

## Static-99R: Revised Age Weights

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## Age and Static-99

Similar to other types of crimes, sexual offending tends to decrease steadily with age (Barbaree & Blanchard, 2008; for research on general offending, see Hirschi & Gottfredson, 1983; Sampson & Laub, 2003). Age is therefore an important factor to consider in actuarial risk assessments. Although Static-99 allocates some weight to age at release (offenders less than 25 years old receive 1 point), research has found that age at release still adds incremental predictive validity above Static-99, with older offenders showing less sexual recidivism (Hanson, 2006). Research with additional samples (described below) was therefore undertaken to further examine the contribution of age at release in the prediction of sexual recidivism, resulting in the development of new age weights for Static-99.

### Age Analyses in the Static-99 Re-norming Project

Information on age at release was available for 7,878 cases from 21 samples (the samples and methods are described in Helmus, 2009). Cox regression analyses were used to examine the relationship between age and sexual recidivism, with sample entered as strata (see Table 1). After controlling for Static-99, age at release had a significant negative linear relationship with sexual recidivism ( $\chi^2$  change = 28.7,  $df = 1$ ,  $p < .001$ ). The rate ratio was .98 (95% C. I. of .98 to .99), meaning that each one-unit increase in age was associated with 98% of the recidivism rate from the previous (younger) age. In other words, the expected recidivism rate of thirty-two year old offenders is 98% of the recidivism rate of thirty-one year old offenders, which is 98% of the recidivism rate of thirty year old offenders, and so on. The study also found a curvilinear relationship between sexual recidivism and age ( $\chi^2$  change for squared age variable = 10.7,  $df = 1$ ,  $p = .001$ ). Adding a cubed age variable was non-significant ( $\chi^2$  change = 1.5,  $df = 1$ ,  $p = .218$ ), indicating that the relationship between age and recidivism does not need two curves.

Further analyses were conducted to examine the shape of the distribution describing the relationship between age and recidivism (after controlling for Static-99). Figure 1 presents the contribution of age and age squared to the prediction of sexual recidivism, estimated from Cox regression. The hazard ratio is centered on the mean Static-99 value, which is represented by a hazard ratio of 1. Figure 2 presents the same analyses using logistic regression at 5 years, with Static-99 scores centered on 2 and the y axis referring to estimated recidivism rates as a percentage. Both figures demonstrate the same pattern, with a slight increase in risk for offenders in their twenties, followed by a fairly linear decrease in risk up until their eighties.

The relationship between age and recidivism depicted in Figures 1 and 2 may be slightly misleading, however, given that offenders less than 25 years old are already given a risk point on Static-99. To better understand the relationship between age and recidivism, Static-99 was re-computed without the age item. For offenders with Static-99 total scores but no individual item scores, the age-free Static-99 could be computed if age information was available elsewhere in the dataset; if not, it was coded as missing.

Table 1

*Cox Regression Analyses Examining the Incremental Effect of Age over Static-99 Scores for the Prediction of Sexual Recidivism*

	$\chi^2$ change			Regression coefficient			Rate ratio	
	change	df	p	b	SE	p	Exp(B)	95% C.I.
<b>Step 1</b>								
Age	28.67	1	<.001	-.016	.003	<.001	.985	.979 – .990
<b>Step 2</b>								
Age				.040	.018	.024	1.041	1.005 – 1.077
Age <sup>2</sup>	10.69	1	.001	-.0007	.0002	.002	.999	.999 – 1.000
<b>Step 3</b>								
Age				.126	.071	.078	1.134	.986 – 1.304
Age <sup>2</sup>				-.003	.002	.101	.997	.994 – 1.001
Age <sup>3</sup>	1.52	1	.218	-.00002	.00001	.208	1.000	.999990 – 1.000044

*Note.* The sample size for these analyses was 7,878 from 21 samples, with 957 recidivists. All analyses are also controlling for Static-99 and using original sample as strata.

*Figure 1. Cox regression hazard ratios as a function of age at release*

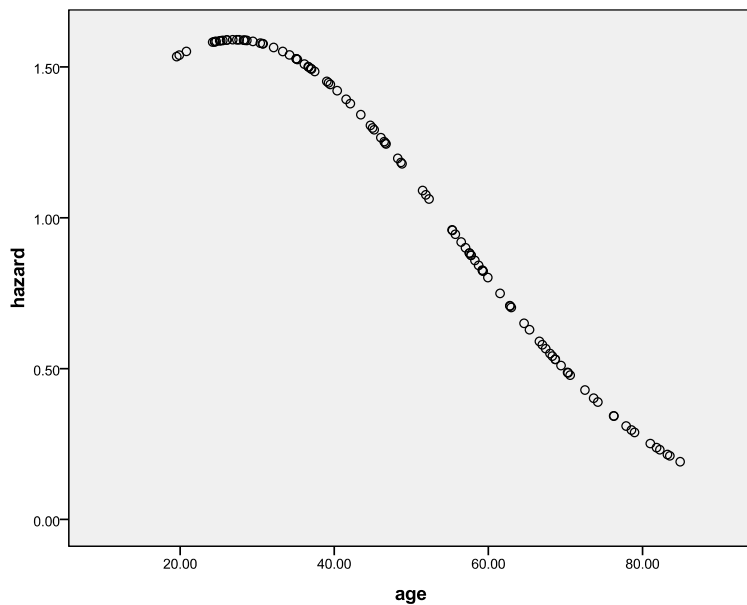


Figure 2. Recidivism as a function of age at release (using logistic regression)

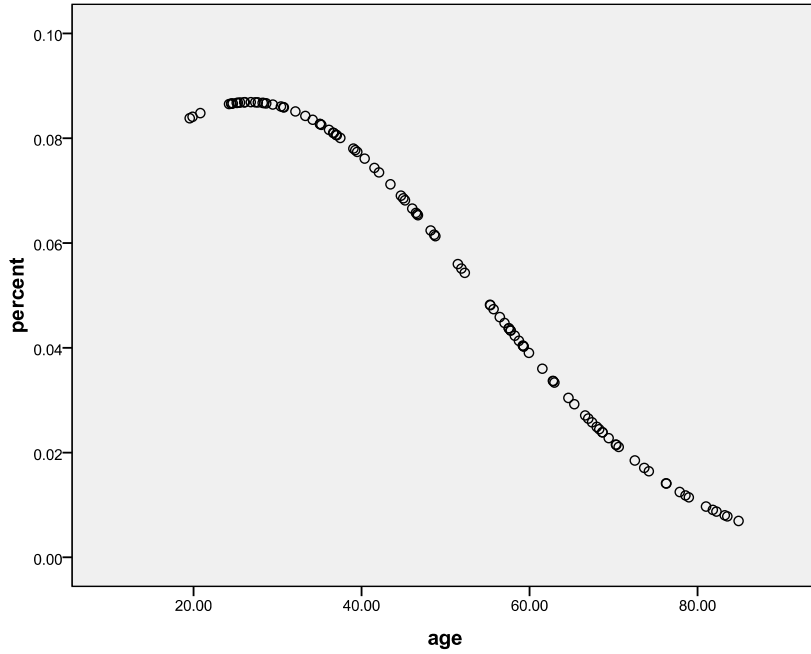


Figure 3. Recidivism as a function of age at release (using logistic regression and removing the age item from Static-99)

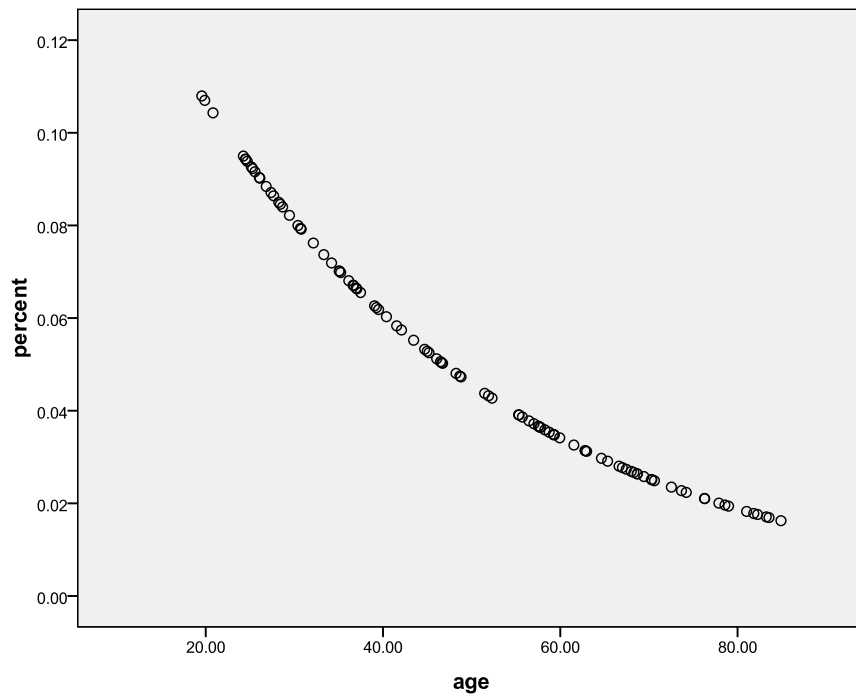


Figure 3 presents the same analysis as Figure 2, but with the age-free Static-99 score. When the age item was excluded from Static-99, the relationship between age and recidivism was clearly linear. Similar results were found in Cox regression, where age added significantly to the prediction of sexual recidivism after controlling for the age-free Static-99 score ( $\chi^2$  change = 48.8,  $df = 1$ ,  $p < .001$ ), but the squared age value did not ( $\chi^2$  change = 2.9,  $df = 1$ ,  $p = .087$ ). Although the curvilinear effect approached significance in the Cox Regression analysis ( $p = .087$ ), a quadratic effect was not used to create new age weights because the effect was small (see Figure 3) and maintaining conservative decision thresholds was viewed as desirable in light of the large sample sizes and high-power analyses used in the current study.

### **Analyses to Develop New Age Item of the Static-99R**

Rather than fitting a complicated curvilinear age adjustment to the original Static-99, a simpler option would be to develop a new age item. For this task, the overall sample was divided into two subsamples: one for the development of new Static-99 age weights, and another sample for validation. Of offenders with age-free Static-99 scores and information on age at release ( $k = 23$ ,  $n = 8,128$ ), offenders with follow-up periods of less than 10 years ( $k = 23$ ,  $n = 5,736$ ) were used as the development sample, and offenders with follow-up periods greater than 10 years were retained for validation ( $k = 15$ ,  $n = 2,392$ ). This method allowed the new Static-99 age weights (developed using 5-year recidivism information) to be validated with another sample at 5 years, and also permitted testing of its generalization to 10 year recidivism rates.

The principles guiding the selection of the new age weights were as follows: a) each unit should approximate the Static-99 units found in other analyses (rate ratio and odds ratio of approximately 1.35); b) offenders with the median age (39 years old) should receive a score of 0 for this item; c) the revised measure should have higher overall predictive accuracy than the original; and d) age should no longer contribute significantly once the Static-99 scale with the new age item is included.

The relationship between age and recidivism in the construction sample ( $n = 5,736$ ) was explored and the following new age weights were proposed: offenders less than 35 would receive 1 point on Static-99, offenders age 35 to 39.999 would receive 0 points, offenders age 40 to 59.999 would have 1 point subtracted from Static-99, and offenders age 60 and older would have 3 points subtracted from Static-99. The revised Static-99 scale with these age weights was called Static-99R.

Comparing Static-99R to Static-99 in the validation sample, there was a slight increase in relative predictive accuracy for Static-99R, as measured by the Area Under the Receiver Operating Characteristic Curve (using fixed follow-up periods: at 5 years, ROC for Static-99R was .720, compared to .713 for Static-99; at 10 years, ROC for Static-99R was .710, compared to .706 for Static-99). Table 2 displays the results of logistic regression analyses (at 5 and 10 years) and Cox regression analyses, all controlling for routine versus non-routine samples. In all analyses, age at release did not add significant predictive accuracy after controlling for Static-99R, whereas it did add

Table 2

*Comparing Static-99R to Static-99*

	Static-99R					Static-99				
	$\chi^2$ change	df	p	Exp(B)	95% C.I.	$\chi^2$ change	df	p	Exp(B)	95% C.I.
<b>Logistic Regression</b>										
<b>5 years</b>										
Static scale	135.82	1	<.001	1.34	1.27 – 1.41	128.92	1	<.001	1.37	1.29 – 1.44
Age	1.27	1	.26			4.14	1	.04		
<b>Logistic Regression</b>										
<b>10 years</b>										
Static scale	164.45	1	<.001	1.32	1.27 – 1.39	157.91	1	<.001	1.36	1.29 – 1.42
Age	1.46	1	.23			5.54	1	.02		
<b>Cox Regression</b>										
Static scale	180.14	1	<.001	1.28	1.23 – 1.32	165.92	1	<.001	1.29	1.24 – 1.34
Age	0.66	1	.42			7.87	1	.005		

*Note.* Values represent incremental contribution after controlling for previously entered variables. The logistic regression analyses began by controlling for routine/non-routine samples (not shown), then Static, and then age. For the cox regression analyses, samples were considered strata.

incremental predictive accuracy to the original Static-99. These results indicate that the original Static-99 did not sufficiently account for age at release, whereas the revised scale does.

No statistical shrinkage (whereby effect sizes tend to decrease in independent replications) was observed with Static-99R. The AUC for 5 year sexual recidivism was .720 in the validation sample compared to .709 in the construction sample.

The new age weights were tested separately for child molesters and rapists (see Table 3). In logistic regression analyses (at 5 and 10 years) as well as Cox regression analyses, age at release did not add significant incremental predictive validity to Static-99R for either rapists or child molesters, suggesting that Static-99R sufficiently accounts for age in both groups.

Table 3

*Examining the Incremental Contribution of Age for Rapist and Child Molesters*

	Rapists		Child Molesters	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
<b>Logistic Regression</b>				
<b>5 Years</b>				
Static-99R	.317	<.001	.319	<.001
Age	-.006	.583	.0007	.926
<b>Logistic Regression</b>				
<b>10 Years</b>				
Static-99R	.325	<.001	.269	<.001
Age	.001	.966	.005	.591
<b>Cox Regression</b>				
Static-99R	.281	<.001	.269	<.001
Age	.002	.778	.002	.689

*Note.* Values represent incremental contribution after controlling for previously entered variables. The logistic regression analyses began by controlling for routine/non-routine samples (not shown), then Static, and then age. For the cox regression analyses, samples were considered strata.

## Static-99R Age Item Coding Rules

**Replaces Age Item in Official Static-99 Coding Rules (Harris, Phenix, Hanson, & Thornton, 2003)**

### 1. Age at Release

**The Basic Principle:** The rates of almost all crimes decrease as people age (Hirschi & Gottfredson, 1983; Sampson & Laub, 2003). Sexual offending does not appear to be an exception. Most studies have found that older sexual offenders are lower risk to reoffend than younger sexual offenders (Barbaree & Blanchard, 2008; Hanson, 2002, 2006). Research has found that the original Static-99 did not fully account for age at release and that a new age weighting had greater predictive accuracy (Helmus, 2009). With the new age weighting (used in this item), age at release no longer significantly contributed to the prediction of sexual recidivism. Similar results were found in subgroups of rapists and child molesters.

**Information Required to Score This Item:** To complete this item the evaluator should confirm the offender's birth date from official records if possible or have other knowledge of the offender's age through collateral report or offender self-report.

**The Basic Rule:** Score -3 to 1 point depending on the age of the offender, referencing the table below.

AGE	SCORE
18 to 34.9	1
35 to 39.9	0
40 to 59.9	-1
60 or older	-3

Under certain conditions, such as anticipated release from custody, the evaluator may be interested in an estimate of the offender's risk at some specific time in the future. Static-99R may be scored months before the offender's release to the community and the offender may advance an age scoring category by the time he is released. For assessing risk in the future consider what his age will be on the date of release. In this case, you calculate risk based upon age at exposure to risk.

Sometimes the offender's release date may be uncertain. For example, he may be eligible for parole but does not qualify for release due to an inadequate release plan. In these cases it may be appropriate to use some form of conditional wording indicating how his risk assessment would change with a delayed release date.

## Static-99R Coding Form

Question Number	Risk Factor	Codes	Score															
1	Young	Aged 18 to 34.9 Aged 35 to 39.9 Aged 40 to 59.9 Aged 60 or older	1 0 -1 -3															
2	Ever Lived With	Ever lived with lover for at least two years? Yes No	0 1															
3	Index non-sexual violence - Any Convictions	No Yes	0 1															
4	Prior non-sexual violence - Any Convictions	No Yes	0 1															
5	Prior Sex Offences	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><u>Charges</u></td> <td style="text-align: center;"><u>Convictions</u></td> <td></td> </tr> <tr> <td style="text-align: center;">None</td> <td style="text-align: center;">None</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">1-2</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">3-5</td> <td style="text-align: center;">2-3</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">6 +</td> <td style="text-align: center;">4+</td> <td style="text-align: center;">3</td> </tr> </table>	<u>Charges</u>	<u>Convictions</u>		None	None	0	1-2	1	1	3-5	2-3	2	6 +	4+	3	
<u>Charges</u>	<u>Convictions</u>																	
None	None	0																
1-2	1	1																
3-5	2-3	2																
6 +	4+	3																
6	Prior sentencing dates (excluding index)	3 or less 4 or more	0 1															
7	Any convictions for non-contact sex offences	No Yes	0 1															
8	Any Unrelated Victims	No Yes	0 1															
9	Any Stranger Victims	No Yes	0 1															
10	Any Male Victims	No Yes	0 1															
	<b>Total Score</b>	<b>Add up scores from individual risk factors</b>																

### Translating Static-99R scores into risk categories

#### Score            Label for Risk Category

-3 through 1    =    Low  
 2, 3            =    Low-Moderate  
 4, 5            =    Moderate-High  
 6 plus         =    High

## References

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