# Predicting the Likelihood of Future Sexual Recidivism: Pilot Study Findings From a California Sex Offender Risk Project and Cross-Validation of the Static-99

Shoba Sreenivasan, PhD, Thomas Garrick, MD, Randall Norris, PhD, Sarah Cusworth-Walker, PhD, Linda E. Weinberger, PhD, Garrett Essres, PhD, Susan Turner, PhD, and Terry Fain, MA, MS

Pilot findings on 137 California sex offenders followed up over 10 years after release from custody (excluding cases in which legal jurisdiction expired) are presented. The sexual recidivism rate, very likely inflated by sample selection, was 31 percent at five years and 40 percent at 10 years. Cumulatively, markers of sexual deviance (multiple victim types) and criminality (prior parole violations and prison terms) led to improved prediction of sexual recidivism (receiver operating characteristic [ROC] = .71, $r$ = .46) than singly (multiple victim types: ROC = .60, $r$ = .31; prior parole violations and prison terms: ROC = .66, $r$ = .37). Long-term Static-99 statistical predictive accuracy for sexual recidivism was lower in our sample (ROC = .62, $r$ =.24) than the values presented in the developmental norms. Sexual recidivism rates were higher in our study for Static-99 scores of 2 and 3 than in the developmental sample, and lower for scores of 4 and 6. Given failures to replicate developmental norms, the Static-99 method of ranking sexual recidivism risk warrants caution when applied to individual offenders.

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Since the advent of the sexually violent predator/sexually dangerous person (SVP/SDP) statutes,[1] several sex offender risk actuarial instruments have been developed. For the purposes of SVP/SDP commitment, most states require at least a qualitative assessment of risk level. In some states, such as Washington, a quantification of sexual recidivism risk above 50 percent is required.[1] The four most commonly used risk scales are the Sex Offender Risk Assessment Guide (SORAG), the Minnesota Sex Offender Screening Tool-Revised (MnSOST-R), the Rapid Risk Assessment of Sexual Offense Recidivism (RRASOR), and the Static-99.[2–7]

All four sex offender risk assessment methods demonstrate statistically moderate correlations with sexual recidivism.[8,9] A moderate statistical accuracy warrants the caution of over- or underestimation of risk when group-based actuarial rates are applied to an individual. Moreover, the tools are developed generally on composite samples from different sites and cohorts because of the difficulty in accessing the complete prison files of a single, large cohort group. Consequently, many researchers have amalgamated existing data sets from different sites to obtain adequate sample sizes.[9,10] This practice, however, occurs at the cost of introducing variability. There are few

Dr. Sreenivasan and Dr. Weinberger are Clinical Professors of Psychiatry and the Behavioral Sciences, Keck School of Medicine, University of Southern California, Los Angeles, CA. Dr. Garrick is Professor of Psychiatry, Geffen School of Medicine, University of California, Los Angeles, CA. Dr. Norris is Chief Psychologist, California Institution for Men, California Department of Corrections and Rehabilitation (CDCR), Chino, CA. Dr. Cusworth-Walker is a Research Associate, University of Washington School of Medicine, Seattle, WA. Dr. Essres is Senior Psychologist, California Men's Colony, CDCR, San Luis Obispo, CA. Dr. Turner is Professor of Criminology, Law, and Society, University of California, Irvine, CA. Mr. Fain is Project Associate, Public Safety and Justice, RAND Corporation, Santa Monica, CA. Address correspondence to: Shoba Sreenivasan, PhD, GLA-VA Medical Center, 11301 Wilshire Blvd., Mental Health Administration, Mail code 691-B116AC, Los Angeles, CA 90073. E-mail: shoba.sreenivasan@med.va.gov

empirical investigations as to the applicability of actuarial tools to ethnically diverse groups that differ from the normative samples on which the tools were based. In addition, there remains a lack of cross-validation in many of the U.S. jurisdictions, such as California,[11] where actuarial tools are used routinely in civil commitment risk assessments.

While proponents of actuarial risk assessment argue that risk tools are superior to clinical judgment in predictive ability,[10] actuarial instruments have the potential for misuse in applied risk assessments if the obtained risk percentages for a specific score are represented as predictive of a specific individual's committing a future sexual offense. While beyond the scope of this report, it should be noted that use of actuarial risk assessments in SVP/SDP evaluations continues to foster debate among forensic researchers and clinicians.[5,12,13]

The purpose of this article is to present pilot findings from a California sex-offender risk assessment project. Two primary areas are targeted: the statistical identification of predictive risk markers as potential variables for a risk assessment tool, and whether the most commonly used actuarial tool, the Static-99, offers a sufficiently reliable and accurate model of risk for sexual reoffense in a racially and culturally diverse prison sample.

## Overview of Static-99 and Its Limitations

The Static-99 was developed by Hanson and Thornton[9] as an amalgamation of the RRASOR and the Structured Anchored Clinical Judgment-Minimum (SACJ-Min).[14] The risk factors for the RRASOR were derived from a factor analysis of seven follow-up studies and one replication sample.[3,4] Recidivism for the RRASOR was defined primarily as reconviction for a sexual offense. The RRASOR items include prior sexual offenses (excluding the last sexual offense, called the index offense), age at release, victim's gender, and relationship to the victim. The Static-99 includes all the RRASOR items and adds the SACJ-Min items of sexual offense against a stranger, noncontact sexual offense, cohabitation status, nonsexual assault, and number of sentencing events greater than four.

In a comparison of the two scales, the Static-99 had a higher statistical association with sexual recidivism than did the RRASOR.[9] This prompted Hanson and Thornton[9] to recommend the use of the Static-99 over the RRASOR. Of note, Hanson and Morton-Bourgon's[8] meta-analysis found only a small association with sex offender recidivism for several of the RRASOR and Static-99 variables (noncontact sexual offense, prior criminal history/history of nonsexual crimes). As with the other actuarial instruments, the overall scores for both the Static-99 and RRASOR demonstrated a statistically moderate predictive accuracy in detecting a tendency toward sexual recidivism.[8,9] Both scales weight prior sexual offenses heavily over other factors because of their robust association with sexual recidivism.[4,8]

The Static-99 was not developed on a single cohort of released sex offenders, but consisted of amalgamating data collected previously from different sites: two Canadian secure psychiatric facilities, one Canadian prison, and one United Kingdom prison. While the sample size of 1,228 allowed for sufficient statistical power, the data did not represent one cohort group (i.e., the offenders were not all released during the same period from the same facility or same type of facility). In addition, some of the predictor variables for the Static-99 risk scale were missing in the developmental sample. For example, the Institut Philippe Pinel sample did not have information about the two predictor variables, stranger victims and noncontact offenses; the Millbrook sample was missing information on conviction for noncontact sexual offenses; and the Oakridge sample had data for relationship to victim only for the most serious offense, counted any male child victims as opposed to male victims regardless of age, and recorded only the most serious last sexual offense. When data were missing, statistical procedures were used to estimate values, a procedure that is less than ideal. Thus, the Static-99 relied on less than optimal sampling to obtain sufficient sample sizes. This merely underscores the state of the art in sexual recidivism risk assessment and the difficulty in obtaining large samples with sufficiently broad data from a single cohort.

Currently, the Static-99 has the most cross-validation studies of any of the actuarial tools, marking this rating method as the most researched of the reviewed actuarial measures.[15–19] These studies and reports demonstrated that the Static-99 has moderate statistical association with sexual recidivism risk in Canadian, U.K., and select U.S. samples (Vermont, Texas).[15,17,20–25] The advantages of the Static-99 are that it offers a quick method of rating risk, and the normative data from the original sample have good

inter-rater reliability.[26] However, risk percentages appear to vary dependent on the base rate of sexual recidivism in the sample studied. Doren[27] examined the correspondence of the developmental risk percentages for Static-99 scores in seven studies for a five-year follow-up period. He found that the underlying sexual recidivism base rate of the sample affected the risk percentage associated with a specific Static-99 score, which led to differences from that derived from the developmental sample. For low-risk scores (in the 1 to 2 range), when the sample had a high underlying base rate of sexual recidivism, there were higher risk percentages associated with the score than in the developmental sample. High-risk scores revealed lower than expected risk percentages when the underlying base rate was low, but remained similar to the developmental sample when the base rates were high. The Doren data failed to replicate the Hanson and Thornton[9] developmental norms.

## Defining Sexual Recidivism

The definition of sexual recidivism varies across actuarial schemes. Some studies have used criminal convictions, reflecting a conservative strategy based on adjudicated offenses for which a guilty verdict was found and the individual sanctioned.[10] However, as is widely acknowledged, such a definition can underestimate the true rate of recidivism, as it is based on both apprehensions and punished offenses.[9,28,29]

In an attempt to determine the full extent of sex offending, the U.S. Department of Justice (DOJ) compared statistics from U.S. law enforcement reports of sexual offense arrests to data from the National Crime Victimization Survey report.[28] It should be stated that these data reflect estimates of the baseline frequency of acts. The U.S. DOJ document noted that in 1995, individuals aged 12 years and older reported to the National Crime Victimization Survey that they experienced 260,300 incidents of attempted or completed rape. By contrast, the number of such crimes actually reported to the police in 1995 was 97,460. Thus, only 37 percent of the sexual crimes reported to the National Crime Victimization Survey came to the attention of law enforcement, leaving a high number (63%) of undetected offenses. Moreover, even among those crimes reported to the police, only one-half resulted in the identification and arrest of a perpetrator (i.e., 48,730 of the reported 97,460 sexual assaults). The Bureau of Justice Statistics findings for the years 1992 through 2000 mirrored these findings (i.e., 63 percent of completed rapes, 65 percent of attempted rapes, and 74 percent of completed and attempted sexual assaults against females were not reported to the police).[30]

Therefore, a comprehensive outcome definition for sexual recidivism should include arrests, convictions, and parole/probation or in-custody sexual violations to address the underestimation of risk created by more limited definitions of sexual recidivism, such as convicted offenses. Nonetheless, even this broad method represents observed rates. The true rate of sexual recidivism would include the unobserved and/or unreported sexual assaults.[31]

## Sample Generalizability

The Static-99 is based on Canadian and U.K. developmental and cross-validation samples.[9] The sample was described as predominantly Caucasian. Consequently, it may have limited applicability to racially diverse U.S. prison samples. Sample limitations could reduce the efficacy and even the applicability of an actuarial tool, a concept articulated in evidence-based medicine.[32] Laws, enforcement methods, judicial procedures, sanctions, and community monitoring differ across countries as well as across U.S. jurisdictions. Such differences contribute to the variation in base rates of detected sexual recidivism. In relation to these sampling problems, the sexual recidivism percentages given in the developmental study for the Static-99 have not been corroborated in cross-validation studies.[27]

## Identifying Sex Offender Risk Predictor Variables

In our study, the predictive markers for sexual recidivism were derived from the existing research base, with the most promising variables selected for inclusion in the analyses. The Hanson and Bussiere[4] meta-analysis examining 23,393 sex offenders by using 61 data sets and 165 predictor variables represents a landmark contribution to the identification of risk predictors. The authors identified several factors that correlated with sexual reoffending. These factors included past sexual offenses, male victims, stranger victims viewed as proxy variables for sexual deviance, and general criminality factors such as past nonsexual violent offenses, antisocial personality, and psychopathy.

A second, updated meta-analysis by Hanson and Morton-Bourgon,[8] including 95 studies and 31,000 sex offenders, confirmed the results of the 1998 meta-analysis, but also added new predictors, such as the ability to comply with conditions of supervision. Recently, Roberts *et al.*[33] conducted a principal components analysis on 10 actuarial items from the Static-99 and the Risk Matrix 2000 (a risk assessment instrument used in the United Kingdom). They identified three factors associated with sexual recidivism: general criminality, sexual deviance, and detachment. The general criminality factor consisted of a history of prior violent and nonviolent offenses; the sexual deviancy factor consisted of prior sexual offenses, noncontact sexual offenses, and male victims; and the detachment factor consisted of attacking a stranger and never being married. Barbaree *et al.*[34] conducted a similar statistical analysis on a sample of 311 sex offenders from a medium security Canadian federal penitentiary. They examined 38 unique items taken from five actuarial instruments (violence risk appraisal guide [VRAG], SORAG, RRASOR, Static-99, and MnSOST-R). Six principal factors were found to be associated with sexual recidivism, encompassed by antisocial behavior and sexual deviance, including detached predatory behavior such as selecting strangers as victims or offending in a public place). Barbaree *et al.*[34] found that violent recidivism is predicted by antisocial factors, while sexual recidivism is predicted by the factors associated with sexual deviance (such as persistence of sexual offending, child sexual abuse). These studies suggest that markers of sexual deviance and criminality may be predictive singly or cumulatively of risk of sexual recidivism. Aggression during the sexual offense may be a predictor,[7] although the recent Hanson and Morton-Bourgon[8] meta-analysis did not support this marker.

## Rationale for Presenting Pilot Data

California-based cross-validation of the Static-99 and the identification of groups of predictive risk variables have the advantage of including the demographics specific to a racially and culturally diverse U.S. prison population. Given the intense effort needed to collect even pilot data, these findings are presented as preliminary in a long-term, ongoing study.

## Materials and Methods

The project was reviewed and approved by the California Department of Corrections and Rehabilitation (CDCR) Research Board (November 15, 2001, and January 30, 2004). Safety procedures were instituted to assure the confidentiality of any information gathered from the archival data review.

### *Pilot Sample*

#### *Files*

A total of 5,898 sexual offenders, both active and inactive, were identified by the CDCR as having been released from prison between January 1, 1989, and December 31, 1990. Active files represented 29 percent ($n = 1{,}709$), and inactive files represented 71 percent ($n = 4{,}189$) of the total sample pool of 5,898. Of the active files, ($n = 1{,}790$), 137 (8%) were selected to serve as the pilot sample.

Active files were those of offenders remaining under supervision (i.e., in custody or on parole) as reflected by a CDCR list generated in June 2002. Inactive files were cases in which the CDCR's jurisdiction over the individual had expired sometime in the period between the person's release in 1989/1990 and the generation of the June 2002 list. These files were selected for the pilot study because they contained full criminal histories (i.e., state and federal criminal records, police reports, parole reports, and prison rules violations) and demographic information. Inactive files would have had a circumscribed data set, given the thinning of materials for storage, and criminal histories would have been limited to state criminal records at follow-up. This sample selection of active files probably created a bias toward inflating the rate of sexual recidivism, as the individuals in the sample had reoffended in some manner after their release from prison custody in 1989/1990 to June 2002, when the sample pool list was generated.

Most active prison files were located in five custodial locations, three of which were selected for the pilot study. These three sites were chosen, as they represented different levels of security (medium-low, medium, and high). Fourteen (10%) files were selected from the medium- to low-security prison, 27 (20%) files from the medium-security prison, and 11 (8%) files from the high-security prison. In addition, one of two parole sites in the state (the one with the largest number of parolees) was selected as the source for inclusion in the pilot study ($n = 85$, 62%). All

active files (prison and parole) that were available at the sites on the date of the file review were included. We acknowledge that this is not a random sample. This method of file selection was used because we had no control over logistical matters, such as staff availability at custodial sites to pull specific identified files; the inability to locate certain files at a site, given the fluidity of transfers between institutions and parole; and time and resource limitations in the availability of trained file reviewers.

A 1989/1990 release date assured that all in the pilot sample had had at least one period of community placement. All individuals in the study had committed a sexual offense sometime in their criminal histories. In some instances, the sexual offense was the controlling offense for the 1989/1990 release. In other cases, the sexual offense was a prior offense, with the 1989/1990 controlling offense being a nonsexual offense.

#### *Definition of Sexual Offense*

Sexual offenses were defined as arrests, convictions, parole violations, or prison rule violations incurred for criminal sexual behavior. The sexual offenses included those involving force and violence or substantial sexual conduct, such as either the offense itself or an attempted offense of rape with force; rape with threat of future retaliation; rape or penetration of genital or anal openings by foreign objects; rape in concert by force or violence; spousal rape with threat of future retaliation; sodomy; oral copulation; all penal code sections of lewd acts on a child under 14, 16, or 18.

Noncontact offenses such as exhibitionism, voyeurism, or annoying/molesting a child were also included as sexual offenses. In addition, an offense was coded as a sexual offense for charges of mayhem, battery, or murder when the file indicated a clear sexual component to the crime that was not filed separately, or if filed, the individual was convicted only of the nonsexual offense. Sexual offenses excluded as either initial or recidivist sexual offenses were solicitation/prostitution, pimping, consensual sexual encounters in custody resulting in prison sanctions, and charges of indecent exposure in custody that would not meet the legal criteria for exhibitionism in the community.

#### *Definition of Sexual Recidivism*

Sexual recidivism was defined as sexual reoffending that occurred after the 1989/1990 release and during an approximate 10+ year follow-up period. The definition of sexual recidivism was any sexual behavior following release that resulted in sanctions, such as arrest, conviction, parole violation, probation violation, or in-prison rules violations that would meet the definition of a sexual crime (excluding pimping and prostitution).

### *Procedures*

In addition to four of the authors, forensic psychologists and psychiatrists familiar with prison records and the research protocol conducted the archival review. Ten files were coded independently by two reviewers to determine inter-rater reliability of recording information. In all cases, the same information was recorded, suggesting that the items on the protocol data sheet were easily coded.

#### *Measurements*

Files were coded for demographics; specifics of each sexual offense, including victim type, relationship, and type and nature of violence; institutional behavior; parole behavior; medical and psychiatric treatment; drug and alcohol abuse history; developmental variables, such as school functioning; gang membership; IQ scores; reading ability; and juvenile and adult criminal history. A weighted scale devised by Quinsey *et al.*[10] and based on the Canadian criminal code was used to arrive at scores for all violent acts involved in the first sexual offense, to give an overall violence score. A similar approach was used for less violent or nonviolent behavior that accompanied the first sexual offense.

#### *Static-99 Ratings*

The Static-99 was scored at the time of the 1989/90 release using only that information available at the release date. The Static-99 was scored for each case by one investigator trained in the coding rules[35] who had extensive experience using the Static-99 in sexually violent predator evaluations. Moreover, the Static-99 was scored in a jurisdiction where evaluator Static-99 rater reliabilities had been calculated.[26] Hanson[26] found evaluator rater reliabilities to have 0.91 average item percent agreement, 0.80 average item $\kappa$, and 0.97 intraclass correlation for total scores. Other studies have also demonstrated high inter-rater reliability of the Static-99 (over 0.90).[15,35] The tool has 10 elements that address static or nonchanging factors: prior sexual offenses (excluding index offense); prior sentencing dates (ex-

**Table 1** Sexual Recidivism Markers

| Item Number | Risk Factor | Codes | Score |
|---|---|---|---|
| Sexual deviance | | | |
| 1 | Prior sex offenses (before 1989/90 release; number of episodes of sex offending: arrest only, prison, jail, probation, parole violation, prison rules violation excluding consensual sex) | 1 = one prior sex offense<br>2 = two prior sex offenses<br>3 = three or more sex offenses | 1<br>2<br>2 |
| 2 | Unrelated victim-any (all sex offense information, charged/uncharged before 1989/90) | No = 0)<br>Yes = 1 | 0<br>1 |
| 3 | Stranger victim-any (all sex offense information charged/uncharged before 1989/90) | No = 0<br>Yes = 1 | 0<br>1 |
| 4 | Multiple victim types (two or more victim types, e.g., child and adolescent, male and female, for any of the sex offenses, charged or uncharged before 1989/90 release) | No = 0<br>Yes = 1 | 0<br>1 |
| 5 | Number of total victims ≥3 (charged and uncharged; information before 1989/90 release) | No = 0<br>Yes = 1 | 0<br>1 |
| 6 | Meets minimal time range criteria A for DSM-IV paraphilia before 1989/90 release (at least six months of deviant sexual behavior) | No = 0<br>Yes = 1 | 0<br>1 |
| Criminality | | | |
| 7 | Number of prison terms (before 1989/90 release) | Low = 1; score, 0<br>Moderate = 2–3; score, 1<br>High ≥ 4; score, 2 | 0<br>1<br>2 |
| 8 | More than one parole violation (before 1989/90 release | No = 0<br>Yes = 1 | 0<br>1 |
| 9 | Juvenile delinquency | No = 0<br>Yes = 1 | 0<br>1 |
| Aggression | | | |
| 10 | Aggression toward victims (before 1989/90 release); beating, maiming, strangulation, and/or stabbing | No = 0<br>Yes = 1 | 0<br>1 |

cluding index offense); any conviction for noncontact sexual offenses (excluding index offense); index nonsexual violence; prior nonsexual violence; any unrelated victims; any stranger victims (known for less than 24 hours); any male victims; young age; and single.

### *Data Analysis*

#### *Predictive Conceptual Risk Markers*

Based on findings in the literature, three predictive conceptual risk markers (sexual deviancy, criminality, and aggression) were used.[7,8,33] These risk markers were rated from information available in the files before the 1989/1990 release date, to predict sexual recidivism at the follow-up points. The risk markers are presented in Table 1.

#### *Follow-up Period*

A 10+ year period was used because longer follow-up periods yield higher base rates of recidivism and capture reoffenses missed by studies with follow-up periods of less than five years.[10,31,36–39] The follow-up period in this study was defined as the number of years from the 1989/1990 release date to the archival record review date conducted between June 2002 and December 2004, allowing for a minimum period of 10 years after at least one known release to the community.

## Results

### *Follow-up Period from Release to File Review Date*

The mean follow-up for the overall sample was 13.80 years (SD = 0.85) from the 1989/1990 release to date of the file review. This period allowed a follow-up sufficient to calculate the Static-99 and predictive risk marker variables for sexual reoffense at 5 and 10 years after release.

### *Characteristics of the Sample*

#### *Demographics*

Table 2 presents demographic and criminal history characteristics of the sample. Most of the sample was African American, followed by whites, and then Hispanics. This breakdown was not representative of

**Table 2** Demographic Characteristics and Criminal History of Pilot Sample

| | Pilot Sample, *n* (%) (*N* = 137) |
|---|---|
| Race | |
| White | 41 (30) |
| Black | 72 (53) |
| Hispanic | 21 (15) |
| Native American | 3 (2) |
| Age at release in 1989/1990, y | |
| 20–29 | 55 (40) |
| 30–39 | 64 (47) |
| 40–49 | 14 (10) |
| 50+ | 4 (3) |
| Controlling offense in 1989/1990 | |
| Sex offense | 84 (61) |
| Violent offense | 10 (7) |
| Parole violation | 7 (5) |
| Other offense | 36 (26) |
| Number of prison terms | |
| 1 | 1 (1) |
| 2 | 36 (26) |
| 3 | 47 (34) |
| 4 | 22 (16) |
| 5+ | 31 (23) |

the racial distribution of those currently incarcerated in California state prisons. As of June 2005, the CDCR Web site listed the inmates' racial classification and percentages as Hispanics (37%), whites (29%), and blacks (29%). However, the authors do not know the overall racial distribution in the CDCR in 1989/1990.

### *Characteristics of the Offender at the First Sexual Offense*

Table 3 lists the characteristics of the offender at the time of the first sexual offense. Most offenders were in their 20s and most were single when they were first arrested.

### *Characteristics of the Victim of the First Sexual Offense*

The most common victims were adult female strangers. Overall, of the 127 primary victims with known characteristics, 78 (61%) were adults, 39 (31%) were children aged less than 14 years, and 10 (8%) were adolescents aged 14 to 17 years; in addition, 101 (80%) were female, 26 (20%) were male, 79 (62%) were strangers, 14 (11%) were relatives, and 34 (27%) were acquaintances.

### *Two or More Victims for the First Sexual Offense*

In 25 (18%) cases, the offender had a second victim where charges were filed. In four (3%) cases, the offender had a third victim who filed charges. In addition, there were 19 (14%) sex offenders who had more than one alleged victim, and the additional victims filed no charges.

### *Characteristics of Violence in the First Sexual Offense*

The most common form of violence was battery, which occurred in 36 (26%) cases of first offenses, most often against adult strangers. Strangulation was used in 10 (7%) cases. Six (4%) sex offenders stabbed their victims, two (1%) maimed their victims, and one (1%) killed his victim.

### *Survival Distribution From First to Second Sexual Offense*

Of the 137 sex offenders in the pilot sample, 79 (58%) had only one sanctioned episode of sexual offending. The remaining 57 (42%) committed another sexual offense. The survival distribution of these 57 sex offenders, from the first to the second sexual offense, indicated that, within five years after their first sexual offense, 26 (46%) sex offenders had committed a second sexual offense. By the 10-year point, an additional 18 (32%) sex offenders had committed a second sexual offense. The remaining 13 (23%) individuals committed a second sexual of-

**Table 3** Offender Characteristics at Time of First Sexual Offense

| | Pilot Sample, *n* (%) (*N* = 137) |
|---|---|
| Age, y | |
| <20 | 37 (27) |
| 20–29 | 83 (61) |
| 30–39 | 16 (12) |
| 40–49 | 1 (1) |
| Marital Status | |
| Single | 90 (66) |
| Married/cohabiting | 22 (16) |
| Divorced/widowed | 4 (3) |
| Unknown | 21 (15) |
| Employment | |
| Stable | 12 (9) |
| Unstable | 42 (31) |
| Unemployed | 43 (31) |
| Student | 7 (5) |
| Retired/disabled | 2 (1) |
| Unknown | 31 (22) |
| Number of charges | |
| 1 | 38 (28) |
| 2 | 45 (33) |
| 3 or more | 51 (37) |
| Unknown | 3 (2) |
| Convicted charges | |
| None | 6 (4) |
| 1 | 59 (43) |
| 2 | 43 (31) |
| 3 or more | 29 (21) |
| Community supervision status | |
| On parole or probation | 4 (3) |

fense between 10 and 21 years after the first sexual offense. The elapsed time (estimated in days) between the first and second sexual offense ranged from less than 1 year to more than 21 years. Offenders who had not committed a second sexual offense were excluded from the analysis.

The analysis does not account for opportunity to offend—that is, time at risk in the community. In some instances, individuals were in custody for offenses other than a sexual offense after the first sexual offense and before the second. When we calculated the available opportunity to offend, the mean time in the community from the first to the second sexual offense was seven years. Nearly half (25/57; 46%) of those with two or more sanctioned sexual offenses had five or fewer years of opportunity to reoffend before the second sexual offense.

### *Predictive Risk Marker Analyses for 5- and 10-Year Sexual Recidivism*

#### *Sexual Deviance Markers*

We were first interested in examining, through Cox regression, a sexual deviance marker of explanatory variables, which were drawn from sexual offenses that occurred before the participants' 1989/1990 release date. Cox regression is a nonparametric technique that estimates the effect of multiple explanatory variables (or covariates) on whether a particular event will occur. For our purposes, its advantage over other multivariate analyses is the ability to account for the passage of time. In this study, we looked at whether the variables in our sexual deviance marker were associated with the first sexual recidivist act after the 1989/1990 release date. Because some of the participants had not reoffended at the time of follow-up, it was not possible to ascertain the length of time from release to the first sexual reoffense; consequently, these cases were censored from the analysis. The variables in the sexual deviance marker were selected based on previous research, which found them to be significantly associated with sexual recidivism. These variables included a sexual offense with a stranger (yes/no), a sexual offense with someone unrelated (yes/no), multiple types of victims (yes/no), three or more total victims (yes/no), prior sexual offenses (1, 2, 3, or more), and meeting the minimum time frame required by DSM-IV criterion A paraphilia: sexual offending over a six-month period (yes/no). This marker was operationalized as either the occurrence of repeated offenses separated from one another by at least six months or repeated offenses occurring within at least a six-month time frame (e.g., one victim repeatedly molested during at least a six-month period). The time variable was the time from the participants' release date in 1989/1990 until the first post-release sexual offense. The participants who did not reoffend in this time were treated as censored cases. The status variable was whether the participant had committed a sexual offense within five years.

Cox regression was used to perform a survival analysis of recidivism at five years after the 1989/1990 release. Cox regression is a common survival analysis technique that is used to study the time between entry into a study and a subsequent event. In our study, the subsequent event was the participant's first post-release sexual offense. The regression allowed us to estimate, while controlling for time, the effect of multiple explanatory variables on whether the participants would sexually reoffend.

The variables were entered into the regression in one step and the overall model was significant ($\chi^2$ (6) = 41.47, $p < .001$). Table 4 shows the coefficients for the regression. Having multiple types of victims was the only variable significantly associated with years since release in the positive direction. This finding indicates that the hazard of recidivism was higher in participants who had multiple types of victims. The hazard ratio for multiple types of victims (Exp(B) = 8.10) indicates that participants with multiple types of victims were approximately eight times more likely to have a sexual offense after release than those without multiple types of victims.

Another Cox regression was used to investigate the effect of these same variables on recidivism 10 years after the release date (Table 4). Again, the variables were entered into the regression in one step, with time to first offense after release as the time variable. The status variable was whether the participant had committed a sexual offense within 10 years. The overall model was significant ($\chi^2$ (6) = 58.81, $p < .001$). Again, the only significantly associated variable was multiple victims. For the 10-year model as well, having multiple victims increased the hazard of recidivism.

#### *Criminality Markers*

To investigate sexual recidivism rates based on past criminality, as measured by parole violations (yes/no), prison terms (1–2, 2–3, 4, or more), and

**Table 4** Cox Regression Coefficients for Sexual Deviance Markers, With Equation Variables

| | B | SE | Wald | *df* | *p* | Exp(B) |
|---|---|---|---|---|---|---|
| Five Years after Release | | | | | | |
| Stranger | .371 | .421 | .777 | 1 | .378 | 1.449 |
| No relation | 1.214 | .933 | 1.692 | 1 | .193 | 3.367 |
| Multiple types | 2.090 | .532 | 15.411 | 1 | .000 | 8.087 |
| Three or more victims | −1.023 | 1.068 | .918 | 1 | .338 | .359 |
| Prior sex offenses | .367 | .494 | .553 | 1 | .457 | 1.444 |
| Paraphilia | .123 | .713 | .030 | 1 | .863 | 1.131 |
| Ten Years after Release | | | | | | |
| Stranger | .008 | .334 | .001 | 1 | .980 | 1.008 |
| No relation | .475 | .748 | .403 | 1 | .525 | 1.608 |
| Multiple types | 1.966 | .464 | 17.949 | 1 | .000 | 7.145 |
| Three or more victims | −.604 | .778 | .603 | 1 | .437 | .547 |
| Prior sex offenses | .510 | .409 | 1.560 | 1 | .212 | 1.666 |
| Paraphilia | .496 | .535 | .860 | 1 | .354 | 1.643 |

juvenile offenses (yes/no) before 1989/1990, we performed a Cox regression with the covariates entered in one step (Table 5). The time variable was the time in years until the first sexual offense after the release date. Censored cases were those participants who did not reoffend within five years. The overall model results were significant ($\chi^2$ (3) = 48.81, $p < .001$). Both prison terms and parole violations were significant and positive, which indicate that these covariates increase the hazard of recidivism within five years. The hazard ratios for these covariates indicate that an individual who had violated parole before the release date was almost six times more likely to commit a sexual offense after the release date than someone who had no parole violations (Exp(B) = 5.87).

Next, we looked at how these criminality covariates were associated with recidivism at the 10-year mark. Again, the covariates were entered into the regression in one step, with time to first sexual offense after release as the time variable. The status variable was now whether the participant had committed a sexual offense within 10 years after the release date. The overall results of the model were significant ($\chi^2$ (3) = 45.83, $p < .001$). The regression coefficients for parole violations and prison terms were positive and significant, indicating that these covariates were associated with a higher hazard of recidivism at the 10-year mark (Table 5).

**Table 5** Cox Regression Coefficients for Criminality Markers, With Equation Variables

| | B | SE | Wald | *df* | *p* | Exp(B) |
|---|---|---|---|---|---|---|
| Five Years After Release | | | | | | |
| Prison | .712 | .285 | 6.244 | 1 | .012 | 2.038 |
| Parole | 1.769 | .551 | 10.313 | 1 | .001 | 5.865 |
| Juvenile | −.718 | .399 | 3.231 | 1 | .072 | .488 |
| Ten+ Years after Release | | | | | | |
| Prison | .720 | .225 | 10.215 | 1 | .001 | 2.054 |
| Parole | 1.443 | .519 | 7.743 | 1 | .005 | 4.234 |
| Juvenile | −.616 | .323 | 3.635 | 1 | .057 | .540 |

### *Aggression Markers*

A Cox regression was performed to examine whether severe aggression had an effect on recidivism at the five-year mark. The covariates used to measure aggression were at least one episode of stabbing, beating, maiming, or strangulation before the 1989/1990 release date (yes/no) and a group 1 violence score from the first sexual offense. The covariates were entered into the regression in one step, with time to first post-release sexual offense as the time variable. The status variable was whether the participant had committed a sexual offense within five years from the release date. Neither covariate was significant in the regression, and the overall results of the model were not significant.

We then performed a Cox regression at the 10-year mark using the same covariates, and the results were again nonsignificant and the covariates were nonsignificant. Further, a correlation analysis between aggressiveness in the first sexual offense (sum of any stabbing, beating, maiming, or strangulation) and aggressiveness in subsequent sexual offenses was not significant ($r = .12$, $n = 137$).

### *Combining Markers*

We created a new scale to examine whether the predictive accuracy of the variables found previously to be associated with recidivism at the 5- and 10-year marks was improved when these variables were combined. The new scale combined the variables from the sexual deviance and criminality markers (all be-

**Table 6** AUC Values for Sexual Recidivism, Derived From Significant Predictive Marker and Combines Variables

| Variables | AUC | Correlation (*r*) |
|---|---|---|
| Multiple victim types alone | | |
| 5 Years after release | .60 | .29* |
| 10 Years after release | .60 | .31* |
| Prison and parole | | |
| 5 Years after release | .66 | .34* |
| 10 Years after release | .66 | .37* |
| Multiple victim types | | |
| Prison and parole | | |
| 5 Years after release | .71 | .42* |
| 10 Years after release | .71 | .46* |

*$p < .001$.

fore the release date) that were significantly associated with recidivism (multiple types of victims, prior prison and parole violations). The new scale was created by summing across the three variables to create a range from 0 to 3 in theory, although none of the participants in our sample had a score of 3. Receiver operating characteristic (ROC) curves were then created for the separate markers and for the combined scale by using recidivism at the 5- and 10-year marks as the dependent variables. The ROC curve plots the specificity (false positives) and sensitivity (true positives) of the scale being studied. An area of 1.0 indicates a perfect prediction of true positives with no false positives and an area of .50 indicates prediction no better than chance. The advantage of using an ROC curve over other statistical measures of prediction (e.g., correlation coefficients) is that it is not constrained by base rates or selection ratios. Only the variables found to be significantly associated with recidivism in the Cox regressions were used for the ROC curves. Consequently, an ROC curve was created for multiple types of victims (sexual deviance), and another was created for prison and parole violations (criminality). As Table 6 illustrates, the area under the curve (AUC) for the combined scale is higher than that of the other ROC curves, indicating better predictive accuracy. The correlation coefficients add further support for this finding.

### *Static-99*

#### *Sexual Recidivism: Predictive Accuracy*

The average Static-99 score calculated at the 1989/1990 release date was 4.28 for the sample and was associated with a 31 percent rate of sexual recidivism at five-years after release and a 40 percent rate 10+ years. The area under the ROC curve was used to measure the predictive accuracy of the Static-99 before the 1989/1990 release date, using recidivism at the 5- and 10-year marks as the dependent variables. The areas under the ROC curve for the Static-99 before 1989/1990 with recidivism at the 5- and 10-year marks were both 0.62 ($r = .24$, $p < .01$). The predictive accuracy of the ROC curve can be roughly compared with a grade point system, which indicates that the present ROC curve would score a D; in other words, the Static-99 score before the release date did not very accurately predict sexual recidivism at either the 5- or 10-year mark.

#### *Sexual Reoffense Rates*

Table 7 offers a comparison of rates of sexual offense associated with the 5- and 10-year post-release mark from the pilot data compared with the Hanson and Thornton[9] developmental norms. Of the 45 subjects scoring in the low-risk range (Static-99 scores of 2 and 3), our data revealed a higher incidence of sexual reoffending than that of the normative sample. Indeed, the 10-year sexual recidivism percentage for those scoring a 3 in our sample was similar to that of the developmental sample score of 5, or a moderately high risk. Therefore, the Static-99 would have erroneously categorized the pilot subjects in 1989/1990 as low risk, when at the 10-year marker their sexual recidivism rate actually mirrored that of the developmental sample's moderate- to high-risk offenders. Conversely, those categorized as a moderately high risk at a score of 4 in the pilot sample demonstrated a low rate of sexual reoffending at the 5- and 10-year follow-up periods. When compared with the developmental sample, the 10-year risk marker was considerably lower: 17 percent versus the 31 percent found by Hanson and Thornton.[9] For those scoring in the high-risk range (score of 6; $n = 13$), those in the pilot sample had a much lower rate of reoffense (15% at 10 years versus a 45% norm) than that found in the developmental sample (most of whom were scored 6 with a very small number at scores above that). At the highest level (scores of 7 or more), the Static-99 worked well. These differences to some degree indicate the instability of the Static-99 developmental norms in providing risk percentages for future sexual recidivism.

## Discussion

Two specific concerns were addressed by the pilot data: the identification of risk factors for sexual re-

**Table 7** Static-99 Scores and Sexual Recidivism at 5 and 10 Years in a Pilot Sample, Compared With Those in a Developmental Sample

| Static-99 Score | Sample Size *n* (%) | Pilot Study Sexual Reoffense Rates | | Hanson and Thornton[9] Static-99 Sexual Reoffense Rates | |
|---|---|---|---|---|---|
| | | 5 y | 10y | 5 y | 10 y |
| 0 | 2 (1.5) | 0 | 0 | .05 | .11 |
| 1 | 1 (0.7) | 0 | 0 | .06 | .07 |
| 2 | 17 (12.4) | .12 | .18 | .09 | .13 |
| 3 | 28 (20.4) | .21 | .36 | .12 | .14 |
| 4 | 36 (26.3) | .03 | .17 | .26 | .31 |
| 5 | 24 (17.50) | .21 | .33 | .33 | .38 |
| 6 | 13 (9.5) | .08 | .15 | .39* | .45* |
| 7 | 7 (5.1) | .29 | .71 | | |
| 8 | 6 (4.4) | .67 | .67 | | |
| 9 | 2 (1.5) | .50 | .50 | | |
| 10 | 1 (0.7) | 1.00 | 1.00 | | |
| Average 4.28 | 137 (100%) | .31 | .40 | | |

*Developmental norms for 6+.

cidivism and the stability of the Static-99 in predicting sexual recidivism. Our base rate for sexual recidivism at the 5-year mark was 31 percent and for the 10-year mark, 40 percent. We suspect that these rates are inflated, as our sample consisted of those who were still under active CDCR supervision. That is, the study excluded those in which legal jurisdiction over the individual had expired during the investigation period of January 1989/1990 to June 2002. Moreover, this base rate remains to be tested in the larger sample.

### *Risk Predictors*

We found that combining the significant variables from two of the risk markers, sexual deviancy (multiple victim types) and criminality (parole violations and prison terms), led to a moderate level of predictive accuracy for sexual recidivism (ROC = 0.71, $r$ = .42 at the 5-year follow-up; $r$ = .46 at the 10-year follow-up). An avenue for improving on the moderate predictive accuracy associated with existing sex offender risk scales may be to weight those variables that tap strongly into sexual deviancy.[8] Multiple-victim types appeared to serve as a good proxy for sexual deviance; however, this definition is not meant to convey that those with one specific victim type (e.g., exclusively homosexual pedophilia) would not be considered sexually deviant.

The criminality marker was significant for both prison terms and parole violations as increasing the risk of sexual recidivism. The hazard ratios indicated that a person who violated parole before the release date was almost six times more likely to commit a sexual offense after the release date in both the 5- and 10-year follow-up periods than an individual who had no parole violations. This finding is consistent with the results of the Hanson and Morton-Bourgon[8] meta-analysis in which prior failure on conditional release was a moderate predictor of sexual recidivism and was statistically similar to the Static-99, RRASOR, or MnSost-R, in terms of predictive accuracy. However, general criminality, as measured by number of prison terms, pointed to an antisocial element as raising the risk of sexual reoffense. These preliminary data suggest that acts of sexual offending associated with an antisocial or criminal bent may be as persistent as those driven by more apparent sexual deviancy. This finding is in contrast with the results of the Hanson and Morton-Bourgon[8] meta-analysis, in which variables associated with general criminal history had small or no association with sexual recidivism.

The aggression marker was not predictive of sexual recidivism. Our findings did not support the use of violence toward victims as a risk predictor in actuarial schemes. This result is consistent with the findings of Hanson and Morton-Bourgon.[8]

Overall, our marker analysis identified sexual deviancy and criminality as two primary risk factors for sexual reoffending and was consistent with that described by Roberts *et al.*[33] Our data provided preliminary support for a cumulative effect increasing risk

(i.e., when both sexual deviancy and criminality factors are present). However, our sample size was small, and cross-validation on a larger sample would be necessary before our three-item scale could be used as an actuarial tool. Psychopathy may increase the risk of sexual recidivism.[16,38,40] In this regard, the PCL-R[41] would have been useful, but the prison files did not contain such scores and there was insufficient information from the file review to generate a PCL-R score. In addition, while physiological ratings such as penile plethysmography (PPG) would have been useful, this procedure is not used in the California prison system. Moreover, both ratings singly offer only small associations with sexual recidivism, as concluded by Hanson and Morton-Bourgon's recent large-scale meta-analysis.[8]

### *Static-99*

Our preliminary data suggest that Static-99 scores may pose a risk of both under- and overestimating risk. The average Static-99 score calculated at the 1989/1990 release date was 4.28 for the sample. However, the Static-99 ROC was at 0.62 for the 5- and 10-year markers, lower than the 0.71 cited in the normative study.[9] This result suggests that the Static-99 was not a very accurate predictor of sexual recidivism in our sample.

The risk of false positives and negatives related to the Static-99 has been raised by prior researchers.[42] Some, however, argue that the concept of false positives and negatives is more relevant to the notion of prediction versus risk assessment. A related concept that has utility for applied risk assessments is examining the stability of the risk percentages identified in the Static-99 developmental sample. Doren[43] cited a lack of stability in a Static-99 score of 4 for the five-year rates, where aggregated data from seven studies had much lower recidivism rates when compared with the Static-99 developmental study score (12.9% versus 25.8%). In our sample, those at moderately low risk according to the Static-99 scores (i.e., 2, 3) at the time of their release in 1989/1990 had higher rates of sexual reoffense at the 5- and 10-year marks than those in the developmental sample. Those categorized as moderate to high risk by the Static-99 (score of 4–6) demonstrated relatively lower rates of sexual reoffending than did the developmental sample during the follow-up periods.

Abracen and Looman[44] and Looman[45] demonstrated lower rates of sexual recidivism at the five-year marker among Canadian moderate and high-risk sex offenders as identified by the Static-99 than in the Hanson and Thornton[9] developmental sample. Both articles reported data on overlapping samples of Canadian sex offenders undergoing treatment. When examining the full sample of 258 sex offenders followed over a 5.1-year period, Looman[45] found a Static-99 AUC of 0.62 for predicting sexual recidivism, similar to the result in our study. The overall incidence of sexual recidivism was low (8.9%), both in the Looman[45] results and the Abracen and Looman[44] data (13.3%) and may be related to the use of sexual convictions as the outcome variable. Abracen and Looman reported the observed rate of sexual recidivism for those with a Static-99 score of 5 as 12.7 percent, markedly lower than the 33 percent cited in the developmental study. Moreover, even for a Static-99 score of 6, the observed sexual recidivism rate was low (10.8 percent), in contrast with that cited by Hanson and Thornton (39 percent).[9] Within the context of applied risk assessments, these data challenge the use of the Hanson and Thornton developmental recidivism percentages for ranking the risk of sex offenders.

Regional differences in how sexual offenses are tried and sentenced as well as offender characteristics (racial diversity) may be elements in the lack of correspondence between the Static-99 risk percentages in our pilot data when compared with the developmental sample. With respect to jurisdictional differences in sexual recidivism rates, our data demonstrated higher, but not substantially so, findings when period of follow-up and outcome measures were controlled. For example, the rate of sexual arrest in a mid-West Mn-SOST-R cross-validation sample was 22 percent in six years,[6] compared with our five-year recidivism rate of 31 percent. Moreover, the survival distribution of multiple-occasion sex offenders from the first to the second sexual offense in our data did not differ when compared with other samples. At the five-year point, almost one-half of those with multiple sexual offenses in our sample had committed a second sexual offense. By the 10-year point, an additional 11 had reoffended. These data are consistent with those reported by Doren[39] and Prentky *et al.*[46] who found that one-half of all detected sexual recidivism was found within the first five years after release and that two-thirds to three-quarters of the

detected sexual recidivism was found by 10 years after release. Whether there are jurisdiction-specific sexual recidivism rates remains to be determined in a larger sample, as our data are limited in scope, both by the small sample size and the selection of only active files.

A recent Swedish study found that the accuracy of the RRASOR and Static-99 varied across ethnicity.[47] While the tools were accurate for those prisoners of Nordic and non-Nordic European descent in the prediction of sexual recidivism, neither actuarial tool could differentiate accurately African or Asian sexual recidivists from nonsexual recidivists. Our pilot data provided some support for the use of the Static-99 among ethnically diverse sex offenders, in that the predictive statistical value was above chance (ROC = .62, $r = .24$). The strength of association, however, was clearly lower than that found in the developmental sample. This may be related to diversity contributed by jurisdictional differences in the prosecution of sexual offenses, as well as cultural and ethnic/racial variations in Canadian or U.K. groups.

## Conclusions

We found that three variables, multiple victim types, parole failures, and prior prison terms, cumulatively predicted sexual recidivism at a moderate level of accuracy. The Static-99 statistical predictive accuracy in our sample was lower than that reported in the developmental sample. In addition, the Static-99 either underestimated or overestimated risk in our sample. The use of the Static-99 in many U.S. jurisdictions to rank the risk level of sex offenders facing SVP/SDP commitment may be problematic, given the failure to replicate the developmental norms.

There are inherent limitations in a pilot report. Notably, this study's sample selection was from only active prison files. This sampling, as mentioned previously, may have inflated the rate of sexual recidivism. Consequently, these findings are not descriptive of the entire sample pool; nonetheless, they may be instructive as to risk factors that emerge as robust in predicting sexual recidivism among long-term offenders who have returned to corrections supervision after community release. In addition, the small sample size coupled with missing data limited the dynamic variables that were available for preliminary analysis. Increasingly, investigators have emphasized the need to include dynamic variables and a broadening of outcomes that measure change in the inclusion of risk schemes.[48–50] Dynamic risk factors in a larger sample may add cumulatively to the predictive accuracy of the combination variables from two markers identified currently.

Sjostedt and Grann[51] urged researchers to develop validity estimates for better conceptualized outcome measures than the generic category of sexual recidivist. The task of developing specific risk characteristics that can be finely tuned to distinguish recalcitrant repeat offenders from those who are at moderate risk for sexual recidivism is more difficult than differentiating broadly between single- and multiple-offense sexual offenders. Sjostedt and Grann found in their application of existing actuarial procedures to a Swedish database that such procedures were useful in identifying imminent and less severe reoffending, but were less accurate in distinguishing who will commit repeat and injurious sexual offenses. These researchers noted that existing actuarial methods are optimized to predict the most common but least severe sexual offenses. Further identification of the characteristics of a severe and persistently reoffending group would be useful in both risk assessment decisions and management during community release.

One rating scale is unlikely to be sufficient to address risk across an offender's lifetime as well as to encompass person-specific factors. Actuarial tables may be one method with which to develop an individual specific algorithm of risk, as in evidence-based medicine.[32] Ultimately, actuarial tools describe group patterns, and the fit to an individual requires a complex analysis beyond a rating scale.

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