This article appeared in the newsletter for the Association for the Treatment of Sexual Abusers, *The Forum*, *21* (1), Winter 2009, p. 38-45.

Reporting Static-99 in Light of New Research on Recidivism Norms

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Static-99 (Hanson & Thornton, 2000) is a 10-item actuarial risk assessment scale designed to predict sexual and violent recidivism in male adult sexual offenders. It is the most widely used risk assessment tool for sexual offenders (Archer et al., 2006; Jackson & Hess, 2007; McGrath, Cumming, & Burchard, 2003) and also the most widely researched, with 63 replications demonstrating, on average, moderate predictive accuracy (ROC = .68, Hanson & Morton-Bourgon, in press).

Total scores on Static-99 can be translated to relative risk categories (low, moderate-low, moderate-high, and high) and each score is associated with an estimated probability of recidivism, developed based on survival analysis from three samples (***n*** = 1,086). Although the ability of Static-99 to rank relative risk has received considerable support, there has been much less research examining the stability of the absolute recidivism rates. The vast majority of offenders used to derive the original Static-99 recidivism estimates were released in the 1960s, 1970s, and 1980s. Given the broad cultural changes during the past 40 years, it is important to consider whether the recidivism rates of sexual offenders have remained the same during that time.

Crimes rates peaked in the early 1990s and have been generally declining since then. This trend has been found for both violent and property offences in Canada (Public Safety Canada, 2007) and the United States (Federal Bureau of Investigation, 2007), using both official crime data as well as victimization surveys (Bureau of Justice Statistics, 2006). Sexual offences appear to be no exception. Declines have been observed in the rates of forcible rape (Federal Bureau of Investigation, 2007), clergy sexual abuse (Terry, 2008), and child sexual abuse measured both by substantiated cases as well as victimization surveys (for a summary, see Finkelhor & Jones, 2006; Jones & Finkelhor, 2006). Recent data from Minnesota (***n*** = 1,782; Minnesota Department of Corrections, 2007) show a dramatic decline in three-year rates of sexual rearrest, reconviction, and reincarceration.

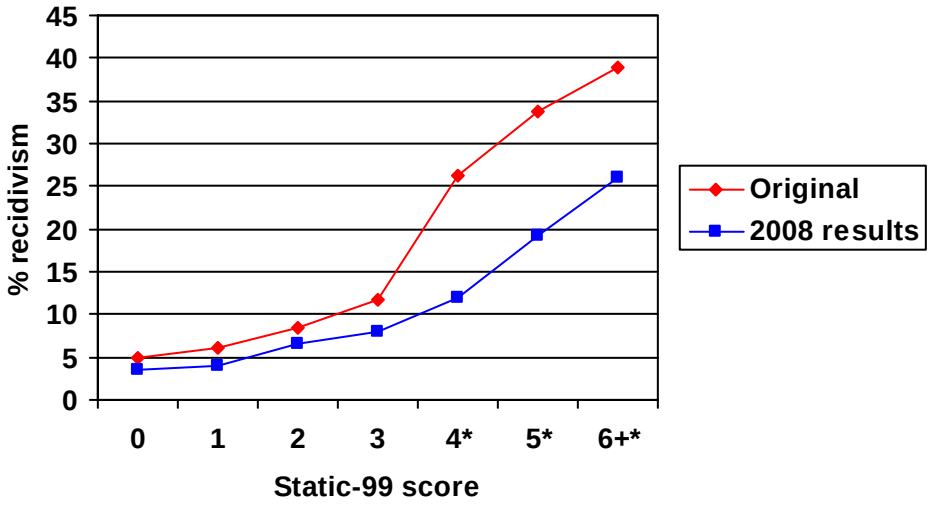
Experts have yet to come to a consensus concerning the reasons for the decline; although, it is unlikely that a single factor is responsible. Possible explanations that have been proposed include demographic factors (e.g., aging population, increased obesity, reliance on medications such as Prozac or other serotonin-affecting agents), cultural factors (e.g., changing mores regarding sexuality, increased awareness about sexual assault leading to greater vigilance and supervision of children), and criminal justice system factors (e.g., offender treatment, increased supervision, deterrent/incapacitation effects of longer sentences—for a summary, see Finkelhor & Jones, 2006).

Evidence of declining crime rates leads to two important, but distinct areas of research: one examining the causes of changing crimes rates, and the other examining how changes affect best practices in offender assessment, management, and supervision. Even without understanding the reasons for the change, the evidence of change forces evaluators to adjust their practice.

Currently, we are in the process of examining the extent to which the original norms apply to recent samples. So far, we have collected datasets from 28 Static-99 replications, of which 18 have been cleaned and merged (***n*** = 6,774). Of the 18 samples, 8 are Canadian (***n*** = 2,271), 4 are from continental Europe (***n*** = 2,416), 4 are from the United States (***n*** = 1,028), and one each are from New Zealand (***n*** = 493) and the U.K. (***n*** = 198). Of 16 datasets with information on year of release (***n*** = 6,114), 90% of offenders were released in 1990 or later, representing much more current samples than those used in the original Static-99 norms.

Figure 1 displays five-year sexual recidivism rates (generated through survival analysis) of the new samples (***n*** = 6,406) and the original Static-99 samples (***n*** = 1,086). For each Static-99 score, recidivism rates are lower in the new sample, and the difference is particularly meaningful for scores of 4+. Cox regression analyses found that, in the new samples, sexual recidivism was two-thirds (66%) the rate of the original samples. When we controlled for Static-99 scores, the difference increased, with offenders in the current samples showing 59% the rate of sexual recidivism as compared to offenders in the original samples. In both analyses, the difference was significant.

Figure 1: Five-year sexual recidivism rates for Static-99 based on survival analysis



For violent (including sexual) recidivism, after controlling for Static-99 scores and offender type (rapist versus child molester), Cox regression found that violent recidivism rates were significantly lower in the current samples as compared to the original samples, with offenders in the newer samples showing approximately 73% the violent recidivism rate of offenders in the original samples (***n*** = 5,192).

Our basic conclusions and recommendations

Sexual and violent recidivism rates per Static-99 score are significantly lower in our data than they were in the samples used to develop the original Static-99 norms (reported in Harris, Phenix, Hanson, & Thornton, 2003). Even though we have yet to finish our analyses, the evidence is sufficiently strong that we believe the new norms should replace the original norms. Compared to the original norms, the new norms are based on more offenders, more complete data, and more recent, representative samples.

How to use the new norms

Unfortunately, updating the Static-99 norms is not as simple as substituting new numbers into the recidivism tables. In our samples, we found significant differences in recidivism rates within the same Static-99 score. Controlling for Static-99 scores, the sexual recidivism rate from five samples of "routine" prison cases from the Correctional Service of Canada (CSC) was approximately 41% of the sexual recidivism rate observed in five samples "preselected" to be high risk (***n*** = 2,522; see below for an explanation). A similar effect was found for violent recidivism, with routine CSC offenders showing approximately 54% of the violent recidivism rate of offenders from the preselected high-risk samples (***n*** = 2,490). Additionally, child molesters showed approximately 62% of the violent recidivism rate compared to rapists, when controlling for Static-99 scores (***n*** = 4,256).

The finding of substantial differences in recidivism within each Static-99 score necessitates further discussion of the two sample types we examined. CSC administers Canadian prison sentences of two or more years, while offenders receiving sentences of less than two years are managed by the respective provincial correctional system. During the 1990s, when the offenders in the CSC samples were incarcerated, CSC offered numerous treatment programs based on principles that are known to be effective in reducing criminal recidivism (Risk-Need-Responsivity—Andrews & Bonta, 2006), and the typical offender would have participated in multiple programs (both general and sexual offender programs). Most CSC offenders would also have been supported through a gradual re-integration into the community by parole supervision and human service programming.

The "preselected" high risk samples typically consisted of offenders who had been judged by some administrative or decision-making body or tribunal to be of sufficiently high risk to warrant exceptional measures (e.g., treatment order, preventive or indefinite detention, denial of statutory release). The factors considered in making these determinations are not fully known and would vary across samples; however, it would be expected that factors external to Static-99 were considered (e.g., recent antisocial behaviour, self-reported sexual deviancy, resistance to treatment, increased presence of salient dynamic risk factors) along with factors already included in Static-99 (e.g., number of prior sexual offence convictions).

Differences in recidivism within each Static-99 score on the basis of sample type and offender type suggest that evaluators can no longer, in an unqualified way, associate a single Static-99 score with a single recidivism estimate. Instead, each Static-99 score is associated with a range of recidivism estimates, and evaluators must make a separate judgment as to where a particular offender lies within that range. This new conceptualization of recidivism norms forces evaluators to consider factors external to the risk scale. Although the best method of considering these external factors is as yet unknown, there are several factors worth considering in this decision. These factors include the risk-relevant characteristics of the population from which the

offender is selected (as described above), as well as risk-relevant characteristics of individual offenders.

Currently, our recommendation is to report recidivism estimates with the new norms in two stages. The first stage involves reporting an empirically-derived range of recidivism risk. The recidivism estimates from the CSC samples represent the lower bound of the range and the preselected high-risk samples are the upper bound of the range. Tables 1 and 2 provide the five and ten-year sexual and violent recidivism estimates for both sample types. The second stage involves making a professional judgment as to where a particular offender is likely to fall within that range. This judgment represents a separate task from reporting the empirical recidivism rates; currently, there is no research to assess how well evaluators are able to make this judgment. Until further research is conducted, however, this professional judgment is unavoidable. It is also important to note that regardless of the evaluator's opinion of which sample the offender most closely resembles, recidivism rates of both samples should be reported in all cases. Although reporting absolute recidivism rates as a range may appear less precise, it is likely more realistic given that predicting behavior was likely never as simple as associating a single number with a single Static-99 score.

Table 1: Static-99 sexual recidivism table

	5 Year Sexual Recidivism (%)		10 Year Sexual Recidivism (%)	
Static-99 Score	Routine CSC Samples	Preselected High Risk Samples	Routine CSC Samples	Preselected High Risk Samples
0	2.3	8.3	1.8	13.0
1	3.2	10.3	2.6	15.8
2	4.3	12.8	3.9	19.1
3	5.7	15.7	5.7	23.0
4	7.7	19.1	8.2	27.3
5	10.2	23.1	11.8	32.1
6	13.4	27.7	16.7	37.3
7	17.4	32.7	23.0	42.8
8	22.3	38.2	30.8	48.5
9	28.2	44.0	39.8	54.3
10+	34.9	50.0	49.7	59.9
Total N*	752	1,163	342	735

**N is the total sample size used in the logistic regression analysis to generate predicted recidivism values. It is not the sample size with a particular Static-99 score. This is because logistic regression uses information on the relationship between Static-99 and recidivism in the complete dataset to generate predicted values.*

Note: Some of the 10-year CSC rates are lower than the 5-year rates due to sampling error (not all of the offenders in the 5-year sample were followed for the full 10 years).

Table 2: Static-99 violent recidivism table

	5 Year Violent Recidivism (%)		10 Year Violent Recidivism (%)	
Static-99 Score	Routine CSC Samples	Preselected High Risk Samples	Routine CSC Samples	Preselected High Risk Samples
0	8.5	16.5	8.5	25.5
1	10.8	20.0	11.4	29.5
2	13.6	24.1	15.1	33.8
3	17.0	28.6	19.7	38.4
4	21.1	33.7	25.3	43.2
5	25.8	39.1	31.8	48.2
6	31.2	44.9	39.2	53.2
7	37.1	50.8	47.0	58.1
8	43.4	56.6	55.1	62.9
9	50.0	62.3	62.8	67.4
10+	56.6	67.6	70.0	71.7
Total N*	752	1,110	342	790

**N is the total sample size used in the logistic regression analysis to generate predicted recidivism values. It is not the sample size with a particular Static-99 score. This is because logistic regression uses information on the relationship between Static-99 and recidivism in the complete dataset to generate predicted values.*

Recidivism estimates generated from logistic regression

A slightly tangential, but important note pertains to the methods used to generate recidivism estimates. The original Static-99 recidivism norms were calculated using survival analysis, which is a statistical technique that tracks reoffending over time and uses that information to correct for varying follow-up periods. An important limitation of survival analysis, however, is that it only uses information from offenders with a particular score. In other words, estimating recidivism for scores of 3 is independent from estimating recidivism for scores of 4. This can lead to random fluctuations, particularly with small sample sizes for certain scores. This fluctuation is evident in the original Static-99 norms, where the 10 and 15-year sexual recidivism rates were slightly higher for a score of 0 than for a score of 1. These fluctuations also necessitated collapsing all offenders with scores of 6+. Another approach to generating recidivism estimates is to report observed rates from fixed follow-up periods. This method has the same problems as survival analysis, but these problems are magnified because using fixed follow-up periods typically reduces the available sample size.

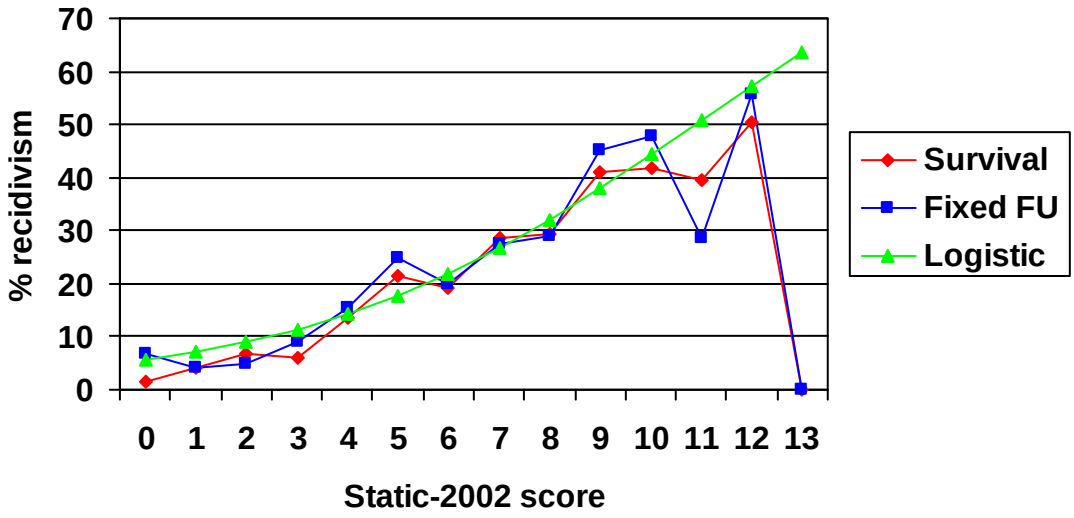
To overcome these limitations, we used logistic regression analysis to calculate recidivism estimates. In simplest terms, regression produces a “line of best fit” that models the relationship between an independent variable (Static-99 scores) and a dependent variable (the probability of recidivism). The slope of the line tells us the average increase in the probability of recidivism associated with each one-score increase on Static-99. The intercept of the line (where the line intersects with the ***y***-axis) tells us the predicted recidivism rate for a Static-99 score of 0. Using both the intercept and the slope, regression allows us to predict recidivism rates for any

score on Static-99. Logistic regression is a specific form of regression that transforms the dependent variable (i.e., the odds of recidivism) into its natural logarithm and is more appropriate for use with dichotomous outcome variables (i.e., recidivism).

An advantage of logistic regression is that it uses information on the relationship between Static-99 and recidivism in the full dataset to make predictions for a given score. This eliminates the logical anomaly whereby offenders with a certain score can have slightly higher estimated recidivism rates than offenders with a higher score. In other words, it smoothes out the random fluctuations inherent in survival analysis and likely provides better estimates of the "true" relationship between the variables. Logistic regression is appropriate to use for generating recidivism estimates as long as the data approximate a logistic distribution (this assumption is satisfied in the tables reported here). A disadvantage of logistic regression is that fixed follow-up periods are required, which reduces the overall sample size.

Figure 2, taken from our research on Static-2002 with 8 samples (Hanson, Helmus, & Thornton, 2008) demonstrates the advantages of using logistic regression as opposed to survival analysis or fixed follow-up periods. The figure shows that survival analysis and fixed follow-up periods produce similar recidivism estimates, with slightly more fluctuations in the fixed follow-up estimates (due to reduced sample size). The logistic regression produces estimates similar to the other two methods, but cleans up the random fluctuations, particularly in the higher risk scores.

Figure 2: Ten-year sexual recidivism rates for Static-2002 estimated by survival analysis, fixed follow-up, and logistic regression.



Other ways of reporting Static-99

An alternative method of reporting Static-99 scores that avoids the ambiguities associated with absolute recidivism rates is to report relative risk. Relative risk answers questions regarding how this offender's risk compares to the risk posed by other sexual offenders. We believe that for most decisions informed by risk assessment—particularly, decisions involving the allocation of treatment and/or supervision resources—reporting relative risk is sufficient and is more informative than absolute risk estimates. Relative risk has the additional advantage that it is fairly consistent across time and samples, which is not true for absolute risk.

Relative risk can be reported in different ways, and we are currently exploring some of these options. Relative risk can be reported as percentiles (e.g., 15% of adjudicated sexual offenders score at or above this score) and can also be reported as relative risk ratios. Relative risk ratios allow us to make statements about a particular offender's recidivism rate relative to the "typical" sexual offender, which we have defined as a score of 2 because it was the median score in a sample re-weighted to approximate the population of adjudicated Canadian sexual offenders (Hanson, Lloyd, Helmus, & Thornton, 2008). Using Table 3 as an example, we could say that an offender with a Static-99 score of 0 shows approximately half (.44) the recidivism rate of the typical sexual offender. Alternately, an offender with a score of 6 shows three times the recidivism rate of the typical sexual offender. Further research on relative risk ratios is needed, but it appears to be a promising method of reporting actuarial scores in way that is useful for decisions regarding offender management and resource allocation.

Table 3: Static-99 relative risk ratios for sexual recidivism based on Cox regression

Static-99 Score	Frequency (*n*)	Relative Risk
0	294	0.44
1	382	0.68
2	488	1.00
3	490	1.41
4	487	1.89
5	337	2.42
6	270	2.96
7	159	3.44
8	91	3.81
9+	36	4.04

Summary and resources for reporting Static-99

For those reporting absolute recidivism rates, we recommend using the tables reported here. Although these tables will be updated as our research progresses, we believe these new norms are better than the original because they are based on larger and more current samples, are derived from better statistical estimation procedures (logistic regression), and more accurately reflect variation in recidivism base rates.

As noted, this research project is ongoing and the absolute recidivism rates presented here will be updated. Given changes in recidivism over time, norms for Static-99 (and likely for other actuarial risk assessment scales as well) should be continually monitored and updated as needed (i.e., when changes are large enough to be meaningful). We are currently adding more datasets and plan to do further analyses to explore other factors that may influence recidivism norms, such as age, treatment, and jurisdiction.

To stay abreast of further developments in this area, we encourage you to periodically check the new Static-99 official website, www.static99.org. This website contains a wide variety of resources for Static-99 users, including copies of presentations related to this research project, the newest Static-99 recidivism tables, percentiles tables, relative risk ratio tables, new templates for reporting Static-99 scores, and information regarding educational/training opportunities.

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