__State of Hawaii, FY 2005__
Validation of the State of Hawaii LSI-R Proxy

The State of Hawaii LSI-R Proxy, developed by private consultants from System Assessment and Training (J-SAT), is administered to all sentenced and a small number of pre-trial offenders. This includes offenders who are adjudicated through Hawaii's court system and placed under the supervision of the Department of Public Safety's Intake Service Center (PSD-ISC); Hawaii Paroling Authority (HPA); and Probation Services (Judiciary). The purpose of the Proxy is to identify offenders who are at minimal recidivism risk. By ICIS policy, offenders who score four or less on the Proxy are classified at the Administrative risk level (lowest level of risk). Offenders who score five or greater are at elevated risk, and consequently are administered an LSI-R, the primary risk assessment instrument used to identify criminogenic risks and needs.

The Proxy is a three-item scaled instrument that is scored by probation/parole officers, and is based on the set of scaled values depicted in Table 1. The offenders are scored on the following basis; their age at first arrest, the number of prior arrests, and current age. The age at first arrest and the number of prior arrests are based on the offender's juvenile record. Age at first arrest and the number of prior arrests are scored from a low of one to a maximum score of three points, while the range of scores for current age are from a low of zero to a maximum of two. The Proxy values are scored based on the premise that the higher the sub-score, then: (1) the younger the age at first arrest; (2) the greater the number of prior arrests; and (3) the younger the current age of the offender. Finally, the LSI-R Proxy is designed as a case management tool where offenders who score low on the Proxy are classified at the Administrative level, are subsequently "Banked" with no or minimal services provided, and are not administered an LSI-R. Currently, only the Probation Services use the LSI-R Proxy to determine appropriate supervision levels based on offender risk classification. The PSD-ISC and HPA officers do not use the Proxy for risk classification purposes, but do utilize it for offender tracking and baseline monitoring.

Table 1: LSI-R Proxy Scoring Guide

	LSI-R Proxy Scale			
	0	1	2	3
Age at First Arrest	n/a	24 or greater	21-23	20 or less
# of Prior Arrests		0-2	3-6	7 or greater
Current Age	38 or greater	34-37	33 or less	n.a.

The purpose of this study is to validate the Proxy as a predictive instrument for recidivism risk. The major findings of this study are documented below, and represent a compilation of scores aggregated along two major categories; administratively classified offenders (Banked), and offenders classified at higher risk (Nonbanked).

Major Findings: This three-year follow-up recidivism study statistically assesses the validity of the LSI-R Proxy as a predictive criminogenic screening instrument. The Hawaii data, and subsequent analysis have validated the following: (1) the Proxy is successfully identifying offenders who are least likely to recidivate, as compared to offenders at elevated risk; (2) increasing Proxy scores positively correlate with recidivism rate; (3) increasing Proxy scores negatively correlate with time-to-recidivism; and (3) risk levels by Proxy score vary by agency. Specific findings include:

- 31.0% of the total offenders who were administered a Proxy are classified at the Banked level (Table 1).
- 45.7% of probationers are classified at the Banked level (Figure 3).
- Offenders at the Banked level have a 37.2% recidivism rate, as compared to a 62.3% rate for offenders at the nonbanked level (Figure 4).
- Offenders who score two points on the Proxy have a 21.3% recidivism rate, as compared to a 70.5% rate for offenders who score eight points on the Proxy (Figure 4).
- The average time-to-recidivism for Banked offenders is 14.6 months, as compared to 13.0 months for offenders at elevated risk (Figure 5).

I. Methodology:

The recidivism dataset includes data fields from the following information systems: the CYZAP database; Department of the Attorney General - Proxy database; Hawaii State Probation - PROBER information system; Department of Public Safety - ISC database; and the Hawaii Paroling Authority - Offender database. The arrest charges compiled for this study are from a Criminal Justice Information System (CJIS), September 29, 2008 download. The data elements from the CJIS download include *Offender Identification Number*, *Arrest/Conviction Dates*, *Initial Charge Severity* (Felony, Misdemeanor, Petty Misdemeanor), and *Initial Charge* and *Disposition* descriptions. Demographic information includes *Race*, *Sex*, and *Date of Birth*.

The CJIS download included 60,049 total charges recorded as of July 1, 2005. Due to the multiple agencies identified in this study, the *Follow-Up Start Date* is determined by each agency. This date is critical in calculating the *Time-to-Recidivism* field (i.e., elapsed time before a new arrest charge or technical violation). In situations where multiple charges are filed on the same arrest date, the most severe charge (Felony, Misdemeanor, or Petty Misdemeanor) is used to record the recidivism event.

II. Offender Profile Analysis

A total of 5,505 Proxies in FY 2005 were compiled for this study. The average age was 35.3 years old at the time of assessment. Additionally, the average age at first arrest is 22.7 years, and the average number of prior arrests is 16. With respect to rearrest, 2,900 out of 5,326 offenders recidivated (54.4% recidivism rate); of these total rearrests, 2,475 or 85.3% were charged with criminal offenses, and 425 offenders or 14.7% were charged with parole or probation revocations.

III. Descriptive Statistics

Table 2: Proxy Score, by Frequency Distribution

Proxy Score	Frequency	Percent	Cumulative Percent	Percent Classified Banked
2	473	8.6	8.6	Banked (31.0%)
3	313	5.7	14.3	
4	921	16.7	31.0	
5	635	11.5	42.5	Nonbanked (69.0%)
6	1,439	26.1	68.7	
7	730	13.3	81.9	
8	994	18.1	100.0	
Total	5,505	100.0		

Table 2 depicts the Proxy Score by frequency distribution. The 1,707 (31%) offenders with scores from two through four are considered low risk, and classified as Banked. There are 3,798 (69%) Nonbanked offenders classified at elevated risk (scores between five and eight), and are subsequently administered an LSI-R.

Note: The frequency distribution of Proxy scores are not normally distributed, which means that the distribution is not a perfect bell-shaped curve, and subsequently reflects errors in estimating averages or percentages (see technical notes section). As a result, the percent of offenders that are Banked and Nonbanked are only estimates and can fluctuate between 30.2% and 31.6% for Banked offenders, and between 68.4% and 69.8% for Nonbanked offenders.
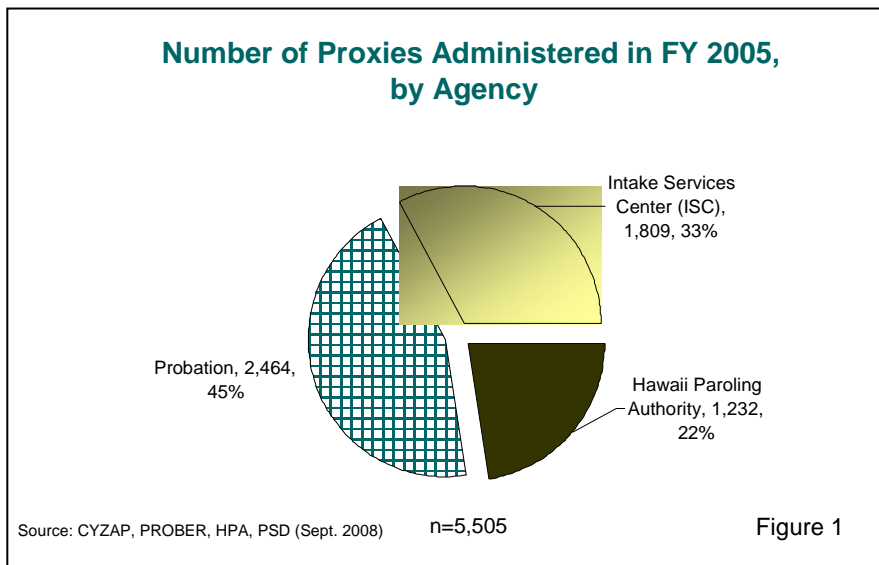

Number of Proxies Administered in FY 2005, by Agency

Intake Services Center (ISC), 1,809, 33%

Probation, 2,464, 45%

Hawaii Paroling Authority, 1,232, 22%

Source: CYZAP, PROBER, HPA, PSD (Sept. 2008)   n=5,505   Figure 1

Figure 1 depicts the proportions (number and percent) of Proxies administered in FY 2005, by Agency. Probation administered 2,464 Proxies, which represent 45% of the total Proxies administered in FY 2005. This was followed by the Intake Services Center (n=1,809), who administered 33% of the Proxies, and the Hawaii Paroling Authority (n=1,232), who administered 22% of the Proxies.
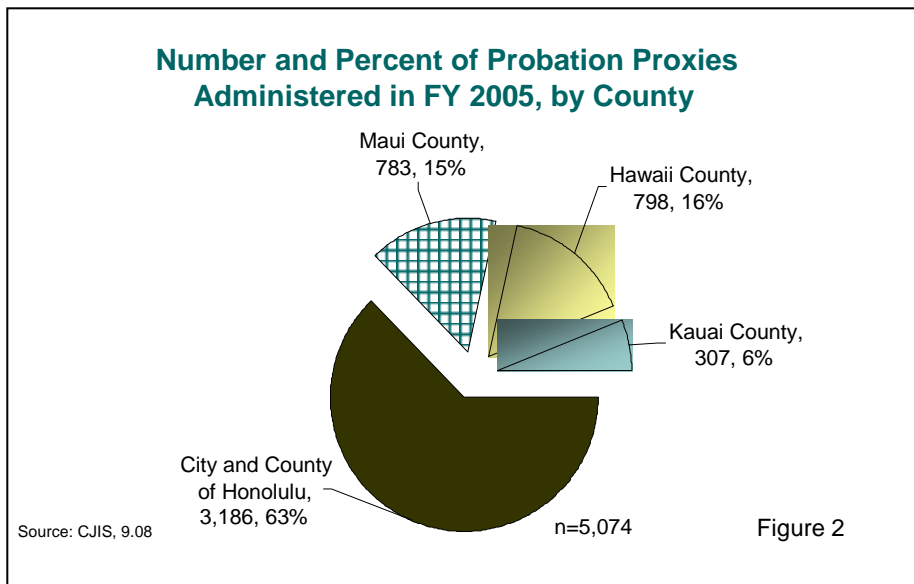
Number and Percent of Probation Proxies Administered in FY 2005, by County

Maui County, 783, 15%

Hawaii County, 798, 16%

Kauai County, 307, 6%

City and County of Honolulu, 3,186, 63%

n=5,074

Source: CJIS, 9.08

Figure 2

Figure 2 depicts the proportions of Proxies administered in FY 2005, by county. This includes 3,186 Proxies administered in the City and County of Honolulu, which represent 63% of the total Proxies in FY 2005. This was followed by 798 or 16% of the Proxies administered to offenders in Hawaii County; 783 (15%) offenders in Maui County; and 307 (6%) offenders in Kauai County.
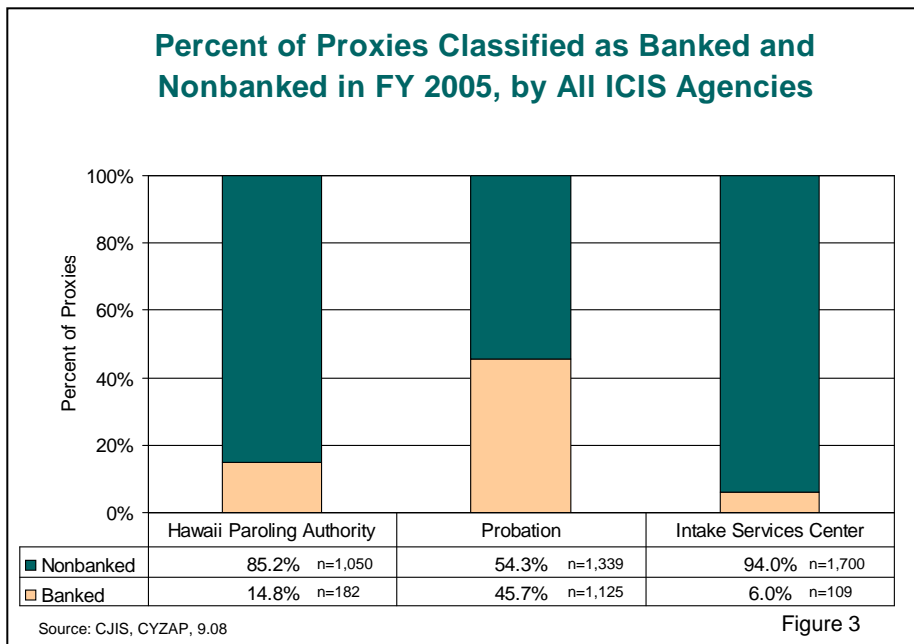
Percent of Proxies Classified as Banked and Nonbanked in FY 2005, by All ICIS Agencies

Percent of Proxies

	Hawaii Paroling Authority	Probation	Intake Services Center
■ Nonbanked	85.2% n=1,050	54.3% n=1,339	94.0% n=1,700
□ Banked	14.8% n=182	45.7% n=1,125	6.0% n=109

Source: CJIS, CYZAP, 9.08

Figure 3

Figure 3 depicts the proportions of Proxies that are Banked (score of four or less) versus Nonbanked (score of five or more) by agencies. Probation has the highest number (n=1,125) and percentage (45.7%) of Banked offenders, followed by the Hawaii Paroling Authority (n=182; 14.8%), and the Intake Services Center (n=109; 6.0%).

IV. Recidivism Analysis

Three-Year Follow-Up Recidivism Rates Based on the Proxy Instrument's Scaled Scores in FY 2005

Banked (PROXY score<5); 37.2% recidivism rate, n=1,665

Nonbanked (PROXY score>4); 62.3% recidivism rate, n=3,661

$\chi^2(5,326)=291.4$; p<.001

FY2005 Recidivism Rate (52.5%)

Banked Level

	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7	Score 8
(n)	(n=465)	(n=305)	(n=895)	(n=620)	(n=1,394)	(n=696)	(n=951)
Recidivism Rate	21.3%	32.8%	46.9%	52.6%	58.0%	68.4%	70.5%

Source: CJIS, PROBER, HPA, ISC-PSD - 9.08

$\chi^2(5,326)=445.1$; p<.001

Recidivism defined as any rearrest, revocation, or technical violation.
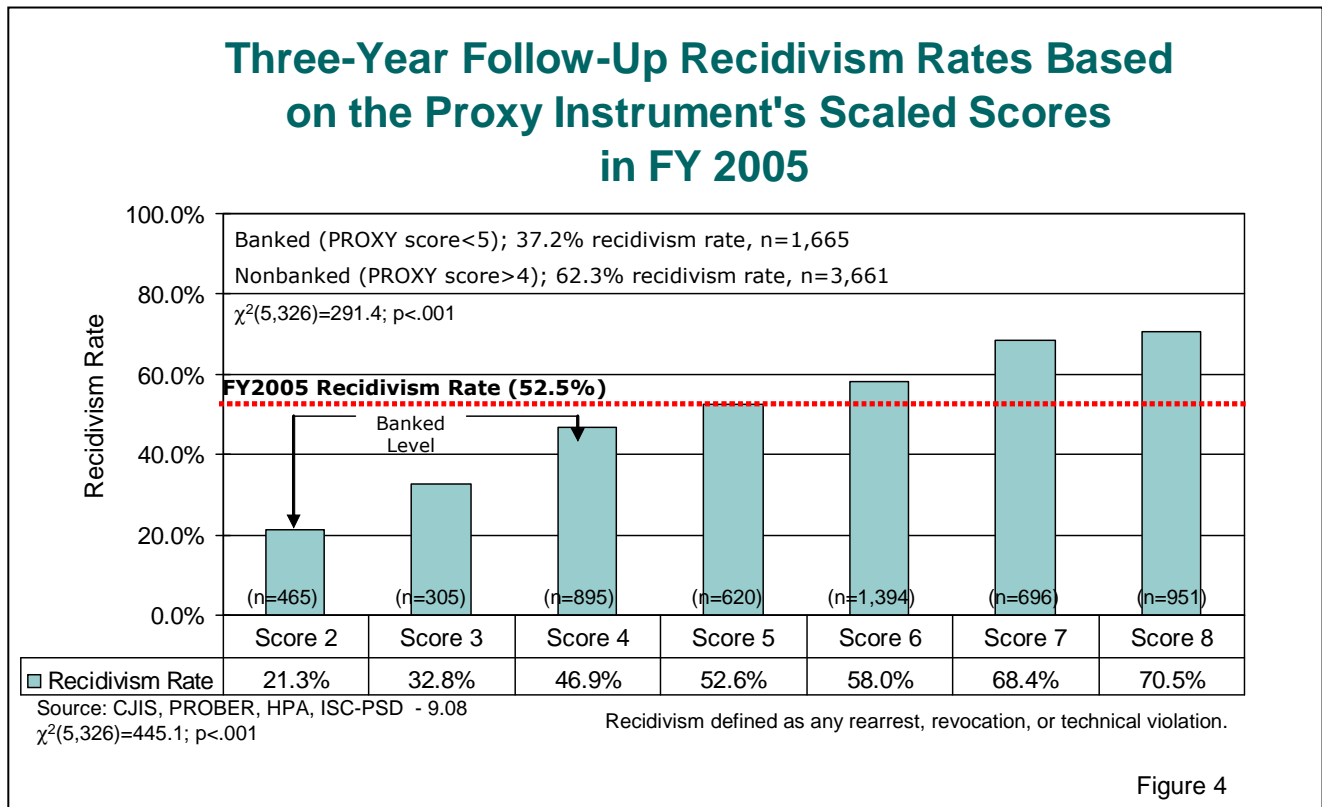
Figure 4

Figure 4 displays the three-year follow-up recidivism rates of probationers and parolees who were administered the Proxy in FY 2005. There were 5,326 Proxy instruments administered in FY 2005, where 1,665 (31.3%) offenders are classified at the Banked level, and 3,661 (68.7%) are classified at the Nonbanked level. The Proxy scores range from a low of two to a high of eight points. The findings provide substantial validation evidence that as Proxy scores increase, the recidivism rates increase. The differences in recidivism rates based on Proxy scores are statistically significant at the p<.001 level. Furthermore, Banked reoffenders (Proxy<5) have a recidivism rate of 37.2% (n=1,665), as compared to Nonbanked reoffenders (Proxy>4) who have a recidivism rate of 62.3% (n=3,661). The difference in recidivism rates is statistically significant at the p<.001 level.
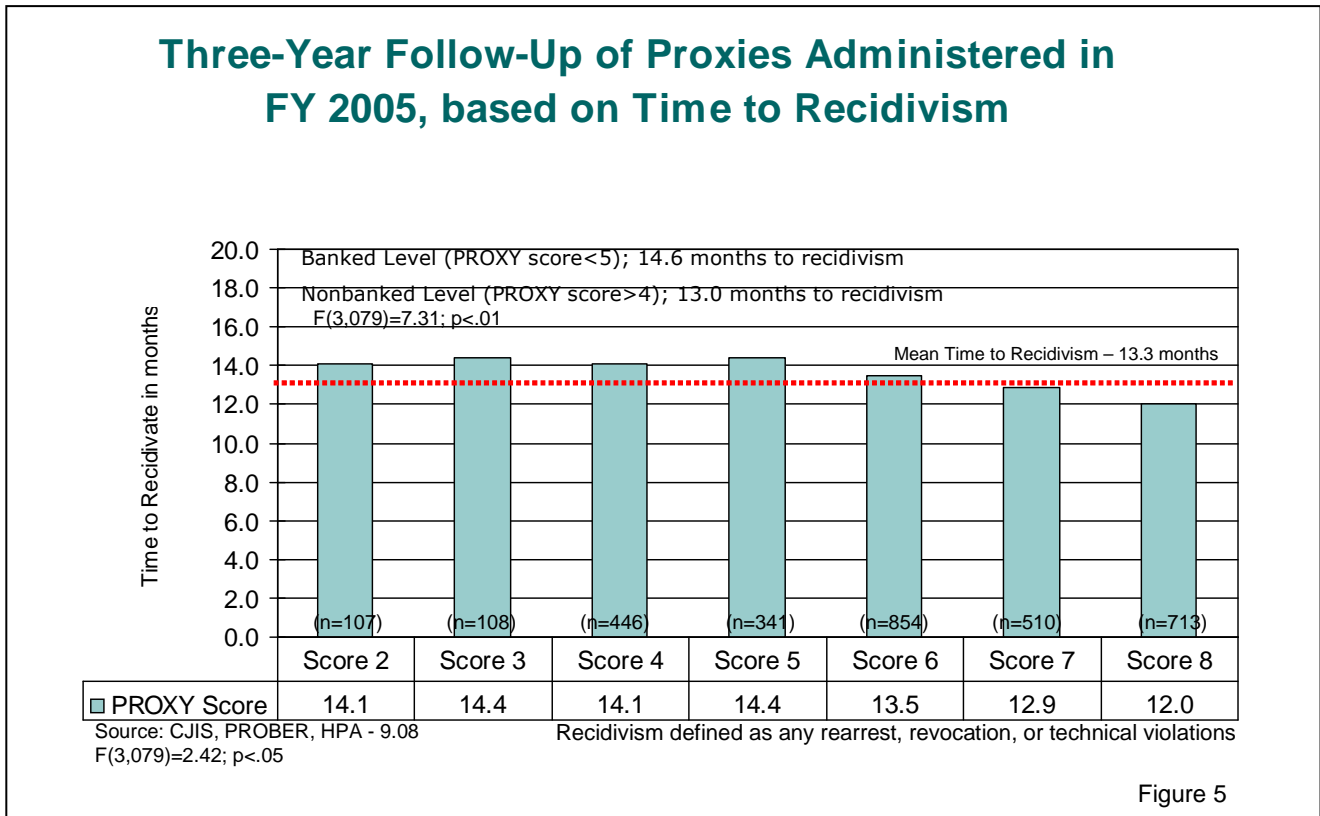
Three-Year Follow-Up of Proxies Administered in FY 2005, based on Time to Recidivism

Banked Level (PROXY score<5); 14.6 months to recidivism
Nonbanked Level (PROXY score>4); 13.0 months to recidivism
$F_{(3,079)}=7.31$; $p<.01$

Mean Time to Recidivism – 13.3 months

Time to Recidivate in months

(n=107) (n=108) (n=446) (n=341) (n=854) (n=510) (n=713)

	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7	Score 8
PROXY Score	14.1	14.4	14.1	14.4	13.5	12.9	12.0

Source: CJIS, PROBER, HPA - 9.08   Recidivism defined as any rearrest, revocation, or technical violations
$F_{(3,079)}=2.42$; $p<.05$

Figure 5

Figure 5 displays the average time (in months) to recidivism for Proxies administered in FY 2005. The Proxy scores range from a low of two to a high of eight points. The findings reveal that as the Proxy scores increase, the time to recidivism decreases. The change in time to recidivism is statistically significant at the $p<.05$ level for the entire range of Proxy scores. With respect to offenders at the Banked and Nonbanked levels, the differences in time to recidivism between these two levels are statistically significant at the $p<.01$ level. The following statements show specific findings regarding the time to recidivism by Proxy score, and provide substantial validation evidence.

- The average recidivism time is 13.3 months for the 3,079 offenders who were administered the Proxy.
- The average recidivism time is 14.6 months for the 661 offenders classified at the Banked level.
- The average recidivism time is 13.0 months for the 2,428 offenders classified at the Non-banked level.

V. Proxy Instrument Validation

ROC Curve

ROC=.647

Figure 6

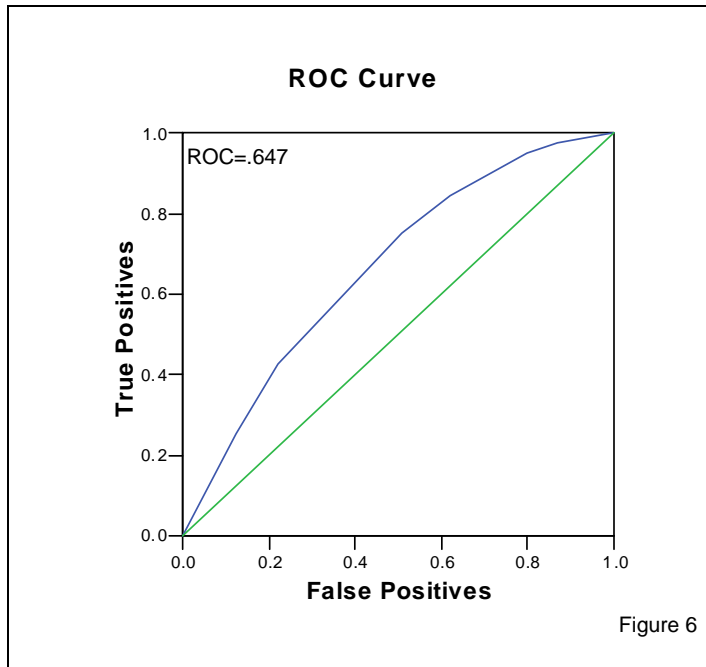**Figure 6** depicts the Receiver Operator Characteristics (ROC) coefficient. The ROC coefficient (arch line above the diagonal) is .647 (p<.001). The greater the area between the ROC arch and the straight diagonal line, the higher is the ROC coefficient. This means that the Proxy instrument accurately predicts recidivism by addressing the ratio of true positives against false positives. In Figure 6, the .647 ROC represents a "fair," but statistically significant predictive value (see technical notes section for statistical details).

Survival Functions

Breslow χ^2=7.55, p<.01

PROXY_SCORE
— 2.00
— 3.00
— 4.00
— 5.00
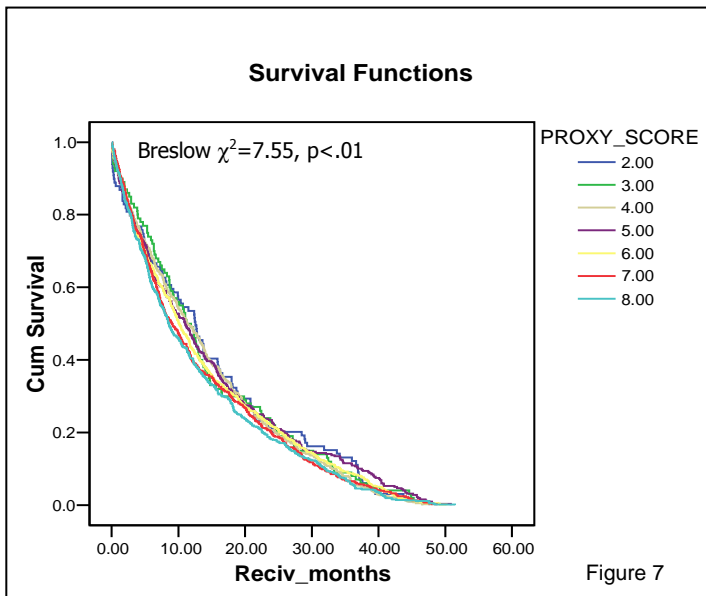— 6.00
— 7.00
— 8.00

Figure 7

Figure 7 depicts the survival functions taken from the Kaplan Meier Regression technique. Each survival curve represents individual Proxy scores. According to the Breslow Chi Square (χ^2=7.55), the survival curves calculated for each Proxy score are significantly distinct and separate from each other (p<.01). The greater the separation of individually plotted Proxy scores, the greater is the difference found in time-to-recidivism for each Proxy score.

Cox Regression analysis (Table 3) substantiates the internal validity of the Proxy instrument. The odds ratio (Exp (B) =1.027) represents statistically significant (χ^2=5.25; p<.05), but weak probability of recidivism based on increasing Proxy scores. See the technical notes section for detailed explanations.

Table 3: Regression Statistics

Cox Regression					
	B	**SE**	**Wald**	**Sig.**	**Exp (B)**
Proxy Score	0.27	.012	5.25	.022	1.027

Note: The "B" coefficient indicates the net strength of the Proxy instrument's power to predict recidivism, while "SE" refers to the standard error, which indicates the variation or dispersion of scores from the Proxy mean. The Wald is a chi square statistical test used in regression analysis, and is used to determine the statistical significance of the Exp(B) or odds ratio.

Discussion and Conclusions:

The State of Hawaii's LSI-R Proxy scale has adequate to good predictive precision. The Proxy distinguishes offenders who are at higher recidivism risk, as compared to offenders who are at lower recidivism risk. The Proxy instrument does not need an adjustment in cut-off scores, based on the *Age at First Arrest*, *Prior Number of Arrests*, and *Current Age*. The current cut-off for Banked offenders should remain at four or less. The study results show that offenders classified at the Banked level are recidivating at a rate of 37%, which is significantly less (p<.001) than the 62% recidivism rate for Non-banked level offenders (Proxy scores of 5 or more). The Nonbanked offenders will likely need a full LSI-R assessment to examine the "Big Six" criminogenic needs, and appropriately classify all offenders by levels of recidivism risk, e.g., administrative, low, medium, high, and surveillance.

The recidivism analyses also show that as Proxy scores increase, the recidivism rates increase (Figure 4). The study reveals that offenders who score two or three on the Proxy are at the lowest recidivism risk (<33% recidivism rate), while offenders with a score of seven or eight are at the highest recidivism risk (>68% recidivism rate). Additionally, increases in Proxy scores are not only loosely related to increases in actual recidivism rates (as contrasted with projected risk), but also to reductions in the time-to-recidivism. Figure 5 depicts offenders who score five or below on the Proxy recidivate on average approximately 14 months after the follow-up start date. On the other hand, offenders who score above six have an average time-to-recidivism period of less than 13 months.

Regression analysis reveals that as a risk classification instrument, the Proxy has good internal validity. The ROC coefficient (.647) is statistically significant (Figure 6), and has adequate predictive powers when comparing the ratios of risk sensitivity rates (successfully identifying offenders who will likely recidivate) to recidivism error rates (falsely identifying offenders who do not recidivate). Regression analysis also shows distinct separation in survival curves (Figure 7), which means that differences in Proxy scores have statistically significant and distinguishable time-to-recidivism survival periods (p<.01).

In conclusion, the LSI-R Proxy is a valuable instrument that is a valid criminogenic screening instrument for the State of Hawaii. It is recommended that the ICIS Proxy cut-off scores remain the same, unless future assessments warrant a realignment of the Proxy scoring criteria.

Technical Notes Section:

1. Technical explanation for Table 2 – Proxy Score by Frequency Distribution.

Histogram

Mean = 5.3355
Std. Dev. = 1.86949
N = 3,696
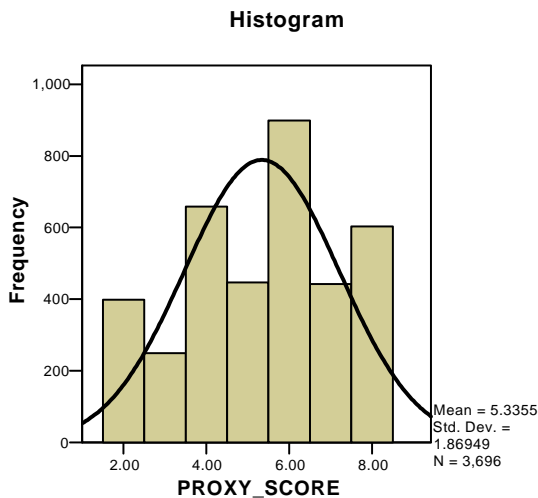
The histogram is a plot of Proxy scores by frequency counts. This figure reveals a negative skew (-.36), which indicates a greater than expected distribution of Proxy scores that are above the mean (x_{ave}= 5.53). The distribution's standard error (SE) is .025, which is used to calculate the confidence interval of the mean. The confidence interval is a calculated range of scores that falls within a specified margin of error, normally based on a 95% confidence level (z=1.96) multiplied by the SE. The confidence intervals represent the upper and lower limits of the mean, specified by the formula…
Upper limits= x_{ave} + 1.96(SE)
Lower limits= x_{ave} − 1.96(SE)

Based on this calculation, the average Proxy score fluctuates between 5.48-5.58, which translates into a mean range of between 55.1-57.7% of the total distribution. With respect to offenders classified at the Banked level, the distribution of Proxies with scores of four or under has a confidence range that is between 30.2-31.6%, based on a .025 standard error. With respect to Nonbanked offenders, the distribution of Proxy scores between five through eight has a confidence range that is between 68.4-69.8%.

2. Technical explanation for Figure 6 – ROC Curves.

The ROC provides a statistical measure that predicts the Proxy instrument's ability to correctly classify offenders into discrete risk groups. A perfect ROC of 1.0 represents the highest degree of risk selection with zero degree of risk classification errors, while a ROC coefficient of <0.5, represents a meaningless risk prediction. **True Positives** refers to an accurate prediction of risk, while **False Positives** refers to the risk of making classification errors, e.g., falsely identifying offenders who do not recidivate.

3. Technical explanation for Table 3 – Regression Statistics.

The Exp (B) reveals an odds ratio of 1.027, which means that there is a 2.7% risk difference in the recidivism ratio (1.027 – 1.0)*100 = .027 or 2.7%) between Proxy scores that increase, as compared to Proxy scores that remain unchanged (do not increase or decrease). This represents a very small and almost indistinguishable change in relative risk. Another approach in evaluating odds ratios is through probability analysis. The probability of recidivism is .51 (1.027 /(1 + 1.027) = .507, which is nearly a non-existent recidivism risk (a probability of .50 is even risk or no probability of recidivism, while a probability of 1.0 is perfect probability of recidivism, e.g., any increase in Proxy scores will result in a recidivism event).

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