations of empirical associations, as well as face validity and ease of use. Each step in developing the scale also took into account differences based on gender or Aboriginal ancestry, in the hopes of creating a tool that would be valid for these groups. Furthermore, these decisions were also guided by consultations with a CSC Working Group that included experts in the area of women offenders, Aboriginal offenders, and mental health. This increased our ability to include gender-informed and culturally-sensitive considerations, and to consider operational relevance. Numerous approaches to scale development were explored, allowing an informed decision about the advantages and disadvantages associated with different approaches. Additionally, a large validation sample allowed for cross-validation of the scale and additional analyses to explore how the scale generalized to subgroups.

Some limitations should be noted. In order to over-sample women, data were obtained dating back to 1999. This means the sample of women is not as recent as the sample of men. This study also did not address *why* the offenders were placed in segregation (such an investigation would require examination of the reports completed upon placement in segregation). Additionally, the scope of this scale development was restricted in several ways. Firstly, only administrative segregation incidents for reasons of jeopardizing security or inmate in danger were examined. The outcome was restricted to placements in segregation of at least six days duration. Without new validation studies, it is unknown whether the scale would be applicable to other types of segregation or to shorter stays in segregation. This scale was also designed specifically to be used at intake. As such, no attempts were made to explore changes in risk for segregation over the period of incarceration, or to develop a scale that would reflect such changes. With future research, it may be possible to create revisions to this scale that would be capable of assessing changes in risk.

Another important limitation is that this study looked exclusively at individual-level predictors of segregation placements. It is possible that institutional factors may play an important role in segregation placements, or that the strength of some of the predictor-outcome relationships may vary across different types of institutions (e.g., based on region, security level,

or social climate). Future research could benefit by exploring some of these factors in more detail.

Conclusions and Implications for Practice

The RAST is a simple six-item static risk scale that can be scored immediately upon admission and can predict administrative segregation placements within two years of admission with large effect sizes. Upon validation, the RAST was found to be robust across different subgroups, types of segregation, and length of observation periods. This scale could be scored upon admission to a CSC institution with little time investment from correctional staff, and can identify a small group of offenders who have a high probability of being placed in segregation. The current study used a validation sample by extracting the relevant information from OMS. The next step would be to validate the scale in an applied setting. This would determine whether appropriately trained staff are able to score the items correctly in an applied setting with a similar level of predictive accuracy.

Using a risk scale for early identification of offenders who are at risk of being placed in segregation creates important opportunities to provide these offenders with additional support and intervention in their adjustment to federal incarceration and reduce their risk of being placed in segregation. Identifying and diverting offenders from administrative segregation has benefits not just for the offenders (e.g., avoiding negative effects of segregation), but also for the institution (e.g., fewer setbacks to the correctional plan, cost savings), and for public safety (e.g., better adjustment to incarceration can help offenders focus on their correctional plan, potentially leading to quicker releases and safer transitions to the community).

The optimal methods of intervening and diverting offenders from segregation are not currently known. Strategies to reduce segregation placements among the highest-risk offenders could include a variety of approaches, such as prioritizing these offenders for early placement in correctional or mental health programs should they meet the criteria, increasing the frequency of meetings with case management staff, and referring offenders to resources such as psychology departments, Aboriginal Elders, chaplains, or inmate peer support groups. Future research is needed to determine the relative effectiveness of such strategies in preventing segregating placements. Current knowledge on correctional practice, however, suggests that intervention efforts should be more effective if the dosage of interventions is proportional to the risk of offenders, if the interventions target key dynamic risk factors related to segregation placements,

and if they are tailored to the needs and learning styles of the offender (Andrews et al., 1990). Although the RAST contains only static risk factors, it is still possible to target interventions based on knowledge of the presence of dynamic risk factors related to segregation placements. There were numerous dynamic risk factors which were not included in the scale, but which nonetheless predicted placements in administrative segregation. These factors could be used to guide case management and intervention decisions to reduce segregation placements. Appendix D summarizes key dynamic risk factors that were predictive of segregation placements and were applicable to Aboriginal and women offenders as well. As mentioned earlier, these factors largely followed the Central Eight risk factors described by Andrews and Bonta (2010), suggesting that interventions that already exist in CSC could be helpful in addressing risk for segregation as well.

These dynamic risk factors should not, however, be used to change or override RAST scores. There is no current research examining how changes in these dynamic risk scores relate to changes in segregation risk. It is possible that future research will allow for the creation of structured rules to adjust initial risk ratings based on change in dynamic risk factors. Until then, information on dynamic risk factors and change over time may be considered but should not affect the RAST score.

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Appendix A: Description of Factor Analysis

Principal Components Analysis (PCA) is a statistical technique that is often considered a form of factor analysis, although it has some important differences (Tabachnik & Fidell, 2007). Both techniques attempt to identify whether a set of variables can be organized into underlying constructs that are relatively independent of each other (i.e., they provide a conceptual way of summarizing correlations among variables). Specifically, factor analyses identify underlying factors based on analyses of covariance among the items. PCA, on the other hand, identifies underlying components based on analysis of total variance in the data (covariance among items, error variance, and unique variance). PCA is a more appropriate choice for providing a simple empirical summary of a dataset (e.g., to reduce a large number of variables into a manageable set of components).

Although there are serious limitations to using any type of factor analysis for dichotomous items (Kubinger, 2003), this technique was considered adequate for our purposes because our intent was to group variables to assist in data reduction and not to identify a replicable underlying factor structure. Despite these limitations (and possibly due to the large sample size), the components had excellent face validity and were considered useful for grouping variables for continued analyses. Following Tabachnik and Fidell (2007), items were considered to load on a component if the standardized regression coefficients were at least .32 (items loading on multiple components were grouped with the component of their highest loading).

One challenge was that PCA uses listwise deletion to deal with missing values. In other words, the analysis is restricted only to cases with information on all variables. Unfortunately, no offender had information on all variables (this was primarily because some offenders were assessed with the original DFIA and others with the DFIA-R). This meant it was not possible to conduct a single PCA using all variables and all cases. Instead, a primary PCA was conducted using 260 of the 278 variables (items that were unique to the revised DFIA-R were excluded). For these analyses, only 2,003 of the 11,110 development cases were included (the remaining cases would have had missing information on at least one item). A subsequent PCA was run on 77 items from the revised DFIA, where 59 of the items in this analysis had been included in the previous PCA (the remaining 18 items were unique to the DFIA-R). Results of these two analyses were subjectively synthesized.

Appendix B: Risk of Administrative Segregation Tool (RAST) Coding Form

1.	Age at admission	0 = 50+ 1 = 40-49.9 2 = 25-39.9 3 = Less than 25	
2.	Prior convictions	0 = 0 to 1 prior conviction 1 = 2 to 4 prior convictions 2 = 5 or more prior convictions	
3.	Admission to administrative segregation in previous federal sentence	0 = no previous admissions 1 = admitted to administrative segregation in a previous federal sentence	
4.	Sentence length	0 = 2 years 2 = more than 2 years but less than 3 years 3 = 3 years up to (but not including) 10 years 4 = 10 years or more (including indeterminate sentences)	
5.	Criminal versatility in current convictions	Check off each category of offence that the offender has a conviction for (in the current offences only). ___ Abduction/kidnapping ___ Administration of justice (e.g., fail to comply…) ___ Public order offences ___ Weapons/explosives ___ Assault ___ Robbery ___ Property offences (includes B&E, theft, and other property offences) Now, total up the number of categories represented by the current convictions and assign a score for this item. 0 = 0 categories 1 = 1-2 categories 2 = 3 or more categories	
6.	Prior conviction for violence	0 = no prior convictions for a violent offence 1 = prior conviction for a violent offence	
	TOTAL SCORE	Sum the scores from all items (Possible range: 0 to 13)	

Note. For information on how to score the RAST items, please review the RAST scoring manual

Appendix C: Items in Dynamic Risk Scales

	Overall	Non-Aboriginal men	Aboriginal men	Non-Aboriginal women	Aboriginal women
Has many criminal friends	Y		Y		
Affiliated with a gang or organized crime		Y	Y		Y
Has combined the use of different drugs	Y	Y			Y
Dissatisfied with current relationship					Y
History of suicide attempts or self-injury					Y
Received outpatient services in the past				Y	
Diagnosed as disordered in the past	Y				
Frequently acts in aggressive manner	Y	Y	Y	Y	Y
Low frustration tolerance				Y	
Difficulty solving interpersonal problems					Y
Attitudes support instrumental/goal-oriented violence	Y	Y	Y	Y	
Engages in thrill-seeking behaviour			Y		
Hostile		Y			Y
Impulsive	Y	Y			
Difficulty setting long-term goals		Y			
Did not graduate high school		Y			
Lacks skill area/trade/profession		Y	Y		
Has no employment history	Y	Y	Y	Y[a]	Y
Job History unstable				(combined)	
Disrespects personal, public, or commercial property	Y	Y	Y		
Displays negative attitudes to correctional systems				Y	
Has concentration problems					Y

Table notes. Y = This item was included in the scale for this group of offenders. [a] = In this scale, the items of "no employment history" and "job history unstable" were combined into a single item measured on a 3-point scale (0 = stable job history, 1 = unstable job history, 2 = no job history).
Although not all items were retained in all scales, the items significantly predicted segregation for all offender subgroups, with few exceptions. The item reflecting dissatisfaction with current relationship significantly predicted segregation only for female offenders (Aboriginal and non-Aboriginal). Having received outpatient services in the past did not predict for Aboriginal male offenders. Lastly, having not graduated high school was not predictive for Aboriginal offenders (male or female).

Appendix D: Dynamic Risk Factors Related to Administrative Segregation Placements

This appendix provides a list of selected dynamic factors (currently being assessed by the DFIA-R; see CSC, 2012) that are related to risk of being placed in administrative segregation. These items were predictive for Aboriginal offenders and for women as well. These factors are intended to guide case management decisions – they should NOT be used to revise the RAST score.

Risk of being placed in administrative segregation increases with the presence of the following risk factors (organized by DFIA-R domain):

Employment

- Has no high school diploma
- Dissatisfied with job skills
- Has no employment history
- Job history unstable
- Marketable job skills obtained through formal training are limited
- Work ethic can be described as poor

Family relationships

- Inability to maintain enduring intimate relationship

(General note: Family variables tended to show small relationships with segregation relative to the associates domain – the latter should be a more important focus).

Associates

- Associates with substance abusers
- Prosocial family support is limited
- Has many criminal acquaintances
- Has many criminal friends
- Affiliated with a gang or organized crime

Substance abuse

- Frequently engages in binge drinking
- Alcohol use interferes with employment
- Alcohol use interferes with interpersonal relationships
- Excessive alcohol use is part of the offender's lifestyle
- Regular drug use is part of the offender's lifestyle
- Becomes violent when drinking or using drugs

(Note: Alcohol-related variables demonstrated consistent but small relationships to segregation. Drug use appeared to be a more important predictor).

Community functioning

- Constructive leisure activities are limited

Personal/emotional

- Difficulty solving interpersonal problems
- Ability to generate choices is limited
- Difficulty setting realistic goals
- Impulsive
- Empathy skills are limited
- Displays narrow and rigid thinking
- Frequently acts in aggressive manner
- Frequently interprets neutral situations as hostile
- Time management skills problematic
- Low frustration tolerance
- Hostile
- Engages in thrill-seeking behaviour
- Manipulates others to achieve goals

Attitudes

- Displays negative attitudes towards criminal justice system
- Displays negative attitudes towards correctional system
- Takes pride in criminal exploits
- Values a substance-abusing lifestyle
- Disrespects personal belongings
- Disrespects public or commercial property
- Attitudes support instrument/goal-oriented violence
- Attitudes support expressive/emotional violence
- Difficulty setting long-term goals