

THE LEVEL OF SERVICE INVENTORY AND FEMALE OFFENDERS:  
ADDRESSING ISSUES OF RELIABILITY AND PREDICTIVE VALIDITY

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## ABSTRACT

The legitimacy of classifying female offenders in the correctional system has been disputed (especially the application of male-normed risk assessment tools), and yet, there is a need to accurately determine the risk of re-offending and the criminogenic needs of the offender along with general and specific issues (i.e., responsivity) that will encourage successful program delivery. The Level of Service Inventory – Ontario Revision (LSI-OR; Andrews, Bonta & Wormith, 1995) is an assessment tool used throughout Ontario’s probation services and provincial institutions. Although the first edition of the LSI was based primarily on a male sample, later revisions included norms for female offenders based on samples spanning three continents (Blanchette & Brown, 2006). Although its reliability and predictive validity has been demonstrated across many field settings and offender populations, few studies (e.g., Rettinger, 1998) have addressed the question of predictive validity on a sufficiently large sample of female offenders to convince the skeptics of the LSI-OR’s applicability to women (Blanchette & Brown).

The current study examined internal consistency, the ability to discriminate recidivists from non-recidivists with t-tests, and the capacity to predict recidivism with correlation and receiver operating characteristic analysis. The sample consisted of 2831 female offenders who were either released from a provincial correctional facility, completed a conditional sentence in the community, or completed a sentence of probation in Ontario during a one year period (2002/2003). Special consideration was given to female offenders from different disposition groups, with different racial backgrounds, with mental health issues and with prior victimization. The LSI-OR had very strong internal consistency and was able to distinguish offenders who committed a re-offence from those who did not commit a re-offence; both when considering the scale as a whole and when considering individual subscales. The LSI –OR was also found to predict recidivism for all female offenders. It also predicted recidivism for all subgroups with the exception of female offenders released on a conditional sentence and who had been previously victimized. While the use of the LSI-OR to assess provincial female offenders is supported,

however, new risk levels are suggested to increase the predictive ability and reduce the potential for over-classification.

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## CHAPTER 1 INTRODUCTION

Female offenders are at a disadvantage in the correctional system when compared to male counterparts because relatively little is known about the aetiology and persistence of female offending. Often overlooked because of the small proportion of offences and the tendency to commit less serious crimes (Boritch, 1997); female offenders have had comparatively little research to support proper assessment, treatment and release planning.

The proportion of female offenders has been changing. Between the years 1977 to 1997, Canadian statistics indicate there has been a 5% increase in the number of women charged with a crime (Finn, Trevethan, Carriere & Kowalski, 1999). Additionally, although there are still fewer female than male offenders in the provincial system deemed a high risk to reoffend (44% vs., 49%), since 1996/1997, there has been an increasing trend to classify female offenders in higher security designations (Finn et al.). Up from 4% in 1996, currently 11% of new federal female admissions are initially rated as maximum security, while just over one half (53%) are initially rated as minimum security (Correctional Service of Canada, 2006). These changes have stimulated gender-inclusive risk assessment research.

Historically, risk assessment tools have been tested using a male offender population. Although there may be some overlap in the factors that determine offending behaviour, it is also important to recognise that there may be some fundamental differences. Tools originally designed for a male population may not translate well to a female population and have been criticized for not taking both feminist and non-feminist literature on the differences between male and female offenders into account (Hannah-Moffet & Shaw, 2001). It is clearly important to have a risk assessment tool that is capable of predicting reoffence for male and female offenders equally well.

The psychology of criminal conduct (PCC) (Andrews & Bonta, 2003) draws upon a rich history of social learning, cognitive-behavioural, and social cognition approaches to criminal behaviour to suggest that criminal behaviour stems from a weighing of costs and benefits with respect to participation in criminal activities and conventional activities. The weighting of

factors may vary across time and situation, but the process is viewed as universal; equally valid for different ethnic/cultural groups, male/female offenders, age categories and offenders with specific offending histories (e.g., sex offences, violent offences). Although risk assessment that draws on this understanding has been shown to be accurate for male offenders as well as for female offenders, there has been extensive research involving male offenders and relatively little with female offenders.

The current study examined the predictive validity of the Level of Service Inventory – Ontario Revision using a sample of female offenders from the province of Ontario. Currently, the Ontario Ministry of Community Safety and Correctional Services (OMCSCS) classifies all offenders serving a sentence of over 30 days and under two years with the purpose of “giving inmates opportunities for successful personal and social adjustment while ensuring the security and safety of correctional institutions” (OMCSCS, 2007). These offenders are assessed using the Level of Service Inventory – Ontario Revision (LSI-OR; Andrews, Bonta & Wormith, 1995), a revision similar to the most current version of the LSI, the Level of Service / Case Management Inventory (LS/CMI; Andrews, Bonta & Wormith, 2004) as published by Multi-Health Systems.

### **Risk Assessment**

Offender assessment helps place offenders in a facility, and within a facility, where the safety of the individual and institution is balanced with meeting the treatment needs of the offender. Often high risk offenders are in need of more services and are more responsive to these services (Andrews & Bonta, 2003; Andrews & Dowden, 2006). After exposure to appropriate treatment, high risk offenders have lowered risk of recidivism, while lower-risk offenders are not as responsive or may even increase their risk as a result of associating with higher-risk offenders (Andrews & Bonta, 2003). Distinguishing high-risk offenders from low-risk offenders supports treatment planning by allowing services to be directed toward offenders who are in greater need

Risk assessment is also used to make decisions regarding offender release. Prior to a parole decision, all Ontario offenders being considered for early release must undergo a standardized risk assessment for review by the parole board. Based on this report, the parole board may make the decision to grant conditional release or hold the offender past their statutory release date. Proper risk assessment can help facilitate this decision as well as inform decisions regarding

frequency of supervision, case management issues and community programs recommended to the offender.

The approach to offender risk assessment has changed over time. Four generations of risk assessment have been identified (Andrews, Bonta & Wormith, 2006). The first generation relied solely on a clinician's judgement of the likelihood of reoffence. This unstructured clinical judgement was often unreliable and inaccurate (Grove & Meehl, 1996). The second generation relied upon actuarial predictors of recidivism (e.g., Statistical Information about Recidivism Scale; Nuffield, 1982). These scales were made up solely of static risk factors found to be related to reoffending. Although they were better able to predict reoffence accurately, they were not able to track positive progress or change as a result of treatment. This led to the third generation of risk assessment tools, which incorporated dynamic (criminogenic) risk factors derived from theoretical backgrounds (e.g., the Wisconsin Risk Scale, Baird, 1981; Level of Service Inventory – Revised, Andrews & Bonta, 1995). The inclusion of criminogenic needs aids in the predictive ability of risk assessment scales and also allows for progress to be acknowledged. The most recent (fourth) generation goes beyond risk assessment and allows for case conceptualization of the offender, takes into account individual strengths, and helps develop a treatment plan (e.g., Level of Service Inventory – Ontario Revision; Andrews, Bonta & Wormith, 1995).

### **General Personality and Social Cognition Approach**

Recently, researchers have realized that there may be no one theory that best describes behaviour in all situations. This realization led to the creation of a general personality and social psychological approach (GPSPA) to problems that draws upon social learning, cognitive behavioural and social cognition theory (Andrews & Bonta, 2003, pp. 10). The GPSPA suggests that behaviour is a result of the interpretation of conscious and subconscious signals that an individual receives concerning rewards for a given behaviour and the costs that performing that behaviour might entail. The density of these reward and cost signals determines whether an action is taken. If the rewards garnered outweigh the costs, the behaviour will be pursued. However, if the costs are perceived as too great, the individual will choose another course. These signals are based on four key variables: attitudes, associates, behavioural history and personality (Andrews & Bonta), which should be used to direct behaviour change. When applied to the study of criminal behaviour, the GPSPA is called the psychology of criminal conduct (PCC; Andrews & Bonta, 2003), and these four key variables are known as the “Big Four” predictors of criminal

behaviour. Consequently, the domains represented by the Big Four can be found in popular risk assessment tools such as the LSI-OR.

### **Personal, Interpersonal and Community-Reinforcement (PIC-R)**

Within the general personality and social psychology framework, there is a lower level theory that specifically addresses criminal behaviours. The Personal, Interpersonal and Community – Reinforcement approach (PIC-R) (Andrews, 1982) describes the three areas that influence the decisions that people make when considering criminal acts. Individuals make decisions based on weighing rewards and costs encountered within three dimensions: a personal dimension (e.g., values, beliefs and personality variables), an interpersonal dimension (e.g., the influence of friends, family and social contacts), and a community reinforcement dimension - the unconscious factors involved, which are usually a result of prior learning (e.g., positive and negative reinforcement of peers) (Andrews and Bonta, 1998; pp. 90).

Drawing on the four key variables derived from the psychology of criminal conduct, PIC-R suggests that the major predictors of crime come from the offender's ties to crime and to convention. For each, one must evaluate four areas: the offender's history of involvement (in crime/convention), personal competencies (or deficits), and cognitive and social supports (Andrews & Bonta, 2003, pp. 242). These predictors have formed the basis for many of the more recent risk assessment tools (Andrews, Bonta & Wormith, 2006).

### **Common Risk Assessment Tools**

Blanchette and Brown (2006) propose that three of the most commonly used risk assessment tools in Canada are the Statistical Information on Recidivism – Revised Scale (SIR-R1; Nafekh & Motiuk, 2002), the Psychopathy Checklist (PCL-R; Hare, 2003) and the Level of Service Inventory (LSI; Andrews, Bonta & Wormith, 1995). Of these three, Blanchette and Brown determined the LSI to be the most appropriate for use with female offenders.

### **Statistical Information on Recidivism – Revised Scale (SIRS)**

The Statistical Information on Recidivism – Revised Scale (Nafekh & Motiuk, 2002) uses 15 static items to predict recidivism in the first three years following release. The scale breaks down risk levels into five categories with approximately 20% of offenders in each category. Originally used to assess male offenders, it is now used to assess female offenders with

some degree of predictive reliability. Blanchette and Brown (2006) report two validation studies (Bonta, Pang & Wallace-Capretta, 1995 & Blanchette, 1996) that suggest the categories used are able to distinguish between rates of recidivism. However, the categories reflect a non-linear relationship. At the two extremes (Very Good and Very Poor), the scales predict the expected relationship. It is the intermediate positions that are more confusing. The “Good” and “Poor” positions both reflect the highest rate of recidivism, even to the extent of surpassing the “Very Poor” category. The “Fair” position demonstrated different effects between the two studies. In the first study, offenders in the “Fair” category reoffended second least often (18.2%) but in the second study, offenders reoffended at the second most often rate (85.7%). Although the first study used a large sample (n= 354), the inconsistent results in the second study are likely a result of a small sample (n=81). In general, Blanchette and Brown determined the prognostic categories of the SIR-R1 to be poor predictors of female recidivism.

### **Psychopathy Checklist – Revised (PCL-R)**

The Psychopathy Checklist – Revised was not originally designed to be a measure of risk assessment, but rather, a means of evaluating the traits associated with psychopathy. It consists of 20 items on two factors (interpersonal/affective traits and behavioural traits).

There appears to be a difference between males and females in how the test items are related to the two factors (Blanchette & Brown, 2006). Blanchette and Brown indicate that while all items were associated with two factors for men, three items for women (early behaviour problems, failure to accept responsibility and revocation of conditional release) were not associated with either factor. Additionally, two items (sexual promiscuity and criminal versatility) were associated with different factors for females than they were for males. Despite this difference, the PCL- R seems to generally reflect the same construct for male and female offenders. Although the PCL-R appears to accurately predict recidivism for male offenders (particularly the score on factor two), Blanchette and Brown determined that it is less able to do so for female offenders. Although the score on factor one shows a relationship with recidivism, neither the overall score, nor the score on factor two demonstrated any relationship with recidivism. In contrast, significant correlations with recidivism have been found for male offenders, particularly on factor two (Hare, 2003). Vitale and Newman (2001) suggest that “if clinicians were using the PCL-R for the sole purpose of predicting specific outcomes for any particular woman [regarding criminal recidivism, predicting institutional violence and planning



correctional interventions], they would be doing so without empirical evidence of the predictive power of the PCL-R [for women] in such domains.

### **Level of Service Inventory – Ontario Revision (LSI-OR)**

The Level of Service Inventory – Ontario Revision was designed as an assessment tool to be used to determine the risk of reoffence. Items making up the LSI-OR are theoretically derived from the GPSPA and the PIC-R. Additionally, all items are related to the “big four” and “central eight” described by Andrews and Bonta (2003). The LSI-OR is an update of the popular LSI-R (Andrews & Bonta, 1995: See Wormith (1997) for a list of the modifications). It is made up of 43 static and dynamic items covering eight subsections: Criminal History, Education/ Employment, Family/ Marital, Leisure/ Recreation, Companions, Substance Abuse, Pro-criminal Attitudes and Antisocial Pattern. These items are theoretically derived from the PIC-R. It addresses specific items as well as item density (as PIC-R suggests). Five risk categories are used to group offenders ranging from very low to very high. Higher LSI-OR scores indicate increased likelihood the offender will engage in inappropriate behaviour such as institutional offences, reoffence, and breach of community supervision (LSI-OR; Andrews, Bonta & Wormith, 1995). Extensive research has demonstrated the predictive ability of the LSI with male offenders (Bonta & Motiuk, 1987; Girard & Wormith, 2004; Kroner & Mills, 2001; Lowenkamp, Holsinger & Latessa, 2001; Loza & Simourd, 1994; Loza, 2003; Simourd & Hoge, 2000), and the few studies which examine the LSI for female offenders have shown very promising results. After examining the current literature surrounding the LSI, Blanchette and Brown (2006) reported that the LSI-R may actually be better at predicting recidivism with female offenders than male offenders. The research justifying such an assertion follows.

### **LSI-OR Risk Factors**

A strong risk assessment instrument takes advantage of a variety of risk factors to strengthen predictive ability, as well as suggest treatment options and provide indicators of treatment success. These risk factors can be divided into two different dimensions both of which are highly correlated with recidivism (Andrews & Bonta, 1998).

## **Static risk factors**

Static risk factors are those that cannot be improved upon by an offender. Items such as criminal diversity, past institutional misconduct and drug abuse history are factors that cannot change over time. Items such as these have been determined to be strong predictors of recidivism through actuarial assessment of criminal behaviour (Andrews & Bonta, 1998). Despite being strong predictors, they are limited because of their inability to account for change over time (Andrews & Bonta). In the LSI-OR, static risk factors include Criminal History, two items in the Education/Employment subsection, and two items in the Substance Abuse subsection.

## **Dynamic risk factors**

Dynamic risk factors are characteristics of an offender that may change over time. Items such as criminal peers, substance abuse and criminal attitudes have been found to have a strong relationship with offending behaviour (Andrews & Bonta, 1998). The LSI-OR contains mostly all dynamic risk factors (with the exception of those listed previously). These items are also known as criminogenic needs as they should be the target of intervention. It is expected that positive changes in these factors will reduce the likelihood of reoffence and negative changes will be correlated with increased recidivism. The strength of dynamic risk factors lay in the ability to track changes as a result of treatment.

## **Potential female risk factors**

There has been a growing body of research identifying variables associated with a person's offending behaviour. However, much of this research has been developed from samples of male offenders. While some researchers propose that these factors are gender-neutral and can be equally applied to both males and females (e.g., Simourd & Andrews, 1994), others suggest that female offenders start on the path to criminal behaviour on different pathways (Daly, 1992) and that the same risk factors are not generalizable to female offenders (e.g., Van Voorhis, Pelier, Presser, Spiropoulis & Sutherland, 2002). Researchers who support the idea that gender-specific risk assessment should include additional variables not found in gender-neutral assessments (e.g., Law, 2007) frequently suggest additional variables that should be assessed. Two frequently cited gender-specific variables are mental health issues (e.g., Benda, 2005; Blanchette & Motiuk, 1996; Wright, Salisbury & Van Voorhis, 2007) and past victimization

(e.g., Lowenkamp, Holsinger & Latessa, 2001; DeHart, 2000; Wright, Salisbury & Van Voorhis, 2007). While the LSI-OR does not directly measure these variables as contributing factors to criminal behaviour, it does include them in two sections devoted to “Personal problems with criminogenic potential” and “Other client issues”.

### **Level of Service Inventory and Female Offenders**

The Level of Service Inventory has had increasing support for use with female offender populations. Coulson and colleagues (1996) examined 526 provincially incarcerated offenders. Following incarceration, offenders were released into the community under a variety of conditions: either directly to the community with no supervision, into the community with supervision, into a halfway house with parole or into a halfway house with no parole. Recidivism (being charged or found guilty of one or more offences) was investigated for all offenders within the available follow up time. This varied from a minimum of 12 months for all offenders to a maximum of 39 months; at least 301 offenders were followed for a minimum of 24 months.

Prior to release, the LSI-R was conducted on all offenders using standard procedures with the exception that an adjustment was made to the items concerning employment. For this study, a women’s involvement in full-time child care counted as employment. The average LSI-R score was 15.5. Across the whole sample, Coulson and colleagues (1996) found that the LSI-R was a strong predictor of recidivism with a point biserial correlation of .51 with recidivism, a correlation of .45 for halfway house failure and a correlation of .53 for parole failure; all which were significant at  $p < .01$ .

Lowenkamp, Holsinger and Latessa (2001) sought to examine risk, needs and the role of childhood abuse for both male and female offenders. The sample consisted of 125 female offenders and 317 male offenders sentenced to a period of incarceration in a state prison for a serious crime. These offenders had their sentence assigned to a residential corrections facility designed for rehabilitation treatment. Recidivism was determined to be reincarceration in a state facility. A second measure, being away without leave (AWOL), was also explored.

The mean LSI-R score for female offenders of 25 had a strong correlation (.371) with reincarceration and a weaker correlation (.177) with being AWOL. These results were found to be stronger for female offenders than for male offenders whose LSI-R scores were correlated with recidivism at .215 and with being AWOL at .132. Additionally, it is important to note that a

history of prior abuse did not add significantly to the prediction of reincarceration beyond the ability of the LSI-R to predict risk.

Holtfreter, Reisig and Morash (2004) sought to assess the ability of two female-centered needs (poverty and state sponsored support) to predict recidivism and to determine if the LSI-R is able to predict recidivism beyond these two variables. The sample consisted of 134 female offenders convicted of a serious crime, entering a period of probation or supervised parole, and agreeing to participate in two interviews: the first interview to take place immediately after recruitment, and the second to take place six months later. Recidivism was determined through self-reported re-arrest and parole or probation violations within the six months between the two interviews.

The study had a large attrition rate; 117 women were unable to be contacted to complete the second interview. Of these, 27 women were AWOL. In cases where the offender was reincarcerated, she was contacted and the second interview was conducted; however, in 10 cases, the second interview was not permitted. There were therefore 37 participants who were not included even though they had violated the terms of release in such a way that they would have been considered recidivated. Comparisons were made between those that completed the study and those who did not. The two groups did not vary according to racial background or level of education but those that dropped out were found to be younger and more economically disadvantaged.

The researchers determined that the LSI-R was not a good risk assessment measure as it had only a small non-significant correlation with self-reported re-arrest (.16) and a small yet significant correlation with self-reported violation (.17). This stood in contrast to the predictive ability of their measure of poverty which had stronger correlations with self-reported re-arrest (.20) and with self-reported violations (.26).

Rettinger and Andrews (2005) examined 172 provincially incarcerated female offenders and 239 female offenders under community supervision. The follow up time was 57 months which started for community offenders after initial data were gathered and for the incarcerated offenders at discharge. Recidivism was determined to be conviction of any new offence. A measure of violent recidivism was also determined by assessing the offence for which the offenders were charged.

Female offenders who were incarcerated had higher LS/CMI scores (20.9) than those in the community (11.04) and recidivism was strongly correlated with LSI scores: general recidivism (.63) and violent recidivism (.45). Rettinger and Andrews (2005) determined that some of the other risk factors that are associated with female recidivism may be best described as responsivity factors and not as stable criminogenic needs as this may lead to overclassification (since many women have these problems).

Reisig, Holtfreter and Morash (2006) examined different pathways to female offending. Offenders from a community setting offender were interviewed to examine social situations, program involvement, quality of life (exposure to violence) and involvement in criminal activity. This interview was used to determine the pathway that each offender had taken into criminality with the pathways sorted into a typical female pathway, an economically centered pathway or an unclassifiable pathway. There was an average of 11 months between the first and second interviews. Offenders were considered to have recidivated if there was an official record of violation of supervision condition, re-arrest, reconviction or revocation of community supervision.

Between the first and second interview, 42% of the female offenders were lost to attrition, bringing the sample from 402 down to 235. It is important to note that some of these offenders were not available because of reasons relating to their outcomes: 37 were not available because they had successfully completed a reduced sentence, and 35 were not included because they were determined to be AWOL or re-incarcerated and not available to complete the second interview. Although there was no significant differences in LSI-R score, age, percent minority and education between those in the initial and follow up groups, the researchers acknowledge that it is unknown how attrition affected the variables used in the analyses.

The mean LSI-R score was 17.75. The authors found a weak correlation between the LSI-R score and recidivism for the entire sample (.05) but found strong correlation with recidivism for those in unclassified pathways (.41) and for those who are economically motivated (.24). They suggest that the LSI-R is not useful for those who follow gendered pathways to crime but is viable for those who are economically motivated.

Holsinger, Lowenkamp and Latessa (2006) explored differences in LSI-R scores for White and Native American offenders. As part of their examination, female offenders in each of these groups were also examined. The female sample consisted of 111 female offenders (10 Native

American and 101 White). Recidivism was determined to be any official record of new arrest while in the community. Overall there was a relatively small but significant correlation with recidivism of .15; however, there was a large difference between the two ethnic groups. While the correlation for White female offenders was quite strong (.26), the correlation for Aboriginal women was in the negative direction (-.13), but not significant. This result may have been due to the very small sample of aboriginal women in this study (n = 10).

Folsom and Atkinson (2007) found results that better supported the ability of the LSI-R to predict recidivism using a sample of federal female offenders. The sample came from all female offenders incarcerated in a federal institution in 1997. Of these offenders, 100 agreed to participate and 85 had been released by the completion of the follow up period and were available to recidivate. A self-report version of the LSI-R was used to determine risk to recidivate and actual recidivation data (defined as any new conviction of any type of offence) was obtained through official sources. Violent recidivism (any crime against the body of another person) was also examined. The average follow-up time was 6 years with a range of 2.6 to 7.1 years. In cases where the offender reoffended and then was released and reoffended against within follow up period, only the first reoffence was counted.

At the end of the follow up period, 32 female offenders had recidivated: 23 non-violently and 9 violently. Overall, there was a statistically significant, positive correlation between LSI-R scores (.30) and recidivism. However, when recidivism was divided into violent and non-violent offences, this correlation changed. The LSI-R was not significantly correlated with violent or non-violent recidivism, although there was a non-significant trend in the expected direction for non-violent recidivism.

Palmer and Hollin (2007) used a sample of 150 female offenders serving custodial sentences in England and a version of the LSI-R adapted for use in prison settings in the United Kingdom. Unfortunately, follow-up data were only available for 64% of the sample, thereby reducing the recidivism results to a sample of 96. There was no difference in age, ethnicity, offence type, or number of previous convictions for those who had reconviction data available and those who did not. Recidivism was considered to be reconviction and was obtained through official reporting. At the end of the follow up period, 37 offenders had been reconvicted. The authors reported a strong correlation between recidivism and overall LSI-R score (.53) as well as strong correlations

with subscale scores, which ranged from .21 (accommodation) and .23 (emotional/personal) to .46 (education/employment) and .47 (criminal history).

In a final research report, Raynor (2007) reported on two studies conducted for the Home Office in the United Kingdom and Jersey Probation and After-Care Service. The first by Raynor and colleagues (2000) examined 163 female probationers and 785 male offenders in England and Wales. The second study (Miles and Raynor, 2004) examined 210 female probationers and 1170 male offenders in the British Channel Island of Jersey. For both studies, recidivism was defined as reconviction of a standard list offence within 12 months

Overall, the LSI-R demonstrated a good ability to predict recidivism in both communities. Raynor et al. (2000) reported a correlation of .336 which was slightly lower than for the male offenders (.361). Miles and Raynor (2004) report a correlation with recidivism that was slightly stronger for female offenders (.297) than for male offenders (.285). However, two issues surfaced during these investigations.

First, Raynor et al. (2000) suggested there is a potential for a problem of overclassification when considering female offenders. This became apparent when examining LSI-R scores and recidivism rates. Higher LSI scores should be related to higher recidivism rates; however, this was not true when comparing male and female offenders. While female offenders reported a mean LSI score of 21.2 and a recidivism rate of 9%, male offenders reported a mean LSI-R score of 20.0 and a recidivism rate of 35%. It is important to note that this problem did not affect the percentage correctly predicted (65% for female offenders and 65.5% for male offenders).

Second, Raynor (2007) noted that there were differences between the samples used in the two studies that suggest the LSI-R should be recalibrated according to the local population. This issue surfaced as LSI-R scores for female offenders were significantly higher for those in Wales (21.2) than for those in Jersey (15.7). Moreover, their reconviction rates were considerably higher (35% and 9% respectively). Raynor suggested that this may reflect societal differences between the two communities, as Jersey is a more isolated community, less industrial, and more rural than Wales and England. While it was suggested that these issues should draw attention to the need to correctly calibrate the LSI-R for use with female offenders, once this is accomplished, it should function well (Raynor, 2007, p. 131).

## **The Present Study**

The purpose of the present study was to examine the relationship between the LSI-OR and recidivism. As the LSI-OR is a theoretically-based risk assessment tool derived from a general personality and social psychology approach as well as the Personal, Interpersonal and Community-Reinforcement Theory, two predictions have been made. First, it was hypothesized that LSI-OR scores would be correlated with recidivism. Specifically, offenders with higher LSI-OR scores would be more likely to commit a reoffence. Risk levels assigned to the offender according to cut-offs proposed by the LSI-OR manual were examined for appropriateness. Second, it was hypothesized that LSI-OR scores would be correlated with severity of offence. Higher LSI-OR scores would be related to more serious types of reoffence and lower LSI-OR scores would be related to less serious reoffence.

In accordance with the assumption of the psychology of criminal conduct, which suggests that criminal behaviour is related to common factors for all people, it was expected that LSI-OR scores would predict recidivism for all subgroups examined. Specifically, the LSI-OR would predict recidivism for female offenders regardless of the offender's legal status as defined by three types of disposition (custody, conditional sentence or probation), their racial category, and if they had experienced mental health issues or past victimization.



## CHAPTER 2

### METHOD

#### **Participants**

The sample was comprised of all female offenders who were released from Ontario provincial correctional facilities, sentenced to a conditional sentence, or began a term of probation during one fiscal year (April 1, 2002 to March 31, 2003) of the Ministry of Community Safety and Correctional Services (MCSCS). There were a total of 3727 female offenders available for inclusion in the sample (356 conditional sentences, 2318 probation sentences and 1053 custodial sentences). Approximately 23% of these offenders were excluded from the sample as they had not been assessed by the LSI-OR or the LSI-OR was completed after release. Individual offenders released more than once in the studied time period were represented only by the first release. The final sample consisted of 2831 offenders: 213 offenders with a conditional sentence, 1973 offenders with a probation sentence and 645 offenders released following a custodial sentence.

#### **Material**

##### **Level of Service Inventory – Ontario Revision**

Section A (General Risk/Needs) of the Level of Service Inventory- Ontario Revision is made up of 43 items covering eight domains: Criminal History, Education/ Employment, Family/ Marital, Leisure/ Recreation, Companions, Substance Abuse, Pro-criminal Attitudes and Antisocial Pattern. Previous research reported by Andrews, Bonta and Wormith (2004; pp.109) has shown the LSI-OR to have strong internal reliability for use with both incarcerated male ( $\alpha = 0.99$ ) and female ( $\alpha = 0.91$ ) offenders as well as both male ( $\alpha = 0.90$ ) and female ( $\alpha = 0.90$ ) offenders serving a community sentence.

Scores from the LSI-OR were then used to assign an offender to a risk level. Very Low risk offenders have a score ranging from 0-4, Low Risk from 5-10, Medium Risk from 11-19, High from 20-29 and Very high from 30-43. Following assignment of this risk level, the assessor has the opportunity to override it by adjusting the risk level up or down by making a logical argument after considering the sections of the LSI-OR. Both original and override risk levels

were examined to ensure that the predictive validity of the LSI-OR is influenced by this adjustment.

The LSI-OR consists of new sections added since its first form (Wormith, 1997). These include Section B (Specific Risk/Need Factors) which consists of 14 items in a Personal Problems with Criminogenic Potential section and 9 items in a History of Perpetration section, Section F (Other Client Issues), which consists of 19 items concerning Social, Health and Mental Health issues and Section G (Special Responsivity Considerations) which consists of 8 items.

## **Recidivism**

### **Official record**

Recidivism was recorded from two different sources. The first was developed from official criminal records as compiled by the Offender Management System (OMS) of MCSCS. The OMS tracks all provincial offences occurring within Ontario. An offender was considered to be a recidivist if the OMS recorded an offence within two years of an offender's follow-up start date. Recidivism was defined as any conviction within the follow-up time period. For custody offenders, this follow-up period started upon their release from custody. For conditionally sentenced offenders and probationers, the follow-up period started when the offender completed their period of supervision in the community.

### **Offence severity scale**

The initial offence and recidivism was coded on the Offence Severity Scale (OSS) derived by Stasiuk, Winter and Nixon (1996). This measure is compiled by the MCSCS for all provincial offences committed in Ontario. The scale is based on an analysis of 60,000 sentences given to offenders in Ontario during a one year period. The average sentence length for each offence type was used to determine offence severity. Offences with the longest average sentence have the highest rating. The original ordinal scale ranges from 1 (unknown) to 26 (homicide). Prior to any examination, the data were examined for any "unknown" offence types. Four offenders had offences with an unknown severity. These were removed for the purposes of analyses concerning offence severity. When examining reoffending, offenders who had

committed no reoffence were given a score of 1 to represent no new offence. Consequently, the scale used a range of 1 to 26 when examining index and recidivistic offences.

In addition to determining the severity of recidivistic offences, the OSS was also used to differentiate violent and non-violent offences. This followed the offence categories listed by Girard and Wormith (2004) as violent offences. They included “robbery or any offence against the person, which include homicide and related offences, serious violent offences, sexual offences, weapons offences, miscellaneous offences against the person, assault and related offences, and arson/property damage offences” (Girard & Wormith, p. 156).

## **Procedure**

### **Data Collection**

Basic demographic information, LSI-OR records and official information pertaining to index offences were gathered from the archival records available through the Offender Management System (OMS) and the MCSCS in-house LSI-OR data collection software. All data were compiled by provincial employees and submitted to the researcher in SPSS files.

Prior to conducting analyses, LSI-OR data were screened for data entry errors, inconsistencies and missing data. Data entry for subscale totals was complete; however, responses to individual items used to generate these totals were entered in an inconsistent manner. To correct for this, negative numbers appearing in scaled items were recoded as positive numbers. When a total LSI-OR score was provided but some individual items were coded as missing, a ‘0’ was assigned since the LSI-OR manual allows for up to four missing items on a completed LSI-OR. With these changes, the totals of the individual items within the subcategories matched with the subtotals provided in the data set. This allowed for the calculation of alpha coefficients for the total score and subscales.

### **Data Analysis**

#### **Correlation**

Predictive ability was assessed first with correlation analysis. Offenders that did not reoffend within the follow-up period were coded as 0 and those that did were coded as 1. This was then correlated with LSI-OR scores. In this type of analysis, a positive correlation would suggest that high LSI-OR scores are more likely to be associated with reoffending.

## **ROC Analysis**

While the correlation coefficient is a strong determination of accuracy of the scale, Quinsey, Harris, Rice and Cormier (1998) suggested correlations are subject to the influence of base rates. They argue a better way to assess the predictive accuracy of a scale is to use Relative Operating Characteristics (ROC). ROC involves the plotting of True Positive rate [ $\frac{\text{true positives}}{\text{true positives} + \text{false negatives}}$ ] against False Positive rate [ $\frac{\text{false positives}}{\text{false positives} + \text{true negatives}}$ ]. This calculation is completed for each value of the LSI-OR which creates a curve. The best way to assess the ROC is to determine the Area Under the Curve (AUC) at a 95% confidence interval (Quinsey, Harris, Rice & Cormier).

## **Survival analysis**

Kaplan-Meier survival analyses were conducted to determine the proportion of offenders at each risk level reoffending daily within two years following release. Those who did not reoffend by the end of the follow-up period were "right-censored". When the survival rate of two or more groups was compared, Log-Rank statistics were used. This test compares the number of observed events to the number of expected events at each time of an event (Peto & Peto, 1972).

## **Determining risk level cut-off points**

LSI-OR risk levels used by the MCSCS to assess female offenders are currently based on cut-offs established for male offenders. Additionally, two alternate cut-off sets were established using two different procedures. The first followed the method of Coulson and colleagues (1996). These researchers chose cut-offs associated with the LSI-OR obtained when dividing the sample into 5 equal groups.

The second uses the statistical package JMP by Statistical Analysis software (SAS) to determine cut-off points statistically via recursive partitioning. This type of analysis partitions data according to a relationship between two sets of values. It does this by exhaustively searching all possible divisions and making a decision based on minimized sums of squared errors. Ideal cut-off points are determined one at a time. In this case, LSI-OR scores were used as the X variable and recidivism was used as the Y variable and the process was repeated four times to determine the five cut-off points. This procedure was conducted twice, first on a randomly selected half of the participants and then on the remaining participants. The predictive validities

of the derived risk levels were examined with Pearson correlations, ROC curves, and survival analyses.

### **Comparison Groups**

Section F of the LSI-OR reports 18 specific items that reflect the social, health and mental health of offenders. Two categories of questions were determined to be of particular interest with concern to female offenders; mental health issues and past victimization. Determining the mental health of the offender followed the procedure of Girard and Wormith (2004). Offenders with a score on at least one of the following items were determined to have a mental health issue: depression, diagnosis of psychosis, attempted suicide, and “other evidence of emotional distress”. Past victimization was reported directly in five categories: family violence, physical assault, sexual assault, emotional abuse and neglect. Offenders were determined to have had a history of victimization if at least one of these items was noted. The predictive ability of the LSI-OR was determined for those with and without mental health issues and for those with and without past victimization as well as for each disposition group within these categories.

## CHAPTER 3 RESULTS

### **Offender Demographics**

The sample consisted of 2831 offenders released into the community from three different types of disposition: conditional sentence (7.5%), probation (69.7%) and custodial sentence (22.8%). Most women for whom marital status was known ( $N = 2413$ ) were not in a relationship at the time of assessment with 62.8% being single, 9.4% divorced, and 1.8% widowed. When in a relationship, approximately equal numbers were in a common-law relationship (13.3%) and married (12.7%).

Although citizenship was not known for 13.4% of the sample ( $n=378$ ), there were 42 different citizenships represented. Most offenders with known citizenship were Canadian (95.6%,  $n=2345$ ). The second and third largest citizenship groups were Jamaican (0.8%,  $n=20$ ) and British (0.4%,  $n=10$ ). All other citizen groups had a maximum of less than 0.2% ( $n < 5$ ).

Racial data were available for 2435 offenders. Of the nine race groups represented in the data, Caucasian offenders were the most common (61.7%), Aboriginal offenders were the second most common (10.4%) and Black offenders were the third most common (7.5%). There is a significant association between the disposition of the offender and the race of the offender ( $\chi^2(6) = 29.567, p < .001$ ). While making up approximately 10% of the sample, Aboriginal offenders comprised 15% of all custodial sentences, 9% of all probation sentences and 9% of all conditional sentences. Caucasian offenders were also more heavily represented in custodial sentences. While making up approximately 62% of the sample, 71% of Caucasian offenders were serving a custodial sentence, 60% were serving a probation sentence and 54% were serving a conditional sentence. Unknown offenders were primarily made up of conditional (11%) and probation offenders (86%). For future analyses involving racial data, offenders with unknown race will be excluded. The breakdown of disposition by racial group can be found in Table 1.

Table 1 Number and percentage of offenders by disposition and racial group

	Conditional		Probation		Custodial		Total	
Caucasian (Row %)	<b>113</b> 6.5%	53.1%*	<b>1174</b> 67.4%	59.5%*	<b>456</b> 26.2%	70.7%*	<b>1743</b> 100.0%	61.6%*
Aboriginal (Row %)	<b>19</b> 6.4%	8.9%*	<b>177</b> 59.8%	9.0%*	<b>100</b> 33.8%	15.5%*	<b>296</b> 100.0%	10.5%*
Black (Row %)	<b>18</b> 8.5%	8.5%*	<b>140</b> 66.0%	7.1%*	<b>54</b> 25.5%	8.4%*	<b>212</b> 100.0%	7.5%*
Other (Row %)	<b>18</b> 11.0%	8.5%*	<b>127</b> 77.4%	6.4%*	<b>19</b> 11.6%	2.9%*	<b>164</b> 100.0%	5.8%*
Unknown (Row %)	<b>45</b> 10.8%	21.1%*	<b>355</b> 85.3%	18.0%*	<b>16</b> 3.8%	2.5%*	<b>416</b> 100.0%	14.7%*
Total (Row %)	<b>213</b> 7.5%	100.0%*	<b>1973</b> 69.7%	100.0%*	<b>645</b> 22.8%	100.0%*	<b>2831</b> 100.0%	100.0%*

\*Column percentages

The age of these offenders ranged from 20 to 83 years with an average of 36 years (SD=10.25). Age differences between disposition groups were approaching significance ( $F(2, 2828) = 2.979, p = .051$ ). However, there was a significant difference in age between racial groups ( $F(3, 2430) = 16.808, p < .001$ ). Post hoc analysis using Tukey's honestly significant difference (HSD) indicated that Caucasian offenders (36.81 years, SD = 10.3) and "Other" offenders (36.16 years, SD = 9.78) were older than Aboriginal offenders (33.26 years, SD = 9.2) and Black offenders (33.24 years, SD = 8.0).

#### Severity of the index offence

The offence severity scale ranges from 1 (unknown) to 26 (homicide). After unknown offences were removed, the mean index OSS was 10.76 (SD=3.53). A one way ANOVA was conducted with the disposition type as the independent variable and severity of the index offence as the dependent variable. Type of offenders' disposition was significantly related to OSS ( $F(2, 2824) = 10.825, p < .001$ ). Post hoc analysis using Tukey's HSD indicated that the offence severity of the index offence of conditional offenders (9.74, SD=3.24) was significantly lower than the offence severity of index offences of those with a probation sentence (10.79, SD=3.33) or a custodial sentence (11.03, SD=4.12). There was no difference between the initial offence

severity of probation and custodial offenders. The distribution of offences by severity level and disposition can be found in Table 2.

Table 2 Distribution of offences by severity and disposition

Offence Severity	Offence Type	Conditional		Probation		Custodial	
		N	%*	N	%*	N	%*
1	Unknown	1	0.5	2	0.1	1	0.2
2	Municipal Bylaw Offences	2	0.9	16	0.8	11	1.7
3	Other Provincial Offences	0	0.0	2	0.1	0	0.0
4	Liquor Licence Act Offences	3	1.4	45	2.3	29	4.5
5	Highway Traffic Act Offences	2	0.9	6	0.3	5	0.8
6	Parole Violations	18	8.5	35	1.8	51	7.9
7	Other Federal Statute Offences	2	0.9	31	1.6	14	2.2
8	Misc. Offences against Public Order	75	35.2	302	15.3	55	8.5
9	Drinking & Driving Offences	7	3.3	92	4.7	30	4.7
10	Breach of Court Order/ Escape	33	15.5	514	26.1	149	23.1
11	Criminal Code Traffic Offences	42	19.7	517	26.2	87	13.5
12	Drug Possession Offences	1	0.5	71	3.6	13	2.0
13	Obstruction of Justice Offences	0	0.0	40	2.0	37	5.7
14	Morals & Gaming Offences	3	1.4	34	1.7	17	2.6
15	Arson/Property Damage Offences	6	2.8	55	2.8	19	2.9
16	Assault & Related Offences	2	0.9	11	0.6	3	0.5
17	Theft/Possession Offences	8	3.8	75	3.8	103	16.0
18	Misc. Offences against the Person	3	1.4	77	3.9	10	1.6
19	Fraud & Related Offences	4	1.9	20	1.0	1	0.2
20	Weapons Offences	1	0.5	11	0.6	2	0.3
21	Traffic/Import Drug Offences	0	0.0	0	0.0	0	0.0
22	Non-Violent Sexual Offences	0	0.0	3	0.2	6	0.9
23	Break & Enter & Related Offences	0	0.0	0	0.0	0	0.0
24	Violent Sexual Offences	0	0.0	14	0.7	2	0.3
25	Serious Violent Offences	0	0.0	0	0.0	0	0.0
26	Homicide & Related Offences	0	0.0	0	0.0	0	0.0

\*Column percentages



## Internal Consistency of the LSI-OR

The degree to which the LSI-OR measures one construct was examined by determining Cronbach's alpha for the items making up the LSI-OR. The eight subscales were also examined for internal consistency in the same way. This measure of internal reliability is based on the intercorrelation of scale items and is affected by the number of items in the scale. Because three items from the LSI-OR (early and diverse antisocial behaviour, criminal attitude and pattern of generalized trouble) are derived in part or in whole from other items contained within the LSI-OR, two sets of analyses were conducted: one with all 43 items and one excluding these three items, for a total of 40 items. Alpha levels for tests using all 43 items were very strong and dropped only slightly when reduced to 40 items. All subscales also had reasonable alpha levels when the greatly reduced number of items is taken into consideration. Table 3 displays alpha rates for the overall LSI-OR as well as for individual subscales for all offender groups as well as for each disposition group.

Table 3 Alpha scores for total LSI-OR and subcomponents by disposition group

Scale (number of items)	Conditional	Probation	Custodial	All
Overall (43)	0.911	0.906	0.890	0.925
Overall (40)	0.905	0.897	0.876	0.917
Criminal History (8)	0.838	0.838	0.748	0.861
Education / Employment (9)	0.829	0.849	0.786	0.848
Family / Marital (4)	0.454	0.379	0.344	0.393
Leisure / Recreation (2)	0.416	0.434	0.456	0.478
Companions (4)	0.666	0.602	0.640	0.657
Procriminal Attitudes (4)	0.493	0.568	0.575	0.605
Substance Abuse (8)	0.875	0.851	0.816	0.861
Antisocial Pattern (4)	0.449	0.420	0.469	0.503

## Comparison of LSI-OR Total Scores for Offender Disposition Types and Racial Groups

LSI-OR scores ranged from 0 to 42 with an average of 13.9 (SD 9.18) across all groups. A 3x4 ANOVA was conducted with disposition type and racial group as independent variables and LSI-OR total score as the dependent variable. A significant main effect was found for

disposition group ( $F(2, 2422) = 104.73, p < .001$ ). Planned contrasts using Tukey’s HSD indicated that custodial offenders had higher LSI-OR scores than offenders with a conditional sentence and offenders with a probation sentence but there was no difference between conditional and probation offenders.

Additionally, a main effect was found for racial group ( $F(3, 2422) = 27.17, p < .001$ ). Follow up analyses using Tukey’s HSD indicated that the LSI-OR scores for each racial category was significantly different than the others. Aboriginal offenders had the highest LSI-OR score, followed by Caucasian offenders and Black offenders. “Other” offenders had the lowest LSI-OR score. There is no interaction between racial group and disposition group ( $F(6, 2840) = 1.32, p = .244$ ). Table 4 displays the average LSI-OR score for disposition groups and racial groups.

Table 4 Mean and LSI-OR score by disposition and racial groups

	Conditional (SD)	Probation (SD)	Custodial (SD)	Total (SD)
Aboriginal	18.37 (6.08)	17.34 (8.21)	24.92 (7.19)	19.97 (8.51)
Black	8.89 (6.19)	10.55 (8.24)	19.24 (8.72)	12.62 (9.07)
Caucasian	12.42 (9.02)	12.15 (7.79)	22.37 (7.83)	14.84 (9.06)
Other	8.58 (6.93)	8.83 (7.09)	17.23 (8.28)	9.81 (7.69)
Total	11.44 (8.27)	11.40 (7.92)	22.23 (8.06)	13.87 (9.18)

## Level of Service Inventory and Index Offence

### Offence severity

All offenders had a severity rating based on their index offence. A set of Pearson correlation were conducted with offence severity scores (OSS) and LSI-OR total score as variables. No significant correlation was determined between an offender’s LSI-OR score and the rated severity of the index offence ( $r = .019, p = .318$ ). This was also true for each of the disposition types (conditional,  $r = .108, p = .115$ ; probation,  $r = -.010, p = .652$ ; custodial,  $r = -.010, p = .806$ ).

### Violent index offence

Offenders were categorized as either violent or non-violent offenders according to the offence severity scale as outlined in the methods section. A t-test was used to compare the mean

LSI-OR score of offenders whose index offence was determined to be violent and those whose index offence was non-violent. Although no significant difference was found between the two groups, the test was compromised because the Levene's test for equality of variances was significant ( $F=6.009, p=.014$ ). When this occurs, it indicates that one of the assumptions of the  $t$ -test is not valid. In order to account for this, the overall sample was broken down by disposition group. In this situation, Levene's test was not significant and the analyses were able to proceed. For offenders with a conditional sentence, the LSI-OR score for violent offenders was higher than those convicted of a non-violent offence ( $t(211) = -3.035, p=.003$ ). Violent offenders with a custodial sentence were also found to have a higher LSI-OR score than non-violent offenders with a custodial sentence ( $t(643) = -2.79, p=.006$ ). No significant difference was found between violent and non-violent offenders with a sentence of probation. Table 5 contains the mean LSI-OR score for violent and non-violent offenders by disposition group.

Table 5 Mean LSI-OR score for violent and non-violent offenders by disposition

	Non-violent (SD)	Violent (SD)	$t$ -score	$p$ -value
Conditional	10.42(8.31)	14.23 (7.53)	3.035	.003
Probation	11.26 (8.06)	11.64 (7.69)	1.042	.298
Custodial	21.72 (8.12)	23.75 (7.68)	2.785	.006
Total	13.89 (9.32)	13.84 (8.89)	N/A	N/A

### Recidivism Description

The overall recidivism rate, as defined by any reconviction, after two years was 28.3% ( $N=802$ ). However, rates varied according to disposition group. A 3x4 ANOVA was conducted with Disposition and Race as independent factors and Recidivism (yes, no) as the dependent factor. This analysis produced a significant main effect of disposition ( $F(2, 2422) = 74.597, p < .001$ ). Post hoc analysis using Tukey's HSD indicated that custodial offenders were more likely to recidivate (63%) than offenders serving a probation (22%) or conditional sentence (11%) and offenders with a probation sentence were more likely to recidivate than offenders with a conditional sentence. There was no main effect for race ( $F(3, 2422) = .201, p = .347$ ), nor was there an interaction between disposition and race ( $F(6, 2422) = .188, p = .402$ ).

### Severity of index offence by severity of reoffence

A Pearson Correlation was conducted between the severity of the index offence and the severity of a reoffence if a reoffence was recorded. Overall, there was a positive relationship between the severity of the index offence and the severity of re-offence ( $r = .154, p < .001$ ). This was also true for custodial offenders ( $r = .215, p < .001$ ), but not for conditional offenders ( $r = .345, p = .125$ ) and probation offenders ( $r = .040, p = .437$ ).

### Survival analyses by disposition types

A Kaplan-Meier survival analysis was conducted on all female offenders. The follow-up period extended two years from the day custodial offenders were released from custody or the day conditional and probation offenders completed community supervision; therefore offenders were censored when they had completed 731 days (two years) of follow-up. Across all disposition groups, 71.7% of the sample was censored, indicating that 28.3% of the offenders reoffended within two years. The mean survival time (time to recidivate) for those who reoffended was 264 days (SE 7.004). Figure 1 displays the survival curve for all female offenders.

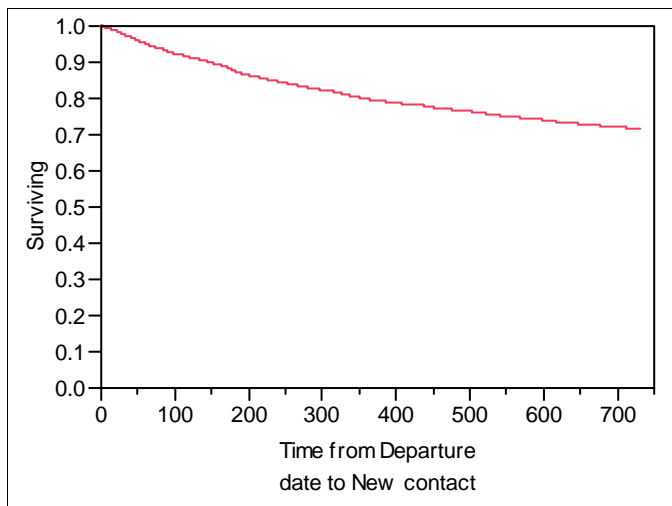


Figure 1 Survival curve for reoffending female offenders

A second Kaplan-Meier survival analysis was performed with the sample broken into disposition groups. A smaller proportion of conditional sentence (censor rate= 90.1%)

recidivated than offenders with a probation sentence (censor rate = 80.8%). However, offenders with a conditional sentence had a shorter mean survival time (233 days, SE=50.48 vs. 280 days, SE= 10.31). The median survival time for conditional offenders was 133 days and for probation offenders was 246 days. Custodial offenders recidivated most often (censor rate = 37.5%) and had shorter mean survival time (250 days) than probation offenders but a longer mean survival time than conditional offenders. The median survival time for custodial offenders was 191 days. A one-way analysis of variance (ANOVA) with the survival time of reoffending offenders as the dependent variable and disposition as the independent variable showed no significant difference in the mean survival time between disposition groups ( $F(2,799) = 2.526, p=.081$ ). Figure 2 displays the survival curve separated by disposition.

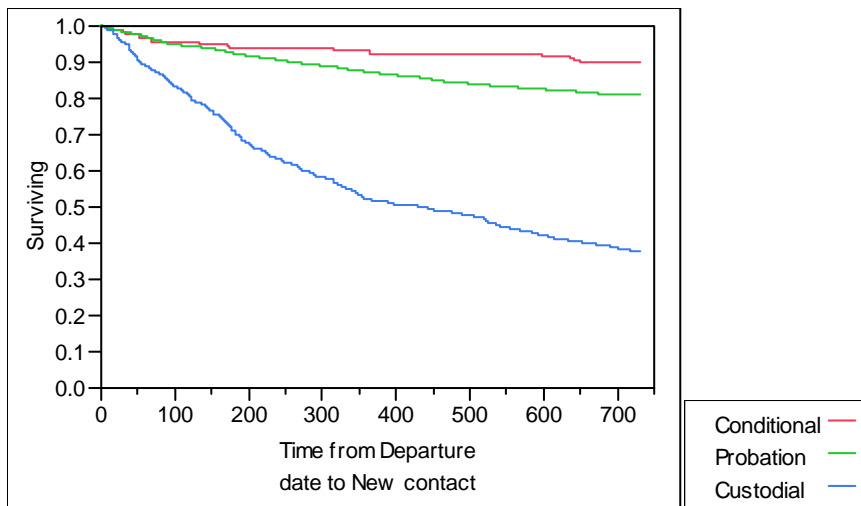


Figure 2 Survival curve for reoffending female offenders by disposition

### Comparison of recidivists and non-recidivists on the LSI-OR

T-tests were used to compare the LSI-OR score of recidivists to non-recidivists for the whole sample, for separate disposition groups and for separate racial groups. For the whole sample, the average LSI-OR score of recidivists was higher than the LSI-OR score of non-recidivists. This was also true when broken down by disposition and racial groups. Table 6 displays the LSI-OR total score and subscale scores for recidivists and non-recidivists for all offenders, and for each disposition group and table 7 displays the LSI-OR total score and subscale scores for recidivists and non-recidivists for each of the racial groups examined.

Table 6 *t*-test of LSI-OR scores between non-recidivists and recidivists by disposition

	LSI-OR Score		<i>t</i> -test	<i>p</i> -value
	Non-Recid	Recid		
<b>All Groups</b>	11.20 (7.87)	20.63 (8.77)	27.797	<i>p</i> < .001
<b>Conditional</b>	10.48 (7.50)	20.14 (9.95)	5.410	<i>p</i> < .001
<b>Probation</b>	10.02 (7.12)	17.23 (8.47)	17.039	<i>p</i> < .001
<b>Custodial</b>	19.53 (7.88)	23.85 (7.73)	6.811	<i>p</i> < .001

Table 7 *t*-test of LSI-OR scores between non-recidivists and recidivists by racial group

	LSI-OR Score		<i>t</i> -test	<i>p</i> -value
	Non-Recid	Recid		
<b>Aboriginal</b>	17.10 (8.16)	24.12 (7.22)	7.630	<i>p</i> < .001
<b>Black</b>	9.43 (7.39)	19.54 (8.52)	8.815	<i>p</i> < .001
<b>Caucasian</b>	12.20 (7.90)	20.67 (8.73)	20.074	<i>p</i> < .001
<b>Other</b>	8.28 (6.44)	15.30 (9.24)	5.499	<i>p</i> < .001

Scores on subscales were also independently able to distinguish recidivists from non-recidivists when examining the whole sample. When broken down by disposition, all subscales differentiated recidivists from non-recidivists, with the exception of “Procriminal Attitudes” and Antisocial Pattern for offenders with conditional sentences and “Family/Marital” for offenders with custodial sentences. When considering racial groups, the offenders’ total LSI-OR scores also discriminated recidivists from non-recidivists for all racial groups, with the exception of “Family/Marital” for Black offenders. A breakdown of the LSI-OR score differences for subscales can be found in Appendix A.

### **LSI-OR Correlations with general recidivism**

For the purposes of conducting a point-biserial correlation, non-recidivists were assigned the value of 0 and recidivists were assigned the value of 1. With this consideration, there was a positive relationship between recidivism and LSI-OR total scores ( $r = .463, p < .01$ ) and for all subscales, indicating that those with a higher LSI-OR score were more likely to recidivate. This

was also true when analyses were conducted on separate disposition and racial groups. LSI-OR scores were correlated with recidivism for the whole sample and disposition groups (table 8) and for racial groups (table 9).

Table 8 Correlation of LSI-OR with general recidivism by disposition

	<b>Whole Sample</b>	<b>Conditional</b>	<b>Probation</b>	<b>Custodial</b>
<b>Total Section A</b>	.463***	.349***	.358***	.259***
<b>Total Strengths</b>	-.148***	-.005	-.110***	-.047
<b>Criminal History</b>	.458***	.266***	.360***	.240***
<b>Strength</b>	-.163***	-.082	-.133***	-.046
<b>Education / Employment</b>	.290***	.225***	.201***	.185***
<b>Strength</b>	-.139***	-.078	-.103***	-.084*
<b>Family / Marital</b>	.154***	.190**	.120***	-.002
<b>Strength</b>	-.061**	-.015	-.035	-.009
<b>Leisure / Recreation</b>	.261***	.135**	.174***	.101**
<b>Strength</b>	-.053**	.088	-.049*	-.057
<b>Companions</b>	.338***	.239***	.229***	.185***
<b>Strength</b>	-.072***	-.014	-.035	-.038
<b>Procriminal Attitudes</b>	.305***	-.028	.216***	.167***
<b>Strength</b>	-.081***	.120	-.066**	-.011
<b>Substance Abuse</b>	.360***	.408***	.266***	.190***
<b>Strength</b>	-.069	-.062	-.044*	-.036
<b>Antisocial Patterns</b>	.363***	.109	.277***	.198***
<b>Strength</b>	-.058**	.076	-.046*	-.012
<b>Total Section B</b>	.322***	.147*	.229***	.149***
<b>Personal Problems</b>	.321***	.113	.232***	.152***
<b>Perpetration History</b>	.203***	.138*	.126***	.086*
<b>Total Section C</b>	.296***	.081	.205***	.132***
<b>Total Section F</b>	.226***	.121	.186***	.068
<b>Social, Health, Mental Health</b>	.198***	.121	.172***	.044
<b>Barrier to Release</b>	.302***	.018	.210***	.160***
<b>Total Section G</b>	.189***	.078	.132***	.078*

\*= $\leq$ .05, \*\*= $\leq$ .01, \*\*\*= $\leq$ .001

Table 9 Correlation of LSI-OR with general recidivism by racial group

	<b>Aboriginal</b>	<b>Black</b>	<b>Caucasian</b>	<b>Other</b>
<b>Total Section A</b>	.407***	.520***	.434***	.330***
<b>Total Strengths</b>	-.203***	-.191**	-.155***	-.006
<b>Criminal History</b>	.346***	.540***	.429***	.394***
<b>Strength</b>	-.243***	-.192**	-.161***	.064
<b>Education / Employment</b>	.208***	.362***	.260***	.163*
<b>Strength</b>	-.161**	-.161*	-.147***	-.053
<b>Family / Marital</b>	.183***	.086	.113***	.014
<b>Strength</b>	-.076	-.089	-.069*	.085
<b>Leisure / Recreation</b>	.302***	.276***	.244***	.164*
<b>Strength</b>	-.154**	-.093	-.042	-.102
<b>Companions</b>	.320***	.397***	.308***	.231**
<b>Strength</b>	-.069	-.123	-.079***	-.028
<b>Procriminal Attitudes</b>	.208***	.403***	.292***	.221**
<b>Strength</b>	-.127*	-.123	-.077**	-.102
<b>Substance Abuse</b>	.324***	.396***	.338***	.257***
<b>Strength</b>	-.097	-.045	-.079***	.066
<b>Antisocial Patterns</b>	.309***	.401***	.339***	.284***
<b>Strength</b>	-.039	-.093	.017	-.070**
<b>Total Section B</b>	.319***	.365***	.277***	.276***
<b>Personal Problems</b>	.285***	.309***	.290***	.301***
<b>Perpetration History</b>	.268***	.334***	.137***	.084
<b>Total Section C</b>	.325***	.265***	.271***	.225**
<b>Total Section F</b>	.162***	.167***	.211***	.209**
<b>Social, Health, Mental Health</b>	.136*	.116	.181***	.195*
<b>Barrier to Release</b>	.256***	.349***	.293***	.207**
<b>Total Section G</b>	.155**	.233**	.164***	.145

\*=<.05, \*\*=<. 01, \* \*\*=<.001

### Receiver operating characteristic analysis

The number of true predictions was weighed against the number of false predictions using ROC analysis and reported using the area under the curve. For the raw LSI-OR scores, the AUC = .785 ±.018 (Figure 3). Individual disposition groups were also examined (Figure 4): conditional sentence, AUC = .780 ±.112; probation, AUC =.746 ± .028; custodial, AUC =.652



$\pm .044$ . All racial groups also displayed a positive AUC (Figure 5): Aboriginal, AUC = .740  $\pm .056$ ; Black, AUC = .816  $\pm .062$ ; Caucasian, AUC = .763  $\pm .024$ ; Other, AUC = .738  $\pm .090$ .

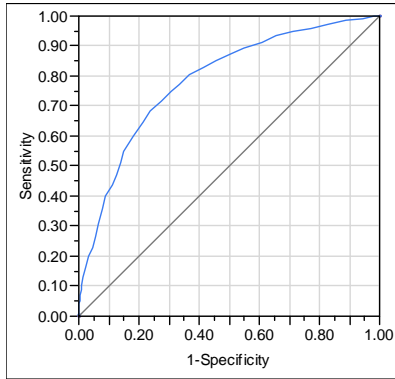


Figure 3 ROC curve: LSI-OR prediction of recidivism for whole sample

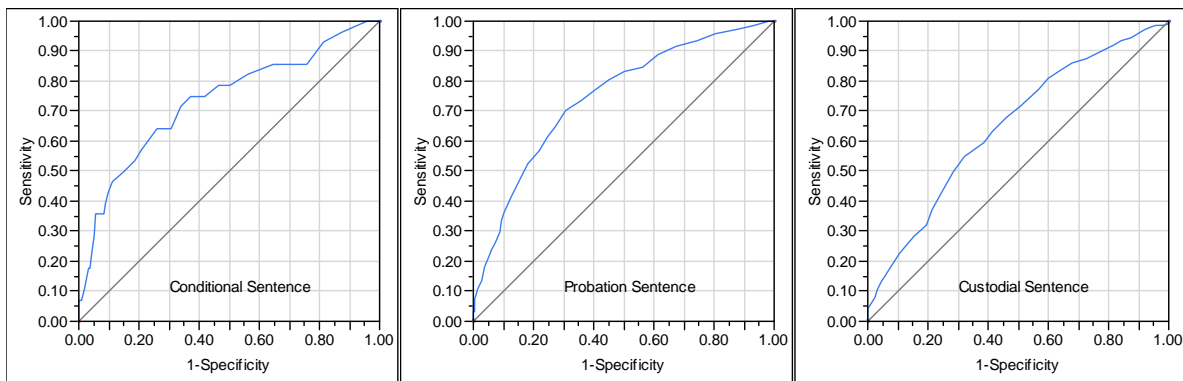


Figure 4 ROC curves: LSI-OR prediction of recidivism by disposition

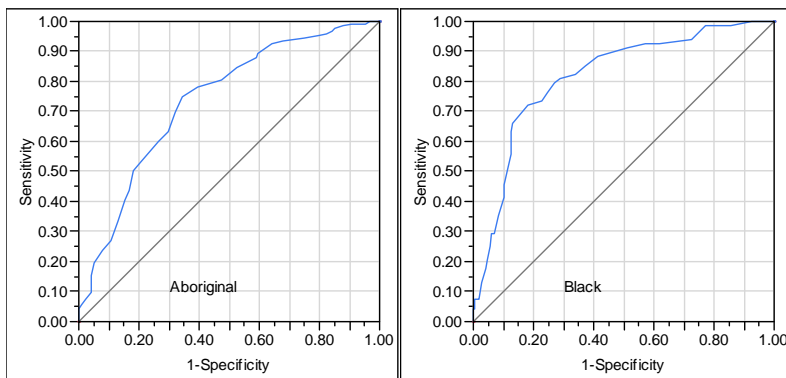


Figure 5 ROC curves: LSI-OR prediction of recidivism - Aboriginal / Black offenders

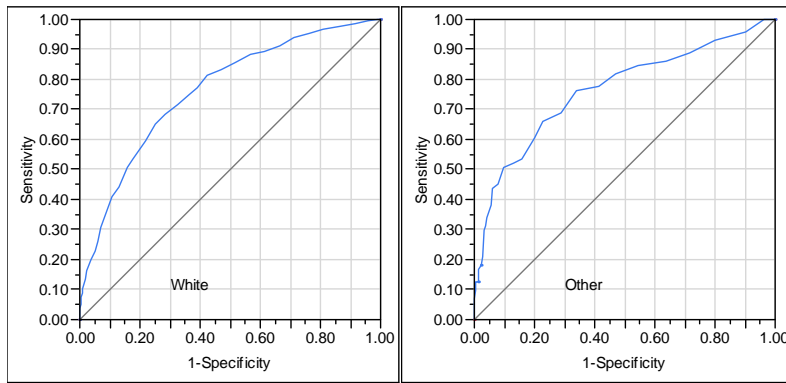


Figure 6 ROC curves: LSI-OR prediction of recidivism - Caucasian / "Other" offenders

### LSI-OR Correlations with violent recidivism

In order to determine the relationship between LSI-OR scores and violent recidivism, correlation analyses were conducted with LSI-OR score and its subscales as one factor and violent recidivism as the other factor. Violent recidivists were coded with a 1 and all other offenders were coded with 0. In this situation, a positive relationship would suggest that as LSI-OR scores increase, so does the likelihood of committing a violent reoffence. When the whole sample was examined, the overall LSI-OR score on section A and its subscales demonstrated a positive relationship with violent reoffence.

When examined by disposition, the overall LSI-OR score was significantly correlated with violent reoffence for probation and custodial offenders but not for offenders who previously serviced a conditional sentence. All subscales were positively related to violent reoffence for probation offenders. However, only one subscale, Substance Abuse, was predictive for conditional offenders and three, Education, Procriminal Attitudes and Antisocial Patterns were predictive for custodial offenders. Table 11 contains the correlations between recidivism and the LSI-OR and its subscales.

When considering racial groups, the LSI-OR total score was also shown to be positively correlated with violent reoffence for all racial groups. However, correlations were not consistently significant between LSI-OR subscales and violent recidivism for many racial groups. While all subscales were predictive for Caucasian offenders, criminal history, education and antisocial patterns were not predictive for Aboriginal offenders, family/marital was not

predictive for Black offenders and education, family/marital and leisure/recreation were not predictive for “other” offenders. Correlations between LSI-OR total score, subscales and violent recidivism by racial group can be found in table 12.

Table 10 Correlation with violent recidivism by disposition group

	<b>Whole Sample</b>	<b>Conditional</b>	<b>Probation</b>	<b>Custodial</b>
<b>Total Section A</b>	.182***	.085	.168***	.110**
<b>Total Strengths</b>	-.056**	-.047	-.043	-.025
<b>Criminal History</b>	.164***	.110	.161***	.051
<b>Strength</b>	-.064**	-.068	-.056*	-.023
<b>Education / Employment</b>	.113***	.015	.089***	.087*
<b>Strength</b>	-.045*	-.067	-.036	-.009
<b>Family / Marital</b>	.081***	-.011	.067**	.068
<b>Strength</b>	-.017	-.060	-.019	.045
<b>Leisure / Recreation</b>	.118***	-.036	.102***	.074
<b>Strength</b>	-.011	.063	-.016	.036
<b>Companions</b>	.128***	.124	.103***	.066
<b>Strength</b>	-.027	-.048	-.003	-.055
<b>Procriminal Attitudes</b>	.125***	-.054	.084***	.115**
<b>Strength</b>	-.029	.036	-.023	-.013
<b>Substance Abuse</b>	.146***	.167*	.142***	.050
<b>Strength</b>	-.048*	-.061	-.026	-.075
<b>Antisocial Patterns</b>	.137***	-.044	.110***	.100*
<b>Strength</b>	-.020	-.031	-.017	.008
<b>Total Section B</b>	.188***	.006	.157***	.172***
<b>Personal Problems</b>	.158***	-.031	.136***	.123**
<b>Perpetration History</b>	.167***	.058	.128***	.178***
<b>Total Section C</b>	.093***	.024	.067**	.038
<b>Total Section F</b>	.103***	-.021	.099***	.054
<b>Social, Health, Mental Health</b>	.092***	-.019	.093***	.043
<b>Barrier to Release</b>	.121***	-.027	.098***	.078*
<b>Total Section G</b>	.132***	-.018	.106***	.129***

\*= $\leq$ .05, \*\*= $\leq$ .01, \*\*\*= $\leq$ .001

Table 11 Correlation with violent recidivism by racial group

	<b>Aboriginal</b>	<b>Black</b>	<b>Caucasian</b>	<b>Other</b>
<b>Total Section A</b>	.151**	.261***	.123***	.326***
<b>Total Strengths</b>	-.159**	-.083	-.032	.003
<b>Criminal History</b>	.090	.206**	.128***	.199*
<b>Strength</b>	-.084	-.057	-.060*	-.026
<b>Education / Employment</b>	.084	.227***	.064**	.152
<b>Strength</b>	-.124*	-.110	-.029	-.017
<b>Family / Marital</b>	.057	.064	.055*	.137
<b>Strength</b>	-.095	-.003	-.016	.174*
<b>Leisure / Recreation</b>	.142*	.212***	.087***	.139
<b>Strength</b>	-.132*	.024	.023	-.078
<b>Companions</b>	.103	.165*	.083***	.239**
<b>Strength</b>	-.048	-.072	-.020	.026
<b>Procriminal Attitudes</b>	.122*	.184**	.079***	.285***
<b>Strength</b>	-.099	-.072	-.003	-.078
<b>Substance Abuse</b>	.135*	.215**	.094***	.331***
<b>Strength</b>	-.146*	-.090	-.027	.029
<b>Antisocial Patterns</b>	.104	.182**	.084***	.365***
<b>Strength</b>	-.068	.024	-.008	-.040
<b>Total Section B</b>	.149*	.317***	.137***	.339***
<b>Personal Problems</b>	.141*	.261***	.113***	.293***
<b>Perpetration History</b>	.115*	.303***	.122***	.269***
<b>Total Section C</b>	.101	.030	.073***	.034
<b>Total Section F</b>	.066	-.046	.094***	.223**
<b>Social, Health, Mental Health</b>	.054	-.090	.086***	.224**
<b>Barrier to Release</b>	.116*	.252***	.086***	.050
<b>Total Section G</b>	.163**	.197**	.085***	.087

\*= $<.05$ , \*\*= $<.01$ , \*\*\*= $<.001$

## Examination of Recidivism by Risk Level

### Original and override risk levels

Pearson correlations, ROC analysis and survival analyses were conducted to determine the predictive ability of the LSI-OR risk levels. The first set of risk levels were provided by MSCSC and based on cut-offs provided in Section E of the LSI-OR scoring sheet. The original risk level then forms the starting point. The override risk level is the level to which a clinician

has reassigned an offender's level or risk. This clinical override was used in 11.6% (n=328) of the cases. Changes occurred in both directions but in the majority of cases (79%) the risk level was increased. The details of the change in risk level following the use of override can be found in Table 12.

Table 12 Change in number of offenders from original to override risk level

Risk Level	Starting N	-2	-1	No Change	+1	+2	+3	Ending N
1	492	0	0	414	13	58	7	417
2	731	0	1	603	116	10	1	637
3	863	2	20	789	52	0	0	1007
4	564	1	39	522	2	0	0	592
5	181	5	1	175	0	0	0	178
	2831	8	61	2503	183	68	8	2831

It appears that the LSI-OR is a better predictor of recidivism prior to the application of clinical override. For all offenders and within disposition groups, there was a stronger positive correlation with recidivism and larger area under the curve for LSI-OR risk levels as they were initially assessed. Table 13 displays number of the correlation and area under the curve for both the original risk level assigned and the override risk level.

Table 13 Reoffence rates of original and over-ride risk levels

	Original Risk Level		Over-Ride Risk Level	
	Overall N	Re-offence Rate	Overall N	Re-offence Rate
V. Low	492	31 (6.3%)	417	27 (6.5%)
Low	731	87 (11.9%)	637	77 (12.1%)
Medium	863	244 (28.3%)	1007	259 (25.7%)
High	564	308 (54.6%)	592	310 (52.4%)
V. High	181	132 (72.9%)	178	129 (72.5%)

Table 14 Pearson correlation for original and override risk levels

	Conditional	Probation	Custodial	Whole Sample
Correlation ( <i>r</i> )				
Original	.315**	.338**	.234**	.439**
Override	.268**	.317**	.226**	.412**
Area Under Curve				
Original	.761(.640-.882)	.730(.702-.758)	.633(.589-.677)	.771(.752-.791)
Override	.738(.616-.860)	.716(.687-.745)	.627(.583-.672)	.755(.735-.775)

\*\*significant at .01

### Comparison of Risk Level Cut-off Types

A second set of LSI-OR risk levels was developed using the same procedure employed by Coulson and colleagues (1996). Five risk categories were created by dividing the sample into 5 equally proportioned categories. This created the following risk categories: Very Low, 0-5; Low, 6-10, Medium, 11-16; High, 17-23; Very High, 24-42. Table 15 displays the number of offenders per risk level and the number of re-offenders per risk level. Table 16 displays this information sorted by disposition. These rates may be compared to the recidivism rates from the original risk levels as reported in table 14.

Table 15 Number of offenders and re-offenders in Coulson-type risk levels

Level	Range	Total	% total	Total Reoffenders	% of Risk Level
V. Low	(0-5)	626	22.1%	39	6.2%
Low	(6-10)	597	21.1%	79	13.2%
Medium	(11-16)	573	20.2%	132	23.0%
High	(17-23)	532	18.8%	232	43.6%
V. High	(24+)	503	17.8%	320	63.6%
Total		2831	100%	802	28.3%

Table 16 Offenders and re-offenders by Coulson-type risk levels and disposition

Level	Conditional				Probation				Custodial			
	All		Reoffenders		All		Reoffenders		All		Reoffenders	
	n	%	n	%	n	%	n	%	n	%	n	%
V. Low	63	29.6	2	3.2	548	27.8	32	5.8	15	2.3	5	33.3
Low	53	24.9	2	3.8	495	25.1	56	11.3	49	7.6	21	42.9
Medium	43	20.2	3	7.0	444	22.5	92	20.7	86	13.3	37	43.0
High	34	16	5	14.7	302	15.3	108	35.8	196	30.4	119	60.7
V. High	20	9.4	9	45.0	184	9.3	90	48.9	299	46.4	221	73.9
Total	213	100	21	9.9	1973	100	378	19.2	645	100	403	62.5

A third set of risk levels was derived from LSI-OR scores using recursive partition following a cross-validation process. The recursive partitioning process exhaustively searches all possible divisions and making a decision based on minimized sum of squared errors. A more complete description of recursive partitioning may be found in the method section. The sample was stratified by disposition and then divided into two groups using a Bernoulli sampling process through the JMP statistical package. There was no significant difference in LSI-OR scores between the groups ( $t(2829) = 0.345, p = .7130$ ). There was also no significant difference in LSI-OR scores when examining disposition groups: conditional ( $t(211) = 0.335, p = .738$ ), probation ( $t(1971) = 1.118, p = .026$ ) and custodial ( $t(643) = 1.132, p = .258$ ). Number and mean LSI-OR score for the trial and validation groups can be found in table 17.

Table 17 Number and mean LSI-OR score for trial and validation groups

	n	M LSI (SD)	t-score	p-value
Conditional				
Trial	106	11.25 (8.47)		
Validation	107	11.63 (8.10)	0.335	.738
Probation				
Trial	996	11.60 (8.01)		
Validation	977	11.20 (7.83)	1.118	.0264
Custodial				
Trial	328	21.88 (8.03)		
Validation	317	22.59 (8.08)	1.132	.258
All dispositions				
Trial	1430	13.93 (9.14)		
Validation	1401	13.81 (9.22)	0.345	.730

Following the stratification of the sample into construction and validation samples, splitting using the recursive partitioning process was undertaken four times in order to generate five groups. The best split in LSI-OR score to predict recidivism was between 17 and 18. The second split was created between 12 and 13. The third split took place between 30 and 31. The final split occurred between 6 and 5. Overall, this produced a ROC of .774 for the development sample. When these splits were applied to the excluded sample, a ROC of .777 was produced. After the cut offs were determined, the groups were recombined and the sample analysed. The number of offenders and re-offenders in the combined sample can be found in Table 18. The number of offenders and re-offenders per risk level by dispositions can be found in Table 19.

Table 18 Number of offenders and re-offenders by statistical risk levels

Level	Range	Total	% total	Total Reoffenders	% of Risk Level
V. Low	(0-5)	626	22.1	39	6.2%
Low	(6-12)	810	28.6	115	14.2%
Medium	(13-17)	440	15.5	125	28.4%
High	(18-30)	815	28.8	415	50.9%
V. High	(31+)	140	4.9	108	77.1%
Total		2831	100	802	28.3%



Table 19 Offenders and re-offenders by statistical risk level and disposition

		Conditional				Probation				Custodial			
		All		Reoffenders		All		Reoffenders		All		Reoffenders	
Level	Range	n	%	n	%	n	%	n	%	n	%	n	%
V. Low	(0-5)	63	29.6	2	3.2	548	27.8	32	5.8	16	2.3	5	33.3
Low	(6-12)	68	31.9	2	2.9	669	33.9	81	12.1	74	11.3	32	43.8
Medium	(13-17)	33	15.5	4	12.1	324	16.4	84	25.9	87	12.9	37	44.6
High	(18-30)	42	19.7	10	23.8	395	20.0	153	38.7	385	58.6	252	66.7
V. High	(31+)	7	3.3	3	42.9	37	1.9	28	75.7	97	14.9	77	80.2
Total		213	100	28	12.73	1973	100	378	19.16	645	100	403	62.5

The Coulson-type and the statistical method both produced strong correlations with reoffending for each disposition group and across disposition groups. While the Coulson-type created a larger ROC curve for offenders with conditional and probation sentences, this is minimized when the disposition groups are considered together. The correlation and area under the curve for these both risk levels strategies for all offenders and by disposition are found in Table 20. When analyzing correlations and ROC curves across racial groups, there was a larger difference between the two sets of cut-offs. The statistical cut-offs produced the strongest positive correlation with recidivism for all groups except for those in the “other” category. This scheme was followed closely by the Coulson type cut-off mechanism. When examined by race, all schemes produced the largest correlations for black offenders, followed by Caucasian and Aboriginal offenders. The Pearson correlations and ROC curve analysis for racial groups can be found in Table 21.

Table 20 Correlation and AUC for Coulson-type and statistical levels by disposition

	Conditional	Probation	Custodial	Whole Sample
Correlation ( <i>r</i> )				
Original	.315**	.338**	.234**	.439**
Coulson-type	.328**	.343**	.254**	.447**
Statistical	.313**	.354**	.249**	.450**
Area Under Curve				
Original	.761(.640-.882)	.730(.702-.758)	.633(.589-.677)	.771(.752-.791)
Coulson-type	.779(.663-.895)	.737(.709-.765)	.642(.598-.687)	.778(.760-.797)
Statistical	.770(.659-.881)	.739(.711-.767)	.635(.591-.680)	.776(.757-.794)

\*\*significant at  $p < .01$

Table 21 Correlation and AUC for Coulson-type and statistical levels by race

	Caucasian	Aboriginal	Black	Other
Correlation ( <i>r</i> )				
Original	.412**	.394**	.472**	.352**
Coulson-type	.415**	.385**	.517**	.383**
Statistical	.419**	.387**	.535**	.357**
Area Under Curve				
Original	.748(.723-.772)	.726(.668-.784)	.786(.718-.853)	.717(.622-.813)
Coulson-type	.754(.730-.778)	.721(.663-.779)	.807(.742-.872)	.742(.652-.831)
Statistical	.752(.727-.776)	.710(.652-.768)	.813(.749-.877)	.719(.628-.810)

\*\*significant at  $p < .01$

Re-offence rates varied according to Coulson-type risk level ( $\chi^2(4) = 595.18$   $p < .001$ ). Offenders in the lowest risk level had the lowest re-offence rate while offenders in the highest risk level had the highest re-offence rate. An ANOVA with the time from departure to reoffence as the dependent variable and Coulson-type risk level as independent variable was conducted to determine if lower risk offenders took longer to reoffend than higher risk offenders. The survival time from departure to reoffence for recidivists did not vary according to risk level although it did approach significance ( $F(4,797) = 2.049$ ,  $p = .086$ ). Re-offence rates and the mean survival

times for reoffenders according to Coulson-type risk levels can be found in Table 22. Figure 7 displays the survival plots for the whole sample according to Coulson-type risk level.

Risk levels calculated statistically were also found to influence re-offence rates ( $\chi^2(4) = 599.40, p < .001$ ). Re-offence rates follow the same pattern as the risk levels established by the Coulson method. The re-offence rate and mean survival time for each risk level derived according to the statistical method can be found in table 22. A second ANOVA used to determine if there was a difference in the time to reoffend for offenders in risk levels grouped using the statistical method. This analysis indicated that this survival time varied significantly between groups ( $F(4,797) = 2.982, p = .018$ ). Post hoc analysis using Tukey's HSD indicated that offenders in the very high risk level offended faster than offenders in the medium risk level. The survival curves associated with the statistical risk levels can be found in figure 8.

Table 22 Mean survival time by Coulson-type and statistical risk levels

	Coulson-type			Statistical		
	Re-offence Rate	Mean Survival Time	SE	Re-offence Rate	Mean Survival Time	SE
V. Low	6.2%	299	30.7	6.2%	299	30.7
Low	13.2%	290	23.9	14.2%	288	19.6
Medium	23.0%	294	18.0	28.4%	299	18.8
High	43.6%	254	12.6	50.9%	253	9.5
V. High	63.6%	248	10.9	77.1%	227	17.4

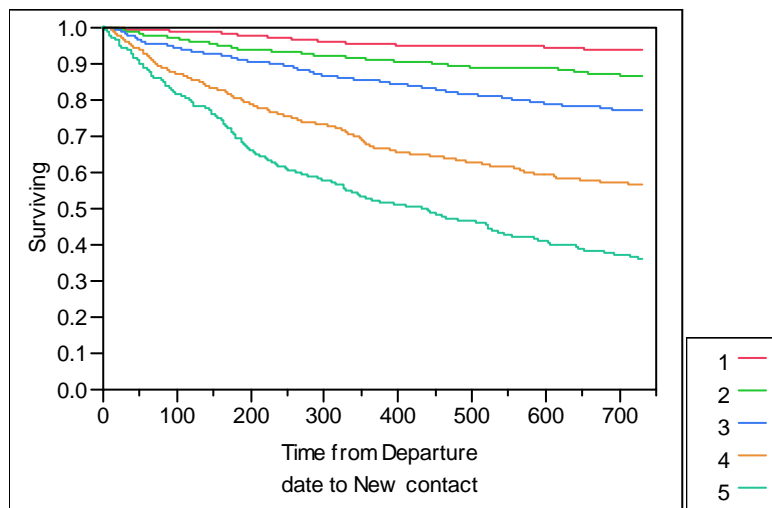


Figure 7 Survival analysis of re-offence by Coulson-type risk levels

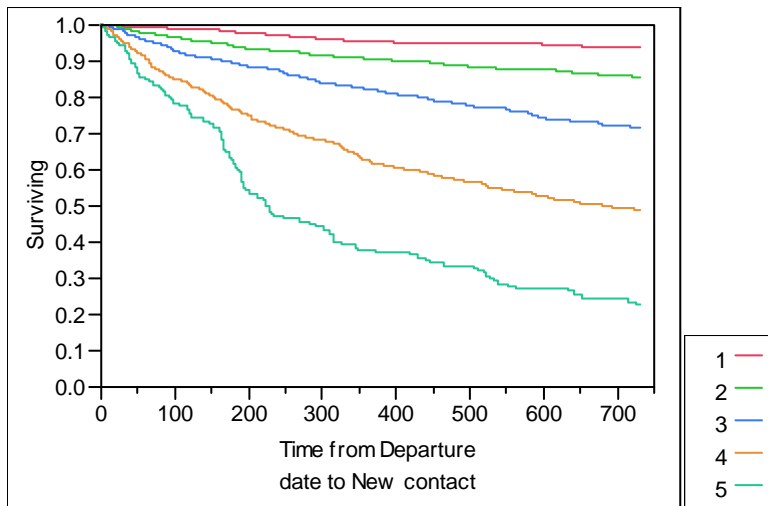


Figure 8 Survival analysis of re-offence by statistical risk levels

### LSI-OR Strength Scales

In addition to the total LSI-OR score and its subscale scores, the LSI-OR also reports areas of strength suggested by the assessor. Areas of strength are to include subcomponents that reflect low or very low risk that also include positive functioning (Andrews, Bonta & Wormith, 2004). These items may be considered to be protective factors and therefore negatively correlated with recidivism (Hoge, Andrews & Leschied, 1996). As was expected, many of the strength scales associated with LSI-OR subscales were negatively correlated with general recidivism. The substance abuse strength scale was the only one not associated with general recidivism. Strength in the substance abuse subcomponents, as well as the criminal history and education/ employment components were negative related to violent recidivism. Table 8 (by disposition) and table 9 (by racial group) report the correlation with general recidivism. Table 10 (by disposition) and table 11 (by racial group) report the correlation with violent recidivism.

When the sample was broken down by disposition, most of the strength scales were only significantly correlated with general recidivism for the probation sample. The two exceptions to this were: the family/marital and companions strength scales were not significant for the probation sample and the education/employment strength scale was negatively correlated for the custodial sample. Only the criminal history strength scale for probation offenders was significantly related to violent recidivism when the sample was broken down by disposition.

The total strength scale was negatively correlated with general recidivism for Aboriginal, Black and Caucasian offenders but not for “Other” offenders. Individual strength scales were more likely to be predictive of general recidivism for Caucasian offenders with six of the scales being negatively correlated. Four strength scales were negatively correlated for Aboriginal offenders and two for Black offenders. Only one was negatively correlated for “Other” offenders. When considering violent recidivism, strength scales were more likely to predict recidivism for Aboriginal offenders. Three of these scales were predictive compared to only one each for Caucasian and “Other” offenders. No strength scales were predictive of violent recidivism for Black offenders.

### **Social, Health and Mental Health**

Section F of the LSI-OR contains items pertaining to social, health and mental health issues of offenders. This section was examined in two different ways. The first created a scaled variable with a possible range of scores from 0 to 18. The second was to dichotomize the sample into groups that either did or did not have a least one issue. This was performed for all of section F, as well as for mental health and past victimization subscales.

#### **Scaled variables**

When considering all 19 items within the social, health and mental health section, offenders had scores ranging from 0 to 15. A one-way ANOVA was used to determine that there was a difference in average score on section F for offenders in different disposition groups ( $F(2, 2828) = 59.888, p < .001$ ). Particularly, post hoc analyses with Tukey’s HSD indicated that offenders with a custodial sentence had a significantly higher score than those serving a conditional sentence or a probation sentence. There was no difference noted between probation and conditional offenders. There was a maximum range of scores for both the mental health (0-4) and victimization subscales (0-5). Differences between disposition groups were determined via ANOVA for each of these scales: mental health section ( $F(2, 2828) = 7.080, p = .001$ ) and victimization scale ( $F(2, 2828) = 36.46, p < .001$ ). Post hoc analyses indicated that, in both cases, custodial offenders had higher scores. Table 23 displays the mean scores on Section F as well as the subscales of mental health and victimization by disposition group

Table 23 Mean score on section F, mental health and victimization scales

	Whole Sample		Conditional		Probation		Custodial	
	M	SD	M	SD	M	SD	M	SD
All Section F	2.99	2.70	2.86	2.59	2.68	2.56	3.99	2.93
Mental Health	.57	.813	.54	.78	.54	.799	.67	.856
Victimization	1.11	1.49	1.06	1.42	.97	1.40	1.54	1.68

### Dichotomized variables

Section F of the LSI-OR contains items examining the social, health and mental health issues affecting many offenders and were used to determine if an offender had a mental health or past victimization issue. An offender was considered to have a mental health concern if they had at least one of the following concerns: depressed, psychosis, suicidal attempts or other emotional problems. An offender was considered to have a past victimization issue if there was at least one of the following concerns: family violence, physical assault, sexual assault, emotional abuse or neglect.

Most offenders (82.4%) had at least one social, health or mental health issue listed in Section F; however, most items were more prevalent amongst custody offenders ( $\chi^2(2) = 65.36, p < .001$ ). This was also true of offenders for offenders with mental health concerns ( $\chi^2(2) = 13.23, p = .0014$ ) and for offenders with past victimization issues ( $\chi^2(2) = 41.74, p < .001$ ). This was also the case for all but five individual items (depressed, physical disability, shy, psychosis and immigration issues) that comprise the scale as well as for mental health and victimization subscales. Table 24 contains the number and percentage of offenders with social, health and mental health issues as well as the chi-square results.

Table 24 Number of offenders with social, health and mental health issues

	Whole Sample		Conditional		Probation		Custodial		$\chi^2$	<i>p</i>
	n	%	n	%	n	%	n	%		
All Section F	2333	82.4	177	83.1	1557	78.9	599	92.9	65.36	<.001
Mental Health	1112	39.3	80	37.6	739	37.5	293	45.4	13.23	=.001
Victimization	1296	45.8	93	43.7	386	42.4	367	56.9	41.74	<.001
Financial Problems	1292	45.6	97	45.5	836	42.4	359	55.7	34.59	<.001
Homelessness	153	5.4	5	2.3	69	3.5	79	12.2	77.02	<.001
Accommodations	319	11.3	19	8.9	173	8.8	127	19.7	59.26	<.001
Health Problems	652	23.0	44	20.7	393	19.9	215	33.3	50.08	<.001
+Depressed	712	25.2	62	29.1	483	24.5	167	25.9	2.431	n.s.
Physical disability	107	3.8	11	5.2	68	3.4	28	4.3	2.284	n.s.
Low Self-Esteem	807	28.5	67	31.5	502	25.4	238	36.9	32.28	<.001
Shy / Withdrawn	143	5.1	15	7.0	95	4.8	33	5.1	2.00	n.s.
+Psychosis	65	2.3	2	0.9	45	2.3	18	2.8	2.45	n.s.
+Suicide Attempts	485	17.1	29	13.6	294	14.9	162	25.1	37.74	<.001
Learning Disability	115	4.1	4	1.9	75	3.8	36	5.6	6.77	.034
+Other Emotional	344	12.2	21	9.9	236	12.0	87	13.5	2.20	n.s.
Immigration Issues	21	0.7	1	0.5	19	1.0	1	0.2	4.54	n.s.
++ Family Violence	726	25.6	54	25.4	462	23.4	210	32.6	21.32	<.001
++ Physical Assault	720	25.4	53	24.9	440	22.3	227	35.2	42.64	<.001
++ Sexual Assault	557	19.7	34	16.0	336	17.0	187	29.0	46.02	<.001
++ Emotional abuse	799	28.2	64	30.0	490	24.8	245	38.0	41.87	<.001
++ Neglect	334	11.8	20	9.4	190	9.6	124	19.2	44.29	<.001

+ Mental Health Issues

++ Victimization Issues

## Recidivism

Across the whole sample recidivists were more likely to have at least one social, health or mental health problem ( $\chi^2(1) = 75.05, p < .001$ ). However, this seems to be primarily driven by probation offenders. While more probation recidivists had an issue under section F than non-recidivists ( $\chi^2(1) = 44.749, p < .001$ ), this was not true for conditional offenders ( $\chi^2(1) = .076, p = .762$ ) and custodial offenders ( $\chi^2(1) = .750, p = .38$ ). The number and percentage of recidivists and non-recidivists with a least one social health and mental health issue can be found in Table 25.

Table 25 Recidivism of offenders with social, health and mental health issues

	Whole Sample		Conditional		Probation		Custodial	
	No F	F	No F	F	No F	F	No F	F
Non – recidivist	436 (87.6%)	1593 (68.3%)	32 (88.8%)	160 (90.4%)	384 (92.3%)	1211 (77.8%)	20 (43.5%)	222 (37.1%)
Recidivist	62 (12.4%)	740 (31.7%)	4 (11.2%)	17 (9.6%)	32 (7.7%)	346 (22.2%)	26 (56.5%)	377 (62.9%)
Total	498 (100%)	2333 (100%)	36 (100%)	177 (100%)	416 (100%)	1557 (100%)	46 (100%)	599 (100%)

### Mental health, victimization and recidivism

As with Section F, recidivists were more likely to have a mental health issue when examining the entire sample ( $\chi^2(1) = 22.05, p < .001$ ). Specifically this occurred in the probation subset ( $\chi^2(1) = 18.526, p < .001$ ) but not conditional offenders ( $\chi^2(1) = .177, p = .814$ ) or custodial offenders ( $\chi^2(1) = .100, p = .408$ ). The number and percentage of recidivists and non-recidivists with a least one mental health issue for the whole sample and disposition groups can be found in Table 26.

Table 26 Recidivism for offenders with mental health issues by disposition

	Whole Sample		Conditional		Probation		Custodial	
	No MH	MH	No MH	MH	No MH	MH	No MH	MH
Non-recidivist	1287 (74.4%)	742 (66.2%)	119 (89.5%)	73 (91.3%)	1034 (83.8%)	561 (75.9%)	134 (38.1%)	108 (36.9%)
Recidivist	432 (25.6%)	370 (33.8%)	14 (10.5%)	7 (8.7%)	200 (16.2%)	178 (24.1%)	218 (61.9%)	185 (63.1%)
Total	1731 (100%)	1121 (100%)	133 (100%)	80 (100%)	1234 (100%)	739 (100%)	352 (100%)	293 (100%)

The same pattern was found with past victimization. There were more recidivists with at least one type of past victimization ( $\chi^2(1) = 43.58, p < .001$ ) when examining the entire sample and offenders with a probation sentence ( $\chi^2(1) = 23.454, p < .001$ ) but not offenders with a conditional sentence ( $\chi^2(1) = .720, p = .488$ ) or custodial sentence ( $\chi^2(1) = .368, p = .300$ ). The number and percentage of recidivists and non-recidivists with a least one type of past victimization can be found in Table 27.



Table 27 Recidivism for offenders with past victimization by disposition

	Whole Sample		Conditional		Probation		Custodial	
	No Vict	Vict	No Vict	Vict	No Vict	Vict	No Vict	Vict
Non- recidivist	1179 (76.8%)	850 (65.6%)	110 (91.7%)	82 (88.2%)	961 (84.5%)	634 (75.8%)	108 (38.8%)	134 (36.5%)
Recidivist	356 (23.2%)	446 (34.4%)	10 (8.3%)	11 (11.8%)	176 (15.5%)	202 (24.2%)	170 (61.2%)	233 (63.5%)
Total	1535 (100%)	1296 (100%)	120 (100%)	93 (100%)	1137 (100%)	836 (100%)	278 (100%)	367 (100%)

### Mental health, victimization and survival analysis

Survival analyses were performed to determine the rate at which offenders with and without mental health issues recidivated. Offenders who did not recidivate within the two year follow-up period were censored. The survival rate for offenders with mental health issues was significantly shorter than for those without mental health issues (*Log-Rank*  $\chi^2(1) = 5.45, p = .020$ ). While 46.1 % of offenders with mental health issues reoffended and had a mean survival time of 246 days (SD= 196.5), those without mental health issues had a reoffence rate of 53.9% and had a mean survival time of 280 days (SD=198.8). Figure 9 displays the survival pattern of offenders with and without mental health issues.

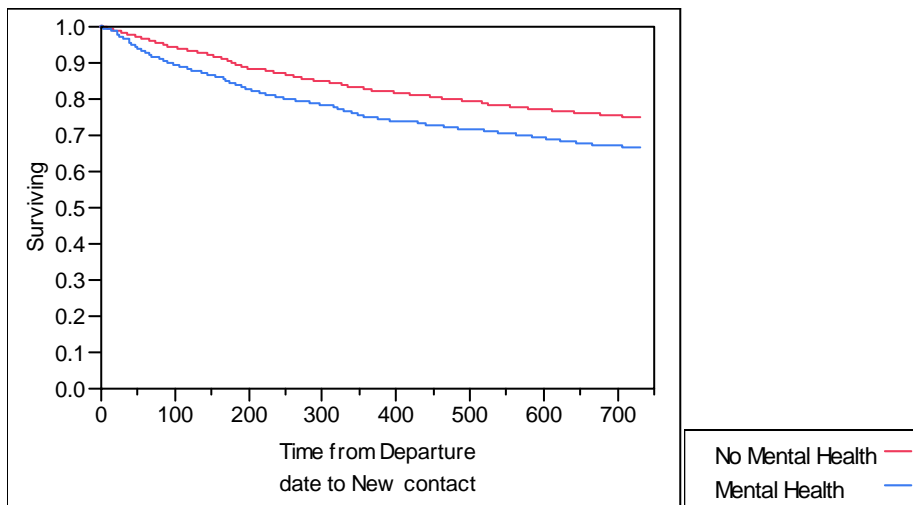


Figure 9 Survival plot for all offenders by mental health status

There was no difference noted in the survival rate of those with and without past victimization. (Log-Rank  $\chi^2(1) = 1.81, p = .179$ ). Offenders with past victimization had a reoffence rate of 55.6% while 44.4% of those without past victimization reoffended. The mean survival time of offenders who had previously been victimized was 255 days (SD=198.1). The mean survival time of offenders with no past victimization was 275 days (SD=198.5). Figure 10 displays the survival pattern of offenders with and without past victimization.

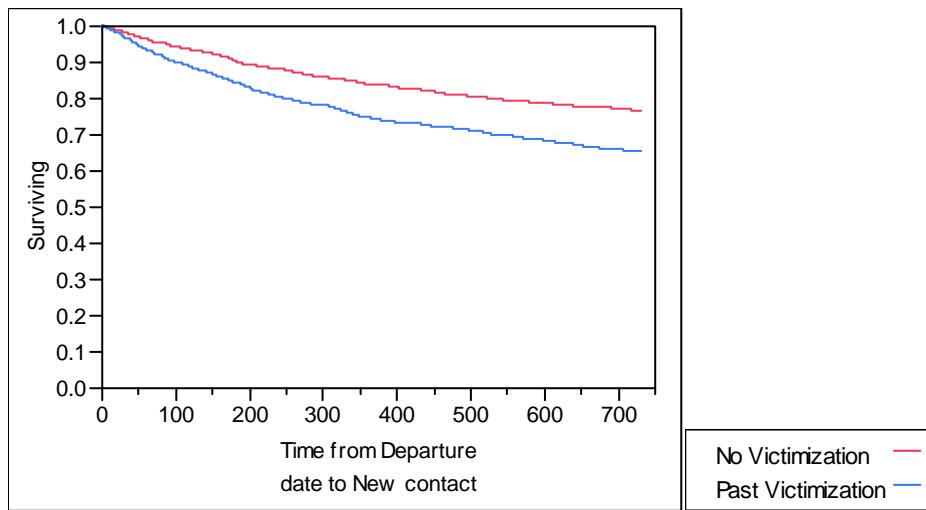


Figure 10 Survival plot for all offenders by past victimization status

### LSI-OR score and Mental Health

A 3 x 2 ANOVA was performed with disposition group (conditional, probation, custodial) and mental health (no issue – at least one issue) as independent variables and LSI-OR score as the dependent variable. There was a main effect of disposition ( $F(2, 2825) = 440.02, p < .001$ ) as well as for mental health  $F(1, 2825) = 41.85, p < .001$ . Post hoc analyses indicated that offenders serving a custodial sentence ( $M = 22.34$ ) had a significantly higher LSI-OR score than those in the other two disposition groups (conditional, ( $M = 11.63$ ); probation,  $M = 11.95$ ). Also, those with a mental health issue ( $M = 16.72$ ) had a higher LSI-OR score than those without a mental health issue ( $M = 13.90$ ). However, this is qualified by an interaction between disposition and mental health status ( $F(2, 282825) = 5.18, p = .006$ ). Specifically, LSI-OR scores for those with mental health issues were more elevated for probation offenders than for conditional or

custodial offenders. Table 28 provides the LSI-OR score for those with at least one mental health issue and those with no mental health issues as well as the correlation of this LSI-OR score. Please see Appendix B for a comparison of LSI-OR subscale scores for those with and without mental health status and the correlation of these subscale scores with recidivism.

Table 28 LSI-OR score and correlation with recidivism by mental health status

	LSI-OR Score				Corr w/ recid	
	No MH	MH	<i>t</i> -test	<i>p</i> -value	No MH	MH
<b>All Groups</b>	12.17 (8.63)	16.50 (9.38)	12.580	<.001	.492**	.411**
<b>Conditional</b>	10.84 (8.09)	12.43 (8.51)	1.356	.177	.390**	.293**
<b>Probation</b>	9.78 (7.14)	14.12 (8.41)	12.204	<.001	.380**	.305**
<b>Custodial</b>	21.07 (7.80)	23.62 (8.16)	4.045	<.001	.272**	.248**

### LSI-OR score and Past Victimization

A second 3 x 2 ANOVA was conducted using disposition group and past victimization (no victimization – at least one type) as independent variables and LSI-OR score as the dependent variable. A main effect of disposition ( $F(2, 2825) = 434.020, p < .001$ ) as well as for victimization  $F(1, 2825) = 117.096, p < .001$ . Tukey’s HSD post hoc analyses indicated that those with past victimization ( $M = 17.45$ ) have higher LSI-OR score than those without past victimization ( $M = 12.88$ ). Table 29 displays the mean LSI-OR score for offenders with and without past victimization by disposition group.

Table 29 LSI-OR score by past victimization and disposition

	No past victimization		Past victimization		<i>t</i> -test	<i>p</i> -value
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Whole Sample	11.27	8.37	16.96	9.13	17.297	<.001
Conditional	9.28	7.02	14.23	8.13	4.529	<.001
Probation	9.33	7.08	14.22	8.13	14.221	<.001
Custodial	20.03	8.21	23.89	7.54	6.207	<.001

## Correlation of social, health and mental health issues with recidivism

A bivariate correlation was conducted between recidivism and the total score on Section F as well as the subscales of mental health and victimization. For the whole sample, recidivism was positively correlated with scores on section F, mental health and victimization. However, this was not the case when the sample was broken down by disposition group. When this was done, this was only true for those with a sentence of probation. Please see table 30 for the correlation rates of recidivism with victimization and mental health problems.

Table 30 Correlation between section F, mental health and victimization and recidivism

		All section F	Mental Health	Victim	Recidivism
Whole Sample					
	All section F	1	.658**	.812**	.198**
	Mental Health		1	.346**	.083**
	Victim			1	.145**
					1
Conditional					
	All section F	1	.681**	.805**	.121
	Mental Health		1	.395**	.015
	Victim			1	.065
					1
Probation					
	All section F	1	.665**	.806**	.172**
	Mental Health		1	.335**	.089**
	Victim			1	.140**
					1
Custodial					
	All section F	1	.639**	.807**	.044
	Mental Health		1	.339*	.000
	Victim			1	-.008
					1

## Predictive Validity with Mental Health and Victimized Offenders

The predictive ability of the LSI-OR for those with social, health and mental health issues was preformed though a correlation of LSI-OR scores and two year recidivism after dividing the sample by mental health and victimization status. Although the LSI-OR was strongly correlated with recidivism for both those with and those without a mental health issue, it is a stronger

predictor for those without a mental health issue. When considering past victimization, the LSI-OR is not significantly correlated with recidivism for conditional offenders with no past victimization. It is, however, strongly correlated with recidivism for those with past victimization. The LSI-OR has a strong correlation with recidivism for all other disposition groups, although the strength of the relationship is greater for those with no past victimization. Table 31 displays the correlation of LSI-OR score with recidivism by mental health status and past victimization.

Table 31 Correlation between LSI-OR and recidivism by mental health and disposition

	Whole Sample	Conditional	Probation	Custodial
No Mental Health	.492**	.390**	.380**	.272**
Mental Health	.411**	.293**	.305**	.248**
No Victimization	.462**	.165	.354**	.276**
Victimization	.439**	.508**	.333**	.249**

The predictive ability of the LSI-OR was evaluated with ROC analysis. The AUC suggests that the LSI-OR is able to discriminate between recidivists and non-recidivists for offenders with and without mental health and past victimization issues. However, the AUC for offenders without mental health issues is larger than for those with mental health issues for the whole sample as well as for each disposition group. The AUC for those without past victimization is also larger than for those with victimization for the whole sample. When examining the individual disposition groups, offenders without past victimization have a larger AUC than those with past victimization for those with probation and custodial sentences but have a smaller AUC than those with past victimization for those with conditional sentences. Table 32 displays the AUC for ROC analysis predicting recidivism using LSI-OR scores for offenders with and without mental health issues and with and without past victimization.

Table 32 AUC for LSI-OR prediction of recidivism by mental health and victimization

	Whole Sample	Conditional	Probation	Custodial
No Mental Health	.810(.786-.833)	.802(.668-.936)	.775(.739-.811)	.661(.602-.719)
Mental Health	.743(.712-.773)	.749(.545-.952)	.689(.644-.735)	.646(.582-.711)
No Victimization	.795(.769-.822)	.671(.499-.844)	.758(.718-.797)	.659(.594-.724)
Victimization	.764(.737-.791)	.905(.834-.976)	.712(.671-.753)	.646(.587-.705)

## Risk Level and Recidivism for Mental Health and Victimized Offenders

Chi-square analyses were conducted using the original risk level (before override) and binary classification of section F, mental health issues and victimization. In each case, if an offender had an issue, it influenced risk level: Section F ( $\chi^2(4) = 351.238, p < .001$ ), mental health ( $\chi^2(4) = 142.541, p < .001$ ) and victimization ( $\chi^2(4) = 264.231, p < .001$ ). The percentage of offenders with at least one mental health issue or at least one type of past victimization for each of the risk levels can be found in Table 33.

Table 33 Offenders with mental health and victimization issues by risk level

Risk Level	Section F	Mental Health	Victimization
Very low	58.1%	21.5%	23.0%
Low	76.2%	34.7%	35.8%
Medium	89.3%	41.7%	50.2%
High	95.7%	48.9%	62.8%
Very High	98.9%	64.1%	74.0%
Total	82.4%	39.3%	45.8%

Cross tabulation analyses was conducted with original risk level on the columns and recidivism as the row variable. Layers were created for the presence or absence of issues on Section F, mental health and past victimization. The gamma statistic, a means of calculating the strength of association between the column and row variables, was computed for each cross tabulation. Gamma produces a symmetrical value with a range of -1 to 1. A value close to 0 reflects a weak association while a value closer to -1 or 1 reflects a stronger association. Recidivism was strongly associated with the risk level of the offender for both those with an issue on Section F, mental health or victimization; however, there is a stronger association for those with an issue. Table 34 displays the reoffence rate of offenders by risk level and presence or absence of social, health or mental health issues.

Table 34 Reoffence rate (%) for special groups by LSI-OR risk level

	VL	L	M	H	VH	Total	Gamma*	r
Section F (n)	286	557	771	540	179	2333		
Recidivism	8.4%	13.6%	27.8%	54.6%	73.2%	31.7%	.630**	.416**
No Section F (n)	206	174	92	24	2	498		
Recidivism	3.4%	6.3%	32.6%	54.2%	50.0%	12.4%	.739**	.401**
Mental Health (n)	106	254	360	276	116	1121		
Recidivism	9.4%	16.9%	26.7%	49.3%	73.3%	33.8%	.579**	.387**
No Mental Health (n)	386	477	503	288	65	1731		
Recidivism	5.4%	9.2%	29.4%	59.7%	72.3%	25.6%	.720**	.464**
Victim (n)	113	262	433	354	134	1296		
Recidivism	7.1%	13.4%	27.0%	54.2%	70.1%	34.4%	.629**	.415**
No Victim (n)	379	469	430	210	47	1535		
Recidivism	6.1%	11.1%	29.5%	55.2%	80.9%	23.2%	.681**	.436**

\*Gamma is recidivism by risk level (2x5)

\*\* p<.001

### Logistic regression with LSI-OR, mental health and victimization

Logistic regression analyses was conducted to examine the contribution of total score of the LSI-OR, the strength scales of the LSI-OR, mental health issues and past victimization to predict recidivism. The total score of the LSI-OR was entered on the first block and the total strength score, the total number of mental health issues and the number of past victimization issues were entered on the second block. The first logistic regression examined the sample as a whole and the second examined the sample separated by disposition group.

Across all disposition groups, the model was significant, -2 Log likelihood = 2742.079,  $\chi^2(4) = 632.676, p < .001$  (Cox and Snell  $R^2 = .200$ , Nagelkerke  $R^2 = .288$ ). The Hosmer and Lemeshow Test (Hosmer & Lemeshow, 2000), however, was significant ( $\chi^2(8) = 16.006, p = .042$ ) indicating that there might be a lack of fit in this model. While LSI-OR scores are a significant predictor of recidivism, the addition of the total strength scores, mental health and past victimization do not add to the model. For every unit increase of the LSI-OR score, the odds of committing a reoffence increased by 13.3% (Exp ( $\beta$ ) = 1.133). Table 35 presents the results of the regression analysis for the whole sample.

Table 35 Logistic regression analysis – whole sample

Predictors	$\beta$	SE	Wald	df	<i>p</i> -value	Exp ( $\beta$ )	95% CI for Exp ( $\beta$ )	
							lower	upper
<b>Whole Sample</b>								
LSI Score	.125	.006	407.432	1	<.001	1.133	1.120	1.147
Total Strength	-.076	.040	3.610	1	.057	.927	.857	1.002
Mental Health	-.072	.061	1.394	1	.238	.931	.827	1.048
Victimization	-.037	.034	1.216	1	.270	.964	.902	1.029
Constant	-2.753	.116	559.308	1	<.001	.064		

The second logistic regression was conducted to determine if the LSI-OR score was able to predict re-offence for individual disposition groups. While the overall model was significant for each of the dispositions [conditional, -2 Log likelihood = 113.384,  $\chi^2$  (4) = 23.778,  $p < .001$  (Cox and Snell  $R^2 = .106$ , Nagelkerke  $R^2 = .222$ ); probation, -2 Log likelihood = 1685.035,  $\chi^2$  (4) = 242.646,  $p < .001$  (Cox and Snell  $R^2 = .116$ , Nagelkerke  $R^2 = .186$ ); custodial, -2 Log likelihood = 803.704,  $\chi^2$  (4) = 49.841,  $p < .001$  (Cox and Snell  $R^2 = .074$ , Nagelkerke  $R^2 = .101$ )], items entered into the model at the second step did not add to its predictive ability [conditional,  $\chi^2$  (3) = 1.211,  $p = .750$ ; probation,  $\chi^2$  (3) = 2.674,  $p = .445$ ; custodial,  $\chi^2$  (3) = 5.561,  $p = .135$ ]. The Hosmer and Lemeshow test for conditional and probation offenders were non-significant [conditional, ( $\chi^2$  (8) = 7.059,  $p = .530$ ); probation, ( $\chi^2$  (8) = 13.923,  $p = .084$ ) and the Hosmer and Lemeshow test for custodial offenders was significant, ( $\chi^2$  (8) = 17.465,  $p = .026$ )]. This indicates that the prediction of recidivism matches well with the actual observation for conditional and probation offenders but not for custodial offenders. Table 36 presents the results of the regression analysis organized by disposition.



Table 36 Logistic regression analysis by disposition

Predictors	$\beta$	SE	Wald	df	<i>p</i> -value	Exp ( $\beta$ )	95% CI for Exp ( $\beta$ )	
							lower	upper
<b>Conditional</b>								
LSI Score	.134	.030	20.181	1	<.001	1.144	1.079	1.213
Total Strength	.072	.135	.288	1	.592	1.075	.825	1.400
Mental Health	-.094	.333	.080	1	.777	.910	.474	1.746
Victimization	-.135	.194	.487	1	.485	.874	.598	1.277
Constant	-4.088	.598	46.659	1	<.001	.017		
<b>Probation</b>								
LSI Score	.107	.008	161.829	1	<.001	1.113	1.095	1.132
Total Strength	-.071	.050	2.064	1	.151	.931	.845	1.026
Mental Health	-.035	.079	.195	1	.659	.966	.828	1.127
Victimization	.027	.044	.362	1	.548	1.027	.941	1.121
Constant	-2.828	.143	388.482	1	<.001	.059		
<b>Custodial</b>								
LSI Score	.078	.012	44.011	1	<.001	1.082	1.057	1.107
Total Strength	.017	.100	.028	1	.866	1.017	.835	1.238
Mental Health	-.064	.106	.362	1	.548	.938	.763	1.154
Victimization	-.112	.056	3.977	1	.046	.894	.801	.998
Constant	-.984	.259	14.394	1	<.001	.374		

## CHAPTER 4 DISCUSSION

While there has been extensive research assessing the validity of the Level of Service Inventory for male offenders, less research has examined the applicability of this risk assessment tool for female offenders. The purpose of this study was to expand this literature base by evaluating the predictive ability of the LSI-OR for a large sample of female offenders sentenced provincially. It was expected that the LSI-OR would demonstrate good psychometric properties, differentiate offenders who reoffended from those who did not reoffend, assign a higher risk level to offenders who were more likely to commit a reoffence, and be equally applicable to various subgroups of female offenders.

### **Internal Consistency**

The scale's internal consistency was first examined to ensure the LSI-OR measures one construct. Overall, the LSI-OR produced high alpha coefficients while producing slightly lower alpha levels when the disposition groups were examined separately. As expected, alpha levels for LSI-OR subscales were lower than for the whole scale. Particularly, alpha levels for subscales with four or fewer items had considerably lower alpha levels when compared to the entire scale. This, however, might be expected as internal consistency often falls when the number of items is reduced. Importantly, it is these smaller scales that also were found to report lower correlations with recidivism. While one might suggest that there is therefore a need for additional items to bolster the alpha levels of the subscales, it should be noted that it is the total score of the LSI-OR that should be used to determine risk to recidivate and not these subscales. Rather, it is the purpose of the subscales to direct treatment. Although this is an important part of the case management portion of the LSI-OR, it lay outside the scope of this examination. Overall, there is evidence to suggest that the items that make up the subscales are legitimately grouped together and that the items that make up the LSI-OR measure the same construct.

These alpha levels reported in this study were consistent with those reported from a large sample of both male and female offenders from Ontario (Andrews, Bonta & Wormith, 2004; pp.

109). The current study reports slightly higher alpha levels when examining the entire sample and probationers only but slightly lower when examining custodial offenders only (See Appendix C).

## **Predictive Validity**

### **Overall LSI-OR**

This study used three types of analyses to determine the predictive validity of the LSI-OR. First, the average LSI-OR score for recidivating offenders was compared to the average LSI-OR score of non-recidivating offenders. While, this comparison indicated that recidivating offenders were more likely to have a higher LSI-OR score, it did not measure the strength of the relationship between LSI-OR scores and recidivism.

The second analysis revealed the strength of relationship. The correlation coefficient demonstrated a positive relationship between LSI-OR scores and recidivism that would be considered moderate (Cohen, 1988). This suggests that as the LSI-OR scores increase so does the likelihood of recidivating. While this is a common method of determining predictive validity, it has been criticized because it can be affected by the base rate of offending. In order to do this, a different type of analysis was required.

Third, the relationship with recidivism was measured using the area under the curve associated with receiver operating characteristic analysis. This measure of predictive validity indicated that the LSI-OR differentiated between true and false positives at what is considered to be at a fair level (Tape, 2003), ROC analyses are independent of the base rate, or number of offenders who reoffend.

### **LSI-OR Subscales**

Further examination into the LSI-OR subscales indicated that they were also able to distinguish between offenders who recidivated from those who did not. While the average scores on all subscales were higher for those who recidivated than for those that did not recidivate, the predictive validity of the subscales varied greatly. The subscale with the greatest predictive ability (criminal history) was related to recidivism at a level that approximated that of the complete LSI-OR. Four subscales (companions, pro-criminal attitudes, substance abuse and

antisocial patterns) had a moderate predictive validity and the remaining (education/ employment, leisure/ recreation and family marital) had a low predictive validity.

### **Female Offender Subgroups**

The predictive validity of the LSI-OR was also examined among numerous subgroups of female offenders. The first two sets of subgroups were defined by disposition and race. The second sets of subgroups were based on mental health and victimization history as derived from the “Other Client Issues” section of the LSI-OR.

#### **Disposition groups**

While the predictive ability of the LSI-OR was strongest when examining the sample of offenders as a whole, correlation and ROC analyses indicated that it was also able to predict recidivism for all disposition groups separately, although at a lower level. This appears to be a common effect as it has also been found in many previous studies (Girard and Wormith, 2004; Rettinger, 1998; Raynor, Kynch, Roberts & Merrington, 2000). This is most likely the result of a reduced range of values. As the heterogeneity of the sample is decreased, so is the ability to detect a difference between groups (Gee, 1993). Gee proposes that when examining a portion of the sample associated with the dependent variable, there is less variability on the independent variable to differentiate offenders who do reoffend from those who do not. Thus, in this case, as incarceration is associated with risk to reoffend (those offenders who have been incarcerated have previously committed a more serious offence, are more likely career criminals and therefore more likely to reoffend), it can be expected that the LSI-OR would be less likely to detect a difference for this group when examined alone. .

The disposition group with the strongest predictive validity was probation followed closely by conditional and more distantly, offenders who served a custodial sentence. It is likely that the strength of the relationship in the probationer sample is a result of the sample size. The probation portion of the sample was considerably larger than the other two dispositions and therefore the greatest power.

While incarcerated offenders had an appropriate range of LSI-OR scores with an appropriate standard deviation, they were more homogeneous in their likelihood to reoffend. One possible explanation is that custody offenders are a more homogenous group. They have a higher base

rate of recidivism and so are more likely to go on to commit a reoffence. However, this does not completely satisfy the predictive difference between custodial and probation offenders as one feature of ROC analysis is to not be affected by base rates. A second potential explanation rests in where the LSI-OR is conducted. For custodial offenders, the LSI-OR assessment is performed in the institution while the assessment of probation and conditional offenders the LSI-OR is performed in the community, the place where the reoffence will actually take place. It may be that the LSI-OR is better predictive when conducted in the setting that resembles the environment in which the offender then has the opportunity to reoffend. In the future, perhaps institutional charges could be examined for custodial offenders to see if this outcome measure is better associated with LSI-OR scores.

### **Racial groups**

As with disposition groups, the LSI-OR has shown predictive validity for the four racial groups examined, but generally at a lower level than recorded for all groups combined. While one racial group, Black offenders, registered correlation and a ROC analysis results stronger than that for the entire sample, the predictive validity for the other three groups was below this mark. In particular, the LSI-OR had a considerably lower predictive ability for offenders of “other” racial background. These findings merit further investigation as there is considerable concern about the applicability of the LSI-OR and other risk assessment tools to differing racial categories (Zinger, 2004).

Unlike the situation of the disposition groups, it should not be expected that LSI-OR scores or risk to reoffend would systematically vary according to racial group. While not expected, analyses indicated that the race of the offender did influence LSI-OR scores. This may have been an influential factor in reducing the predictive ability between racial groups. However, if this were the case, it would be expected that the predictive validity of the LSI-OR would be reduced for all racial groups. This possibility is supported by the work of Bonta, LaPrairie and Wallace-Capretta (1997). These researchers examined the subscales of the Manitoba Risk/Needs Scale and reported that, while most risk factors were predictive for both Aboriginal and Non-Aboriginal offenders, two subscales (Family/Marital and School/Employment) did not predict the risk to reoffend. Similarly, in the current study, the Family/Marital subscale was least predictive of reoffending, particularly when broken down by racial group. Although it distinguished recidivists from non-recidivists, and was correlated with recidivism for other racial

groups, this did not occur with the sample of Black offenders. It is interesting to note that in spite of this, the LSI-OR was most strongly correlated with recidivism and had the largest area under the curve in ROC analyses for black offenders.

### **Offenders with mental health issues**

An important subgroup of this female offender sample consisted of those who had a mental health issue because it has been frequently suggested that female offenders are more likely to have a mental disorder than male offenders and this may affect their likelihood of recidivism. It is, however, unclear whether having a mental disorder should be considered a risk or a protective factor in determining risk to reoffend. It was expected that the LSI-OR would be equally valid for offenders with and without a mental disorder. Support from this comes from Bonta, Law and Hanson (1998). These researchers examined 74 predictor variables in personal demographics, clinical, criminal history and deviant lifestyle for application to mentally disordered and non-mentally disordered offenders and concluded that the risk factors that predicted recidivism for non-mentally disordered offenders were largely the same for mentally disordered offenders.

The results of this study revealed that female offenders with a mental disorder had a higher average LSI-OR score and were also more likely to reoffend. Moreover, the correlation of LSI-OR scores with recidivism for those with mental health issues was lower than for those without mental health issues. This difference was less pronounced for custodial offenders than for conditional and probation offenders. Although the predictive validity of the LSI-OR was lower for the offenders with mental health status, the addition of mental health status to the LSI-OR did not add to the predictive validity of the LSI-OR.

This finding runs contrary to that of Girard and Wormith (2004) who found that male offenders with mental health issues had higher LSI-OR scores but were also slightly less likely to commit a reoffence. However, it is in line with the research of Blanchette and Motiuk (1996) who found that federally sentenced female offenders with a major mental disorder were more likely to be readmitted for a violent offence, a non-violent offence or a technical violation. Consequently, it appears that the impact of mental health issues on recidivism may differ by gender. Further research should explore the potential for a differential effect of mental disorder on recidivism for male and female offenders.

## **Offenders with past victimization**

The predictive validity of the LSI-OR was also examined for female offenders with a history of victimization. In general, offenders who had previously been victimized had higher LSI-OR scores than those who had not been victimized. Victimized offenders were also more likely to reoffend, although, when analyzed by disposition type, it became apparent that this effect occurred primarily among those offenders who were serving a sentence of probation.

In general, the LSI-OR was predictive of reoffence both for offenders who had and who had not been previously victimized, although the effect was stronger for the second group. However, this pattern varied by disposition group. Although the LSI-OR was positively correlated with reoffence for previously victimized offenders in the probation and custodial disposition groups although this correlation was at a lower level than for those who had not reported past victimization. For offenders serving a conditional sentence, while the LSI-OR was positively correlated with recidivism for those who had been victimized, the correlation with recidivism was not significant for those who had not been victimized.

Although past victimization was positively correlated with recidivism, it did not contribute incrementally to the prediction of reoffence. This was found to support the bulk of research examining the effect of victimization on recidivism. While much of this research has determined no association (e.g., Loucks & Zamble, 1999; Rettinger, 1998), others have found an association. For example, Bonta, Pang, Wallace-Capretta (1995) reported that while sexual abuse as an adult or as a child and physical abuse as a child was not related to recidivism, physical abuse as an adult was related to reoffence.

Although 46 percent of the current sample of female offenders had experienced past victimization of at least one type, victimization was not found to be related to recidivism over a two year period. Thus, it is not recommended to include this variable when trying to determine the risk of reoffence. In sum, the predictive validity of the LSI-OR was supported for use with female offenders, with mental health and victimization issues having not incremental validity to their predictions. However, it is unclear why the LSI-OR did not significantly predict recidivism among previously unvictimized offenders serving a conditional sentence. Further research should examine this effect to determine if this is consistent across samples.

## **Use of Override to Change Risk Level**

Risk levels are a key feature of the Level of Service Inventory because they are used to group offenders together who have a similar risk to reoffend. These groupings are also used to make programming, supervision and release decisions for individual offenders. After determining that LSI-OR scores were predictive of recidivism, it was also important to demonstrate how LSI-OR scores should be translated into risk level recommendations. The original set of risk levels, which are provided in the LSI-OR manual, was predictive of recidivism as demonstrated by ROC and correlation analysis. These risk levels were then compared to risk levels generated following the application of clinical override. Finally, two new methods of determining risk levels were explored with the hope of developing risk categories that approximate the predictive ability of the raw scores.

### **The original risk levels**

The original risk levels assigned were based on cut-offs suggested to be appropriate for both male and female offenders in the LSI-OR manual (Andrews, Bonta & Wormith, 2004). Predictive validity analyses suggested that these risk levels are quite adequately related to recidivism ( $r = .438$ ,  $AUC = .770$ ), but are not as strong as LSI-OR raw scores ( $r = .462$ ,  $AUC = .785$ ). This comes as no surprise as the translation from risk score to risk level on the LSI-OR is achieved by collapsing a 44-point scale to a 5-point scale. It is also noted that these risk levels are not necessarily the final risk levels that are assigned to offenders as assessors are allowed, in accordance with the LSI-OR manual (Andrews, Bonta & Wormith, 1995) to increase or decrease the risk level if it is believed that the original does not adequately represent the offender. In other words, the final risk level assigned to the offender occurs after the application of the clinical override.

### **Clinical override risk levels**

The final risk level applied to offenders uses the original risk level as derived from the LSI-OR total score (Andrews, Bonta & Wormith, 1995) as a base, but then it may be raised, maintained, or lowered according to the clinician conducting the assessment. The clinical override, as applied to these offenders, followed the same pattern as in previous studies. Overall, the clinical override was used in 11.6% of cases. While 9.2% of offenders had their risk level



increased, 2.4% of offenders had their risk level decreased. The proportion of raised and lowered risk levels was not equivalent for community (probation and conditional sentence) and institutional offenders. While approximately the same proportion of community offenders (2.1%) and institutional offenders (3.5%) had their risk levels decreased, a larger proportion of community offenders had their risk levels increased (11%) compared to institutional offenders (3.0%). Andrews, Bonta and Wormith (2004, pp.124) reported a similar pattern of overrides. These authors report that 1.7% of community offenders and 3.4% of institutional offenders had their risk levels decreased while 16.4% of community offenders and 3.8% of institutional offenders had their risk levels increased in the override process.

The purpose of the clinical override is to aid in the prediction of recidivism and not to suggest treatment options. As a result, the prediction of recidivism is the key outcome that should be examined when determining if the override should be used. The results of this study indicate that the LSI-OR risk level is predictive of recidivism following the application of the clinical override ( $r = .412$ ,  $AUC = .755$ ). However, the current findings revealed no improvement over the originally assigned risk levels. It is therefore suggested that the use of clinical override should be specifically examined to clarify its role in predicting recidivism. Such a finding is consistent with that of Wormith and Goldstone (1984) whose research indicated that the addition of subjective variables to a statistical risk assessment instrument did not increase its predictive validity. Similarly, Harris, Rice and Cormier (2002) found that the prediction of violence by the actuarial risk assessment tool, the Violence Risk Appraisal Guide (VRAG) was not improved following the addition of clinical judgement.

While few studies have examined the addition of clinical judgement to actuarial methods of risk assessment, there is a large body of research comparing the two types of assessment. Meta-analyses conducted by Grove and Meehl, (1996), Grove, Zald, Lebow, Snitz and Nelson (2000) and Ægisdóttir and colleagues (2006) suggest that mechanical or statistical methods consistently outperform clinical judgements on prediction tasks across a variety of domains (e.g. educational, financial, forensic).

### **Changing cut-offs used to determine risk levels**

While the original risk levels are adequate for the prediction of recidivism, it is also important to consider the possibility that other risk level systems might better reflect the risk that offenders pose to reoffend. Therefore, two other sets of risk levels were developed and compared

to the original risk levels proposed in the LSI-OR manual. The second set of cut-offs was developed using a method proposed by Coulson and colleagues (1996) in which approximately equal percentages of offenders were allocated to each risk level and the third was developed statistically using recursive partitioning in which groups are developed statistically to maximize their differences (Gaudard, Ramsey & Stephens, 2006).

The latter two risk level systems and their respective new cut-offs produced correlations and ROC curves that were similar to each other, but modestly superior to those of the original scheme described in the LSI-OR manual. However, the two methods produced considerably different distributions of offenders and reoffenders. The statistical-recursive cut-offs were more likely to classify offenders in a lower risk level than the Coulson-type cut-offs. In particular, the statistical cut-offs classified 8% fewer offenders in the two highest risk levels and 28% fewer in the highest risk level, while also classifying 8% more offenders as Low Risk than the statistical-recursive system. As changing the distribution of offenders in the risk levels will have practical implications for correctional agencies as the risk level an offender is assigned to is used to make numerous correctional decisions. Before either of these schemes is adopted, they should be reviewed with considerable caution. Appendix D displays the distribution of offenders and reoffenders for the original risk levels, Coulson-type risk levels and statistically generated risk levels.

Further research may also want to investigate risk level cut-offs for female offenders that reflect the proportion of reoffenders found in each category for male offenders. In this way, the descriptive properties of risk levels would be the same for both genders.

### **Limitations and Future Considerations**

A clear strength of this research comes from the large size of the data set made available by the OMCS; however, operating with such a large data set collected by a third party presents a unique challenge. First, one must rely on the accuracy of hundreds of staff to conduct the assessment precisely according to manual and its scoring instructions. Secondly, one must rely on this same staff to input the test data accurately into a large, province-wide database. As mentioned earlier, extensive data cleaning was required to ensure the individual items and subscale scores corresponded with the overall LSI-OR score. While it is believed that all changes made were accurate, it is possible that some incorrect assumptions were made in cleaning the

item data. If there were errors created as a result of cleaning item data, they would have affected the calculation of alpha levels for the examination of internal consistency.

A second challenge to be considered when examining the quality of data is the lag between the time the LSI-OR was conducted and the time of departure. For most offenders, the date of LSI-OR assessment and the date of release were not particularly close. This was a particularly long time difference for probationers. While it would have been preferable to conduct an LSI-OR immediately prior to the offenders release date to ensure it best represents the condition of the offender at release, this was not possible considering the large sample size. It is unclear whether there may or may not have been significant changes in the LSI-OR score as a result of the time between LSI-OR assessment date and release date. However, it may be noted as a point of strength that this study used the LSI-OR assessment in the same manner as is commonly used in the field, thus adding to the external validity of the instrument.

A weakness of the current research rests on the measure of recidivism. Recidivism data were coded from offender files that were maintained by Ontario's Ministry of Community Safety and Correctional Services and not from the Canadian Police Information Centre (CPIC) that is maintained by the RCMP and frequently used in recidivism studies of Canadian offenders. As a result any provincial offences committed in a jurisdiction other than Ontario would not be recorded. Although, it is unclear to what extent this has underrepresented the number of offenders that recidivate, it should be noted that moving from the province while serving a conditional or probationary sentence is very often prohibited. This limitation suggests the results of this study should be interpreted with caution, as the number of recidivists may be higher than stated.

The predictive validity of the LSI-OR was demonstrated quite well for this sample, but it remains limited in scope as it includes adult women from one province and it excludes federally sentenced women. Therefore, caution should be exercised when generalizing the findings to the whole female offender population. With this in mind, the correlation and ROCs reported here should not be viewed as being representative of female young offenders, offenders serving a federal sentence or those in other jurisdictions. It rests on further studies to replicate the current study.

While there is a large body of research assessing the predictive validity of male offenders, there is considerably less that compares male and female offenders. Future research

should be conducted with a sample of offenders that includes both male and female cohorts. This will help with an understanding of how gender differentially influences the ability of the LSI-OR to predict recidivism. Comparisons between these two groups will highlight both differences and similarities in the specific weight each subscale holds in the predictive ability and therefore help to direct treatment options and establish if both male and female offenders should be offered the same treatment. Importantly, this will also aid in determining if female offenders are overclassified as a result of unfair comparisons with male offenders (Van Voorhis, Pelier, Presser, Spiropoulis & Sutherland, 2002)

Additionally, researchers should consider expanding this research to other provinces as well as to a federal population. The importance of addressing other provinces rests in the racial demographics of this population as western provinces report having a larger Aboriginal population and a lower Black population. A federal sample is necessary considering the results of this study suggest the LSI-OR to be most predictive with probationary offenders; it therefore might be less predictive when dealing with more severe offenders in the federal system. This examination will help to delineate the question of why the LSI-OR has a lower predictive ability with custodial offenders.

### **Conclusion**

As a result of this investigation, the LSI-OR was found to be a useful tool to predict female offenders' risk to reoffend. It is an instrument with strong internal consistency and is moderately correlated with recidivism. Although no direct comparison with male offenders was possible in this investigation, the predictive ability of the LSI-OR with female offenders demonstrated in this study does compare favourably to those previously examining male offenders. A key tenet of the Psychology of Criminal Conduct is supported by this research in two ways. The PCC postulates that the reoffence behaviour of all offenders, regardless of gender or race, is influenced by the same eight factors. Indeed, this study demonstrates that the same eight items that have been consistently shown to predict male recidivism are also able to predict female recidivism. Further, the LSI-OR is able to predict recidivism for sub-groups within the female offender population: those with mental health conditions and those with a history of victimization.

Despite strong results for the LSI-OR, this study suggests areas of improvement. In particular, problems with the application of clinical override need to be addressed and an evaluation of appropriate risk level cut-offs should be undertaken. With these two items addressed, it is expected that the LSI-OR will become the “gold-standard” for assessing female offenders.

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APPENDIX A  
Subscale Predictive Ability by Disposition and Race

*t*-test of LSI-OR scores between non-recidivists and recidivists by disposition

	<b>Non-Recid</b>	<b>Recid</b>	<b><i>t</i>-test</b>	<b><i>p</i>-value</b>
<b>All Groups</b>				
<b>Total</b>	11.20 (7.87)	20.63 (8.77)	27.797	<i>p</i> < .001
<b>Criminal History</b>	1.68 (2.11)	4.16 (2.30)	27.431	<i>p</i> < .001
<b>Education / Employment</b>	3.10 (2.76)	4.93 (2.64)	16.114	<i>p</i> < .001
<b>Family / Marital</b>	1.55 (1.16)	1.94 (1.11)	8.281	<i>p</i> < .001
<b>Leisure / Recreation</b>	1.00 (0.75)	1.45 (0.73)	14.387	<i>p</i> < .001
<b>Companions</b>	0.99 (1.00)	1.80 (1.05)	19.090	<i>p</i> < .001
<b>Procriminal Attitudes</b>	0.59 (0.92)	1.32 (1.24)	17.060	<i>p</i> < .001
<b>Substance Abuse</b>	1.81 (2.27)	3.82 (2.54)	20.532	<i>p</i> < .001
<b>Antisocial Patterns</b>	0.48 (0.76)	1.22 (1.03)	20.751	<i>p</i> < .001
<b>Conditional</b>				
<b>Total</b>	10.48 (7.50)	20.14 (9.95)	5.410	<i>p</i> < .001
<b>Criminal History</b>	1.78 (2.14)	3.76 (2.32)	4.003	<i>p</i> < .001
<b>Education / Employment</b>	2.76 (2.64)	4.81 (2.84)	3.360	<i>p</i> = .001
<b>Family / Marital</b>	1.52 (1.17)	2.29 (1.38)	2.818	<i>p</i> = .005
<b>Leisure / Recreation</b>	0.91 (0.72)	1.24 (0.83)	1.981	<i>p</i> = 0.049
<b>Companions</b>	0.94 (1.06)	1.81 (1.03)	3.584	<i>p</i> < .001
<b>Procriminal Attitudes</b>	0.58 (0.86)	0.67 (1.11)	.410	<i>p</i> = .683
<b>Substance Abuse</b>	1.54 (2.17)	4.81 (2.44)	6.486	<i>p</i> < .001
<b>Antisocial Patterns</b>	0.47 (0.77)	0.76 (0.89)	1.598	<i>p</i> = .112
<b>Probation</b>				
<b>Total</b>	10.02 (7.12)	17.23 (8.47)	17.039	<i>p</i> < .001
<b>Criminal History</b>	1.31 (1.86)	3.23 (2.32)	17.135	<i>p</i> < .001
<b>Education / Employment</b>	2.92 (2.74)	4.35 (2.75)	9.129	<i>p</i> < .001
<b>Family / Marital</b>	1.48 (1.14)	1.82 (1.08)	5.365	<i>p</i> < .001
<b>Leisure / Recreation</b>	0.94 (0.74)	1.27 (0.78)	7.847	<i>p</i> < .001
<b>Companions</b>	0.88 (0.94)	1.46 (1.05)	10.435	<i>p</i> < .001
<b>Procriminal Attitudes</b>	0.49 (0.84)	1.01 (1.18)	9.819	<i>p</i> < .001
<b>Substance Abuse</b>	1.60 (2.13)	3.15 (2.54)	12.260	<i>p</i> < .001
<b>Antisocial Patterns</b>	0.40 (0.68)	0.94 (0.94)	12.822	<i>p</i> < .001
<b>Custodial</b>				
<b>Total</b>	19.53 (7.88)	23.85 (7.73)	6.811	<i>p</i> < .001
<b>Criminal History</b>	4.05 (2.06)	5.04 (1.90)	6.264	<i>p</i> < .001
<b>Education / Employment</b>	4.52 (2.61)	5.48 (2.40)	4.768	<i>p</i> < .001
<b>Family / Marital</b>	2.03 (1.18)	2.04 (1.12)	.045	<i>p</i> = .964

<b>Leisure / Recreation</b>	1.48 (0.68)	1.62 (0.64)	2.572	$p = .010$
<b>Companions</b>	1.74 (1.04)	2.12 (0.94)	4.763	$p < .001$
<b>Procriminal Attitudes</b>	1.21 (1.23)	1.64 (1.22)	4.289	$p < .001$
<b>Substance Abuse</b>	3.42 (2.59)	4.40 (2.40)	4.905	$p < .001$
<b>Antisocial Patterns</b>	1.08 (0.93)	1.50 (1.05)	5.123	$p < .001$

*t*-test of LSI-OR scores between non-recidivists and recidivists by racial group

	<b>Non-Recid</b>	<b>Recid</b>	<b><i>t</i>-test</b>	<b><i>p</i>-value</b>
<b>Aboriginal</b>				
<b>Total</b>	17.10 (8.16)	24.12 (7.22)	7.630	$p < .001$
<b>Criminal History</b>	2.90 (2.39)	4.62 (2.17)	6.332	$p < .001$
<b>Education / Employment</b>	4.44 (2.78)	5.55 (2.27)	3.644	$p < .001$
<b>Family / Marital</b>	1.94 (1.20)	2.36 (0.96)	3.188	$p = .002$
<b>Leisure / Recreation</b>	1.07 (0.81)	1.56 (0.71)	5.441	$p < .001$
<b>Companions</b>	1.56 (0.96)	2.18 (0.84)	5.784	$p < .001$
<b>Procriminal Attitudes</b>	0.86 (1.18)	1.39 (1.28)	3.644	$p < .001$
<b>Substance Abuse</b>	3.52 (2.22)	5.01 (2.03)	5.873	$p < .001$
<b>Antisocial Patterns</b>	0.81 (0.91)	1.45 (1.07)	5.566	$p < .001$
<b>Black</b>				
<b>Total</b>	9.43 (7.39)	19.54 (8.52)	8.815	$p < .001$
<b>Criminal History</b>	1.64 (1.96)	4.40 (2.11)	9.295	$p < .001$
<b>Education / Employment</b>	2.66 (2.70)	4.87 (2.53)	5.630	$p < .001$
<b>Family / Marital</b>	1.36 (1.06)	1.55 (1.02)	1.253	$p = .212$
<b>Leisure / Recreation</b>	1.00 (0.74)	1.46 (0.78)	4.167	$p < .001$
<b>Companions</b>	0.92 (1.00)	1.85 (1.00)	6.263	$p < .001$
<b>Procriminal Attitudes</b>	0.65 (0.98)	1.67 (1.30)	6.377	$p < .001$
<b>Substance Abuse</b>	0.70 (1.59)	2.46 (2.46)	6.248	$p < .001$
<b>Antisocial Patterns</b>	0.49 (0.77)	1.27 (0.95)	6.338	$p < .001$
<b>Caucasian</b>				
<b>Total</b>	12.20 (7.90)	20.67 (8.73)	20.074	$p < .001$
<b>Criminal History</b>	1.95 (2.17)	4.22 (2.30)	19.804	$p < .001$
<b>Education / Employment</b>	3.28 (2.76)	4.88 (2.69)	11.256	$p < .001$
<b>Family / Marital</b>	1.65 (1.16)	1.93 (1.12)	4.750	$p < .001$
<b>Leisure / Recreation</b>	1.03 (0.75)	1.43 (0.72)	10.496	$p < .001$
<b>Companions</b>	1.07 (1.01)	1.78 (1.06)	13.513	$p < .001$
<b>Procriminal Attitudes</b>	0.63 (0.94)	1.31 (1.23)	12.762	$p < .001$
<b>Substance Abuse</b>	2.06 (2.35)	3.92 (2.51)	14.983	$p < .001$
<b>Antisocial Patterns</b>	0.53 (0.78)	1.20 (1.02)	15.049	$p < .001$
<b>Other</b>				
<b>Total</b>	8.28 (6.44)	15.30 (9.24)	5.499	$p < .001$
<b>Criminal History</b>	1.08 (1.75)	3.15 (2.12)	6.292	$p < .001$

<b>Education / Employment</b>	2.78 (2.70)	4.20 (2.84)	2.913	<i>p</i> = .004
<b>Family / Marital</b>	1.31 (1.13)	1.45 (1.22)	.693	<i>p</i> =.489
<b>Leisure / Recreation</b>	0.92 (0.71)	1.28 (0.78)	2.700	<i>p</i> = .008
<b>Companions</b>	0.66 (0.90)	1.20 (1.09)	3.201	<i>p</i> = .002
<b>Procriminal Attitudes</b>	0.46 (0.79)	1.00 (1.28)	3.269	<i>p</i> = .001
<b>Substance Abuse</b>	0.71 (1.64)	2.10 (2.45)	4.206	<i>p</i> < .001
<b>Antisocial Patterns</b>	0.36 (0.70)	0.93 (1.05)	4.047	<i>p</i> < .001



APPENDIX B  
Subscale Predictive Ability by Mental Health Status

	LSI-OR Score				Corr w/ recid	
	No MH	MH	<i>t</i> -test	<i>p</i> -value	No MH	MH
<b>All Groups</b>						
<b>Total</b>	12.17 (8.63)	16.50 (9.38)	12.580	<.001	.492**	.411**
<b>Criminal History</b>	2.10 (2.35)	2.83 (2.48)	7.900	<.001	.502**	.385**
<b>Education / Employment</b>	3.25 (2.81)	4.18 (2.82)	8.559	<.001	.314**	.233**
<b>Family / Marital</b>	1.41 (1.10)	2.04 (1.15)	14.743	<.001	.145**	.122**
<b>Leisure / Recreation</b>	1.06 (.76)	1.23 (.78)	5.771	<.001	.257**	.251**
<b>Companions</b>	1.14 (1.03)	1.34 (1.14)	4.607	<.001	.344**	.318**
<b>Procriminal Attitudes</b>	.70 (.99)	.94 (1.18)	5.781	<.001	.320**	.274**
<b>Substance Abuse</b>	1.94 (2.31)	3.06 (2.67)	11.773	<.001	.365**	.333**
<b>Antisocial Patterns</b>	.57 (.82)	.88 (1.00)	9.246	<.001	.382**	.324**
<b>Conditional</b>						
<b>Total</b>	10.84 (8.09)	12.43 (8.51)	1.356	.177	.390**	.293**
<b>Criminal History</b>	1.92 (2.25)	2.05 (2.22)	.395	.693	.306**	0.194
<b>Education / Employment</b>	2.80 (2.62)	3.23 (2.88)	1.111	.268	.270**	0.161
<b>Family / Marital</b>	1.46 (1.20)	1.81 (1.20)	2.086	.038	.217*	0.160
<b>Leisure / Recreation</b>	.97 (.74)	.89 (.73)	.793	.429	0.147	0.109
<b>Companions</b>	1.05 (1.05)	.98 (1.16)	.503	.615	.265**	0.199
<b>Procriminal Attitudes</b>	.58 (.84)	.61 (.96)	.268	.789	-0.003	0.079
<b>Substance Abuse</b>	1.61 (2.14)	2.28 (2.74)	1.976	.049	.465**	.359**
<b>Antisocial Patterns</b>	.45 (.76)	.59 (.82)	1.226	.221	0.151	0.048
<b>Probation</b>						
<b>Total</b>	9.78 (7.14)	14.12 (8.41)	12.204	<.001	.380**	.305**
<b>Criminal History</b>	1.41 (1.96)	2.14 (2.24)	7.660	<.001	.397**	.291**
<b>Education / Employment</b>	2.80 (2.72)	3.86 (2.81)	8.255	<.001	.212**	.155**
<b>Family / Marital</b>	1.29 (1.06)	1.96 (1.13)	13.326	<.001	.095**	.098**
<b>Leisure / Recreation</b>	.94 (.74)	1.11 (.78)	4.833	<.001	.178**	.148**
<b>Companions</b>	.94 (.95)	1.09 (1.04)	3.203	=.001	.226**	.221**
<b>Procriminal Attitudes</b>	.52 (.85)	.71 (1.04)	4.402	<.001	.235**	.178**
<b>Substance Abuse</b>	1.50 (2.05)	2.57 (2.51)	10.336	<.001	.253**	.251**
<b>Antisocial Patterns</b>	.39 (.67)	.68 (.88)	8.200	<.001	.297**	.233**
<b>Custodial</b>						
<b>Total</b>	21.07 (7.80)	23.62 (8.16)	4.045	<.001	.272**	.248**

<b>Criminal History</b>	4.59 (1.96)	4.77 (2.09)	1.166	.244	.289**	.184**
<b>Education / Employment</b>	5.01 (2.52)	5.25 (2.53)	1.238	.216	.193**	.175**
<b>Family / Marital</b>	1.81 (1.10)	2.31 (1.13)	5.652	<.001	-0.008	0.007
<b>Leisure / Recreation</b>	1.52 (.66)	1.63 (.65)	2.207	.028	0.056	.155**
<b>Companions</b>	1.90 (.94)	2.06 (1.05)	2.055	.040	.206**	.162**
<b>Procriminal Attitudes</b>	1.38 (1.18)	1.60 (1.30)	2.280	.023	.173**	.159**
<b>Substance Abuse</b>	3.64 (2.46)	4.50 (2.49)	4.388	<.001	.186**	.197**
<b>Antisocial Patterns</b>	1.23 (.97)	1.48 (1.07)	3.200	=.001	.190**	.208**

APPENDIX C  
Internal Consistency

Scale (number of items)	Current Overall	Previous Overall (Male and Female)	Current Custodial	Previous Custodial (Female only)	Current Probation	Previous Community (Female only)
Overall (43)	0.93	.90	0.89	.91	0.91	.90
Overall (40)	0.92	.89	0.88	.90	0.90	.89
Criminal History (8)	0.86	.72	0.75	.73	0.84	.83
Education / Employment (9)	0.85	.82	0.79	.82	0.85	.84
Family / Marital (4)	0.39	.37	0.34	.36	0.38	.40
Leisure / Recreation (2)	0.48	.43	0.46	.53	0.43	.44
Companions (4)	0.66	.58	0.64	.63	0.60	.62
Procriminal Attitudes (4)	0.61	.54	0.58	.58	0.57	.56
Substance Abuse (8)	0.86	.79	0.82	.83	0.85	.83
Antisocial Pattern (4)	0.50	.54	0.47	.54	0.42	.42

Previous alpha scores are taken from Andrews, Bonta & Wormith, 2004; pp. 109

APPENDIX D  
Proposed Risk Levels

Original		Total				Institution				Community			
		All		Reoffenders		All		Reoffenders		All		Reoffenders	
Level	Range	n	%	n	%	n	%	n	%	n	%	n	%
V. Low	(0-4)	495	17.36%	34	6.87%	9	1.37%	5	55.56%	486	22.16%	29	5.97%
Low	(5-10)	732	25.67%	88	12.02%	56	8.50%	22	39.29%	676	30.83%	66	9.76%
Medium	(11-19)	870	30.50%	251	28.85%	172	26.10%	91	52.91%	698	31.83%	160	22.92%
High	(20-29)	573	20.09%	317	55.32%	301	45.68%	204	67.77%	272	12.40%	113	41.54%
V. High	(30+)	182	6.38%	133	73.08%	121	18.36%	95	78.51%	61	2.78%	38	62.30%
Total		2852	100%	823	28.86%	659	100%	417	63.28%	2193	100%	406	18.51%

Coulson-type		Total				Institution				Community			
		All		Reoffenders		All		Reoffenders		All		Reoffenders	
Level	Range	n	%	n	%	n	%	n	%	n	%	n	%
V. Low	(0-5)	629	22.05%	42	6.68%	16	2.43%	6	37.50%	613	27.95%	36	5.87%
Low	(6-10)	598	20.97%	80	13.38%	49	7.44%	21	42.86%	549	25.03%	59	10.75%
Medium	(11-16)	579	20.30%	138	23.83%	90	13.66%	41	45.56%	489	22.30%	97	19.84%
High	(17-23)	535	18.76%	235	43.93%	198	30.05%	121	61.11%	337	15.37%	114	33.83%
V. High	(23+)	511	17.92%	328	64.19%	306	46.43%	228	74.51%	205	9.35%	100	48.78%
Total		2852	100%	823	28.86%	659	100%	417	63.28%	2193	100%	406	18.51%

Statistical		Total				Institution				Community			
		All		Reoffenders		All		Reoffenders		All		Reoffenders	
Level	Range	n	%	n	%	n	%	n	%	n	%	n	%
V. Low	(0-5)	629	22.05%	42	6.68%	16	2.43%	6	37.50%	613	27.95%	36	5.87%
Low	(6-12)	813	28.51%	118	14.51%	74	11.23%	33	44.59%	739	33.70%	85	11.50%
Medium	(13-17)	445	15.60%	130	29.21%	87	13.20%	41	47.13%	358	16.32%	89	24.86%
High	(18-30)	824	28.89%	424	51.46%	385	58.42%	259	67.27%	439	20.02%	165	37.59%
V. High	(31+)	141	4.94%	109	77.30%	97	14.72%	78	80.41%	44	2.01%	31	70.45%
Total		2852	100%	823	28.86%	659	100%	417	63.28%	2193	100%	406	18.51%