The proportion of youth offenders who receive an additional conviction at a five year follow up: Testing and developing an actuarial risk model for predicting long term recidivism

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Abstract

The first aim of this thesis was to determine the percentage of individuals who having received a youth justice intake, went on to be convicted for a further offence five years on. A second aim was to assess the long term predictive validity of the Juvenile Risk Scale (JRS) and to then determine if a statistical model, developed specifically for predicting convictions in the long term, was able to provide more accurate predictions of convictions. An entire cohort of New Zealand Youths, who received a juvenile justice intake in 2002 in New Zealand, were matched to conviction records five years on (N= 4,307) . A nationally representative subsample of this cohort (N = 936), youths aged 13 to 17 years (745 male, 191 female), was utilised to assess the predictive validity of the JRS. Best-subsets logistic regression was used with this sub-sample to produce a predictive model for convictions five years on. Receiver Operating Curve analyses were used to assess and compare the predictive validity of the two models. Of the cohort sample, 54% have received a conviction five years on. The JRS was shown to hold good long term predictive validity for males but not females. The model developed yielded an 'Area Under the Curve' of .693, indicating moderate accuracy. Findings suggest that an automatically scored actuarial model for predicting risk of conviction in youths is feasible and may aid in the allocation of intervention resources.

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List of Abbreviations

AIC	Akaike Information Criterion
AUC	Area Under the Curve
FGC	Family Group Conference
JRS	Juvenile Risk Scale
ROC	Receiver Operating Curve
RoC*RoI	Risk of Conviction/Risk of Imprisonment
SPJ	Structured Professional Judgement
VIF	Variance Inflation Factor
YORST	Youth Offending Risk Screening Tool

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Chapter One

The proportion of youth offenders who receive an additional conviction at a five year follow up: Testing and developing an actuarial risk model for predicting long term recidivism

Currently crime causes a significant problem to society, not only in the form of economic costs but in the suffering experienced by its victims. Relative to adults, youth are more likely to re-offend (Nadesu, 2009). Early, accurate and efficient risk prediction provides the opportunity to promptly intervene, potentially reducing the costs of crime. Implementing an empirically validated, computer based actuarial, risk screening tool, that uses information already collected by social and forensic agencies, may provide an economical solution to the task of risk assessment which can be resource demanding (McKinlay, James, & Grace, 2013). The statistical model, the JRS, developed and assessed for feasibility by McKinlay et al. (2013), was found to be moderately accurate in predicting imminent risk of juvenile recidivism. This thesis primarily seeks to determine the percentage of youth, who have offended, go on to receive a conviction five years on and to assess the long term predictive validity of the JRS.

1.1 The Cost of Crime

The cost of crime in New Zealand was estimated by the New Zealand Government's Treasury to be approximately 9.1 billion dollars per year (Roper & Thompson, 2006). On top of this, we can add the on-going emotional costs to victims and their families as a flow on effect of the crimes committed against them. Research indicates that a small proportion of people commit a high proportion of committed offences (Farrington, 2003; Moffitt, 1993). More than half of the offenders released from prison in New Zealand have been convicted of a subsequent offence and re-imprisoned a minimum of once within five years (Nadesu, 2009). Findings regarding youth offenders are even more concerning. Youth (those 20 or

under at time of release) are more likely than any other age group to be both reconvicted and re-imprisoned. In a study undertaken by the New Zealand Department of Corrections, only 8.3% of this group of offenders had not been reconvicted of another offence five years on (Nadesu, 2009). The early identification of those at risk of reoffending will allow for early intervention, and may dramatically reduce the costs to society.

1.2 A Response to Offending

In 1990, Andrews, Bonta and Hoge presented three initial principles of effective intervention of offending. These principles have provided the basis of the Risk-Needs-Responsivity (RNR) model which has been expanded upon and added to since then (Andrews & Bonta, 2010). The model aims to help determine who requires treatment (who is at risk of reoffending), what treatments are appropriate (what are the individual's criminogenic needs) and what strategies are most likely to be effective as interventions (what response is appropriate and likely to be effective). Risk, a core principle of the model, combines two important ideas: a) that offending can be predicted, and b) intensity of intervention should be matched to the identified level of risk, where high risk required high intensity intervention and vice versa. Empirical evidence indicates that matching the intensity of treatment to an individual's level of risk is vital in the effectiveness of offender intervention approaches (Andrews & Bonta, 2010). Therefore, the effectiveness of our ability to assess risk of offending, at all ages, is paramount in the process of crime intervention and reduction.

1.3 Antisocial Behaviour from a Developmental Perspective

Extensive evidence in the literature regarding offending supports the idea of the age-crime curve, which describes offending trends at the aggregate level across the lifespan (Farrington, 1986; Gottfredson & Hirschi, 1990; Piquero, Farrington, & Blumstein, 2003; Sampson & Laub, 1990). Essentially, crime levels rise in early adolescence and then swiftly decrease in early adulthood. However, it has been argued that there are a number of factors

that impact upon the shape of the curve on an individual level (Loeber & Farrington, 2012). These factors include individual differences in self-control, brain maturation, cognitive modifications, behavioural factors, social factors, mental health, life circumstances, situational contexts of criminal behaviour, neighbourhood, and justice system approach (such as the age and conditions under which a youth is transferred to adult court and length or harshness of sentences). One prominent example of how the 'age curve' can vary between groups of individuals is a taxonomical theory first proposed by Moffitt (1993).

Moffitt (1993) taxonomy provides a developmental perspective of antisocial behaviour. Essentially the theory proposes that offenders can be categorised into two very different groups; 'life-course-persistent' and 'adolescence-limited' offenders (Moffitt, 1993). Individuals classified as life-course-persistent are those whose central deficits are neuropsychological, either inherited or acquired. These individuals are described as displaying antisocial behaviour continuously throughout the life span and are thought to be the five percent of the population that commit fifty percent of crime (Moffitt, 1993). Life-course-persistant individuals behave in an antisocial manner consistently throughout their life span. However, manifestations of these antisocial predispositions are argued to differ across the life span. For example, a life-course-persistent individual may bite others in very early childhood, shoplift in late childhood, steal cars in adolescence, commit robbery in his or her early twenties, and commit fraud later as older adult. While the expression changes with age, the underlying problems remain the same. Drawing together findings from two thorough longitudinal studies, Moffitt highlights the link between antisocial behaviour and neuropsychological deficits which she describes as temperament (activity level, emotional regulation), behavioural development (speech, motor coordination, impulse control) and cognitive abilities (including attention, language, learning, memory or reasoning). These individuals' characteristics may be the result of either a genetic predisposition or exposure to

a hazardous environment prior to, during, or after birth. It is these features that, Moffitt suggests, underlie their persistent antisocial behaviour in combination with environmental interactions.

Moffitt (1993) highlights research that indicates that vulnerable and difficult children are disproportionately found in families that are disadvantaged and antisocial. Arguably, parents of life-course-persistent individuals are likely to be struggling with the same difficulties as these children. This means that vulnerable and antisocial people are likely to struggle to rear such vulnerable and difficult children. Additionally, these children are likely to evoke negative responses from others (e.g. parents and teachers) and interactions with their social environment such as home or school are likely to render more criminogenic environments. To provide an example, a child who misbehaves consistently at school (due to underlying neuropsychological difficulties) may become isolated from his or her prosocial peers, become labelled as 'naughty' by teachers, and eventually become truant. This is likely to impact the individual's long terms prospects, as the individual will have limited opportunities to build a prosocial behavioural repertoire. As such, this group of individuals is believed to have the most undesirable prognosis, as along with having the neuropsychological deficits or inherently antisocial attributes they have a restricted behavioural repertoire; and therefore have great difficulty desisting from antisocial behaviour.

On the other hand, adolescence-limited offenders are argued to be those who start offending in early adolescence and finish in young adulthood. Their offending careers are short. Moffitt (1993) notes that contact with police and antisocial behaviour are common in adolescence. For adolescence-limited offenders this antisocial behaviour is not constant, as in the case of the life-course-persistent offenders. For adolescence-limited individuals, antisocial behaviour is affected by reinforcement and punishment. Antisocial behaviour will occur when the result is perceived to profit the adolescent, as is the case for prosocial

behaviour. (Moffitt, 1993) argues that adolescence-limited offenders begin behaving in an antisocial manner due to the influence of antisocial peers. Adolescence-limited offenders mimic adults and life-course-persistent individuals in a pursuit to prove their independence (Moffitt, 1993). During adolescent years life-course-persistent individuals may influence others adolescents. As life-course-persistent individuals tend to do as they wish without the constraint that most adolescents have from their parents. A number of common life-course-persistent behaviour is perceived by youths as adult-like. Examples of such behaviour include consumption of alcohol and tobacco and partaking in sexual acts. The majority of adolescence-limited offenders desist from antisocial behaviour when they reach early adulthood. This desistance is thought to occur for adolescence-limited offenders when they are able to attain some adult privileges. They are believed to weigh up the consequences of illegal behaviour which, at this time, moves from being reinforced to being seen as jeopardising accomplishments and future goals. This transition is arguably straightforward for many of these youths who had had years prior to their antisocial stint in which they have developed social skills and successfully undertaken a basic education. These skills mean these youths have options in that they are able to pursue further education, develop healthy intimate relationships and attain desirable jobs. Unfortunately, for a group of adolescence-limited offenders, the consequences of their behaviour prior to desistance can have more permanent or long term consequences such as a drug addiction, lack of educational achievement and teen pregnancy. For these individuals desistance can be more difficult, however, the majority of adolescence-limited offenders manage to more though this period and follow crime free paths (Moffitt, 1993).

This taxonomy has received extensive empirical support (Jennings & Reingle, 2012). However, researchers often use different terms to describe these two groups and have more recently incorporated groups that represent those whose offending escalates and those who do

not offend (Jennings & Reingle, 2012). Males and females have slightly different trajectories of antisocial behaviour (Fergusson & Horwood, 2002; Moffitt, 1993). A later onset of prolonged offending is more likely in males, relative to females, and females are more likely to be at a lower absolute risk of offending and fall under the adolescent-limited offending taxon (Fergusson & Horwood, 2002; Moffitt, 1993). Arguably, at least some individuals who offend display early signs of antisocial behaviour or are exposed at an early age to interactions which may elicit antisocial predispositions (Moffitt, 1993). These factors can be conceptualised as risk factors which may allow for the prediction of future offending. As noted earlier, risk prediction is a core principle of the RNR model of that guides effective approaches to the management of crime (Andrews & Bonta, 2010; James Bonta & Andrews, 2007). Accordingly, risk factors for offending have been extensively researched.

1.4 Risk Factors

Factors that are predictive of criminal behaviour are able to be categorised into two groups, static and dynamic variables (Andrews & Bonta, 2010). Static variables are those that are unable to be changed, such as an individual's age at first offence. Dynamic variables are able to change over time, such as an individual's level of antisocial cognitions. A number of meta-analyses suggest that there are several well established static and dynamic risk factors for offending that are applicable to both youth and adults (Gendreau, Little, & Goggin, 1996). The most empirically validated risk factors include: prior antisocial behaviour; antisocial personality traits; the presence of antisocial cognitions; an antisocial peer group; lack of quality interpersonal relationships; low levels of performance or attendance in academic and/or occupational settings; little involvement and gratification from pro-social leisure activities; and difficulties with alcohol and/or other recreational substances (Andrews & Bonta, 2010; Gendreau et al., 1996; Lipsey & Derzon, 1998). Research has predominantly indicated that males and females share the same risk factors (Andrews & Bonta, 2010),

although some factors may be more crucial for one of the sexes in comparison to the other (Belknap & Holsinger, 2006; Bender, 2010; Bright & Jonson-Reid, 2008). These variables are also thought to predict offending right across the life span. However, the strength of the link between some of these factors and antisocial behaviour can vary dependent upon age. These factors and their link with offending are outlined in more detail below, in relation to adults, as well as to children and youth.

1.4.1 Antisocial History.

Historic antisocial factors, or an antisocial history, are commonly understood as a criminal history as it appears in court records. Examples of such factors include the number of prior offences committed, the age at which one committed their first offence, and the type of offences committed. These factors are highly correlated with criminality and have consistently been shown to predict offending (Glueck & Glueck, 1950; Leschied, Chiodo, Nowicki, & Rodger, 2008; Simourd & Andrews, 1994). Empirical reviews have reported that in studies of adult populations, the correlation coefficients (*r*) between antisocial history and future offending is estimated as ranging from .16 to .38 (Glueck & Glueck, 1950; Simourd & Andrews, 1994). Differences may exist between the sexes (Collins, 2010). For example, a meta-analysis, which included 57 studies, found that although violent antisocial histories were linked to violent reoffending for males, they were not for females (Collins, 2010).

Research specific to youth also shows that criminal history is linked with recidivism. In their 2008 meta-analysis of 38 studies, Leschied et al. (2008), found that criminal history of adolescents such as previous imprisonment, type of previous transgression, and the quantity of offender's victims were predictive of offending in adulthood when measured in adolescence. The effect size was estimated as being .38 and results indicated that these effects are stronger as individuals mature throughout childhood. Small effects were reported for early and middle childhood (r = .20 and .31 respectively) and medium effects for adolescents

(r = .52). Since this analysis, further studies have found similar results. For example, Mulder, Brand, Bullens, and Van Marle (2011) found, in a sample of 728 youth offenders, that those who had reoffend two years later tended to have had a higher the number of prior offences and were younger when they committed their first offence than those who had not reoffended. These two factors were also found to predict the seriousness of the ensuing offence.

Factors that account for antisocial histories are clearly static in that they rely on antisocial behaviour having already taken place. Logically, the sooner antisocial behaviour can be identified and used to help determine who may be at high risk of further antisocial behaviour, the sooner interventions can be undertaken in an endeavour to change this path. As highlighted earlier when describing Moffitt's (1993) taxonomy, the earliest signs of antisocial behaviour are unlikely to be criminal and more likely to be expressed as more general behavioural difficulties. This, therefore, makes it challenging to assess risk in young populations who do not yet have a court record, but who show conduct difficulties. As such, a more broad definition of antisocial behaviour may be useful in predicting the future offending of young people. One way in which this might be accomplished is with the use of police records relating to frequency of contact, as opposed to only including arrest or conviction information. Empirical findings have suggested that regularity of police contact is associated with youth recidivism (McAra & McVie, 2007). Police records have also been used for screening risk of offending by McKinlay et al. (2013) in the development of the JRS and by the New Zealand Police, although in both cases further validation of such an approach is still required.

1.4.2 Antisocial Personality.

An antisocial personality 'pattern' has been described by various researchers in slightly different ways. Although Gottfredson and Hirschi (1990) argue that self-control is the

single stable characteristic associated with antisocial behaviour, others have considered multiple traits that ought to be incorporated in an understanding of crime. For example, Miller and Lynam (2001) and Jones, Miller, and Lynam (2011) describe an antisocial personality according to a general five-factor model of personality. From this perspective, someone with an antisocial personality sits at the lower end of two of the five dimensions. The first of these dimensions is agreeableness ("low" would mean, e.g., hostile, spiteful, jealous, self-centred, indifferent to others and antagonistic) and the second is conscientiousness ("low" meaning, e.g., lacking determination, impulsivity, weak planning and constraint, and having antisocial values).

Moreover, Hare (1999) has extensively researched the construct of 'psychopathy'. He defines psychopathy as having: interpersonal attributes that are grandiose, arrogant, callous, dominant, superficial, and manipulative; affective features including a short-temper and being incapable of establishing strong emotional relationships; and an absence of guilt or anxiety. These attributes are associated with negligent and impulsive behaviour that disregards social norms, giving 'psychopaths' an increased risk of displaying aggressive and violent behaviours (Hare, 1999). While around one percent of the general population may meet criteria for psychopathy, a significant proportion of the offender populations display psychopathic tendencies (Hare, 1999).

All of the definitions of antisocial personality overlap considerably. As such, Andrews and Bonta (2010) describes this risk factor as a 'pattern' of impulsiveness, adventurousness, pleasure seeking, restlessness, aggressiveness, and a lack of empathy or regard for others. An antisocial personality 'pattern' has been classified as a dynamic factor. Individuals with an antisocial personality pattern will have criminogenic needs (e.g. difficulties with self-control, aggressiveness and a lack of empathy) that can be targets for treatment, like any other offender (Andrews & Bonta, 2010). Correlations (*r*) between

patterns of antisocial personality fall between .18 and .34 (Gendreau et al., 1996; Hanson & Morton-Bourgon, 2004; Jones et al., 2011; Miller & Lynam, 2001).

With regard to youth, 'Conduct Disorder' is seen as prognostic of an adult Antisocial Personality Disorder and can be diagnosed in childhood (American Psychiatric Association, 2013). Conduct Disorder is characterised by a repetitive and persistent pattern of behaviour that violates the basic rights of others or major developmental societal rules (American Psychiatric Association, 2013). A 2010 study found that sixty percent of the juvenile offender sample met criteria for Conduct Disorder (Mulder et al., 2011). Similar to some adults with antisocial personality patterns and with 'psychopaths' specifically, a proportion of children who meet criteria for Conduct Disorder also appeared to lack empathy for others (Fontaine, McCrory, Boivin, Moffitt, & Viding, 2011).

1.4.3 Antisocial Cognitions.

The term antisocial cognitions can be defined as thoughts and beliefs that are supportive of antisocial behaviour and are considered a dynamic factor, as thoughts and beliefs are able to be altered. Andrews and Bonta (2010) drew on a broad scope of research and concluded that such cognitions could be classified into three groups. 'Techniques of Neutralisation' are described as thoughts that serve to justify behaviour and to avoid feeling responsible by minimising the impact of the behaviour for others. 'Identification with Criminals' is defined as thoughts that are approving of criminality. Finally, 'Rejection of Convention' is defined as thoughts and beliefs where prosocial values, such as work or education, are rejected, making criminality more favourable.

Multiple meta-analyses have indicated that such antisocial cognitions positively correlate with offending (r = .15 to .48) (Andrews & Bonta, 2010; Simourd & Andrews, 1994). However, the relationship between such attitudes and offending is not necessarily a

simple one. For example, Engels, Luijpers, Landsheer, and Meeus (2004) found, in a study of 550 youths, that antisocial attitudes influenced antisocial behaviour. However, for those youth who had a history of antisocial behaviour, it was this behaviour that influenced their attitudes. Similarly, van Leeuwen, Rodgers, Gibbs, and Chabrol (2014) found in their recent study of 972 youths that antisocial cognitions had both direct and indirect effects on delinquent behaviour, as cognitions were partially mediated by a lack of empathy. Research has also indicated that, for antisocial youths, altering attitudes toward delinquency can contribute to desistance from criminality (Shulman, Cauffman, Piquero, & Fagan, 2011), highlighting both the dynamic nature of this risk factor and the causal nature of antisocial cognitions.

1.4.4 Antisocial Peers.

The antisocial peers factor can be summarised as having associations with antisocial others and lacking associations with pro-social peers (Andrews & Bonta, 2010). This factor can be classed as dynamic, as one can both form new relationships and restrict or cease contact with old associates. Associating with antisocial others has been shown in numerous studies to have both direct and indirect effects on delinquency (Matsueda & Anderson, 1998; McGloin & Shermer, 2009; Pratt & Cullen, 2000; B. R. E. Wright, Caspi, Moffitt, & Silva, 2001). The literature in this area has consistently reported that having antisocial associations is a strong correlate of criminal behaviour (r = .21 to .37) (Gendreau et al., 1996; Lipsey & Derzon, 1998).

Some would argue that criminally inclined individuals actually seek out antisocial peers, meaning the relationship between antisocial peers is indirectly linked with antisocial behaviour. For example, Gottfredson and Hirschi (1990), in essence, argued that ‘birds of a feather, flock together’ and that the link between having antisocial peers and delinquency was either the outcome of low self-control individuals seeking each other out, or a spurious

variable due to validity issues with the measurement of levels of peer deviance. Others would argue that having antisocial associates itself drives or at least exacerbates delinquency, meaning having antisocial peers directly links with antisocial behaviour. Antisocial behaviour has been described as behaviour learnt though social experiences. From this perspective, criminal behaviour can occur when antisocial peers have modelled such behaviour and indirectly cause antisocial behaviour though the reinforcement of antisocial behaviour and punishment of pro-social behaviour (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979). Furthermore, antisocial behaviour is, arguably, passed down from one unsupervised youth to another, much like the transfer of traditions within cultures (Shaw and McKay as cited by Matsueda & Anderson, 1998). Research has supported both the indirect and direct relationship between antisocial associates and delinquency (Matsueda & Anderson, 1998; McGloin & Shermer, 2009; Pratt & Cullen, 2000; B. R. E. Wright et al., 2001 2001)

Studies indicate that the impact of antisocial peer associations on antisocial behaviour changes with age (Krohn, Ward, Thornberry, Lizotte, & Chu, 2011; Lipsey & Derzon, 1998). As children approach adolescence it is typical for them to spend increased amounts of time with peers, who arguably influence their behaviour. A meta-analysis conducted by Lipsey and Derzon (1998) highlighted the changes in the relationship between peer associations and antisocial behaviour with early age. The effect sizes reported in this study showed changes in the relationship between antisocial peers and antisocial behaviour. For children under eleven years of age the effect size was .12. In children between twelve and fourteen years of age this effect size increased to .43 (Lipsey & Derzon, 1998). Furthermore, research has indicated that the younger youths are when they become involved with gangs, the more likely they are to have involvement in criminal behaviour and the more likely this behaviour is to be of a serious nature (Krohn et al., 2011; Lipsey & Derzon, 1998; Mulder et al., 2011). This indicates that although children may be more influenced by peers as they get older, the

impact of having antisocial associations at a very young age can be long lasting. Peers are not the only people in youths' lives who can impact their risk of offending. The quality of other key relationships is the next risk factor discussed.

1.4.5 Quality of Key Interpersonal Relationships.

Low quality key relationships have been indicated by research in this area to be a risk factor for offending that is particularly relevant to youth (Andrews & Bonta, 2010; Bergen, Martin, Richardson, Allison, & Roeger, 2004; Crooks, Scott, Wolfe, Chiodo, & Killip, 2007; Gendreau et al., 1996; Hoeve et al., 2012; Lansford et al., 2007; Lipsey & Derzon, 1998; Mulder et al., 2011; Swanston et al., 2003). A key interpersonal relationship can included both relationships with key adults and child-parent relations. Meta-analyses have indicated that the effect size (*r*) of relationships between key adults and offending ranges between .10 and .33 (Gendreau et al., 1996; Simourd & Andrews, 1994). The quality of these relationships can be described as a dynamic factor, in that the quality of relationships can be enhanced and monitoring or supervision of children, by their parents, can be increased.

Children and youth whose parents lack nurturance or do not provide adequate supervision, are at an increased risk of offending (Andrews & Bonta, 2010; Bergen et al., 2004; Swanston et al., 2003). Furthermore, children who have been maltreated have been shown to display delinquent behaviour earlier than their peers (Rivera & Widom, 1990). As adults, these children are more likely to commit violent offences compared to those who were not maltreated in their childhood (Crooks et al., 2007; Lansford et al., 2007; Mulder et al., 2011) and are also more likely to be arrested (Maxfield & Widom, 1996). Those who suffer multiple types of abuse are at the most risk of displaying violent behaviour in adolescence (Crooks et al., 2007) and those who receive ongoing abuse have been shown to be at an increased risk of recidivism (Chang, Chen, & Brownson, 2003). The age at which a child is abused also appears to impact the likelihood that an individual will go on to offend. Children

whose abuse began in or continued into adolescence have been shown to be more likely to go on to offend, in comparison to children whose abuse occurred only prior to adolescence (Stewart, Livingston, & Dennison, 2008).

A recent review noted that, on the whole, research in this area provides considerable support for an overlap between victimisation and offending (Jennings, Piquero, & Reingle, 2012). In New Zealand, between July and December of 2014, over 23,000 reports were made to Child, Youth and Family services regarding concerns that children were being abused or neglected. Over 8,500 of these reports were substantiated based on the agency's findings (Child Youth and Family Services, 2014), providing at least some insight into the magnitude of the potential risk in New Zealand. However, the relationship between low quality relationships with offending is not straightforward. The impact of these relationships occur for individuals in varying ways and via varying paths and for some individuals not at all (Bender, 2010).

Poor quality of key relationships at a young age may lead to a child developing a disorganised attachment style (Bowlby, 2005). Attachment is believed to provide an internal working model which individuals then use to relate to and make sense of in all other relationships in their life (Bowlby, 2005). It is possible that a disorganised attachment style, in contrast to a secure attachment style, may lead to the development of low self-esteem (Laible, Carlo, & Roesch, 2004). This low self-esteem may in turn lead to behavioural problems and offending. Hoeve et al. (2012) found in a recent meta–analysis, which reviewed 74 studies, that attachment style was significantly associated with delinquency. For example, in a longitudinal study in the United States, children who experience two or more different caregivers prior to age 10 were found to be more likely to have committed a violent offence in adulthood, relative to children who maintained the same caregiver through to this age (Loeber et al., 2005). In New Zealand specifically, The Dunedin Longitudinal Study found

links between low self-esteem in childhood and both behavioural problems in later childhood and offending in early adulthood (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Trzesniewski et al., 2006).

On the other hand, some studies have indicated that parents socialise their children according to their own values, meaning that antisocial parents are more likely to raise antisocial children (Glueck & Glueck, 1950; Murray, Farrington, & Sekol, 2012; Newcomb & Loeb, 1999). These children may then become socially restricted; in that they may struggle to make friends with prosocial peers, pushing them towards antisocial others (Lacourse et al., 2006), amplifying their risk of offending (Matsueda & Anderson, 1998; McGloin & Shermer, 2009; Pratt & Cullen, 2000; B. R. E. Wright et al., 2001).

It is likely that multiple variables impact upon the link between key relationship and offending. Bender (2010) has suggested, based upon the literature, that various factors including substance abuse, school disengagement and antisocial associates, mediate the relationship between child abuse and delinquency. Evidence supporting at least some elements of such a model is emerging from the literature. For example, a recent study indicated that levels of anxiety moderate the relationship between victimisation in youth and offending (Jencks & Burton, 2013). However, the paths that link problematic key relationship and/or child abuse to offending have been argued to differ between genders (Bender, 2010).

Although offender populations are predominantly male, females offenders report being victims of more maltreatment in childhood comparative to males offenders (Moore, Gaskin, & Indig, 2013). Research has indicated that compared to males, female offenders are more likely to consider their experiences of victimisation as being a crucial influence initiating their criminal behaviour (Belknap & Holsinger, 2006). This suggests that for females, the risk factor of maltreatment may be more central than it may be for males

(Belknap & Holsinger, 2006) and that the paths from child abuse to criminality probably differ between the sexes (Belknap & Holsinger, 2006; Bender, 2010; Bright & Jonson-Reid, 2008).

1.4.6 Difficulties in Academic or Occupational Settings.

Difficulties in educational and vocational settings have been defined as: having low quality of relationships with fellow students, colleagues and authority figures; having low levels of involvement in educational and vocational endeavours; and having low levels of achievement and an ensuing lack of gratification (Andrews & Bonta, 2010). Such difficulties can be considered dynamic as it is possible, although understandably difficult at times, for individuals to engage more positively in education and find stable employment. Empirical findings suggest that educational and vocational difficulties have a positive relationship with offending, with correlations (*r*) ranging from .04 to .28 (James Bonta, Law, & Hanson, 1998; Simourd & Andrews, 1994). Employment stability and contact with prosocial colleagues have been linked with lower rates of offending in youth (J. P. Wright & Cullen, 2004). These, however, are not the only factors that relate to how individuals spend their time that can play a role in risk of offending.

1.4.7 Lack of Prosocial Leisure Activities.

A lack of prosocial pastimes is just that, a lack of participation and gratification from activities that are not delinquent. Being limited in pro-social activities is a dynamic factor, as one may be introduced to such activities. Empirical finding suggests that difficulties in this area have a correlation (*r*) with offending of approximately .21 (Andrews, Bonta & Wormith, 2004, as cited by Andrews & Bonta, 2010). Research relating to participation in leisure activities is, however, limited. One factor that is more thoroughly researched, and that is arguably an example of how leisure time could be spent, is that of substance use.

1.4.8 Difficulties with Alcohol and/or Other Substances.

Problems that are faced by individuals with substance use are diverse. Use can range from the acute use of legal substances, such as alcohol, to the chronic use of illegal substances, such as heroin. Defining a drug or alcohol problem, in relation to offending, is therefore difficult. Simply meeting diagnostic criteria for substance or dependence does not, in and of itself, have a direct causal relationship with offending (Lipsey, Wilson, Cohen, & Derzon, 1997). On the other hand, the possession or sale of some substances is an offence itself (Misuse of Drugs Act, 1975). For youth this is particularly relevant in that if you are under the age of 18 (and not with a legal guardian) it is illegal to drink alcohol in a public space, or to go into bars, or buy alcohol (Sale and Supply of Alcohol Act, 2012).

In any case, research has shown that the rates of alcohol abuse are much higher in the adult offender population relative to the general population (Andrews & Bonta, 2010). In a meta-analysis of 23 studies across nine countries Kuhns, Exum, Clodfelter, and Bottia (2014) found that 48% of homicide offenders were reportedly under the influence of alcohol at the time of the offence. In New Zealand, a 30 year longitudinal study has indicated a causal link between alcohol misuse and impulsive offending (Boden, Fergusson, & Horwood, 2012). Substance use has also been linked with rates of reoffending (Collins, 2010; Young, Wells, & Gudjonsson, 2011). For example, a Scottish study found that frequent use of heroin in the year prior to imprisonment was the single most powerful predictor of the extent of total offending (Young et al., 2011). Alcohol intoxication has also been shown to frequently play a role in a variety of offences (e.g. murder and burglaries), though is thought to have stronger links with offences that involve personal confrontation (Felson & Staff, 2010). The correlation between alcohol abuse and offending is indicated as being between .10 and .15 (Lipsey et al., 1997). These are findings that have also been established in youth populations and drug use has been shown to be relatively stable across the lifespan (Jennings et al., 2014).

Mulder et al. (2011) found that the majority of their youth offender sample were noted to have moderate or severe drug problems. Such problems have been found to both uniquely predict juvenile reoffending (van der Put, Creemers, & Hoeve, 2014) and to moderate the relationship between mental health problems and juvenile offending (Schubert, Mulvey, & Glasheen, 2011). When used in both adolescence and in adulthood, substance use is associated with a greater risk of being convicted for a crime in adulthood (Jennings et al., 2014) and increases the probability of violent behaviour for both sexes (McMurran, Riemsma, Manning, Misso, & Kleijnen, 2011). While this research highlights that a number of individual factors are empirically linked with offending, there are various ways in which they are used to predict.

1.5 Approaches to Risk Screening and Assessment

There have been substantial developments in the way in which risk is assessed in recent years. The best approach to assessing risk of recidivism is constantly debated (Childs, Frick, Ryals, Lingonblad, & Villio, 2014). This debate is, in part, due to the conflicting findings reported in the multiple meta-analyses conducted (Singh & Fazel, 2010). In a systematic meta-review of 31 meta-analyses, Singh and Fazel (2010) found dramatic differences in the findings reported in terms of: the population the assessments are developed for and used with (including the gender, age, and ethnicity of the population); the aim of tools (for example, some tools are designed to simply screen for risk while others aim to provide a full assessment); the follow up timeframes; and outcome measures used. Assessment approaches and screening have improved from simple impressionistic assessments to actuarial tools and, more recently, they have moved towards comprehensive assessment systems that blend empirically validated tools with professional judgements, which then, in theory, are able to guide intervention processes (Andrews & Bonta, 2010; James Bonta &

Andrews, 2007). Andrews and Bonta (2007, 2010) have described the changes in approaches to risk assessment as occurring in four generations.

The accuracy of risk screening or assessment tools are commonly evaluated using Receiver Operator Characteristic Curve (ROC) analysis (Rice & Harris, 1995, 2005). A ROC analysis is an analysis that does not make assumptions about the probability distributions of the variables being assessed and provides an indication of an assessment's predictive validity (Swets, 2014). The key outcome statistic of the ROC analysis is the 'Area Under the Curve' (AUC). An AUC describes the probability that a recidivist, selected at random, will have a risk score that is higher than a non-recidivist who is also randomly selected. AUC scores, for practical purposes, range from .5 (accuracy that is no better than chance) to 1 (representing 100% accuracy). In comparison to correlation coefficients, AUC has the advantage of being more robust to common difficulties in risk assessment, such as difference in base rates and truncated distributions (Rice & Harris, 1995). With regard to accuracy of recidivism predictions, it is with the AUC statistic that the generations of assessment approaches will be, where possible, described.

1.5.1 First Generation - Professional Judgement.

Risk assessment via professional judgement, relied solely on the conclusions of clinicians' impressionistic assessments, were not empirically validated, and have been shown to suffer from various biases (Andrews & Bonta, 2010; James Bonta & Andrews, 2007). For example, one study found that level of fatigue, recent experience and the order in which information is presented produces random variations in the conclusions reached by individuals. This means that the reliability and accuracy of individuals' ensuing predictions were impacted upon (Kahneman & Tversky, 1984).

1.5.2 Second Generation - Actuarial Risk Assessment Tools.

Known as actuarial risk scales, second generation assessment methods were developed in an attempt to more accurately predict level of risk (James Bonta & Andrews, 2007). These measures use a statistical approach to prediction risk and capitalise on established statistical relationships between risk factors and reoffending. One of the first examples of such an approach actually dates back to 1928, when adult parolees were provided with a point for each of the 21 factors that had been found to differentiate those who were successful and those who failed their parole period (Burgess 1928, as cited by James Bonta & Andrews, 2007). Those who scored maximum scores were able to be classified as being at a greater risk of reoffending (76%) relative to those who received a low score (<2%). More sophisticated statistical approaches were established in the 1970s and provide impressive predictive abilities (James Bonta & Andrews, 2007).

In some cases these assessment scales have provided AUC reaching .78 (Rice & Harris, 2005) and have been found, when reviewed, to be more accurate than professional judgement alone (Grove, Zald, Lebow, Snitz, & Nelson, 2000; Hanson & Morton-Bourgon, 2009), by an average of ten percent (Grove et al., 2000). A review of second generation assessment tools for youth recidivism has indicated that their accuracies average an AUC of .635 (Schwalbe, 2007). As such, instruments are often preferred to a purely professional judgement-based decision making process, as they are less likely to result in inconsistent or biased outcomes (Krysik & LeCroy, 2002). Second generation risk scales are, however, not without their limitations (James Bonta & Andrews, 2007).

Although they provide accurate predictions, variables that are used in such scales are selected merely due to their association with reoffending and their availability, meaning the scales are not necessarily theoretically relevant (James Bonta & Andrews, 2007). These measures also tend to rely heavily on factors that are static, meaning they are unable to be

changed (G. M. Vincent, 2006). As such, second generation measures do not generally allow for risk to be reduced and, therefore, may provide unfairly pessimistic prospects for offenders, no matter their potential for change (Andrews & Bonta, 2010; James Bonta & Andrews, 2007). Furthermore, static factors are not useful in determining intervention, unlike dynamic factors such as the types of associates an individual spends time with or whether or not someone is employed (Andrews & Bonta, 2010; James Bonta & Andrews, 2007). This limits second generation tools' clinical utility, in that they do not provide an indication of what can be changed to ameliorate risk (G. M. Vincent, 2006).

Second generation tools can also vary substantially in term of what is involved. Some require conducting an assessment in which information is manually gathered from interviews with youths and parents/caregivers, case file notes, from schools and other relevant services (Schwalbe, Fraser, Day, & Arnold, 2004). Others are automatically scored and provide a computer-generated risk score. Both are commonly used. However, an automatically scored screening tool could be an efficient way to determine who might require a further, more in-depth, assessment that can include the assessment of dynamic factors (McKinlay et al., 2013). For example, in New Zealand the Department of Corrections employs the Risk of Reconviction/ Risk of Re-imprisonment Scale (RoC*RoI) (Bakker, Riley, & O'Malley, 1999) in this very manner.

The RoC*RoI (Bakker et al., 1999) was developed to enable the Department of Corrections to predict individual offender's risk of conviction and imprisonment. The relationship between variables in the criminal histories of more than 133,000 individuals and their future offending was analysed using Logistic regression. The result was the development of an automatic, computer-based statistical tool that weighs up each piece of information and generates a risk score. The resulting probability score ranges from 0.0 to 1.0 which represents 0% risk to 100% risk of serious recidivism and indicates the likelihood that

an individual will both reoffend and be re-imprisoned for that offence. The RoC*RoI has been found to hold a good level of predictive accuracy with an AUC of .76. The instrument was constructed primarily using offenders' past criminal history from court records as predictor variables, such as age of first criminal offence and total time spent in prison. This means the tool is not suitable, and was not intended to be, for assessing risk of conviction for youth who are under the legal age able to be trialled in an adult court. A similar tool, which utilises information in social and forensic services databases (as opposed to relying on court records) has been shown to be feasible means for predicting youth recidivism (McKinlay et al., 2013).

1.5.3 Third Generation - Actuarial 'Risk' and 'Needs' Assessment Tools.

Due to the limitations of the second generation risk scales, dynamic factors were incorporated along with the static factors in the next generation of assessment approaches (Andrews & Bonta, 2010; James Bonta & Andrews, 2007). This change meant that scales were then able to both provide information about where intervention might be focused and allow for reductions in risk to be realised. Therefore, advanced third generation tools assess risk, needs and responsivity factors, and aim to be more comprehensive than their predecessors (Hess & Turner, 2013). Third generation assessments have also been shown to perform similarly to second generation assessments, with an average AUC of .646 (Schwalbe, 2007). They are however, rather time consuming. For example, the Youth Level of Service Inventory-revised (Donald A Andrews & Bonta, 2000) has been indicated as yielding an average AUC of .641 (Schwalbe, 2007). A semi structured interview is required for administration that is noted to take 30-40 minutes (Donald A Andrews & Bonta, 2000). Although this may seem like a fairly short interview, had it been administered with all of the children who received a youth justice intake in the 2002 year, using the 30 minute guideline, this equates to 2,153 hours (or 269 eight hour days) in that year alone spent interviewing. In

perspective, this is arguably a huge total of human resources spent for a very limited improvement, if any, in predictive accuracy in comparison to a second generation screening tool that does not require such resources.

In New Zealand more specifically, the Youth Offending Risk Screening Tool (YORST)[1], was developed by the New Zealand Police in 2007 (New Zealand Police, 2011). The YORST was a revision of the department's previous screening tools the Adolescent Risk Needs Inventory and the shorter 'Risk Screening Tool', which was implemented nationally in 2009. The tool was intended to be used for multiple purposes including: to screen youth for level of recidivism risk; to screen for areas in which a youth is at risk; to assist other agencies (such as Child, Youth and Family services) to further assess youth who offend; and to allow police to research the impact of their own interventions of reoffending risk. While some of the YORST's 14 items are automatically scored by the New Zealand Police National Intelligence Application, the majority of the items are scored by the police officer completing the assessment. This is a process which may require speaking with the youth, their family and other agencies such as Child, Youth and Family services, and/or the young person's school. The YORST is traditionally scored by summing the scores from each of the items, producing a total risk score. Total scores are then categorised into risk levels (e.g. low, medium, and high risk).

A review of the YORST in 2011 indicated the tool is moderately accurate in predicting youth re-apprehension by police. YORST total risk scores significantly correlate to youth re-apprehension status (r=.34) and the screens' overall accuracy in predicting reoffending has been reported as yielding an AUC of .695. No significant differences were found between the performance of the YORST for males and females. It has, however, been

[1] We are grateful to Inspector Tracey Thompson, National Prevention Centre, New Zealand Police, for providing the information outlined in this section regarding the YORST, the YORST-v2 and the Child & Young Person Offending Risk Indicator.

found to be less accurate in predicting offending in Māori youth relative to New Zealand European youth, and less accurate for younger individuals relative to older youth. The YORST was also noted to be more accurate in distinguishing between low and medium risk offenders than between medium and high risk individuals. The results of the review indicated that modification would improve accuracy. Indicated modifications included the removal of redundant items, applying weightings to the items established using logistic regression analysis, and re-coding items based upon the responses to each item and their correlation with reoffending. This provided the basis for the development of the YORST-v2 which is the process of being reviewed by the New Zealand Police.

The review also indicated that of the tool's items, three most significantly contributed to the prediction of police re-apprehension. These three items are: 1) time since the individual last came to notice for an offence; 2) time since last came to notice for an incident (e.g. Truancy, Care and Protection matters); and the number of prior offences. What is called the 'Child & Young Person Offending Risk Indicator' was developed on this basis. It includes these three items which are automatically generated in the New Zealand Police database, meaning the indicator score can be accessed by police officers at any time, should the young person have an existing police identity number. The Child & Young Person Offending Risk Indicator was released nationally within the New Zealand Police in June 2014 and is subject to evaluation at a later date. Interestingly, the Child & Young Person Offending Risk Indicator is essentially a second generation too and therefore provides no information that is useful in determining intervention. Attempting to combine risk assessment with intervention processes is something that the next generation has also attempted.

1.5.4 Fourth Generation - 'Risk', 'Need' and 'Responsivity' Systems.

Fourth generation assessments are designed with the aim of assimilating risk and needs assessment outcomes with offender management plans to ensure that interventions are

specifically targeted at criminogenic needs, which are tracked over time (Latessa & Lovins, 2010). This is a comprehensive approach to the management of crime in that these 'assessments' direct and track offenders from intake right, through treatment to case closure (Don A Andrews, Bonta, & Wormith, 2006). These systems aim to develop information systems, as well as human service assessment and treatment systems, that are as consistent as possible to principles of the RNR model (Andrews & Bonta, 2010). Theoretically, this permits correctional departments and facilities a framework for concentrating resources and intervention efforts where risk is empirically identified and supported (Latessa & Lovins, 2010). Empirical validation of outcomes associated with such an approach in terms of reduced rates of reoffending still requires further validation (Fazel, Singh, Doll, & Grann, 2012). Fourth generation tools take only some and not all dynamic factors into account. Therefore, they are also criticised for not accounting enough for altering environmental and potential protective factors (Borum, 2003) that determine the risk and intervention targets for youth offenders (Childs et al., 2014).

1.5.5 Blending Approaches - Structured Professional Judgement.

Risk assessment instruments that blend professional judgement and empirical information, or at times actuarial tools, are known as Structured Professional Judgement (SPJ) assessments. They have been developed in recent years in response to the criticisms of actuarial assessments (Borum, 2003). SPJ assessment tools vary in their approach. Commonly they contain both static and dynamic factors and are empirically validated as having a relationship with levels of risk for offending. However, conclusions are at times made without use of a mathematical formula (Douglas & Kropp, 2002). Alternatively, the assessing 'professional' makes a judgement on a case by case basis of how much weight to give each risk factor. Unlike purely impressionistic assessments, these approaches are 'structured' in that assessment procedures are guided attempting to allow SPJ assessment

approaches to maintain a sense of consistency while being flexible, individualised and providing assistance in guiding intervention. Meta-analyses have indicated that predictions made using SPJ assessment tools provide comparable levels of accuracy to actuarial tools (Schwalbe, 2008; Yang, Wong, & Coid, 2010). For example, a meta-analysis, which included both published and unpublished data of 104 different samples, concluded that SJP assessments averaged an AUC of .65 (Guy, 2008).

SPJ assessments tools, like any other approach, are not without limitations. Research has documented that professionals do not always opt to use such tools in the manner in which they are intended (Krysik & LeCroy, 2002). In addition, substantial variability, such as bias towards youth from minority backgrounds, has been observed in the conclusions drawn by such professionals (Leiber, Bishop, & Chamlin, 2011). Schwalbe (2008) notes that how professionals use, in practice, the data gathered as part of assessments in order to estimate risk is unclear, even though guidelines are provided on how the process is meant to work. The utility of such tools has been argued to be directly related to the willingness of correctional staff, facilities and institutions to implement them (J Bonta & Wormith, 2008). Aside from this, comprehensive SPJ assessments, like third and fourth generation assessments, can require a considerable time commitment. The Tuituia Assessment is an example of a structured clinical judgement assessment used in New Zealand.

The Tuituia Assessment is a holistic assessment that aims to determine areas of needs, strengths, and risks for children, youth and their caregivers (Child Youth and Family Services, 2013). It is currently used by Child, Youth and Family services care and protection, youth justice, and residential and high needs services to inform intervention plans, placement decisions and on-going work with this population. The extent of each assessment is dependent upon the specific concerns and circumstances of each child/youth and the focus of enquiry of the agencies' engagement with the individual. As such, the assessments are

completed by various professionals such as care and protection officers, youth justice staff, psychologists and psychiatrists. The assessments aim to consider the child/youth themselves, the parent or caregiver's capacity to parent, the child's extended family, and the child's social, cultural, and environmental influences. With regards to Youth Justice, these assessments are carried out by Child, Youth and Family services prior to a Family Group Conference (FGC) for: all children aged 10 to 13 years; child custody under s238(1)(d) of the Child Young Persons and Their Families Act (1989) for 72 hours or more; for a child who also has current care and protection involvement, and for any other child where consultation has deemed it necessary.

A data base is used to record the assessing staff member's evidenced-based perceptions and information gathered relating to each of the assessment dimensions (Child Youth and Family Services, 2013). Information is recorded using both a narrative and a scale-based system. Assessors rate the child and their family/caregiver in a structured nature. A ten point scale is used to assess multiple domains and subdomains. These include 29 factors that are the agency describe as dynamic risk factors. A score on the scale of 10 indicates strength and 1 indicates highest concern/need. This allows the Tuituia Assessment to measure and track progress. Summary diagrams are used to provide a visual aid in the understanding of the uniqueness of each child/youth and their circumstance and a summary is completed in order to visually highlight the needs, strengths and risks of each child/youth. In situations where this process highlights a dynamic risk factor a further specialist assessment may be implemented. For example, the Substances and Choices Scale (Christie et al., 2007) is used as part of the assessment when deemed helpful. It is a psychometric questionnaire that was developed in New Zealand for screening alcohol and drug difficulties and measuring outcomes of interventions (Christie et al., 2007). The final report includes two sections specific to children/youth who have offended in the past which include perspectives from

both the victim and the informant of the offending. Risk level of offending is broadly categorized into three groups: Low, Medium and High (Ministry of Justice & Ministry of Social Devlopment, 2002).

It has been argued that, aside from being accurate, risk assessment tools should ideally convert empirical findings into practical procedures for intervention (Lowenkamp, Latessa, and Holsinger (2006). This assessment approach provides an example of how structured clinical judgment assessments consider each individual's characteristics, environmental, and protective factors. A lack of these consideration is a key criticism of actuarial screening tools (Borum, 2003). However, the time required to provide a full risk, needs and responsivity, and the lack of significant improvement in predictive accuracy from such assessments, indicate that a different approach may be more efficient. Assessments of youths' risk of recidivism could be approached using a two-tiered system, where a quick and automatically scored, validated screening tool is used initially to determine children deemed high risk. The individuals could then be prioritised for a more thorough assessment of their individual dynamic criminogenic needs, allowing effective intervention to be undertaken. An example of this type of approach is utilised by the New Zealand Department of Corrections and described earlier in relation adults and the RoC*RoI.

Another approach could be to use an automatically scored, validated, screening tool in combination the qualitative information gathered as part of assessments such as the Tuituia Assessment. This could potentially help to aid the allocation of resources, early intervention strategies and efforts to reduce rates of crime. Previous research findings have indicated that an automatically scored screening tool is feasible for predicting risk of recidivism in youth. A study, described below, undertaken by McKinlay et al. (2013) assessed just this.

1.6 Juvenile Risk Scale (JRS) (McKinlay et al., 2013)

McKinlay et al. (2013) aimed to establish whether an actuarial risk tool for predictive recidivism in juveniles could be achieved and automatically scored, using information already located in the databases of social and forensic services. As described earlier, actuarial tools are unlikely to result in biased outcomes and tend to provide accurate predictions by taking advantage of the statistical relationship between variables and offending (Krysik & LeCroy, 2002). This type of approach refines a complex pathway to offending. While some variables (which may be correlated with offending) become statistically redundant in the presence of other variables, others are included in the statistical model and are weighted in a regression analysis based on the variable's statistical predictive merits. While this means these tools are not, necessarily, theoretically relevant (James Bonta & Andrews, 2007), they do tend to include variables that are known risk factors for offending and provide a very quick screening type assessment of risk. When these tools utilise information that is already available in a service's or departments' records system they are able to be set up so that they are automatically scored, meaning once they are set up they do not require intensive human resources for use.

McKinlay et al. (2013) examined the feasibility of such an approach and included analyses to specifically assess if actuarial risk factors for reoffending differed between the sexes. They utilised a sample of New Zealand youths aged between 13 and 17 years (N=936, 745 male, 191 female) who had received a juvenile justice intake in the 2002 calendar year. Information was retrieved for the sample from social and forensic agencies and analyses were undertaken to establish which variables were able to predict reoffending one year on.

McKinlay et al. (2013) found a significant difference between the proportion of males and females who reoffended in their youth. At the time of their follow up, 60% of the males had reoffended compared to 46% of the female cases ($\chi^2 = 12.59$, $df = 1$, $p < .001$). They also

found that a large number of the social and forensic variables were correlated with juvenile recidivism which broadly included variables that could be categorised into two of the well-researched and empirically supported risk factors for offending described earlier; history of antisocial behaviour broadly defined (e.g. number of prior police notes) and difficulties in the youth's key relationships (e.g. findings of neglect). With the exception of one variable (the number of prior occurrences which captured the amount of contact an individual has with police) no differences were established regarding the relationships of these variables and recidivism for males and females.

McKinlay et al. (2013) used best-subsets logistic regression to generate a predictive model for reoffending using only the male sample. This model was assessed in terms of its accuracy for both sexes. The model found to be most effective in predicting youth recidivism included the following variables: sex, age of first social or forensic service intake, the number of prior court dates, and number of prior police notes on record. A large number of variables that they had found to be significantly correlated with youth recidivism, and are also known empirical risk factors, were excluded from the model based upon the Akaike Information Criterion (AIC) (Akaike, 1974). The AIC is a means for determining the relative efficiency of statistical models. This means that while these variables were statistically correlated to offending, they became redundant when statistically controlling for the predictive abilities of the other variables. The statistical model developed was found to have moderately high accuracy in predicting overall youth recidivism one year on (AUC = .71). Although males posed a higher absolute risk of recidivism, the model was also found to be as accurate in predicting recidivism for males as it was for females.

These findings illustrated the feasibility of an automatically scored tool, that utilises information already stored in social and forensic databases, for the prediction of youth recidivism. This type of tool, when more fully validated, could either be incorporated as part

of a larger assessment, or used as a screening tool to identify young individuals who require further assessment for treatment planning.

1.7 Aims of Present Study

The first aim of this thesis is to determine, prospectively, what percentage of individuals who received a Youth justice intake (meaning individuals who commit at least one offence as a young person) went on to be convicted of an adult offence. A further aim was to determine what proportion of the sample used in the McKinlay et al. (2013) study went on to be convicted in the longer term. Given that youth who have offended are more likely to reoffend relative to any other age group (Nadesu, 2009), it is hypothesised that a high proportion of the individuals in this sample will have gone on to receive a conviction five years on.

The second aim of this thesis is to determine if the risk factors that were identified by McKinlay et al. (2013) as predictive of recidivism in the short term, were also predictive of convictions in the longer term as indicated by similar analyses to McKinlay et al. (2013), but with longer term follow up data. It is hypothesised that the variables that are predictive of recidivism in the short term will be predictive of offending in the longer term as previous research findings indicate that there are similarities in risk factors offending at all ages.

A further aim was to assess how accurately the statistical model developed by McKinlay et al. (2013), named the JRS for the purposes of this thesis, was able to predict who would go on to receive convictions five years on. It is hypothesised that the JRS scale will be moderately effective in predicting convictions in the longer term; as the JRS included some of the most empirically validated risk factors, specifically a history of antisocial behaviour (Glueck & Glueck, 1950; Simourd & Andrews, 1994) and difficulties in key

relationships (Andrews & Bonta, 2010; Bergen et al., 2004; Crooks et al., 2007; Gendreau et al., 1996; Hoeve et al., 2012; Lansford et al., 2007; Lipsey & Derzon, 1998; Mulder et al., 2011; Swanston et al., 2003); and established second generation instruments, on average, tend to be as accurate as later generation assessments (Schwalbe, 2007).

Finally, this thesis aimed to determine if a statistical model developed specifically for predicting offending in the long term, drawn from the same social and forensic variables as the JRS (McKinlay et al., 2013), is able to provide a more accurate prediction of convictions in the long term. This thesis will use a more conservative measure of recidivism than that used to develop the JRS. Given this, the slightly differing relationship between risk factors at different ages, and the fact that the longer term follow up data will be used to provide the basis for the development of the endeavoured model in this thesis, it is hypothesised the model developed will be more accurate relative to the JRS in predicting convictions long term.

Chapter Two - Method

2.1 Approvals and Consent

Ethical consent was applied for and obtained from the Human Ethics Committee of the University of Canterbury. A letter confirming this consent is presented in Appendix A on page 87. An application was put to the Department of Corrections' Research & Evaluation Governance Committee and the Ministry of Social Development's Research Access Committee concurrently. Confirmations of approval from these bodies are presented in Appendices B and C respectively, on pages 88 and 89.

2.2 Sample and Dataset

This study used data obtained from various sources. Two samples were utilised; an entire cohort sample and a stratified subsample of this cohort. The cohort sample was initially identified from Child, Youth and Family services' database case records. The cohort included 4,307 individuals who were recorded by the agency as having received a Youth Justice intake in the 2002 calendar year. Further information was collected for the stratified subset of the cohort sample from the New Zealand Police National Intelligence Application database (N=936). A statistical risk model was later developed by McKinlay et al. (2013) based upon a stratified subset, providing JRS scores and one-year recidivism records for the 936 youth. Finally, adult conviction data were obtained from the New Zealand Department of Corrections in 2008 and matched to the entire initial cohort sample of 4,307 individuals, providing five year follow up conviction data that included adult convictions.

2.2.2 Social and Forensic Variables.

The cohort utilised in this study were identified from a database maintained by New Zealand's Ministry of Social Development social work agency, Child, Youth and Family services. In 2002 these records were imported into a Microsoft Access database and multiple

variables were extracted, for example, the number of youth justice intakes that had occurred prior to 2002 for each individual (McKinlay et al., 2013). The variables extracted were made use of in this thesis as potential predictor variables for receiving an adult conviction (see Table 1, on page 38). Child, Youth and Family services' database contains information pertaining to each child's care and protection needs and antisocial behaviour committed. Care and protection intakes take place in the situation where a child or youth is understood to be at risk of harm or suffering. In such an instance a social worker is assigned to investigate the situation and records are kept relating to the circumstances of the case. These findings are classified into groups which include: physical abuse, emotional abuse, sexual abuse, neglect, behavioural or relationship difficulties, and self-harm. Findings are also coded to acknowledge if the situation falls under Section 15 of the Child Young Persons and Their Families Act (1989), the situation is deemed urgent, or the child concerned is under 10 years of age. Based on the social worker's findings, measures are put in place to protect the child. Measures include providing a placement in a residential facility or moving the child to reside with relatives. As such, all of the social workers findings and measures then undertaken based upon these findings have been utilised possible risk variables pertaining to Child, Youth and Family services in this study.

The further variables derived from the Child, Youth and Family services database relate to youth justice intakes. This occurs in New Zealand in the instance where a young individual has transgressed. The child or youth may be referred by police to Child, Youth and Family services and allocated a youth justice social worker. A FGC is often then organised in order to provide the individual the opportunity to be accountable and provide compensation for their offending. FGCs were designed to align with a restorative justice model and they occur with the aim of redirecting youth from an antisocial pathway that might otherwise lead to the adult court and justice system (Morris & Maxwell, 2001). The variables relating to

these situations in this study include the number of intakes and categories relating to the outcomes of the FGCs held.

2.2.1 Stratified Sample.

From within this full cohort sample, McKinlay et al. (2013) and colleagues selected a subsample of 936 cases (745 male, 191 female) using a random but stratified sampling method. This sub-sample was geographically representative of New Zealand and included those who were aged between 13 and 17 years when receiving their first youth justice intake. The ethnic classifications of males in the this sample was 35.3% New Zealand European, 36.0% New Zealand Maori, 10.3% were of Pacific Island ethnicity, and 18.4% were other. The females included 27.2% New Zealand European, 48.7% New Zealand Maori, 5.2% were of Pacific Island ethnicity and 18.8% were other. These stratified methods provided a sample for which data was gathered from the New Zealand Police.

The New Zealand Police database provided the next group of variables. These include ‘Intelligence Notes’ and ‘Occurrences’. Intelligence Notes are records acquired by police relating either to the youths’ relationship to criminal associates or to suspected illegal activities. Occurrences refer to an actual interaction between police officers and youths that do not result in formal charges.

2.2.3 Juvenile Recidivism and JRS Scores.

In 2013, McKinlay, James and Grace used the social and forensic services records described above to develop an actuarial static risk model for predicting reoffending in youth. This was based upon the stratified sample (N=936) and was suitable for automatic scoring. Juvenile Recidivism was defined by McKinlay et al. as either a criminal prosecution, or another youth justice intake, for a new offence within *one year* of their initial (2002) youth

justice intake. Both juvenile recidivism and the JRS scores were included as variables in this study.

2.2.4 Conviction Data.

A list of those convicted in New Zealand courts during the years 2002 to 2007 was obtained from the Department of Corrections Integrated Offender Management System[2]. The list was restricted to persons with dates of birth between 1st January 1984 and 31st Dec 1988, thereby targeting those who had been eligible, by virtue of their age, for a Youth justice intake with Child, Youth and Family services in 2002, the cohort sample described above. This list was obtained in 2008, and contained full name, date of birth, and the identification number used by Police, the Courts and the Department of Corrections to identify the person. It was then searched to find any individuals whose name and date of birth matched those of individuals in the full cohort sample of 4,307 to provide the follow data for this thesis.

2.2.5 Matching Process.

A large number of direct matches (N=877) were found. In these cases the full name and date of birth matched to the smallest detail, giving as near as possible to absolute certainty that an individual in the initial cohort sample had been convicted in court. There were, however, many other cases where there could be high confidence in a match, despite minor differences in name or date of birth. Sometimes, for example, individuals were recorded with just first and last names in one dataset, and with first, middle, and last names in the other (with matches on first and last name, and date of birth). "High-confidence" matches ranged from a match on "short" name (first name and last name), with a match on date of

[2]We are grateful to Alex Skelton, Department of Corrections, for his efforts in extracting this list.

birth (N=1,250), through a match on name, and a credible discrepancy in date of birth (N=41).

"Credible" date of birth discrepancies were 1) cases where either the day or month entries were discrepant by a small number, 2) cases where the month and day were the same, but there was a difference of 1 in the year, 3) juxtaposition of the month and day. To give some examples: 31/10/1986 instead of 31/10/1985; 07/08/1986 instead of 10/08/1986; 17/08/1987 instead of 07/08/1987; and 01/04/1986 instead of 04/01/1986). Including these high-confidence matches brought the total number to 2,168. Finally, cases were included as matches if there was a match on short name and credible date of birth discrepancy (as defined above; N=191). The reasoning supporting "credibility" here is that New Zealand's population is small enough that these "almost-matches" are likely very rarely coincidental. Of the 4,307 cases in the original sample 2,359 were identified, with high confidence, as present in the conviction sample (54.77%). Of the cases that were included in the stratified sample, 514 of the total 936 were present in the conviction sample (54.91%).

2.2.6 The Resulting Dataset.

Variables from: the Child, Youth and Family services database (N=4,307); the New Zealand Police (N=936); McKinlay, James and Grace's (2013) juvenile recidivism data and JRS scores (N=936); and conviction information from the Department of Corrections were compiled to produce the final dataset used in this study. A full list of these variables is displayed in Table 1. Values and coding information is presented in Appendix D.

Table 1

Full List of Variables Included in the Dataset

Variables
Child, Youth and Family Intakes
Sex of the Child
Age at First Child, Youth and Family Intake
Age at First Youth Justice Intake
Total Number of Both Prior Care and Protection and Youth justice intakes
Number of Prior Care and Protection Orders
Number of Prior Youth Justice Intakes
Number of Prior Placements
Prior Intake Under Section 15
Prior Intakes Classified as Urgent
Number of Intakes Prior to Age 10
Social Worker Findings
Number of Prior Social Worker Findings
Evidence of Prior Emotional Abuse
Evidence of Prior Behavior and/or Relationship Difficulties
Evidence of Prior Neglect
Evidence of Physical Abuse
Evidence of Self-Harm and or Suicidal Behavior
Evidence of Sexual Abuse
Number of Prior Findings – not specified
FGCs
Number of Prior Youth Justice FGCs
Number of Prior FGCs with No Agreement
Number of Prior Supervision Orders
Number of Prior FGCs resulting in Custody or Supervision
Court Related and Other Outcomes
Total Number of Prior Court Orders
Number of Prior Court Dates
Number of Court Custody Orders
Number of Court Ordered Custody/Supervision
Number of Other Prior Youth Justice Outcomes
Prior Youth Aid Intervention
Police Variables
Number of Prior Intelligence Notes
Number of Prior Occurrences
McKinlay, James and Grace (2013)
JRS Scores
Juvenile Recidivism (Youth Justice Intakes and/or Convictions)
Department of Corrections Variable
Offending/No-Offending Indicator

2.3 Data Analyses Plan

For clarity, the entire cohort sample will be referred to as the cohort sample and subsample of this cohort will be referred to as the stratified sample. The matching process, described above, was undertaken to obtain the conviction data for cohort sample. Descriptive statistics were decided upon to be used to provide an overview of this dataset and to calculate the proportions of youth who went on to offend in young adulthood for both the entire cohort and for the stratified sample. *T*-tests and Cohen's *d* were planned for comparing male and female records. It should be noted that some of these analyses are parallel to those computed and presented by McKinlay et al. (2013) but that the description of the adult conviction data, the focus of this study, can now be added.

Pearson's correlation coefficients were used to measure the relationship between the potential predictor variables and adult convictions, both for the overall stratified sample and for males and females separately within this sample. An asymptotic z-test (Lee & Preacher, 2013), which tests the equality of correlation coefficients obtained from the same sample, where the two correlations share one variable in common, was planned order to highlight potential differences between risk variables of youth reoffending relative to those of adult convictions.

To determine the strength of the relationship between the JRS Scores and adult convictions Pearson's correlation coefficients were planned. Again, this was to be undertaken for the overall stratified sample and for males and females separately. These coefficients could then be compared to the correlations between the JRS scores and juvenile recidivism outcomes (McKinlay et al., 2013) using Lee and Preacher's (2013) asymptotic *z*-test. ROC analyses (Rice & Harris, 1995) were planned for determining the efficiency of the JRS Scores in predicting adult convictions for the overall stratified sample and for males and females separately. The AUC outcome statistic of the ROC analysis, which indicates how well a scale

is able to predict who received an adult conviction, could then be compared with the AUCs that McKinlay et al. (2013) computed for the JRS Scores predictions of juvenile recidivism. Hanley and McNeil's (1983) test of significance was planned to determine if there is a significant difference between these results, providing an indication of how effectively the JRS is able to predict convictions in the long term comparatively to recidivism in the short term. Bivariate logistical regression analyses were planned to determine the predictive relationship between the JRS Scores (and other potential predictor variables) and adult convictions. A hierarchical approach was intended which asked whether improvement in prediction of longer-term risk can be achieved by a combination of the JRS score plus further information.

It was planned that a model for predicting adult convictions would be developed using a Best-Subsets logistic regression (Hosmer & Lemeshow, 2000; King, 2003), based upon the stratified sample. The 'best' model highlighted by this analysis would initially be evaluated using the AIC (Akaike, 1974) which, as described earlier, is a means for determining the relative efficiency of statistical models. Hierarchical bivariate logistical regression analyses could then be used to determine if the addition of any further variables would significantly increase the accuracy of the model's prediction of adult convictions. Chi-square coefficients (χ^2) could be used to establish if there was a significant difference between actual conviction data and the predictions made. ROC analyses (Rice & Harris, 1995) could also be used to assess the final model in terms of its accuracy. The AUC outcome could be compared to the AUC, or predictive accuracy of the JRS Scores ability to predict adult convictions in order to test if the newly developed model was more accurate in its predictions of longer term convictions. This was planned for the stratified sample overall, and for male and females separately to test the generalisability of the models to both sexes. Data analyses were

completed using the packages SPSS (IBM, 2013) and STATISTICA 12 (StatSoft, 2013). A significance value of .05* was set for all statistical tests.

Chapter Three - Results

3.1 Descriptive Statistics

Of the 936 cases, 79.6% (745) were male and 20.4% (191) were female. The average age at the time of sample identification in 2002 was 15.64 years and ranged from 13.00 to 17.00 years. Males were an average of 15.57 years of age, the eldest was 17.00 years and the youngest was 13.00 years. Females were an average of 15.66 years of age and ranged in age from 13.35 to 16.93 years. At 31st December 2007, the time of follow up, the average age of the stratified sample was 21.19 years, ranging from 18.32 to 22.91 years. At this time males were now, on average, 21.21 years of age and ranged from 18.32 to 22.89 years. Females were then 21.11 years of age and ranged between 19.06 and 22.91 years. No significant difference was observed between males and females age, neither at the time of initial sample identification (t = -1.24, *ns*, d = -.08), nor at time of follow up (t = -1.23, *ns*, d = -.08).

Means and standard deviations for each of the potential risk variables were computed for the sample. These are presented in Table 2 and provide a basic description of the distribution of each of the potential risk variables. McKinlay et al. (2013) recoded variables that were substantially positively skewed to 3, 4 or, 5 point scales. A copy of their appendix, outlining the values for these variables is displayed in Appendix D on page 90. Given that there was a significant difference found between the proportion of males and females that went on to receive an adult conviction, *t* tests were used to identify any differences between the sexes in the distributions of each of the potential risk variables, as presented by McKinlay et al. (2013). The effect size, Cohen's *d*, was used to describe any differences between the male and female sample for each variable. These results are displayed in Table 3.

Table 2

Means and Standard Deviations of the Potential Risk Factors for the Overall Stratified Sample

Variable	Mean	Standard Deviation
Child, Youth and Family Intakes		
Age at First Child, Youth and Family Intake	15.64	0.90
Age at First Youth Justice Intake	15.24	1.03
Total Number of Intakes	2.10	2.40
Number of Prior Care and Protection Orders	1.27	1.51
Number of Prior Youth justice intakes	1.57	1.11
Prior Intake Under Section 15	0.74	1.22
Prior Intakes Classified as Urgent	0.72	1.26
Number of Intakes Prior to Age 10	1.84	2.57
Social Worker Findings		
Number of Prior Social Worker Findings	0.99	1.38
Evidence of Prior Emotional Abuse	0.06	1.28
Evidence of Prior Behavior/Relationship Difficulties	0.41	0.77
Evidence of Prior Neglect	0.18	0.57
Evidence of Physical Abuse	0.15	0.47
Evidence of Self-Harm and or Suicidal Behavior	0.02	0.13
Evidence of Sexual Abuse	0.10	0.38
Number of Prior Findings – not specified	0.23	0.58
FGCs, Court Related and Other Outcomes		
Number of Prior Youth Justice FGCs	0.50	1.12
Number of Prior Supervision Orders	0.07	0.36
Number of Prior FGCs resulting in Custody or Supervision	0.72	1.61
Number of Prior FGCs with No Agreement	0.03	0.21
Total Number of Prior Court Orders	0.40	1.10
Number of Prior Court Dates	0.30	0.75
Number of Court Custody Orders	0.16	0.51
Number of Court Ordered Custody/Supervision	0.22	0.72
Number of Other Prior Youth Justice Outcomes	0.03	0.42
Prior Youth Aid Intervention	1.40	2.55
Number of Prior Placements	0.78	1.39
Police Variables		
Number of Prior Intelligence Notes	1.73	1.70
Number of Prior Occurrences	2.50	2.05
McKinlay et al. (2013)		
JRS Score	8.37	4.14

Table 3

Means and Standard Deviations for the Potential Risk Factors for Males and Females Separately and Effect Sizes

	Male Cases		Female Cases		Cohen's *d*
Variables	M	SD	M	SD	
Child, Youth and Family Intakes					
Age at First Child, Youth and Family Intake	12.77	3.84	12.04	4.16	0.18**
Age at First Youth justice intake	15.24	1.07	15.28	0.88	-0.04
Total Number Intakes	2.04	2.39	2.36	2.43	-0.13
Number of Prior Care and Protection Orders	1.19	1.48	1.58	1.56	-0.26**
Number of Prior Youth justice intakes	0.60	1.14	0.45	0.98	0.14
Prior Intake Under Section 15	0.68	1.16	0.97	1.41	-0.24**
Prior Intakes Classified as Urgent	0.65	1.20	1.00	1.46	-0.28***
Number of Intakes Prior to Age 10	1.81	2.63	1.96	2.33	-0.06
Social Worker Findings					
Number of Prior Social Worker Findings	0.92	1.36	1.27	1.44	-0.25**
Evidence of Prior Emotional Abuse	0.06	0.27	0.08	0.31	-0.06
Evidence of Prior Behavior/Relationship Difficulties	0.39	0.76	0.50	0.77	-0.14
Evidence of Prior Neglect	0.16	0.55	0.26	0.65	-0.17*
Evidence of Physical Abuse	0.15	0.48	0.17	0.46	-0.05
Evidence of Self-Harm and or Suicidal Behavior	0.01	0.10	0.03	0.20	-0.16*
Evidence of Sexual Abuse	0.10	0.39	0.13	0.35	-0.08
Number of Prior Findings – not specified	0.21	0.54	0.33	0.71	-0.20*
FGCs, Court Related and Other Outcomes					
Number of Prior Youth Justice FGCs	0.54	1.16	0.36	0.95	0.16
Number of Prior Supervision Orders	0.07	0.38	0.06	0.28	0.03
Number of Prior FGCs resulting in Custody/Supervision	0.77	1.67	0.54	1.38	0.14
Number of Prior FGCs with No Agreement	0.03	0.18	0.04	0.28	-0.05
Total Number of Prior Court Orders	0.41	1.13	0.36	1.00	0.05
Number of Prior Court Dates	0.35	0.95	0.30	0.88	0.05
Number of Court Custody Orders	0.17	0.51	0.12	0.49	0.10
Number of Court Ordered Custody/Supervision	0.23	0.75	0.18	0.61	0.07
Number of Other Prior Youth Justice Outcomes	0.07	0.41	0.09	0.47	-0.05
Prior Youth Aid Intervention	1.48	2.64	1.08	2.16	0.16
Number of Prior Placements	0.74	1.38	0.91	1.42	-0.12
Police Variables					
Number of Prior Intelligence Notes	1.84	1.75	1.28	1.44	0.33***
Number of Prior Occurrences	2.59	2.07	2.17	1.92	0.21*

Note: *$p < .05$, **$p < .01$, ***$p < .001$, Adapted from McKinlay, James and Grace (2013)

In the stratified sample females had a significantly higher number of social worker findings, not only overall ($t = 3.16$, $p < .010$, $d = .25$), but more specifically, significantly more findings of neglect ($t = 2.07$, $p < .050$, $d = .17$), self-harm ($t=1.95$, $p<.000$), and abuse of unspecified type ($t = 2.55$, $p < .050$, $d = .20$). A difference was also found between the age

at which males and females first experienced intakes, with males being significantly older than females ($t = 2.30$, $p < .050$, $d = .18$). Males also had significantly fewer prior care and protection intakes ($t = 3.24$, $p < .050$, $d = .26$), urgent intakes ($t = 3.40$, $p < .001$, $d = .28$), and intakes relating to reports under Section 15 of the Child Young Persons and Their Families Act (1989) relating to suspected abuse or neglect ($t = 3.03$, $p < .010$, $d = .24$). By contrast, males had significantly more police intelligence notes ($t = 4.06$, $p < .001$, $d = .33$) and recorded occurrences ($t = 2.50$, $p < .050$, $d = .21$) relative to their female counterparts. Overall these results suggested that young females have less contact with police and more contact with care and protection services than males of a similar age.

At the time of follow up, 54.77% of the entire 4,307 cases and 54.96% of the 937 stratified sample cases had been convicted as an adult. In other words, over half of the sample had gone on to offend in young adulthood. Analyses were undertaken regarding the differences between males and females in the stratified sample. Results indicated that a significant difference was observed between the proportion of male verses the proportion of female cases who had received a conviction by this time ($\chi^2 = 25.35$, $df = 1$, $p<.000$). Of the male cases, 59.1% had been convicted, compared to only 38.7% of the female cases. This result is comparable to the finding reported by McKinlay et al. (2013) who also found significant differences between the proportion of males and females who reoffended in their one-year follow up. At the time of their follow up, 60.80% of the males had reoffended compared to 46.60% of the female cases ($\chi^2 = 12.59$, $df = 1$, $p < .001$).

3.2 Correlational Analyses

Pearson's correlation coefficients were computed to describe the relationship between each of the potential risk variables and having a conviction by early adulthood for the entire sample. The resulting coefficient are presented in Table 4 alongside the correlations, reported by McKinlay et al. (2013), between these variables and juvenile recidivism. These

correlations were then compared using an asymptotic z-test (Lee & Preacher, 2013) in order to highlight any statistically significant differences in the relationship between potential risk factors of juvenile offending versus potential risk factors of adult convictions. In order to gauge potential differences between the sexes in risk factors, this process was also undertaken for males and females separately and results from this analysis is presented in Table 4a.

Table 4

Correlations Between Potential Risk Factors and Both Youth Recidivism and Adult Convictions, and the z-score Test of Significant Difference for the Overall Stratified Sample

	Youth Recidivism	Adult Convictions	*z*-score
Social Services Intakes			
Age at First Child, Youth and Family Intake	-0.19***	-0.12***	-1.86
Age at First Youth justice intake	-0.13***	-0.09**	-1.06
Total Number of Intakes	0.25***	0.17***	1.97
Number of Prior Care and Protection Intakes	0.19***	0.12***	1.79
Number of Prior Youth justice intakes	0.20***	0.21***	-0.28
Prior Intake Under Section 15	0.13***	0.04	2.30*
Prior Intakes Classified as Urgent	0.13***	0.02	2.78**
Number of Intakes Prior to Age 10	0.24***	0.15***	2.20*
Social Worker Findings			
Number of Prior Social Worker Findings	0.16***	0.08*	2.11*
Evidence of Prior Emotional Abuse	0.04	-0.03	1.66
Evidence of Prior Behavior and/or Relationship Difficulties	0.16***	0.06	2.64**
Evidence of Prior Neglect	0.08*	0.01	1.81
Evidence of Physical Abuse	0.05	0.07*	-0.50
Evidence of Self-Harm and or Suicidal Behavior	0.03	-0.04	1.86
Evidence of Sexual Abuse	0.02	-0.04	1.43
Number of Prior Findings – not specified	0.12***	0.01	2.68**
FGCs, Court and Other Outcomes			
Number of Prior Youth Justice FGCs	0.17***	0.19***	-0.44
Number of Prior Supervision Orders	0.11**	0.11**	0.05
Number of Prior FGCs resulting in Custody or Supervision	0.19***	0.19***	0.10
Number of Prior FGCs with No Agreement	0.01	0.05	-0.98
Total Number of Prior Court Orders	0.18***	0.12***	1.46
Number of Prior Court Dates	0.20***	0.13***	1.79
Number of Court Custody Orders	0.16***	0.10**	0.69
Number of Court Total Orders Custody/Supervision	0.17***	0.12***	1.06
Number of Other Prior Youth Justice Outcomes	0.09**	0.04	1.23
Prior Youth Aid Intervention	0.16***	0.12***	0.81
Number of Prior Placements	0.18***	0.08*	2.47*
Police Variables			
Number of Prior Intelligence Notes	0.31***	0.28***	0.78
Number of Prior Occurrences	0.26***	0.22***	1.05

Note: *$p < .05$, **$p < .01$, ***$p < .001$

Table 4a

Correlations between Potential Risk Factors and Both Youth Recidivism and Adult Convictions, and the z-score Test of Significant Difference for the Males and Females Separately

	Males			*Females*		
	Youth Recidivism	Adult Convictions	*z*-score	Youth Recidivism	Adult Convictions	*z*-score
Social Services Intakes						
Age at First Child, Youth and Family Intake	-0.19***	-0.17**	-0.36	-0.20**	0.06	-2.85**
Age at First Youth justice intake	-0.14***	-0.10**	-0.92	-0.06	-0.03	-0.35
Total Number of Intakes	0.25***	0.22**	0.79	0.31***	0.07	2.74**
Number of Prior Care and Protection Intakes	0.20***	0.18**	0.55	0.25***	0.01	2.71**
Number of Prior Youth justice intakes	0.19***	0.22**	-0.60	0.21**	0.15*	0.62
Prior Intake Under Section 15	0.13**	0.08*	1.06	0.20**	-0.01	2.56*
Prior Intakes Classified as Urgent	0.13***	0.06	1.66	0.18*	-0.01	2.15*
Number of Intakes Prior to Age 10	0.23***	0.19**	0.99	0.27***	0.05	2.50*
Social Worker Findings						
Number of Prior Social Worker Findings	0.15***	0.12**	0.63	0.25**	-0.00	2.80**
Evidence of Prior Emotional Abuse	0.03	-0.01	0.94	0.09	-0.04	5.81***
Evidence of Prior Behavior or Relationship Difficulties	0.17***	0.11**	1.39	0.18*	-0.10	3.10**
Evidence of Prior Neglect	0.08*	0.01	1.54	0.12	0.05	0.77
Evidence of Physical Abuse	0.05	0.10**	-1.10	0.07	-0.03	1.13
Evidence of Self-Harm and or Suicidal Behavior	0.06	-0.02	1.76	0.01	-0.07	0.87
Evidence of Sexual Abuse	0.01	0.05	-0.80	0.09	0.02	0.74
Number of Prior Findings – not specified	0.12**	0.03	2.02*	0.19**	0.02	1.84
FGCs, Court and Other Outcomes						
Number of Prior Youth Justice FGCs	0.17***	0.19**	-0.39	0.12	0.15*	-0.33
Number of Prior Supervision Orders	0.12**	0.11**	0.11	0.03	0.07	-8.68***
Number of Prior FGCs resulting in Custody/Supervision	0.20***	0.19**	0.14	0.15*	0.11	0.44
Number of Prior FGCs with No Agreement	0.02	0.03	-0.16	-0.01	0.13	-1.50
Total Number of Prior Court Orders	0.20***	0.15**	1.14	0.12	-0.00	1.36
Number of Prior Court Dates	0.21***	0.14**	1.51	0.14	0.01	1.42
Number of Court Custody Orders	0.16***	0.12**	0.81	0.16*	-0.02	1.98*
Number of Court Total Orders Custody/Supervision	0.17***	0.14**	0.61	0.14	0.01	1.37
Number of Other Prior Youth Justice Outcomes	0.10**	0.04	1.39	0.08	0.05	-4.51***
Prior Youth Aid Intervention	0.14***	0.13**	0.27	0.22**	0.06	1.73
Number of Prior Placements	0.18***	0.13**	1.09	0.22**	-0.07	3.19**
Police Variables						
Number of Prior Intelligence Notes	0.32***	0.27**	1.09	0.17*	0.21**	-0.45
Number of Prior Occurrences	0.24***	0.22**	0.46	0.31***	0.14	1.98*

Note: *$p < .05$, **$p < .01$, ***$p < .001$

3.2.1 Social Service Intakes.

3.2.1.1 Age at Time of Social Service Intakes.

The age at which children were recorded as experiencing their first Child, Youth and Family services intake was significantly negatively correlated with youth recidivism for both males and females, meaning the younger the children were when receiving their first intake, the more likely they were to offend later in their youth. However, the age at which children were recorded as experiencing this intake was only significantly correlated with having an adult conviction for males, not for the females. For females, a significant difference was observed in the correlational relationship of this variable with youth recidivism compared with adult convictions. Similarly, the age at which children received their first youth justice intake was significantly negatively correlated for males with both juvenile offending and having an adult conviction. This was not the case for females, whose age of first youth justice intake was not found to be correlated with either youth recidivism or adult offending.

The number of intakes children received prior to 10 years of age was significantly positively correlated with juvenile recidivism for the overall stratified sample. However, in relation to adult convictions, differences were again observed between the sexes. Intakes children received prior to 10 years of age were significantly positively correlated with having a conviction in adulthood for males and not for females. For females, although these intakes were significantly positively correlated with juvenile recidivism, they were not significantly correlated with adult convictions. The difference in the strength of these correlations, as measured by the *z*-score, was found to be significant for females, as well as for the overall stratified sample.

3.2.1.2 Number of Social Service Intakes.

The total number of intakes and the number of care and protection intakes specifically were shown to positively correlate with juvenile recidivism, for the overall stratified sample and for males and females separately. Although, for males, adult convictions were shown to positively correlate with the number of overall and the number of care and protection intakes recorded, neither of these variables were significantly correlated with adult convictions for females. The difference in the correlations for these two variables for adult compared to youth offending for females was statistically significant. On the other hand, the recorded number of Youth justice intakes was significantly positively correlated to both youth recidivism and adult convictions for both sexes.

3.2.1.3 Critical Social Service Intakes.

The number of intakes that were recorded as being urgent was significantly positively correlated with juvenile recidivism for the overall stratified sample and for males and females separately. Urgent intakes were not, however, significantly correlated with adult convictions for either of the sexes. For the sample as a whole, the difference between the correlational relationship between urgent intakes and adult offending was significantly weaker than the relationship between this variable and youth recidivism.

Juvenile recidivism was found to be significantly positively correlated with the number of intakes recorded as being undertaken under Section 15 of the Child Young Persons and Their Families Act (1989). Differences were, however, observed between these intakes and adult convictions when assessing the sexes separately. For males, intakes undertaken under Section 15 were significantly correlated with adult convictions. This was not the case for females. For the overall stratified sample and for females specifically, a significantly weaker correlation was obtained between intakes under Section 15 and adult convictions, compared to youth recidivism.

3.2.2 Social Worker Findings.

For the sample as a whole and when analysing the sexes separately, juvenile recidivism was significantly correlated with the total number of prior social worker findings. For females, there was a significant decrease in the strength of the relationship between total findings and adult convictions, compared with juvenile recidivism, to the extent that the correlation between the total number of such findings and adult offending was no longer significant. On the other hand, for males, the relationship between these variables did not change significantly; a positive significant relationship was observed between the total number of findings and adult convictions.

For males, social worker findings that included evidence of behaviour and/or relationship difficulties were significantly correlated with both juvenile recidivism and adult convictions. However for females, while the relationship between this variable was significantly correlated with juvenile recidivism, it was significantly reduced when analysed in relation to adult convictions to the point that is was no longer significant with adult convictions. For females, evidence of neglect was neither correlated with juvenile recidivism nor with adult convictions. For males, while evidence of neglect was significantly correlated with juvenile recidivism, it was not significantly correlated with adult convictions; although the asymptotic z-tests did indicate that there was not a significant change in the strength of the correlations between evidence of neglect with juvenile recidivism and adult recidivism

While evidence of physical abuse was not significantly correlated with juvenile recidivism, it was significantly positively correlated with adult convictions for males. Again however, the difference between these correlations was not significant. For females there was no association was found between evidence of physical abuse and offending either in youth or in early adulthood. Evidence of self-harm, suicidal behaviour, emotional abuse and sexual abuse were not found to correlate significantly with juvenile recidivism or adult convictions

for the overall stratified sample, or for males and females separately. Social worker findings, the type of which was not specified, were correlated with juvenile recidivism for the whole stratified sample. This was not the case when analysed in relation to adult convictions for males or females. The difference in the strength of the relationships, in this case a decrease, found between adult versus youth offending was significant.

3.2.3 FCGs, Court and Other Outcomes.

For males, the majority of the eleven variables that related to FGCs, Court and other outcomes were significantly positively correlated with both juvenile offending (10/11) and adult convictions (9/11). No significant change was observed in the strength of this association between juvenile recidivism and adult convictions. This was not the case for females, whose juvenile offending was significantly correlated with four of these variables (the number of FGCs that resulted in custody/supervision orders, the number of court custody orders, the number of prior youth aid interventions, and the number of prior placements). Female adult offending was significantly correlated with only one of these variables, the number of prior youth justice FGCs. The change in strength of correlation for the number of court custody orders between juvenile recidivism and adult convictions was statistically significant.

3.2.4 Police Variables.

The number of recorded police intelligence notes was significantly related to both juvenile and adult offending, for both males and females. A positive correlation was found between prior police occurrence records and reoffending in youth and receiving an adult conviction. The exception was for females and adult offending; police occurrence records were only significantly related to juvenile offending not adult convictions, and the strength of this correlation significantly decreased.

3.2.5 Summary of the Correlational Analyses.

These results indicate that there are differences in the relationship between the records of social and forensic services and juvenile recidivism compared to having adult conviction. The findings also suggest that there are more significant correlational relationships between these services' records and having a conviction for males, comparatively to females. What these results do not tell us is whether these variables or the JRS are able to effectively predict adult convictions, or, given the differences in the variables relationship with males and females, whether or not prediction is possible for both sexes. Therefore, further analyses were undertaken to establish if the JRS was able to predict adult convictions and then to see whether additional variables could be used in a statistical model to predict, or improve upon the JRS's prediction of adult convictions.

3.3 McKinlay et al. (2013) JRS Scores and Adult Convictions

McKinlay et al. (2013) developed a scale for predicting recidivism among juveniles seen by social and forensic services. It was not developed, or tested, in terms of the model's ability to predict adult offending. However the model incorporates several variables that are well-validated predictors of adult offending such as history of criminal behaviour (Police Occurrences) and antisocial associates (Police Intelligence Notes). Correlational analyses presented above show similarities, for males at least, in the relationships between records of social and forensic services with juvenile offending and with adult convictions. Therefore, the next analyses presented were undertaken to test the predictive qualities of the JRS with respect to adult convictions and to provide a starting point for determining if the records of social and forensic services are able to predict adult conviction. Comparisons are then able to be made between the potentially differing predictive variables of adult convictions, relative to juvenile recidivism.

Correlation coefficients were calculated to determine the strength of the relationship between the JRS scores and adult convictions. The resulting coefficients are presented alongside the coefficients between the JRS scores and juvenile recidivism as calculated by McKinlay et al. (2013). These results were compared in the current study using an asymptotic *z*-test (Lee & Preacher, 2013) to determine if this relationship significantly differed. Findings are presented in Table 5.

Table 5

Correlation Coefficients between JRS Scores and both Juvenile Recidivism and Adult Convictions for the Stratified Sample Overall and Separately for Males and Females

Sample	**JRS Score**		
	Juvenile Recidivism	Adult Convictions	*z*-score
Overall	0.39**	0.31**	2.21*
Male	0.37**	0.31**	1.66
Female	0.37**	0.15*	2.56*

Note: *$p < .05$, **$p < .01$
Juvenile Recidivism coefficients from McKinlay et al. (2013)

For the whole stratified sample and for both males and females separately, the JRS scores were positively correlated with both juvenile recidivism and adult convictions. The strength of this relationship did not significantly differ for males when comparing juvenile recidivism to adult convictions. However, the strength of the relationship between the risk scores and female adult convictions and for the overall stratified sample significantly declined, though it remained statistically significant. This indicates that the relationship between risk of youth recidivism and adult convictions is stronger for males than it is for females. This finding corroborates those found in earlier analyses of the current study regarding differences between the sexes in the relationship between records of social and forensic services and adult convictions.

To more directly assess the JRS's ability to accurately predict adult convictions a Receiver Operating Curve analyses were undertaken for the overall stratified sample and for males and females separately. Receiver Operating Curve analyses graphs of sensitivity, or true positives, plotted along the y-axis and 1-specificity, or false positives, plotted along the x-axis (Rice & Harris, 1995). The resulting Area Under the Curve (AUC) provides a measure of how well the statistical models are able to distinguish between those who did and did not go on to offend by adulthood. Results are displayed in Table 6 below.

Table 6

AUCs for the JRS's Predictions of Both Juvenile Recidivism and Adult Convictions, for the Overall Stratified Sample and for Males and Females Separately

	Juvenile Recidivism		Adult Convictions	
	AUC	95% CI	AUC	95% CI
Overall	.718***	.689-.754	.681***	.647-.715
Males	.712***	.675-.749	.682***	.644-.721
Females	.700***	.626-.775	.593*	.510-.676

Note: *p < .05, **p <.01, ***p <.001

Results indicate that the JRS performed reasonably well in predicting adult convictions. This is impressive as it was not specifically developed to predict adult offending. The computed AUCs were then compared using Hanley and McNeil's (1983) test of significance in the difference between dependent AUC values. This test was undertaken to test both the differences between predictions of juvenile recidivism and adult convictions and any differences between the accuracy of predictions for males compared to females. This test revealed a significant difference in the scale's ability to predict juvenile recidivism comparatively to predictions of adult convictions for the overall stratified sample (z =4.11, p<.000). This was also the case when the same test was used to assess the accuracy of the JRS for males (z=5.35, p<.000) and for females (z=7.43, p<.000) in the stratified sample separately, as expected given the difference found between the earlier examination correlation coefficients. Additionally, while McKinlay et al. (2013) found no significant

difference in the predictive accuracy of the JRS for juvenile recidivism (z=0.28, *ns*), a significant difference was observed between the sexes in the predictive accuracy of the JRS of adult convictions (z = 1.95, p<.050),

Given this finding and the differences in risk factors for adult convictions versus juvenile recidivism reported above, it is was important to determine if any of the social and forensic services variables were able to improve upon the JRS's ability to predict adult convictions. Therefore, a set of hierarchical binary logistic regression analyses were completed in order to determine if the potential risk variables (those found to be significantly or close to significantly correlated with adult convictions) were able to predict adult convictions after statistically controlling for JRS scores. A separate analysis was run for each of the potential risk variables. For these analyses, at 'Step 1' the JRS scores were regressed onto as 'Adult Convictions', while the potential risk variables were added individually at 'Step 2'.

The chi-squared coefficient computed in this analysis at 'Step 1' indicated that JRS scores provided a prediction of adult convictions that was significantly more accurate than a prediction based on chance alone (χ^2=94.77, p<.000, B=0.17, Exp (β) = 1.18). Findings also indicated that the predictions made using the JRS scores were not significantly different to the actual conviction data records, as determined by the Hosmer and Lemeshow (2000) goodness of fit test (χ^2=9.96, *ns*). The results of 'Step 2' are displayed in Table 7 below, which presents the chi-square coefficient, beta weights and the odds ratios.

Table 7

Chi-square Coefficient, Beta Coefficient and Odds Ratio for each potential risk variable at Step 2 of the multiple hierarchical logistic regression analyses predicting adult offending outcomes.

Variables	χ^2	β	**Exp (β)**
Child, Youth and Family Intakes			
Sex of the Child	40.42***	.448*	1.56
Age at First Child, Youth and Family Intake	2.32	.106	1.11
Age at First Youth justice intake	1.13	.077	1.08
Total Number of Intakes	0.46	-.025	0.97
Number of Prior Care and Protection Orders	1.44	-.064	0.94
Number of Prior Youth justice intakes	4.80*	.174*	1.19
Number of Prior Placements	4.60*	-.124*	0.88
Prior Intake Under Section 15	4.84*	-.134*	0.87
Number of Intakes Prior to Age 10	0.71	-.029	0.97
Social Worker Findings			
Number of Prior Social Worker Findings	4.95*	-.127*	0.88
Evidence of Prior Behavior/Relationship Difficulties	7.73**	-.286**	0.75
Evidence of Physical Abuse	0.04	.030	1.03
FGCs			
Number of Prior Youth Justice FGCs	2.67	.136	1.15
Number of Prior Supervision Orders	0.44	.210	1.23
Number of Prior FGCs resulting in Custody or Supervision	0.80	.054	1.06
Court Related and Other Outcomes			
Total Number of Prior Court Orders	0.97	-.078	.925
Number of Prior Court Dates	1.07	-.122	0.88
Number of Court Custody Orders	1.92	-.231	0.79
Number of Court Ordered Custody/Supervision	0.42	-.080	0.92
Prior Youth Aid Intervention	3.20	-.062	0.94
Police Variables			
Number of Prior Intelligence Notes	4.15*	.128*	1.14
Number of Prior Occurrences	2.94	-.096	0.91

Note: *$p < .05$, **$p < .01$, ***$p < .001$

Seven of the potential predictor variables were shown to significantly improve upon the JRS's predictions of adult convictions. These variables include: sex; the number of prior Youth justice intakes, intakes under section 15, placements, social worker findings, social worker findings that specifically involve behavioral and/or relationship difficulties; and police intelligence notes. Notably, sex and the number of prior police intelligence notes were variables that are already incorporated within the JRS model. As these variables found to be

significant predictors of adult convictions in these analyses, results suggest that these variables are underweighted in the original JRS when being used to predict adult convictions.

This suggested that predictions of adult convictions by the JRS were likely to be improved by further analysing records of social and forensic services contact and their relationship with adult convictions. What is yet to be addressed is the determination of which combination of these potential risk variables provide the most accurate prediction of adult offending, how accurate the best combination is in predicting adult convictions, and whether this same combination of variables are able to accurately predict offending for the both sexes.

3.4 Predictive Model Development

As a step towards establishing which variables provide the most accurate prediction of adult convictions a Best-Subsets regression analysis was undertaken. Best-subsets logistic regression analysis allows for the comparison of all the possible statistical models using a set of predictor variables. The outcome of this analysis is a list of models which have been determined to provide the best predictions of adult offending. Each model contains varying numbers of, and differing, predictor variables. The AIC is a measure calculated in this analysis that deals with the trade-off between the goodness-of-fit and the complexity of each model in terms of number of predictors (Akaike, 1974). The AIC therefore provides an indication of the relative quality of each of the statistical models which provided an initial measure by which a model was selected for further evaluation. Due to there being a limit of 13 of variables in such an analysis when using STATISTICA 12 (StatSoft, 2013), predictor variables were selected based on how strongly they correlated with adult convictions for the overall stratified sample (as displayed in Table 1.). A list of the selected variables is displayed in Table 8 below for the reader's convenience.

Table 8

Variables Used in the Best-Subset Logistic Regression for Predicting Adult Convictions.

Variables
Sex of the Child
Total Number of Intakes
Number of Prior Care and Protection Intakes
Number of Prior Youth justice intakes
Number of Intakes Prior to Age 10
Number of Prior Youth Justice FGCs
Number of Prior FGCs resulting in Custody or Supervision
Total Number of Prior Court Orders
Number of Prior Court Dates
Number of Court Total Orders Custody/Supervision
Prior Youth Aid Intervention
Number of Prior Intelligence Notes
Number of Prior Occurrences

Results of the AIC comparison indicated that the 'best' model for predicting adult offending included the variables: sex of the child, the number of prior youth justice intakes, the number of prior care and protection intakes, intakes prior to age 10, the number of prior police intelligence notes, and the number of police occurrences records (AIC = 1180.78 (Model 1). The number of prior police intelligence notes and occurrences, and the sex of the child were variables that were also included in the JRS. Although the number of intakes the child received under the age of 10 and the number of both youth justice and care and protection intakes were not included in the JRS, the scale does include the age at which the child received their first intake.

Inspection of AIC values indicate which of the models provide the best fit amongst the set of possible models, but does not provide an analysis of how accurate the models are in predicting adult convictions, nor does it indicate if the addition of any other variables add significantly to the model's ability to predict adult offending. The next best model included the variables from the Model 1 with the addition of the number of youth aid interventions, but the increased AIC value (1181.17) meant that the increased complexity (one more predictor)

was not justified by improved accuracy. Further analyses were required to test the model and to determine if the addition of any of the other variables, not included due to the limited number of variables able to be used in the Best-Subsets regression analyses, provided significantly improved predictions of adult convictions.

3.5 Testing and Refining the Predictive Model

A binary logistic regression analysis was then undertaken to establish how efficiently this model was at predicting adult convictions. The variables that consisted of Model 1 were regressing on to adult convictions. Results displayed in Table 9.

Table 9

Beta Weights and Odds Ratios for the Binary Logistic Regression Where Model 1 was Regressed on to Adult Conviction Data

Variable	B	**Exp (β)**
Sex of the child	0.74***	2.09
Number of Prior Youth justice intakes	0.24**	1.27
Number of Prior Care and Protection Intakes	0.45***	1.57
Number of Prior Intakes Under the Age of 10 Years	-0.19**	0.83
Number of Prior Police Intelligence Notes	0.24***	1.28
Number of Prior Police Occurrences	0.11**	1.11
Constant	-1.23***	0.29
Nagelkerke R^2	1.63	

Note. $*p < .05$, $**p < .01$, ***p<.001

Model 1 was observed as being able to significantly predict adult convictions, relative to chance alone (χ^2=121.73, p=.000) and predictions of adult convictions made by Model 1 did not significantly differ from actual conviction data according to the Hosmer and Lemeshow (2000) goodness of fit test (χ^2=9.16, *ns*). However, the negative beta weight produced for the variable 'Number of Prior Intakes Under the Age of 10 Years' suggested that multicollinearity may be an issue in the model. Multicollinearity is the term used when independent variables in a regression model are highly linearly related (O'Brien, 2007). As collinear variables contain very similar information about the independent variable (adult

convictions in this case) the estimate of each of these variables' impact on the independent variable is likely to be less precise. There is then the risk that the model is 'overfitting' the data, meaning the model is less statistically robust and less likely to reliably predict across other samples from similar populations where the pattern of collinearity patterns differ to the sample in which the model was developed (O'Brien, 2007). In order to establish if the predictor variables were correlated, Pearson's correlation coefficients (*r*) between all six variables in Model 1 were calculated. The results are displayed in Figure 1.

	Care and Protection Intakes	Youth Justice Intakes	Intakes Under Age 10	Intelligence Notes	Occurrences
Sex	-0.11**	0.06	-0.02	0.13**	0.08*
Care and Protection Intakes		0.25**	0.67**	0.25**	0.27**
Youth justice intakes			0.73**	0.50**	0.30**
Intakes under age 10				0.46**	0.32**
Intelligence Notes					0.41**

Figure 1. Correlation Coefficients (*r*) for the Variables in Model 1.

Multicollinearity was not able to be ruled out as a potential issue based upon the results from this analysis. A number of the variables (namely intakes under age 10 with care and protection intakes and youth justice intakes) were found to be highly correlated. In order to further test the hypothesis of multicollinearity, linear regression analyses were completed so that collinearity statistics, Tolerance and Variance Inflation Factor (VIF), could be computed. Tolerance values indicate whether the variable in question has a similar linear combination as the other independent variables in the equation (O'Brien, 2007). Tolerance of

less than 0.20 indicates a multicollinearity problem. The VIF is a measure of the effect of any collinearity between the variables (O'Brien, 2007). VIF values higher than 2.50 may be a cause for concern and a VIF of 5 and above indicates a likely multicollinearity problem in a predictive Model. The first linear regression analysis was undertaken with all six Model 1 variables. Results are displayed in Table 10.

Table 10

The Variance Inflation Factor and the Tolerance Statistics for the Potential Model

Variable	**Tolerance**	**VIF**
Sex of the child	0.96	1.04
Prior Youth justice intakes	0.33	2.99
Prior Care and Protection Intakes	0.41	2.44
Prior Intakes Under Age 10 Years	0.21	4.83
Prior Police Intelligence Notes	0.65	1.53
Prior Police Occurrences	0.79	1.27

Results of the VIF and Tolerance suggest a multicollinearity issue with the number of prior intakes under the age of ten years with other variables as indicated by the prior correlation analysis undertaken. The binary logistic regression analysis was re-run with Prior Intakes Under Age 10 Years removed from Model 1. This analysis yielded a negative beta weight for the variable Care and Protection Intakes. Accordingly, Care and Protection Intakes was also removed from the model used for further analyses which contained 'Sex', 'Prior Youth justice intakes', 'Prior Police Intelligence Notes' and 'Prior Police Occurrences' (Model 2).

A number of hierarchical binary logistic regression analyses were then undertaken to establish if any of the other variables were able to add to Model 2's ability to predict adult convictions. At 'Step 1' the variables that consisted of Model 2 were regressing on to adult

convictions. The other variables were then added at 'Step 2', each in separate analyses. The results for 'Step 1' are displayed in Table 11 below.

Table 11

Beta Weights and Odds Ratios for 'Step 1' of the Hierarchical Binary Logistic Regression Where Model 2 was Regressed on to Adult Conviction Data

Variable	β	**Exp (β)**
Sex of the child	0.70***	2.01
Number of Prior Youth justice intakes	0.21**	1.24
Number of Prior Police Intelligence Notes	0.23***	1.25
Number of Prior Police Occurrences	0.12**	1.13
Constant	-1.12***	0.32
Nagelkerke R^2	0.15	

Note. $*p < .05$, $**p < .01$, ***p<.001

Model 2 was able to significantly predict adult convictions, relative to chance alone (χ^2=111.06, p<.000) and predictions of adult convictions made by Model 2 did not significantly differ from actual conviction data according to the Hosmer and Lemeshow (2000) goodness of fit test (χ^2=5.25, *ns*). Results from 'Step 2' indicated that none of the other variables were able to significantly predict adult convictions after controlling for the predictive ability of Model 2. What these results do not indicate is whether this model is more accurate in predicting adult convictions, relative to the JRS developed by McKinlay et al. (2013), and if it is equally effective for both males and females. Therefore, further comparative analyses were undertaken.

3.6 Comparative Predictions

The accuracy of adult conviction predictions made by Model 2 was analysed using ROC analyses (Rice & Harris, 1995). Results are displayed in Table 12, which also includes for comparison, the ROC outcomes of the JRS in predicting adult convictions (calculated in section 3.3 of this document). Hanley and McNeil's (1983) test of significance of the

difference between two AUCs was then used to compare these results for the overall stratified sample, and for males and females separately.

Table 12

AUCs for predictions of Adult Convictions by the JRS and Model 2, both for the Overall Stratified Sample and for Males and Females Separately

	JRS Scores		Model 2		z-score
	AUC	95% CI	AUC	95% CI	
Overall	.68***	.65-.71	.69***	.66 -.73	2.78*
Males	.68***	.64-.72	.68***	.64-.72	0.00
Females	.59*	.51-.68	.63**	.55-.71	1.85*
z-score	-1.90*		-1.061		

Note. *p < .05, **p <.01, ***p<.001

These findings suggest that Model 2 performed most efficiently in predicting adult convictions. For the overall stratified sample and for females, predictions made by Model 2 were significantly more accurate than those made by the JRS. However for males, the predictions made by the two Models were indistinguishable. Outcomes also indicate that the predictions made by Model 2 for males, compared to females, were of a similar accuracy and not significantly different (z=1.06, *ns*). As noted earlier in the current study this was not the case for the JRS (z=1.90, p<.050).

Although the earlier result of the current study indicated that the risk factors and predictors of juvenile recidivism differ slightly from those for adult convictions, particularly for females, these findings indicate that a statistical model based on youths' social and forensic records is able to effectively predict adult convictions, both in male and female populations. Results also indicate that a model developed specifically for predicting adult convictions from these early risk factors is possible and likely to be more accurate in predicting offending for both sexes than a model developed for predicting general youth recidivism.

Chapter Four - Discussion

A key aim of this study was to determine the percentage of children who, having received a youth justice intake, go on to receive a further conviction. Findings indicate that over half of these children went on to receive a conviction within five years. The study also aimed to assess the JRS's (McKinlay et al., 2013) ability to predict convictions in the longer term. Results suggest that the scale was effective in predicting convictions long term for males, but not so effectively for females. A third aim of this study was to determine if the JRS's prediction of long term convictions could be improved upon, using a statistical model developed specifically for predicting convictions in the longer term. A model was developed using the same predictor variables that were available to McKinley et al. It was more accurate, relative to the JRS, in predicting adult convictions for females. Predictions made for males were indistinguishable from predictions made by the original JRS. These results indicate that a model developed specifically for predicting risk of conviction in the longer term may be beneficial for predicting adult convictions at an early age.

4.1 Interpretation of Findings

4.1.1 Rate of Convictions.

As expected, a high number of children and youth went on to receive a conviction. In fact, the majority of children in both the entire cohort sample and the stratified subsample were shown to have received an adult conviction in the five years after the end of 2002. This indicates that in the cohort sample 2,332 individuals ended up with a conviction. While this number may appear quite high, this sample of youths had a history of antisocial behaviour, which as discussed in the introductory section of this thesis, is a known theoretical and empirical risk factor for offending (Glueck & Glueck, 1950; Leschied et al., 2008; Simourd & Andrews, 1994). This recidivism rate is relatively low comparably to findings regarding

recidivism in young adults released from prison. Analyses undertaken by the New Zealand Department of Corrections have indicated that 70% of those under age 20 were reconvicted at least once, within two years of being released from prisons. This percentage is considerably higher than the 49% rate of reconviction found for the overall adult offenders released from New Zealand prisons (Nadesu, 2009). Although, the age at which an individual displays antisocial behaviour is arguably an indicator of offending trajectory (Moffitt, 1993), only half of the youths in this study's sample, who had an antisocial history, went on to be convicted of a crime in early adulthood. This indicates that this sample have, on average, histories that are perhaps less antisocial that those are both convicted and imprisoned prior to age 20 and who were captured in the New Zealand Department of Corrections analyses.

Males were more likely to have received an adult conviction, in comparison to females (59% compared to 39%). This was also the pattern observed by McKinlay et al. (2013) and is comparable to the New Zealand Department of Corrections' finding relating to the adult population. Their analysis indicated that while 50% of males released from prisons were reconvicted within a year, this was the case for only 33% of females (Nadesu, 2009). The higher rate of offending observed in the current study for males, compared to females, could potentially be due to the groups differing levels of historic antisocial behaviour. The pattern observed in the correlations between records regarding this behaviour and convictions provides some evidence for this and is described next.

4.1.2 Social and Forensic Records and Convictions.

4.1.2.1 Records Pertaining to Historic Antisocial Behaviour.

Males had more contact with police and social services in relation to antisocial behaviour compared to females. For males, the correlations of the social and forensic records with juvenile recidivism were normally about the same as those with adult convictions.

Variables that related to a history of antisocial behaviour, such as the number of youth justice intakes, social worker findings of behaviour and relationship difficulties, the number of court dates and FGCs, court and FGC outcomes, and amount police contact were all significantly correlated with both juvenile recidivism and convictions long term. For females, where there had been a significant relationship between these records and juvenile offending, the correlations weakened when adult convictions were used; more often than not, significantly so. However, three variables pertaining to antisocial behaviour remained significantly correlated with future offending when adult convictions were used, namely, the number of prior youth justice intakes, the number of prior youth justice FGCs and the number of prior intelligence notes. Finding an ongoing relationship between a history of antisocial behaviour and future offending aligns with previous research which has indicated that a history of antisocial behaviour is highly predictive of recidivism (Glueck & Glueck, 1950; Leschied et al., 2008; Simourd & Andrews, 1994). For example, Simourd and Andrews (1994) found, in a meta-analysis that specifically assessed the differences in risk factors between the sexes, that both male and female antisocial behaviours were linked to later delinquent behaviour. The number of the variables pertaining to antisocial histories was higher for males compared to females. This also supports previous research findings have indicated that violent histories are more linked to reoffending in males compared to females. For example, another meta-analysis, which included 57 studies, found that although violent antisocial histories were linked to violent reoffending for males, this was not the case for females (Collins, 2010).

4.1.2.2 Records Pertaining to Problematic Key Relationships.

The records pertaining to care and protection needs were also found to be different between the sexes. In comparison to males, females had more contact with social services regarding care and protection needs. This finding aligns with previous research that has indicated that the prevalence of victimisation in childhood is comparatively higher for

females compared to males offenders (Moore et al., 2013) and that for females this victimisation is more frequent (Wood, Foy, Goguen, Pynoos, & James, 2002). The correlations between the care and protection records and adult convictions differed between the sexes.

For females, there was a significant decrease in the strength of the relationship between care and protection records and later offending when adult convictions were used in place of juvenile recidivism. This was to the extent that, for females, none of these variables were significantly correlated with adult convictions. This was surprising, in that previous research has indicated that female offenders are more likely to consider their experiences of victimisation as being a crucial influence in initiating their criminal behaviour (Belknap & Holsinger, 2006; Hubbard & Pratt, 2002) and that past experiences of abuse are key in the development of antisocial behaviour in females comparatively to males (Andrews & Bonta, 2010). However, females, relative to males, have been shown to be more likely to respond to maltreatment by internalising difficulties and experience problems such as depression (McClellan, Farabee, & Crouch, 1997). This could mean that for those females who were victims of abuse and who then went on to receive a conviction, the abuse could be seen as pivotal in this path, but that on the whole abuse was not linked to a significantly greater risk of recidivism.

For males on the other hand, the overall number of social worker findings, the age at which they received their first care and protection intake, and the number of these intakes associated with care and protection needs were significantly correlated with both juvenile recidivism and receiving a conviction in the longer term. Furthermore, for males, social worker findings specific to physical abuse, though not significantly correlated with juvenile recidivism, were significantly correlated with adult convictions. Research in this area has suggested that males, in comparison to females, are more likely to respond to physical abuse

with externalising and aggressive behaviours (Sullivan, Farrell, & Kliewer, 2006). However, this does not explain the lack of a relationship between physical abuse and juvenile recidivism. While it is possible, given these findings, at first glance, that physical abuse is a risk factor for offending in the longer term, but not in the shorter term, further analyses were undertaken to investigate this relationship further.

Juvenile recidivism had been defined by McKinlay et al. (2013) as at least one subsequent youth justice intake or a conviction (*see* section 2.2.3). Also, recall that the way in which child and youth offenders are managed by the New Zealand justice system is dependent upon the offender's age and the nature of the offending (Ministry of Justice, n.d.). For example, while criminal responsibility begins at age 10, prosecution is limited to murder and manslaughter; from age 12, serious or persistent offending can result in formal convictions; from 14 years onwards youths can be formally charged and prosecuted for any offence. Moreover, as highlighted in the introductory section of this thesis, children who have been maltreated, relative to those who have not been, tend to display antisocial behaviour earlier than their peers (Rivera & Widom, 1990) and are more likely to commit violent offences (Crooks et al., 2007; Lansford et al., 2007; Mulder et al., 2011). Accordingly, further analyses were completed in order to establish if for males, physical abuse is significantly correlated with convictions in the short term which arguably represent more serious or persistent offending; and is not significantly correlated with youth justice intakes. The juvenile recidivism variable used by McKinlay et al. (2013) was separated into two variables (youth justice intakes and convictions, both at 1 year follow up). Using the stratified sample, correlation coefficients were computed for findings of physical abuse with subsequent youth justice intakes and with convictions (both in the short term), separately. This was done for males and females independently.

Findings indicated that for females physical abuse was not correlated with either a subsequent youth justice intake (*r*=.08, *ns*) or convictions (*r*=.03, *ns*) in the shorter term. For males, however, while physical abuse was not significantly correlated with subsequent youth justice intakes (*r*=.06, *ns*), it was significantly correlated with convictions (*r*=.08, p<.050). Therefore, it is possible that, for males, physical abuse is a risk factor for more serious or persistent offending in the short and long term, i.e., behaviour which is relatively unlikely to result in a further YJ intake and instead, more likely to result in a conviction. This finding corroborates the Cambridge Study in Delinquent Development, which followed 411 men from age 8 to age 48. Their findings have suggested that one of the most significant risk factors for persistent and chronic offending is parent's use of harsh discipline with their child, aged between 8 to 10 years (Farrington, 2009). Harsh discipline was defined as parents' who are cruel or harsh and who commonly used physical punishment.

4.1.3 JRS and Convictions.

The JRS as a whole, as opposed to the individual variables from which it was based, also showed a significant relationship with convictions in the long term. More specifically, the JRS scores, generated by McKinlay et al. (2013), were found to be significantly correlated with convictions in the longer term, for the stratified sample as a whole and for females and males separately. However, when compared to the model's relationship with adult convictions, the correlations were found to have significantly declined for females and for the stratified sample overall.

The comparison of AUC statistics revealed that for both the overall stratified sample, and for males and females separately, the JRS significantly differed in the accuracy of the predictions for long term convictions compared to the accuracy of the shorter term follow up published by McKinlay et al. (2013); meaning the model was significantly less accurate at predicting convictions long term. Given that the JRS was developed based on the males in the

stratified sample and was initially evaluated on the stratified sample as a whole, which is predominantly made up of the males, it is expected that there would be a decrease in predictive ability of the tool when assessed using new conviction data. However, given that the JRS was not developed for predicting convictions in the long term and that JRS's AUCs were similar to the reported average AUC of validated second generation assessment tools (Schwalbe, 2007), these findings are noteworthy. Hierarchical binary logistic regression findings indicated that the predictions of conviction in the long term could be improved upon, particularly for females, with a model developed specifically for longer term risk prediction.

4.1.4 A New Model.

The 'best' model able to be developed using best-subsets regression and hierarchical binary logistic regression, with the same set of social and forensic variables, was found to predict adult convictions significantly more accurately than the original JRS for the overall stratified sample and for females in particular. For males, predictions made by the model were practically identical to that of the JRS. Unlike the JRS, the model developed in the current study did not differ significantly in its ability to predict adult convictions for both sexes but included sex as a predictor variable. It must be noted, however, that the model was tested on the same dataset on which it was developed. This means that the model may be capitalising on specific or unique instances in this dataset. Further validation is therefore required to test the efficiency of the model in a separate sample.

The model developed included very similar variables to those used in the JRS. Specifically the new model included: sex, number of care and protection intakes, the number of youth justice intakes, the number of police intelligence notes, and the number of recorded police occurrences. In contrast the JRS included: age at first intake (either care and protection or youth justice), the number of prior court dates, and like the new model it also includes sex, the number of police intelligence notes, and the number of recorded police occurrences. The

key difference between the two models is that the new model includes separately the number of both care and protection intakes and youth justice intakes, as opposed to using the age of first intake. This indicates that, for the purposes of predicting risk of recidivism, the amount, or perhaps the continuity, of maltreatment and antisocial behaviour (represented here as higher rates of care and protection intakes) is more important than the age at which these incidence first come to the attention of social services. It is puzzling, however, that the number of care and protection intakes is not, on its own, directly correlated with convictions in the longer term for females. However, as highlighted in previous research, the relationship between maltreatment and offending is not straightforward, likely different for the sexes, and remains to be fully understood.

Even with the differences reported between males and females in the frequency of contact with social and forensic services, and the link between these records and conviction, the ability of the model to predict convictions in the long term is not surprising. Other juvenile risk assessment instruments have been found upon review to be comparably accurate in predicting the risk of recidivism for both sexes (McKinlay et al., 2013; Schwalbe, 2008). Furthermore, while research has indicated that males and females potentially follow different pathways to offending (Belknap & Holsinger, 2006; Bender, 2010; Bright & Jonson-Reid, 2008), the model developed utilised variables that are indicators of a history of antisocial behaviour, one of the strongest predictors of criminality for both males and females (Andrews & Bonta, 2010; Glueck & Glueck, 1950; Leschied et al., 2008; Simourd & Andrews, 1994).

4.2 Practical Implications

This thesis highlights the high probability that children and youth who receive a youth justice intake will go on to receive a criminal conviction in the long term. It also corroborates and builds on the findings of McKinlay et al. (2013) who conclude that the frequency of

contact with social services and police provides effective static risk factors for recidivism, not only in the short term, but up to five years on. The most central implications of this is the potential for a reduction in uncertainly regarding which of the youths that receive a youth justice intake are likely to receive a conviction.

The 54% conviction rate of the cohort sample, mean that when trying to predict risk of long term recidivism there is maximum possibly uncertainty. Essentially, it is 50:50 in terms of whether or not a youth is going to end up with a conviction. Without a 'risk sensitive' approach, assessments are likely to have a false positive rate of fifty percent and a false negative rate of fifty percent. This means, hypothetically, that half of the individuals provided interventions with such an approach were, potentially, not going to have gone on to receive a conviction anyway. One way of limiting this uncertainly could be with the use of a risk screening tool, such as the JRS or a similar model as was developed in this thesis. This is likely to significantly improve the true positive rate and decrease the false positive rate substantially compared to chance. To highlight this, using the scores generated by the model developed in this thesis, the proportion of individuals who received a conviction were computed for those who scored in the top 25, 50, and 75 percent of the stratified sample. These results are displayed in Table 13.

Table 13

Percentages of the Stratified Sample Convicted at Five Year Follow Up For Varying Proportions of this Sample, Based upon Risk Level as Identified by Model 2

Group	**Proportion Who Received a Conviction**
100% of stratified sample	54%
Top 75%	60%
Top 50%	68%
Top 25%	77%

As highlighted by the figures in Table 13, if an actuarial risk scale was used, based on this type of statistical model, the uncertainty of the chances of an individual receiving a conviction in the long term is likely to be reduced. Ultimately, limited resources normally mean that intervention is unable to be undertaken with every youth, thus intervention is always applied selectively. As such, interventions could be focused more intensively at those whose risk is identified as falling, perhaps, in the top 25% (where more than three quarters of the group are likely to receive a conviction), or even with those scoring in the top 50% (where more than two thirds are likely to receive a conviction). The actual percentage used as the cut off score is likely to be determined by the amount of resources available for intervention, as this would determine how many cases were able to be handled. However, using this approach means that these resources are likely to be used more efficiently than is likely without the use of a risk sensitive screening tool or assessment. Inevitably, even with this improved rate of uncertainty, there is still a miss rate. However, the role of a well-developed model is that it provides a way of minimising this miss rate by improving the chances that resources are invested in a youth whose empirically-determined risk level is high.

A tool developed using variables from the New Zealand Police and Child Youth and Family data base could also be incorporated within the already broad and thorough Tuituia Assessment currently used by Child, Youth and Family services in order to provide quick, automatic and efficient actuarial indication of the likelihood that an individual may reoffend both in the short and longer term. This is likely to help provide effective interventions to those who require it most, and that could potentially steer these youths away from a path of recidivism, reducing both the cost and the suffering associated with victimisation at the hand of crime. It is also likely to reduce the costs in terms of time spent undertaking these types of

assessments where risk is indicated as being very low, allowing for the potential saving of resources which could be allocated for use with those most at risk.

4.3 Limitations

Although the model developed in this thesis is only intended to provide a quick and efficient risk screen, the exclusive use of static variables can be problematic when looking to assess risk over the longer term, from youth into adulthood, as was attempted in the current study. The accuracy of static factors in predicting long term outcomes can be expected to reduce because dynamic factors have the opportunity to change in the meantime, at least potentially moderating actual risk. For example, the sample utilised in this study potentially undertook some form of intervention that may have modified dynamic risk factors. Although early life experiences have been shown to have an empirical relationship with offending in the long run, the pathways from these experiences to offending are complex (Bender, 2010; Piquero et al., 2012) and were not able to be accounted for in the current study. In saying this, the predictive ability of the model developed was observed to be as accurate as third generation tools which incorporate dynamic factors (Schwalbe, 2007). This indicates that although the predictions made by such a tool ought to be interpreted with caution and with consideration of an individual's prospect for change and immediate situation, it is fairly accurate, and the limitation therefore lies in the tool's inability to direct the focus of intervention efforts. While determining a focus for intervention is important, the tools ought to be considered in the context of their purpose. In this case, the purpose would be to provide a quick and economical indication of risk and help to determine who might require further assessment, part of which should include, or perhaps have a focus on, criminogenic needs.

It should also be noted that the process undertaken in matching the conviction data to the stratified sample also provides a possible limitation. Although we can be fairly confident

that the matches made between the adult conviction data and the stratified sample were as accurate as possible, some matches were made with minor differences in name or date of birth, as described in the methods section of this document. Whereas the United States, for example, has system of personal identification in the form of Social Security Numbers, which can be used to track individuals through their social system, New Zealand does not. Therefore, complete certainty regarding the reliability of these matches in this thesis is not possible, potentially limiting the reliability of the resulting predictions.

It is also possible to receive a conviction in an adult court as a youth, should the offences committed be persistent or of a particularly serious nature, meaning that it is possible that individuals may be convicted in adult court during their youth and never again as an adult. Determining which convictions occurred prior to adulthood is not possible when solely using a dichotomous 'conviction/no-conviction' variable, as was the case in this thesis. This limits the ability to generalise the resulting predictions of convictions to predicting who will offend in adulthood per se. It would be of great interest to examine the 5-year conviction histories of these youth in detail, but that information was not available for the present work.

The utilisation of the entire cohort of those who received a youth justice intake, in the 2002 calendar year and the matching conviction data provided the opportunity to prospectively calculate the proportion of those who have received a youth justice intake who go on to receive a conviction. This means the calculation of the proportion of youths who went on to receive a conviction was likely to have revealed the true incidents rate and relative risk of conviction. The disadvantage of using a single cohort is that the findings of this study may not generalise to other cohorts. This may be particularly relevant in New Zealand specifically, where the number of children and youth who have appeared in court since 2007 has decreased by 59% (Ministry of Justice, 2015).

Moreover, as the age of the stratified sample at time of 'assessment' ranged from 13 to 17 years, the results may not be generalisable to individuals who do not fall within this age range. A longer follow up timeframe may have also been of benefit, particularly if the follow up period was determined based upon the age of the individuals in the sample. As the outcome variable was obtained at one time point, the age of each of the individuals within the sample varied. This means that each of the individuals in the sample varied in the opportunity to receive an adult conviction. Having a follow up based upon the age of the individuals would allow each of the individuals the same opportunity to receive a conviction.

4.4 Future Research

As pointed out by McKinlay et al. (2013), in theory, it would be feasible to produce dynamic variables for use in developing a similar type of model as the JRS, using methods of text data mining. Social worker's case notes could be mined. The New Zealand's Child Youth and Family Services database have been shown to include information that is able to be used for the prediction of offending (Vincent, 2010). This could potentially improve the accuracy of long term outcome predictions and provide a general guideline as to which criminogenic needs require further investigation for each individual for treatment purposes.

This process may also provide a means of assessing individuals' strengths or protective factors. Protective factors have been theorised to be factors that adjust, improve or change in some way an individual's ability to manage circumstances that predisposes a dysfunctional outcome (Rutter, 1987), such as offending. It therefore makes logical sense that such factors be considered in the prediction of someone's probability of future offending. However, extremely few assessment tools include protective factors (Ullrich & Coid, 2011). This may be in part due to a lack of consensus around the conceptualisation of protective factors. Protective factors have been defined as the absence of a risk factor or the reciprocal

of risk factors, while others describe protective factors as present without a parallel risk factor (Ullrich & Coid, 2011). In the future, as researchers in the field come to a more comprehensive understanding of protective factors and their relationship with offending, the inclusions of protective factors in a screening tool may provide an indication of factors that ought to be included in subsequent assessment.

Further research could also be undertaken to ensure that this type of tool is able to be used for individuals of all ethnic backgrounds. Significant differences have been found in the predictive validity of individual items of some risk assessments (Schwalbe, Fraser, Day, & Cooley, 2006). Risk assessment tools tend to be more accurate in predicting recidivism in predominantly Caucasian populations; however, this is thought to be due to many of the tools being developed with primarily European origins (Singh, Grann, & Fazel, 2011). The sample used to develop the JRS and utilised in this thesis, however, was ethnically representative of New Zealand youth offenders and is a relatively mixed ethnic sample (see Section 2.2.1.). While McKinlay et al. (2013) reported that ethnicity was correlated with juvenile recidivism for males, ethnicity was not found to predict recidivism over and above the JRS for either sex. Further research could be undertaken to determine the longer term predictive accuracy of a screening tool such as the JRS among individuals of differing ethnicities. This would ensure that risk screening was efficient for youths in New Zealand independent of their ethnicity.

The predictive validity of risk assessment tools are consistently found to differ dependent on the age at which the individuals are assessed (Singh et al., 2011), whereby the older the individual is at the time of assessment the higher the predictive accuracy. Further research could be undertaken to assess the extent to which this type of screening tool is effective for individuals assessed at varying ages. This research would provide an indication as to whether different risk screening tools should be used for children as opposed to

adolescents and to ensure that any screening tool that is used is effective for the age of the individual being assessed.

It would be useful to undertake a similar process as was carried out in this thesis, to develop a model that utilised data pertaining to the nature of the crimes that were committed as an outcome. Analyses that considered the type, seriousness and frequency of offences committed would allow the research to determine how early social and forensic records relate to the nature of convictions. This may potentially enable the prediction of not only who will receive a conviction, but who will commit a serious offence and who will commit offences more regularly.

The length of follow up used in this thesis meant that the long term predictive validity of the JRS was able to be tested more rigorously than in the initial publication, which provided a follow up period of 12 month follow up period. However, future research could utilise a longer follow up period. Recent research has indicated that a late onset of offending may be predicted by different variables to the variables that tend to be related to both early-onset offending and adolescence-limited offending (Zara & Farrington, 2009). With information regarding the nature and frequency of the convictions that occur, a longer follow up would allow for the social and forensic services variables to be analysed in relation to offending trajectories such as desistance from offending, ongoing or escalated offending, and late onset of offending.

4.5 Conclusion

The aim of this thesis was to determine what proportion of children who received a youth justice intake went on to receive a criminal conviction five years on. Results indicate that over half of these children went on receive a conviction by this time. Previous analyses undertaken by the Department of Corrections has suggested that being under 20 when first

imprisoned is linked to a higher rate of recidivism than found in the current study (Nadesu, 2009). Taken together, these findings suggests that while early offending is a risk factor for future offending, other factors (such as age of first imprisonment which is arguably linked with offending that is more serious or undertaken at a slightly older age) is more strongly linked with future offending. The secondary aim of the thesis was to assess the long term predictive validity of JRS (McKinlay et al., 2013) which was found to be significantly less accurate at predicting convictions five years on than it is for predicting recidivism short term. A third aim was to determine if the social and forensic services variables were able to predict convictions in the longer term using a statistical model. This was found to be possible. Although this model provided an improvement of predictions of convictions in the longer term for females, the predictions made for males were indistinguishable from those made by the JRS. These findings support long history literature that indicates that a history of antisocial behaviour is a strong predictor of future antisocial behaviour, for both males and females. It also supports conclusions made by McKinlay et al. (2013), that the development of an automatically scored actuarial model, based on information already held in social and forensic services files and data bases, are able to be used for predicting future offending.

The approach undertaken here provides evidence that supports the conclusions made by McKinlay et al. (2013), that an automatically scored risk screening approach is feasible. Using this approach as a quick indicator of risk of conviction to either identify youths who require further assessment or as a component of a full risk and needs assessment could allow for intervention resources to be implemented efficiently. This may ultimately reduce the rates and associated costs of crime.

NOTE: Statements and opinions expressed are those of the author and not necessarily representative of the Ministry of Social Development, the New Zealand Police or the Department of Corrections.

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Appendices

Appendix A - Approval Letter from the Human Ethics Committee

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2014/11/LR

28 March 2014

Lucy Kioa
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Lucy

Thank you for forwarding your Human Ethics Committee Low Risk application for your research proposal "What proportion of youth offenders go on to offend in young adulthood and can we predict which individuals will?".

I am pleased to advise that this application has been reviewed and I confirm support of the Department's approval for this project.

With best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair, Human Ethics Committee

Appendix B - Approval Letter from the Department of Corrections' Research & Evaluation Governance Committee

16 September 2014

Lucy Kioa
15 Rutherglen Ave
Ilam
Christchurch

Dear Lucy

Congratulations on receiving approval to undertake your research project "What proportion of youth offenders go on to offend in young adulthood and can we predict which individuals will?" with the Department of Corrections.

Enclosed please find two copies of our research agreement for you and a witness to sign. Please return both copies to us in the enclosed pre-paid envelope, and we will have the General Manager sign them and return one to you.

As you already have the dataset you require, you are 'good to go'.

Good luck with your research.

Kind regards,

COfallon

Carolyn O'Fallon
Principal Research Adviser
Research & Analysis

Appendix C - Approval letter from the Ministry of Social Development's Research Access Committee

MINISTRY OF SOCIAL DEVELOPMENT
TE MANATŪ WHAKAHIATO ORA

16 March 2015

15 Rutherglen Ave
Ilam
CHRISTCHURCH 8041

Dear Lucy,

LETTER OF RESEARCH ACCESS APPROVAL
"What proportion of youth offenders go on to offend in young adulthood"

Thank you for submitting a research application dated 2 May 2014 to the Ministry of Social Development (MSD) Research Access Committee (RAC).

This letter of research approval formally confirms your recent discussion with the Research Access Coordinator, and earlier email correspondence dated 6 June 2014, giving your project full research approval.

As specified, your project is subject to a number of research access requirements.

- The thesis contains a summary of the data set used and the variables contained within the sample and research
- The penultimate draft of your thesis and any publication(s) are sent to the Research Access Coordinator for review (to ensure that ethical and privacy considerations are reviewed)
- A report and/or summary of your findings is provided to the RAC/MSD, in addition to a final copy of your thesis

Proceeding with the project requires full acceptance of and compliance with these requirements. Should you have any concerns or questions about these requirements, please contact the RAC's Research Access Coordinator.

As a matter of course, the RAC also asks that you sign a Deed of Confidentiality. This is an acceptance of the way information for which research access has been granted will be used. It also reflects the seriousness of any breach of the information privacy principles contained within the Privacy Act 1993.

The RAC also recommended that the researcher become familiar with the assessment tools and practice guidance already in place within Child, Youth and Family (CYF). It was also suggested that sharing any future research findings based on the sample cohort with CYF through the RAC would be worthwhile.

Good luck with the completion of your research.

Yours sincerely,

Dr James McIlraith
Research Access Coordinator (Acting)
Senior Analyst | Research and Evaluation | Insights MSD (iMSD)

Appendix D – Variable Recoding Specifications from McKinlay et al. (2013)
Values given to variables for different numbers of events in youths histories

Number of Prior Care and Protection orders
0 = 0
1 = 1
2 = 2
3 = 3
>3 = 4

Number of Prior placements
0 = 0
1 = 1
2 = 2
3–6 = 3
>6 = 4

Number of Prior Youth Justice intakes
0 = 0
1 = 1
2 = 2
3 = 3
>3 = 4

Number of Prior Police Contact (Intelligence Notings)
0 = 0
1 = 1
2 = 2
3-4 = 3
5–6 = 4
>6 = 5

Number of Prior Youth Justice-Family Group Conferences
0 = 0
1 = 1
2 = 2
3 = 3
>3 = 4

Number of Prior Occurrences
0 = 0
1 = 1
2 = 2
3 = 3
4 = 4
5–6 = 5
>6 = 6

Total Prior Intakes
0 = 0
1 = 1
2 = 2
3 = 3
4 = 4
5 = 5
6 = 6
>6 = 7

Number of other Prior Youth Justice Outcomes
0 = 0
1 = 1
>1 = 2

Number of Prior social worker Findings
0 = 0
1 = 1
2 = 2
3 = 3
>3 = 4