Dimensions of Delinquency

Exploring group differences in the prevalence and frequency of offending: A linkage based study of offending in the Western Australian population

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Anna Ferrante

Bachelor of Arts, Diploma of Education

Crime Research Centre, Law School

University of Western Australia

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Abbreviations

ALs	Adolescent-limited offenders – see Moffitt (1993)
APC	Age, period and cohort (effects)
ABS	Australian Bureau of Statistics
BIC	Bayesian Information Criterion
CBC	Community Based Corrections system (database)
CHIPS	Children's Court and Petty Sessions Case Management System (database)
CRC	Crime Research Centre, University of Western Australia
CRIS	Database containing children's panel data (Department for Community Services)
DCP	Department for Child Protection
DCS	Department of Corrective Services
DL	Data Linkage
DLB	Data Linkage Branch, WA Health Department
DLC	Developmental and/or Life-Course
DPP	Developmental Pathways Project (research project, ICHR)
ERP	Estimated Resident Population
FA	Female, Aboriginal
FN	Female, non-Aboriginal
GMMs	General mixture models (McLaughlan and Peel, 2000)
HLMs	Hierarchical linear models (Raudenbush and Bryk, 2002)
HoDWA	Health Department of Western Australia
HREC	Human Research Ethics Committee
ICD	International Classification of Diseases (World Health Organization, 2008)
ICHR	(Telethon) Institute for Child Health Research http://www.childhealthresearch.org.au/

INOIS	Integrated Numerical Offender Identification System (Ferrante, 1993)
JJT	Juvenile Justice Teams (a form of juvenile diversion in Western Australia)
LBW	Low birth weight
LCGAs	Latent class growth analysis e.g. Muthen (2006)
LCPs	Life course persistent offenders - see Moffitt (1993)
MA	Male, Aboriginal
MN	Male, non-Aboriginal
NATSI	National Aboriginal and Torres Strait Islander
NATSISS	National Aboriginal and Torres Strait Islander Social Survey (ABS, 2004)
NAPLAN	National Assessment Program – Literacy and Numeracy
OCC	Odds of Correction Classification
OLS	Ordinary least squares
OR	Odds ratio
prf	perinatal risk factors
PM	Prevalence measure
RCIADIC	Royal Commission into Aboriginal Deaths in Custody
SEIFA	Socio-Economic Indexes for Areas
SLA	Statistical Local Area
SOP	Study Offender Population
SPGM	Semi-parametric group based modelling (Nagin and Land, 1993)
TOMS	Total Offender Management System (database)
WA	Western Australia
WADLS	Western Australian Data Linkage System
WALNA	Western Australia Literacy and Numeracy Assessment
YOA	*Young Offenders Act (WA) 1994*

Summary

Aim and Methods

The purpose of this thesis is to gain a deeper understanding of the development of offending over the life course and to explore if, and how, offending behaviour varies in ways that reflect the diversity of the general population. The thesis documents the prevalence and frequency of offending in the Western Australian population and investigates whether or not there are observable "group" differences in these criminal career dimensions. "Groups" of primary interest are those defined by gender and Aboriginal status. The study uses linked, administrative data drawn from multiple government agencies. A risk factor framework is used to identify the correlates associated with participation in and frequency of offending. While the identification of correlates *per se* does not make explicit the mechanism by which these factors affect offending, the process is seen as an important first step towards a deeper and more causative explanation of why people offend.

Key findings

Key findings to emerge from the research are:

- Official offending is unevenly distributed in the general WA population. Offending prevalence is highest amongst males and the Aboriginal population. Aboriginal children have much earlier contact with the criminal justice system than non-Aboriginal children.

- A review of long term trends in prevalence finds evidence of net-widening following reforms to the WA juvenile justice system in the 1990s. The reforms had a much

greater impact on the Aboriginal population than on other segments of the population. The individual frequency of offending was also found to have increased during 1990s, suggesting that the structural reforms of the period may also have made the justice net denser. The results point to the need for more effective monitoring and evaluation of policies, as they may result in differential effects or unintended consequences.

- Life-course patterns of offending, as modelled through group based offending trajectories, appear similar (in terms of the number and shape of trajectories) across gender and ethnic groups. This suggests that offending pathways are more shared than different across the offender population. An exploratory study of the factors associated with trajectory membership found that few of the available risk factors could discriminate between trajectories for any gender/ethnic offender group.

- Many risk factors associated with *participation* in offending were found to be shared across gender and/or ethnic group. The most significant risk factors associated with participation in offending include gender, Aboriginal status, assault victimisation, drug and alcohol abuse, being placed in out-of-home care, maltreatment in adolescence, sibling criminality, parent death, family mobility, low school achievement and neighbourhood disadvantage.

- Although there are some risk factors that are unique to a particular gender and/or ethnic group, on the whole there appear to be more similarities than differences in participation risk factors suggesting common underlying causal processes. The findings support the view that general, dynamic theories of crime may be better descriptors of offending participation that more specific ones.

- In terms of Aboriginal offending, two factors emerge as being protective against involvement in crime – connection to community and cultural strength. The evidence suggests that these factors may be at least as influential as some of the more

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recognised protective factors (e.g. educational achievement) in reducing Aboriginal involvement in crime.

Conclusion

Results from the study provide essential information to theorists, researchers and practitioners taking a developmental approach to crime and crime prevention. The study is one of few empirical studies to demonstrate how offending varies across both gender and ethnicity. Although the study finds some evidence of differences between these groups, the differences are generally on a smaller scale, suggesting that gender specific and/or ethnic specific pathways may only be relevant to selected sections of the population. From a policy perspective, this suggests that primary gender- and/or ethnic- specific interventions may only need to be designed for certain sub-groups and targeted at selected developmental factors only. The study also extends knowledge and offers new insights into the positive and negative forces shaping the relationship between Aboriginal people and the Australian justice system. This is important because Aboriginal over-representation in the justice system remains one of the most intractable social issues facing Australia.

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Preface

The purpose of this thesis is to gain a deeper understanding of the development of offending over the life course and to explore if, and how, offending behaviour varies in ways that reflect the diversity of the general population. Adopting a criminal career/developmental approach, the research seeks to document the prevalence and frequency of offending in the Western Australian population and identify observable "group" differences in these criminal career dimensions. "Groups" of primary interest are those defined by gender and Aboriginal status. A risk factor framework is used to identify the correlates associated with participation in and frequency of offending. While the identification of correlates *per se* does not make explicit the mechanism by which these factors affect offending, the process is seen as an important first step towards a deeper and more causative explanation of why people offend. Results from the study are important in the development of empirically grounded theories of offending and in the development and implementation of effective (and potentially targeted) criminal justice policies/interventions.

The thesis has a further methodological objective - to test the feasibility of using record linkage methods for social science research by bringing together and analysing longitudinal, population level, multi sectoral data from administrative collections. Population level data provides a powerful tool for identifying risk and protective factors, for investigating often overlooked sub-groups, for evaluating research outcomes and for targeting prevention efforts and service delivery. While data linkage methods are common in epidemiological research, their use in criminological and multi-disciplinary social studies is relatively underdeveloped.

A population level analysis of delinquency using multi-sectoral data linkage methods has not previously been undertaken in Australia.

To help guide the research, the thesis poses a series of research questions (see Chapter 1, section 1.11) which are answered through a series of discrete but related studies (described in Chapters 3 to 7). The first of these, Sub-study 1 (Chapter 3), focuses on *participation* in offending. To begin, the study takes a macro look at participation in offending, aggregating individual participation across the population to estimate prevalence levels. Using multiple birth cohort data drawn from linked records of offending, the study estimates the prevalence of offending for specific sub-groups within the population (i.e. males, females, Aborigines and non-Aborigines). For each of these groups, the study investigates whether prevalence has changed over time and whether this trend can be accounted for by changes in the age structure of the population, period effects and/or cohort variations.

The second and third studies both explore another criminal career dimension - the *frequency* of offending. The second study (Chapter 4) uses descriptive statistics and linked, population level offending data, sourced from official records of police arrest and juvenile justice diversion in Western Australia (WA), to examine how offending frequency varies not only *within* individuals (i.e. with age) but also *between* distinct groups of individuals. The study examines the age-offending frequency relationship through the derivation of age-crime "curves" which are estimated for the total offender population, as well as for a number of offender sub-groups defined on the basis of offence type, gender, Aboriginal status, geographic locations, age of onset and birth cohort.

The third study (Chapter 5) extends the investigation of the *frequency* of offending through the use of more sophisticated statistical techniques (semi-parametric group based methods). The study explores the hypothesis that there may be latent offender groups defined on the basis of some otherwise unknown or "latent" characteristic. Testing this hypothesis, the study investigates, first, whether such sub-groups of offenders follow distinctively different offending trajectories and, second (and in line with thesis objectives), what factors might account for these distinctive pathways.

The fourth study (Chapter 6) makes most use of *linked*, *cross-sectoral* data, drawing on administrative information sourced from a broader spectrum of government agencies (including health, education and child protection). The study examines *participation in offending* at the micro (individual) level. Using a case-control design and a multi-factorial regression framework, the study estimates the effects from a range of individual, family and community factors on participation in offending. Continuing with the thesis theme of exploring group difference, the study considers different sections of the population and investigates if, and how, the associated risk factors vary across groups. The study finds that the population groups share many common risk factors; however, some important differences also emerge.

The fifth and final study (Chapter 7) takes a combined look at both participation in, and frequency of, offending. Owing to the extraordinarily high level of involvement of Aboriginal Australians in the criminal justice system, the enquiry focuses exclusively on the Aboriginal population. As an alternative to official records and, in part, as a way of validating the use of linked data, the study makes use of self-reported data rather than official, administrative records. The study uses the 2002 National Aboriginal and Torres Strait Islander Social Survey

(Australian Bureau of Statistics, 2004b) to estimate the influence of various individual, family and community factors on both participation and frequency levels. As the survey collected much more detailed personal, family and community information than was available from official records, it was possible to explore whether "culturally specific" factors such as cultural strength have a role in the interplay between Aboriginal people and the justice system.

To improve the flow of the thesis, there is an introduction which is presented as Chapter 1. This comprises an extensive review of the literature, identification of current issues/research gaps, and a list of guiding research questions. Chapter 2 describes the administrative datasets and data linkage methods that were used in the research. Chapters 3 to 7 describe the separate but related sub-studies – each with background, methods, results and discussion. A summary of the main findings and subsequent general discussion is provided in Chapter 8.

Ethics approval for the research was obtained from the University of Western Australia Human Ethics Committee, the Confidentiality of Health Information Committee of the WA Department of Health and the WA Aboriginal Health Information Ethics Committee. Approval was also obtained from the Research and Evaluation Committee of the WA Department of Corrective Services.

1. Background, Literature Review and Research Questions

1.1 Rationale for the study

The primary aim of this thesis is to identify and explore group differences in the prevalence and frequency of offending. The rationale for doing this is simple - to provide a better understanding of offending so as to inform criminological theory and develop more effective (and, potentially, better targeted) crime prevention and crime reduction strategies. By charting the distinctive developmental pathways of criminal activity for different groups of offenders, and by understanding what factors influence these distinct pathways, policymakers and practitioners will be better placed to determine *whether* and *how* clusters of offenders can be targeted with specific interventions. Through the identification and understanding of specific offender groups, it may be possible to test whether those following different pathways respond differently (and, arguably, positively) to specific interventions.

As will be evident, the notion of "group difference" permeates this thesis. A proposition constantly put forward (and tested) is that there are meaningful sub-groups or taxonomies within the population that follow distinctively different developmental pathways. Some of the groupings are identified *ex ante*, that is, on the basis of some known or predefined characteristic such as gender or Aboriginal status. However, in some instances and where the data permits, groupings are explored *post ante,* that is, based on some latent characteristic. Latent offender groups are identified through the use of specialised statistical modelling -

specifically, semi-parametric group based modelling. A grouped or taxonomic approach in research has been shown to be useful for summarising and simplifying very complex patterns in data. By identifying clusters of individuals with similar developmental pathways, differences that may explain or predict individual level heterogeneity can be expressed in terms of group differences. This approach is particularly appealing to government because, due to scale and cost-effectiveness, interventions and services are typically delivered at population or group based level rather than at an individualised level.

The thesis adopts a criminal career/developmental perspective on offending. The criminal career paradigm, originally presented by Blumstein, Cohen, Visher and Roth (1986), structured offending into constituent parts which included participation (or, prevalence, when aggregated i.e. the proportion of a population that participates in crime); frequency (i.e. the rate at which an individual commits crimes); duration (i.e. the length of a criminal career; includes notions of persistence and desistance) and crime type or mix (includes consideration of the seriousness of offending and whether offenders specialize in a type of crime or escalate to more serious offences over time). The two most fundamental criminal career "dimensions" are participation in and frequency of offending. Both are studied in this thesis.

It has been claimed that criminal career research has influenced both the evolution of developmental/life-course (DLC) theories and the advancement of developmental crime prevention initiatives, contributing a substantial body of evidence on offending over the life-course (Farrington, 1990). However, the criminal career framework has also been criticised for being atheoretical and for its limited ability to address causation (Piquero et al., 2003). These criticisms, coupled with methodological advances in the last decade (such as advent and growing utilisation of multi-level statistical modelling), have led to a paradigm shift away

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from the analysis of criminal career dimensions towards a search for, and understanding of, risk factors. According to Piquero and colleagues (2003), this "represents a significant advance in criminology and has fostered links between explanation and prevention, fundamental and applied research, and scholars, policymakers and practitioners." (Piquero et al., 2003: 469)

Despite some criticism [see, for example, Case (2007) and later O'Mahony (2009)], the risk factor paradigm has been alluring to both researchers and policymakers. Proponents argue that by identifying characteristics correlated with offending it may be possible to develop effective and targeted strategies to moderate deviant or anti-social behaviour, to improve life circumstance and, ultimately, to enhance the strength and safety within communities. The Communities that Care program (Hawkins and Catalano, 1992) is often cited as a successful example of how a focus of risk and protection factors can be helpful in intervention policy and practice.

Bernard et al. (2010) maintain that the risk factor paradigm also has utility for the development of criminological theory. Their view is that the risk factor approach is 'integrative' in the sense that it allows many factors to influence crime (allowing some factors to have larger effects than others) without the need to subscribe to any one particular theory. According to Bernard and his colleagues, the risk factor approach allows for graduated conclusions. Factors identified by some theories may explain a lot of the variation in crime, while the factors identified by other theories may explain only a little. The authors contend that criminological theories ought to be interpreted and classified in terms of their 'location of independent variation' and 'direction of causation'. In this way, the approach can highlight the policy implications of a theory by focusing on what the theory proposes as causes of

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crime. They argue that the risk factor framework "allows criminology to increase the explanatory power of its theories and identify practical policy implications that may ultimately reduce crime" (Bernard et al., 2010: 342)

Studies over the past three decades have identified a raft of factors that are either "correlated" with or argued to "predict" delinquent behaviour. These factors are often categorised into those that relate to individual characteristics, to family functioning, to schooling and peers, and to broader community influences. Individual based risk factors include, for example, low birth weight, hyperactivity, impulsivity, low IQ, mental health problems, drug use, gender (being male), ethnicity and early age of onset of offending. Family factors linked to offending include lack of parental supervision, neglect, physical abuse, violent behaviour, parental criminality and parental or family drug use. Delinquent peers and neighbourhood poverty have also been linked to offending. A number of reviews present structured lists of risk factors and protective factors (Loeber and Farrington, 1998a; Huffman et al., 2000; Wilson and Dunne, 1998). Loeber and Farrington (1998a) maintain that the risk factors for child delinquency lie, initially, within the individual and, second, within the family. As the child's social domain increases to include school and peers, so too do the influences from these other domains. In Australia, the National Crime Prevention Pathways to Prevention Report (National Crime Prevention, 1999) reviewed the literature on risk and protective factors associated with offending and categorised them along similar lines. Table 1.1, which summarises risk factors for antisocial and criminal behaviour, is taken from that Report. A more detailed discussion of such risk factors is presented in Section 1.6.

Table 1.1: Risk factors for antisocial and criminal behaviour

RISK FACTORS				
CHILD FACTORS	**FAMILY FACTORS**	**SCHOOL CONTEXT**	**LIFE EVENTS**	**COMMUNITY AND CULTURAL FACTORS**
prematurity low birth weight disability prenatal brain damage birth injury low intelligence difficult temperament chronic illness insecure attachment poor problem solving beliefs about aggression attributions poor social skills low self esteem lack of empathy alienation hyperactivity/disruptive behaviour impulsivity	*Parental characteristics:* teenage mothers single parents psychiatric disorder, especially depression substance abuse criminality antisocial models *Family environment:* family violence and disharmony marital discord disorganised negative interaction/social isolation large family size father absence long term parental unemployment *Parenting style:* poor supervision and monitoring of child discipline style (harsh or inconsistent) rejection of child abuse lack of warmth and affection low involvement in child's activities neglect	school failure normative beliefs about aggression deviant peer group bullying peer rejection poor attachment to school inadequate behaviour management	divorce and family break up war or natural disasters death of a family member	socioeconomic disadvantage population density and housing conditions urban area neighbourhood violence and crime cultural norms concerning violence as acceptable response to frustration media portrayal of violence lack of support services social or cultural discrimination

Source: Table 3.1, National Crime Prevention Pathways to Prevention Report (National Crime Prevention, 1999)

Given so much prior research on identifying the correlates and predictors of offending, an important question to ask, then, is: *Why embark on a similar quest?* There are several reasons:

- First, there are few studies based on large, multiple cohort, population-sized samples. The influential and often cited Cambridge Study in Delinquent Development (Farrington, 2001; West and Farrington, 1973), for instance, identified a broad range of personal, family, and community risk factors associated with offending, yet this influential study was based on a sample of only 411 London boys. Such a small sample size makes findings difficult to generalise. There are a significant number of other studies based on larger samples; however, few are at population level. Of 15 'classic and contemporary' criminal career studies reviewed by Piquero and

colleagues (2003), the largest study comprised 27,160 individuals from only one birth cohort (Philadelphia residents, born in 1958), while the smallest had just 411 boys draw six schools (the Cambridge Study).[1] Multi-cohort, population level studies have design strength and significantly fewer methodological problems relating to loss to follow-up, recall, selection, response and reporting bias than smaller, single cohort studies.

- Second, few studies are based on Australian data. Of the studies reviewed by Piquero and colleagues (2003), none were based in Australia (nine were based in the U.S., two in Canada, one in Europe and one in New Zealand). Some European researchers have claimed that it may be dangerous to generalise findings from American studies owing to differences in gun usage, gang involvement, drug laws, income inequality and concentrations of poverty (e.g. Wong et al., 2010). This same claim can be made for Australia. A further point of difference between Australia and the U.S. and Europe is the persistently high rate of contact between Aboriginal Australians and the criminal justice system - an issue discussed in more detail in later chapters.

- Finally, there is much discussion in the literature surrounding group based differences in offending - in particular, differences based on gender and ethnicity; however, there is little empirical evidence which demonstrates *how* risk factors vary *across* these groups. Gender and ethnicity, in particular, are two of the most important predictors of offending, yet there is surprisingly little data which demonstrates how individual, family and community based risk factors vary *across* these groups.

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[1] This is based on information from Table 1, Piquero et al (2003), pp. 364-365.

In the review of literature which follows, evidence is presented to further support these assertions. The review begins with discussion of some theoretical concepts, leaning heavily on perspectives from DLC criminology. This is followed by a discussion of criminal career dimensions (prevalence/participation and frequency of offending) and of offender taxonomies and trajectories. The final parts of the review focus on risk factors. Given the central focus by this thesis on risk factors, the discussion here is longer and more detailed than others. An important part of the discussion on risk factors focuses on gender and ethnic based differences. Throughout the review, relevant research gaps and issues are identified.

1.2 Developmental theories and models of offending - perspectives from criminology

Understanding the origins of, and influences on, offending is essential for determining effective prevention and intervention strategies. Criminologists have taken a range of positions regarding the extent and origins of offending. DLC theories offer one perspective – they contend that individual offending is influenced by developmental patterns which change over time and with age. DLC theories focus on behaviour over the life-course and consider both continuity and change (and their causes) within a temporal dimension (Loeber & Stouthamer-Loeber, 1996). DLCs are therefore challenged to explain within-individual change as well as between-individual differences (Farrington, 2005b).

Some of the more influential DLC theories include Lahey and Waldman's (2005) psychological model, Catalano and Hawkins' (1996) 'social development model', Sampson and Laub's general age graded theory of social control (Laub and Sampson, 2003; Sampson

and Laub, 1993), Patterson's social learning model (1982), and Thornberry and Krohn's (2001) interaction theory.

There are some researchers within the developmental domain, who contend that there are distinct groups of individuals that follow different age related patterns of development. Each sub-type or class of offender has its own defining characteristics (which may, or may not, include time stable patterns) and its own developmental etiology (Moffitt, 1993; Patterson, 1982; Nagin and Land, 1993). Moffitt's (1993) developmental taxonomy of antisocial behaviour is one of the earliest typologies of offenders.

1.2.1 Moffitt's taxonomic theory

Moffitt's (1993) theory is arguably the most known and tested taxonomic theory of offending[2] (see, for example, Bartusch et al., 1997; Tibbetts and Piquero, 1999; McGloin et al., 2007). Her theory posits two types of offenders – those dubbed "adolescent-limited" (AL) and those labelled as "life-course persistent" (LCP). The offending patterns of each group are theorised to be quantitatively and qualitatively different and are ascribed to different 'root causes'.

Moffit's Adolescent-limited offenders

Moffitt (1993) argues that for the AL, offending arises when the gap in maturity (i.e., the gap between biological maturation and access to adult privileges and responsibilities) is combined with peer social context. The causal factors associated with offending are proximal, that is, specific to the period of adolescent development. Some of the defining characteristics of this

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[2] The inclusion of testable hypotheses about differential predictors and outcomes (p. 694) in Moffitt's original specification of the theory make the latter all the more possible.

period include variability in biological age, increasing importance of peers and awakening of teenagers' self-conscious values, attitudes and aspirations.

Moffitt argues that mimicry and reinforcement are the principal drivers of AL offending. The desire for acknowledgement and for adult power and privilege (which come with maturity) are seen as the prime motivators for adolescents. When combined with exposure to peers – particularly those who already have access to income or possessions, or who have broken free from the control of parents, this produces a form of "social mimicry" or a yearning for and learning of the behaviour of LCPs in their midst. Further, the negative consequences of delinquency (i.e. formal and informal sanctions) act to reinforce delinquency. Moffitt asserts that, for ALs, antisocial behaviour is an effective way of knifing off parental apron strings, proving that young people can act independently in conquering new challenges. Above all else, delinquency is a way of demonstrating autonomy from parents and teachers, and winning acceptance from peers.

Moffitt contends that, for ALs, antisocial behaviour is temporary (thus, unstable over the life-course). Further, it is argued to diminish as ALs mature into adulthood. It is also inconsistent across situations. According to Moffitt, inconsistency and instability suggest that engagement in deviant lifestyles may be under the influence of other factors such as waning motivation and varying punishment contingencies. For instance, she argues that ALs are likely to engage in antisocial behaviour in situations where such responses seem profitable to them, but are equally likely to abandon such activities if/when pro-social options offer more rewards.

Unlike LCPs (described below), ALs are not subject to cumulative or contemporary continuity. Antisocial behaviour of ALs is seen to be normative, adaptive social behaviour.

Moreover, ALs engage primarily in offences that symbolise adult privilege or autonomy from parental control (e.g. vandalism and "status" crimes such as theft). LCPs, on the other hand, engage in a variety of offences including those that are often committed alone or that are committed against others (e.g. violence, fraud).

Moffitt's Life-course Persistent offenders

Moffitt argues that the aetiology of offending for LCPs is very different. For LCPs, offending is the result of interaction between neuropsychological factors and the social environment. Moffitt (1993) contends that LCPs are an extreme group, comprising only a small group of individuals (about 5% of the general population). Individuals in the category are more likely to start offending early, to persist with offending into adulthood, to be lone offenders and to be more violent than ALs. Moreover, LCPs are likely to exhibit persistence or continuity across a range of antisocial behaviours throughout the life-course and in different situations.

According to Moffitt, the antisocial behaviour exhibited by LCPs is persistent (i.e. continuous over the life-course) and pathological; but not pre-determined. She claims that its origin is located early in childhood and is formed through interactions between a child's neuropsychological vulnerabilities and their poor social environment. Moffitt argues that neuropsychological dysfunctions disrupt normal development and that these deficits, in turn, interact with various 'criminogenic' aspects of the rearing environment to detrimental effect. Children with problem or 'difficult' behaviours are a challenge for any parent; however, the challenges are magnified when the parents themselves exhibit similar temperament, personality traits and/or cognitive abilities, or when the social environment lacks the resources or structure to foster effective parenting and pro-social development. Moffitt contends that 'the juxtaposition of a vulnerable and difficult infant with an adverse rearing context initiates

risk for the life-course-persistent pattern of antisocial behaviour. The ensuing process is a transactional one in which the challenge of coping with a difficult child evokes a chain of failed parent-child encounters' (Moffitt, 1993: 682).

Moffitt argues that cumulative and contemporary processes maintain antisocial behaviour across time and encase individuals in a "pervasive adult life-style". She identifies two sources of continuity that act to narrow options for change in these LCP individuals. First, they fail to learn conventional pro-social behaviour early in life and so lack recourse to alternative conformist behaviour. Second, they become ensnared in a deviant life-style through their own personal characteristics (e.g. low self-control, impulsivity and inability to delay gratification) and through labelling early in life (which, she argues, forecloses later opportunities). In short, the behaviour of LCPs is increasingly maintained and supported by narrowing options for conventional behaviour. Moffitt asserts that although the 'topography' of antisocial behaviour may change over time, the underlying propensity or disposition to antisocial or criminal conduct is otherwise time stable.

In all, Moffitt's taxonomic theory explains offending over the life-course through the explicit recognition of qualitatively distinct groups of offenders, some of whom offend only for a short time while others offend at higher rates and over longer periods of time. Her taxonomic view of offenders is shared by others. For example, Patterson and colleagues (Patterson, 1996; Patterson & Yoerger, 1997) identified trajectories for Early- and late- onset juvenile offending.

Evidence supporting Moffitt's theory

There is considerable evidence to support the assertion that there are distinct groups or types of offenders with distinct trajectories of offending behaviour. A consistent finding to emerge from numerous criminal career studies is the identification of a small group of offenders, so called 'chronic offenders', who account for a disproportionate amount of all crime (Piquero et al., 2003; Cohen, 1986). Some studies have lent specific support to Moffitt's dual taxonomy theory. A New Zealand study based in Dunedin (Moffitt et al., 1996) showed that LCP offending is *differentially* predicted by individual risk factors (temperament, neurological abnormalities, delayed motor, low IQ, reading difficulties, hyperactivity) and parenting risk factors (teenage single parents, mothers with mental health problems, harsh or neglectful parenting, family conflict, inconsistent discipline, low family SES). AL offending was, on the other hand, associated with delinquent peers. Tibbetts and Piquero (1999), too, found that the biosocial interaction of low birth weight and disadvantage *predicted* early onset (but not late-onset) offending and violent (but not non-violent) offending. Piquero and Brezina (2001), also, found AL offending was rebellious (non-violent) and predicted by maturational timing and peer activities related to personal autonomy. Other studies, including a six site cross-national study (Broidy et al., 2003), have found similar associations. In Australia, the Australian Temperament Project (Vassallo et al., 2002) identified three clusters of children labelled 'low/non-antisocial', 'experimenter' and 'persistent' in terms of their antisocial behaviour. Identifiable differences emerged between the 'low/non-antisocial' and 'persistent' groups from the beginning of primary school, and differences between 'low' and 'experiment' groups from early adolescence. The groups also differed on family environment and individual characteristics.

1.3 Perspectives from other developmental domains

The following section introduces the concepts of latency and pathway models and draws links with other developmental perspectives to provide further insight into the study of antisocial and criminal behaviour. The area of developmental health provides one such perspective. It is a relatively new discipline with a focus on integrating theory, concepts and research evidence from a variety of academic and health disciplines to improve developmental outcomes (Kendall, 2003). Keating and Hertzman (1999) coined the term 'developmental health' and maintain that physical and mental wellbeing, coping and competence in populations arise largely as a function of the quality of the social environment. The developmental health domain shares or adopts a number of key concepts from the child development area.

There are commonalities between developmental health and DLC criminology. For instance, both perspectives study the factors within individuals, families and communities that contribute to poor developmental outcomes (juvenile delinquency is seen here as one of these outcomes), both are interested in the interplay between factors and both conceptualise pathways of development. However, developmental health differs from developmental criminology in some important respects. Firstly, its field of interest is much broader than the spectrum of outcomes normally studied by developmental criminologists. Typically, the range extends beyond antisocial behaviour, conduct disorders, aggression and criminal behaviour. Second, both its historical origins and its strong emphasis on *health* outcomes mean that aspects of biochemistry, genetics, biology and physiology are incorporated into theoretical and conceptual models of development. These are not usually found in criminological models (although the situation is gradually changing). Third, the general approach within the field is to support *integrated* research and to seek complementary explanations rather than competing

ones. As a consequence, debates about the influence of 'nature' (genes) versus 'nurture' (environment) have been transformed into discourses about interactions between these factors and the causal mechanisms which sustain them.

Influential theories in the area include those proposed by Bronfenbrenner (1979), Cicchetti and Cohen (1995) and Gottlieb (1992). Bronfenbrenner conceptualised an ecological model (subsequently upgraded to a bio-ecological model to incorporate the interactions between genes and the environment) in which a person is seen to develop within a nested setting. At the core of models is the individual themselves (the micro-system). Surrounding the individual is their *immediate* social setting containing the family, school and local neighbourhood (the meso-system). Beyond this is the exo-system, a setting which is near to the individual but does not bear directly on them. At the outermost level is the macro-system which incorporates the wider society, culture and belief systems. An abundance of studies in the developmental sciences area have shown human behaviour to be a function of these nested individual, family and environmental risks. More often than not, these factors are found to operate in bundles and to be interconnected.

Influenced by child development, the developmental health area places a heavy emphasis on the impact of early childhood experiences on later life. The interaction between biological, psychological, and social factors are especially important in early childhood when the brain and the nervous system undergoes its most dramatic development (Shonkoff and Phillips, 2000: 185). Hertzman and Keating (1999) propose two alternative explanatory models for this effect – a 'latency' model and a 'pathways' model. The latency model posits that during childhood there are critical periods for development in which children's brains need appropriate nutrition and stimulation to establish neural pathways. If neural pathways are not

established at critical times then development in areas such as language, numeracy, literacy and behaviour may be compromised. The pathways model, on the other hand, posits that 'life events and the reinforcing effect of different psychosocial and socio-economic circumstances throughout the life cycle' impact on developmental trajectories (Keating and Hertzman, 1999). The hypothesis is that poor neural development influences outcomes and reduces opportunities in the short term, which in turn lead to longer term implications. Keating and Hertzman used the term 'biological embedding' to describe the process of early experiences affecting wellbeing over the life-course. The developmental concept of 'pathways' is characterised by the notion that a risk at one point can leave an individual vulnerable to a new risk at the next life phase. It is not simply that a risk continues with time or increases. Rather, it is that each phase of life carries the possibility of new kinds of risks and that some individuals will accumulate these over time.

1.4 State dependence, population heterogeneity and alternative theories of crime

The discussion concerning 'latency' versus 'pathways' models can be matched to a similar discourse in developmental criminology over 'state dependence' and 'population heterogeneity'. The latter terms are used in competing explanations of crime and appear in debates on the relationship between past and future offending. The 'state dependence' argument proceeds on the basis that changes in life circumstances lead to changes in offending, facilitated through a number of mechanisms such as reduced opportunities, differential association, labelling, attenuated social bonds, and so on. 'State dependence' is often associated with 'dynamic' theories of crime because these posit that life events affect an

individual's *propensity* to offend.[3] Population heterogeneity, on the other hand, asserts that an individual's propensity to offend is determined early in the life-course and, though it may vary from person to person, is otherwise time stable. Population heterogeneity is often associated with static theories of crime such as Gottfredson and Hirschi's general theory of crime (1990).

Most developmental theories align to 'state dependence' and are considered to be dynamic theories of crime. However, taxonomic theories such as Moffitt's (1993) and Patterson's (1982) are more complex and combine elements of both state dependence and population heterogeneity. Rather than proposing a single, general causal process that applies to all individuals, these theories posit that different offenders follow different pathways. Thus, offenders differ by 'type' rather than by 'degree', and the associated pathway for each 'type' of offender also differs. Moffitt's LCPs, for example, are defined by time stable differences in crime propensity which are set early in life. Continuity/persistence in LCP offending is due to these time stable differences. In other words, population heterogeneity predicts LCPs. ALs, on the other hand, are influenced by factors occurring during adolescence. Offending is due to the state dependent processes of change (maturation) and adaptation to change. In short, state dependence predicts ALs. Patterson's taxonomy is very similar. His early starters are like

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[3] Dynamic theories propose that changes in life circumstances affect an individual's propensity to offend. However, the precise mechanism by which this occurs varies one theory to another. For example, changes in life may lead to changes in forms of social control (control theory) or may affect levels of stress and strain (strain theory) or might influence peer and other relationships (differential association; social learning) which, in turn, have an effect on the propensity to offend. However, both static and dynamic theories are similar in that they propose that all offenders follow a single pathway to crime (i.e. underlying causes of offending are presumed to be the same for all persons). Thus, these theories share an assumption of generality (Paternoster et al 1997).

Moffitt's LCPs – unchanging propensity caused by inadequate socialisation early in life, while late starters are influenced by peers and situational factors (state dependence).

In an illuminating article, Paternoster and colleagues (1997) classify developmental and general crime theories on the basis of whether they regard "criminal propensity" as being a time stable (static) or time varying (dynamic) attribute. Taxonomic theories fall into both categories and were labelled as being 'category-dependent'.[4] Paternoster and colleagues tested a number of key hypotheses arising from these classifications and concluded that purely static or purely dynamic models of criminal offending did not fit observations very well. Offending behaviour could neither be attributed solely to persistent individual differences in criminal propensity nor to state dependent processes of change and adaptation. Other studies have produced similar evidence that both time stable individual differences *and* dynamic factors (including prior offending) have implications for future offending (Nagin and Paternoster, 2000; Sampson and Laub, 1993). Piquero et al (2003) have stressed that state dependence and heterogeneity are not necessarily incompatible and can be mixed in theory and in application. In other words, stability and change *both* matter in explanations of offending over the life-course.

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[4] Classifications of theories are not unique. In an earlier study, Tremblay and Craig (1995) categorised DLC theories along different dimensions. They proposed three 'types' of theoretical models: simple linear models, multiple pathway models and cumulative effect models. More recently Piquero et al (2003) identified two central concepts which underlie life-course dynamics: pathways (trajectories) of development and transition points (e.g. developmental milestones; specific and significant life events). Further, they identified two areas of study within the DLC approach – the *development and dynamics* of the trajectory and the *causal factors* that affect the shape and position of this trajectory. These latter areas of inquiry are investigated by this thesis – the primary focus being on identifying the kinds of life events that influence the making and shaping of delinquent pathways.

1.5 Criminal career dimensions – participation/prevalence and frequency of offending

Proponents of the criminal career paradigm have argued that structuring knowledge around the "dimensions" of crime (i.e., participation/prevalence, frequency, duration, specialisation and escalation) is of fundamental importance to understanding crime and developing effective social policies (Blumstein et al., 1988; Tillman, 1987). Participation and frequency lie at the core of the criminal career construct, for these basic components tell us *who* commits crime (participation) and *how much* crime they commit over time (frequency).

1.5.1 Participation/prevalence

Participation in crime is often studied at a macro level where individual involvement in crime is aggregated into the "prevalence" of offending. Research on the prevalence of offending tends to be centred on three important questions: *What is the overall prevalence of offending in the population? How does prevalence vary between groups? How does prevalence vary over time?* The answers to these questions provide essential knowledge about the extent and distribution of offending in the population. "Basic" population prevalence rates have been estimated by various U.S. and European studies (Wolfgang et al., 1972; Farrington and West, 1990; Office of Juvenile Justice and Delinquency Prevention, 1986; Wikstrom, 1990; Tarling, 1993; Prime et al., 2001). A number of Australian studies have also documented population level prevalence rates of offending (Morgan and Gardner, 1992; Skrzypiec and Wundersitz, 2005; Hua et al., 2006). The relative difference in prevalence rates between some sub-groups of the population – most notably that between males and females – has also been well

documented in the literature and has fed into substantive theoretical debates about the gendered nature of crime (see later discussion).

Compared with disparities based on gender, there is much less empirical evidence of prevalence rate differences based on other categorisations (e.g. ethnic groupings). Moreover, there are hardly any studies which have estimated prevalence levels based on both gender *and* ethnic groups (Piquero et al., 2003). In Australia, only two studies (both based in South Australia) have estimated prevalence rates based on Aboriginal status (Morgan and Gardner, 1992; Skrzypiec and Wundersitz, 2005). In New South Wales, Hua et al (2006) were unable to estimate Aboriginal participation rates because of data on Aboriginal status was unavailable. However, they argued that undertaking such analyses had *"important implications for the targeting of crime prevention resources"* (p. 9). It is important to note also that, except for two U.K. studies – Tarling (1993) and Prime et al (2001) - almost all studies have estimated prevalence levels based on single study cohorts, rather than at population level involving multiple birth cohorts.

1.5.2 Offending frequency

The frequency of offending is defined as the rate at which individual offenders commit crimes. A considerable amount of research has been undertaken to estimate this individual frequency of offending (often this rate is referred to as 'λ' or 'lambda'). There has been some contention over whether the frequency rate varies over time (i.e. with age) or stays constant over the life course. Some studies have reported the peaking of offending frequency during mid to late teens (e.g. Loeber and Snyder, 1990; Wikstrom, 1990; Nagin and Land, 1993), however, other studies have found little evidence of age effects on offending frequency (Farrington and West, 1990). Proponents of group based or taxonomic perspectives contend

that offending frequency varies with age, but only for some types of offenders (Patterson, 1982; Nagin and Tremblay, 2005a; Moffitt, 1993). Moffitt (1993), for example, argues that age influences the frequency of offending *for one group of offenders in particular – those labelled as Adolescent-limited (ALs)*.

Gender and ethnic difference in offending frequency

Researchers and policymakers have also been interested to know whether the frequency of offending varies by gender and by ethnicity. Empirical research on gender differences in offending frequency show mixed results. Some studies suggest that females offend less frequently than males (Office of Juvenile Justice and Delinquency Prevention, 1986; Tarling, 1993; Wikstrom, 1990); however, others indicate otherwise (Graham and Bowling, 1995; Piquero, 2000; Block et al., 2010). There is more conclusive evidence of gender difference in the *peak age* of offending frequency. Several studies have confirmed that females reach their peak levels of offending earlier in the life course and desist sooner than males (Elliott, 1994; Moffitt et al., 2001; Fagan and Western, 2005; Graham and Bowling, 1995; Block et al., 2010).

Comparatively few longitudinal studies have examined whether ethnic based differences exist in the frequency of offending (Elliott, 1994; Fergusson et al., 1993). However, there are some cross-sectional and recidivism based studies which confirm higher rates of offending amongst Aboriginal groups in Australia (e.g. Broadhurst and Loh, 1995; Ferrante et al., 2004).

Both of these issues (gender difference *and* ethnic difference in offending frequency) are pursued in greater depth in Chapters 4 and 5.

1.5.3 Distinction between participation and frequency

The study of distinctions between the dimensions of participation and frequency has its genesis in the 1986 National Academy of Science's Report on criminal careers (Blumstein et al., 1986). From the outset, the Report proposed that patterns of participation and frequency of offending varied (with age, at least) and the factors that predicted participation or initiation into offending were different to those which predicted the frequency of, or continuity in offending.[5] This distinction between criminal career dimensions raised the possibility that different theories of crime might be needed to explain the patterns and underlying causes of each dimension. The underlying hypothesis being that if different criminal career dimensions share that same risk factors/correlates/predictors then this suggests 'generality' in crime. In other words, the underlying causes (of either dimension) are fundamentally the same. However, if prevalence and frequency have different correlates, then this suggests unique causal pathways and confirms the need for more complex theories of crime. In the words of Paternoster and colleagues, "in deference to the principle of parsimony, we should want to relax the constraint of a single [general] theory only if the additional complexity of a "multiple pathways" theory significantly increases our understanding of the aetiology of crime" (Paternoster et al., 1997: 236).

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[5] Blumstein and his colleagues (1986) reported evidence of sex and ethnicity having strong effects on participation but not on frequency. They reasoned that the predictors of participation and frequency might vary because, i) the relationships or effects of age might differ between initiation and persistence in offending, ii) the effects of individual characteristics (gender) might vary, and iii) the effects of life circumstances (marriage or employment) might also differ.

Although the debate between general and taxonomic theories has featured prominently in the criminological literature, empirical studies of the participation-frequency distinction *per se* have been limited and few have specifically addressed the question of whether correlates *differentially* relate to participation and frequency (Petras et al., 2010).[6] Of those that have examined this issue, results have been mixed and, as yet, no clear conclusion has emerged as to whether participation and frequency of offending arise from same underlying processes.

In one of the earliest studies, Nagin and Smith (1990) found that gender, age, peers, alcohol use and prior offending all had an influence on both criminal career dimensions; however, ethnicity, household size and social isolation/alienation were associated with frequency only. Smith and colleagues (1991), too, tested for differences in the risk factors associated with participation and frequency of offending. They found some similarities as well as some differences. Nagin and Land (1993) found both age and a "criminal propensity" index (comprising IQ, parenting factors, parent criminality and sensation seeking tendencies) to be associated with both dimensions. Sampson and Laub (1993) also found correlates of participation and frequency to be similar. Interestingly, Smith and Brame (1994) found gender and peer associations to be associated with both dimensions; however, ethnicity was not linked to either! They also found moral beliefs and living in a rural setting were associated with participation, not frequency; while informal labelling was related to frequency and not participation. In the same year, Britt (1994) examined multiple waves of the U.S. National Youth Survey and found few differences between the factors that influenced participation and

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[6] Petras and colleagues (2010) provide two reasons why empirical research in the area has been limited. First, data requirements for such analyses are onerous – such studies need longitudinal, population-based data at individual level and these are not always at hand. Second, methods of analyses to study these features (e.g. HLMs, LCGAs or GMMs) have only recently become available.

frequency of offending. Indeed, only one of six factors (regular dating) had an influence on one dimension (participation) and not the other.

More recently, Brame and colleagues (2010) examined data from a cohort of serious offenders in Queensland, Australia. The study examined the influence of only two demographic factors (gender and Aboriginal status) and found both to be correlated with participation *and* frequency of offending. The researchers concluded that the findings were consistent with the generality claims of Gottfredson and Hirschi (1990).[7]

Most recently, Petras and colleagues (2010) used longitudinal data from a large sample of Dutch offenders to test the effects of gender, age and marital status on both participation and frequency of offending. The researchers found that all three factors exerted a strong influence on *both* dimensions. As there was little difference in correlates and owing to the fact that marital status was viewed as a dynamic, time varying predictor of both dimensions, the researchers argued that their evidence supported a general, dynamic theory of crime. As the Dutch researchers concluded, theirs was not 'the final word' on whether correlates

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[7] A limitation of the study is, however, that it is based on a serious offender group rather than the general population, so it is not well positioned to discuss issues related to the 'generality in crime'. If one were to adopt Moffitt's taxonomic perspective, for instance, then the same findings would lead to a different interpretation. Consider this: as a group of serious offenders, the study population could be argued to be representative of Moffitt's LCPs. If this were the case, then Moffitt's theory predicts the behaviour of these offenders to be characterised by time stable factors *only* so it should not surprise that both participation and frequency are affected by the same (static) demographic variables. Moffitt's theory would further predict that other time stable factors set early in life would also influence both dimensions of crime. In short, the study population used for the research may not have been the most appropriate.

differentially relate to participation and frequency. However, their study provides a more complete picture of how participation and frequency vary across life course. Replication to other (non-White, non-European) samples are required, and additional time stable (static) factors and other dynamic, life events (e.g. lifestyle factors, employment) needs to be included in empirical models.

In sum, the evidence to date presents no clear distinction between participation and frequency of offending. There is conflicting evidence about whether or not the correlates of participation and frequency are the same and theoretical views regarding causal processes underlying these criminal career dimensions remain mixed.

1.6 Risk Factors associated with offending

Despite the importance of prevalence and frequency, the literature does not always distinguish between the risk factors associated with each of these dimensions. For this reason, and to enhance the flow of reading, the following section of the thesis also does *not* attempt to distinguish between participation and frequency risk factors; rather, such differences are discussed in later parts of the thesis (Section 1.5.3 and Chapters 6 and 7). The structure of this section follows largely that of Table 1.1 (see p. 8) where individual factors, and then family and other factors, are identified and described.

The purpose of this section is to provide a contemporary review of the developmental risk factors associated with offending. While the identification of risk factors *per se* does not make explicit the mechanism by which these factors affect offending, the process is seen as an important first step towards a deeper and more causative explanation of why people offend. In

this thesis, as elsewhere, risk factors are viewed as statistical associations or correlations which may (or may not) have relevance for theories of causation. It should be noted that although this thesis does not impute causation from identified risk factors, the *predictive utility* of some risk factors is noted when the correlation between these and offending is observed to be high.

1.6.1 Individual risk factors

At the individual or person level, there are a range of risk factors that have been associated with delinquency. These include demographic factors (e.g. gender, Aboriginal status), early life factors (e.g. birth complications, low birth weight), individual characteristics (e.g. hyperactivity, impulsivity, low IQ, learning difficulties, mental health issues) and some other individual or personal factors (e.g. illness, injury). A number of individual risk factors are considered "static" in that they cannot be changed – gender and ethnicity are the best examples.

Consideration of individual risk factors frequently gives rise to questions about biology and genetics. Biological or organic models of offending are not new to the field of criminology but have been unpopular amongst criminologists for many decades. Only more recently has interest in biological/genetic aspects of criminal behaviour surfaced due, in part, to advances in the behavioural, genetic and developmental sciences. The development and refinement of developmental theories (e.g. Moffitt, 1993; Patterson, 1982) have also renewed interest in charting biological determinants of offending. An increasing number of bio-social explanations for delinquency are now evident in the literature (Beaver and Wright, 2005a; Ratchford and Beaver, 2009; Anderson, 2007; Raine et al., 1997; Arseneault et al., 2002; Moffitt, 2005; Walsh, 2002).

Raine (2002) provides one of the most comprehensive reviews of biosocial studies. In documenting more than 30 studies of the biological and social risk factors associated with antisocial behaviour, Raine put forward a 'simple' heuristic biosocial model (Figure 1.1 below). The model not only proposes how biological and social risk factors influence antisocial behaviour, but also how genetics and environment play a part in determining both risk and protective factors. Although much is known about each of these two sets of risk factors, Raine argues that further understanding of the interactional effects is required. This view concurs with Rutter's (2003) view that, having identified risk factors, researchers must move towards determining causal mechanisms. An important discovery uncovered by Raine was that having both sets of risk factors has an exponentially increasing effect on the rate of violent behaviour.

Raine (2002) found that birth complications and obstetric factors – which were further broken down into two categories: minor physical; pre-natal exposure (nicotine & alcohol) – produced the most compelling case for biosocial interactions. Along the same lines, Ratchford and Beaver (2009) identify three main groups of biological variables that are argued to have an effect on delinquency – neuropsychological functioning, birth complications and low birth weight. As these factors are often associated with poor developmental outcomes and have relevance to same taxonomic theories (e.g. Moffitt, 1993), they are explored further.

Figure 1.1: Raine's biosocial model (Raine, 2002: 312)
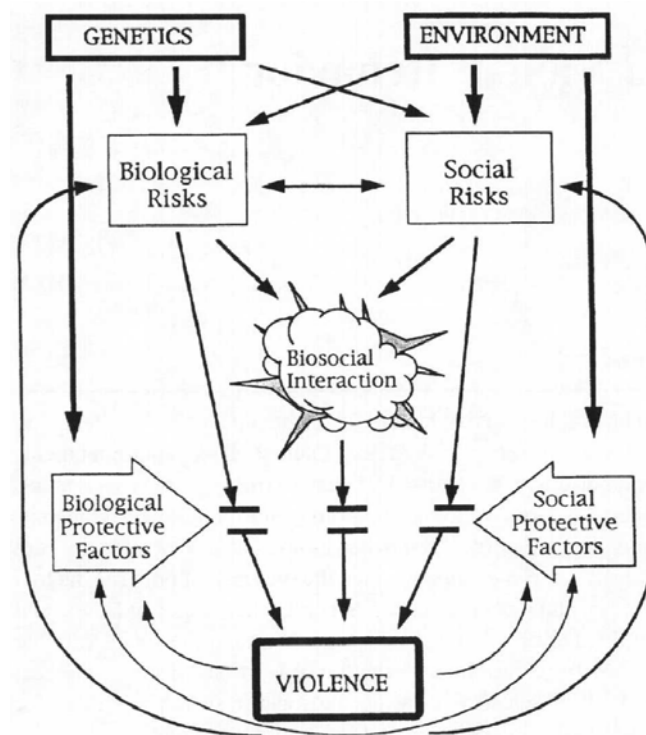
Fig. 1. Heuristic biosocial model of violence.

Neuropsychological deficits

Although their article was not a meta-analysis, Ratchford and Beaver (2009) report on at least five studies which identify neuropsychological deficits as contributors to low levels of self-control. Neuropsychological deficits adversely affect the prefrontal cortex which is responsible for higher order or "executive" function. This part of the brain is responsible for behaviour regulation, impulse control and judgment. The proposition is that deficits reduce self-control, which in turn, affects delinquency. Ratchford and Beaver cite a study by Beaver et al (2007) in which neuropsychological deficits were found to influence levels of self-control, over and above other factors such as parental socialisation. This was observed for boys, as well as girls. Not all researchers link neuropsychological deficits to prefrontal dysfunction, however. Some have argued that it is arousal deficits which produce fearlessness

and/or stimulation seeking that leads to antisocial and aggressive behaviour (Raine et al., 1998).

Birth complications

As with neuropsychological deficits, birth complications are associated with a wide range of poor behavioural outcomes (Beaver and Wright, 2005a; Raine, 2002). Some studies have linked birth complications specifically to violent criminal behaviour (Arseneault et al., 2002; e.g. Raine et al., 1997; Hodgins et al., 2001). Others have found that only serious birth complications, such as anoxia (lack of oxygen), produce adverse effects (Beaver and Wright, 2005b). While some studies suggest that the relationship between birth complications and delinquency is mediated by impulsivity, aggression and/or self-control, others propose that it is the interaction between birth complications and certain environmental factors that results in poor behavioural outcomes (Piquero and Tibbetts, 1999). For example, low Apgar scores[8] have been shown to interact with maternal smoking to predict offending (Gibson and Tibbetts, 1998). Such findings are consistent with bio-social interaction theories (Raine, 2002) and with Moffitt's theory (2005) in that it is the *interaction* between a child's vulnerability to neuropsychological disorders and poor social environments that produces delinquency outcomes. Such views are consistent with broader bio-social perspectives promoting gene-environment interactions (Brennan et al., 1997).

Low birth weight

Although low birth weight (LBW) is often associated with poor developmental outcomes (Hack et al., 1995), relatively few studies have linked LBW *explicitly* to delinquency

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[8] The Apgar score was devised in the 1950s as a simple, repeatable method of assessing the health of newborn babies.

(Tibbetts and Piquero, 1999). Kandel and colleagues (1991) found that LBW, combined with family instability, predicted offending. Ross et al (1990), too, found that LBW boys had a higher incidence of hyperactivity, aggression and delinquency than normal birth weight boys. Tibbets and Piquero (1999) found LBW and socio-economic status interacted to predict early, but not late, onset of offending. A recent meta-analysis by Bhutta and colleagues (2002) identified 13 studies in which children who were born prematurely showed increased incidence of externalising behaviours (ADHD and other). However, not all studies concur with these findings. Hack and colleagues (2004), for example, found no difference in delinquency outcomes (externalising behaviours) between very LBW and normal weight boys. Tessier and colleagues (1997), too, found that internalised social behaviour, but not aggressive behaviour, was related to LBW.

Interestingly, the study by Ross et al (1990) and that by Tibbetts and Piquero (1999) looked at whether there were any gender differences in the link between LBW and delinquency. Both found evidence of associations and interactions for males, but not for females. Tibbetts and Piquero (1999) defer to Moffitt's theory to account for this. Citing Moffitt's theory (1993), they provide three reasons for the observed differences: i) neuropsychological disorders are rarer among females that males, ii) childhood onset conduct problems are very rare in girls, and iii) female delinquency lacks stability in relation to male delinquency. In other words, and in accordance with Moffitt's theory, exposure to risk factors rather than causal processes were argued to account for the gender differences.

Other theoretical perspectives have been used to explain the association between LBW and delinquency. Ratchford and Beaver (2009) speculate that, like birth complications, LBW may link to low levels of self-control; however, empirical evidence of this is scant. They further

argue that low self-control is most likely the result of both biological and social risk factors. Although they do not engage in a discussion of bio-social interactions and how these might be incorporated in criminological theory, they hint at this. For instance, they assert that biological risk factors do not necessarily have direct effects on behaviours; rather, they work indirectly through personality traits. They further assert that, when biological factors do have direct effects on behaviour, these are usually on more serious and violent forms of delinquency.

1.6.2 Family functioning – theory, factors and evidence

A significant amount of criminological theory and research has been devoted to investigations of the link between family processes and the development of offending behaviour. This is not surprising given the importance of family in socialising children and exercising informal controls to support and maintain social norms (Simons et al., 2005).

In the developmental domain, social learning models are usually used to explain the link between parental behaviour, family functioning and child behaviour. Patterson's model (1989) is worth noting here because it incorporates notions of group difference. The model distinguishes between two groups of antisocial children – early and late starters. Patterson provides evidence that for early starters (those manifesting antisocial behaviour at an early age), the effects of family function are particularly significant. For this group, behaviour is argued to be a consequence of reciprocal family processes. In other words, ineffective parenting causes the development of serious social-skill deficits which results in generally 'poor' life course trajectories. More specifically, what begins with poor family functioning develops into social ineptitude and problems with peers, then progresses to academic failure and associations with deviant peer groups, with resultant amplification to criminal behaviour.

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Patterson's dual taxonomy of antisocial children as either early or late starters is not dissimilar to Moffitt's typology of life-course persistent and adolescent limited offenders (Moffitt, 1993).

Empirical evidence

Some of the earliest criminological evidence linking parenting to delinquency was provided by the Gluecks (1950), Nye (1958) and the McCords (1959). Each of these studies found evidence that parental supervision, parental discipline and parent-child attachment were each strong, independent predictors of delinquent behaviour.

In a later review of family factors associated with juvenile delinquency, Loeber and Stouthamer-Loeber (1986) found that lack of parental supervision, parental rejection and parent-child involvement were amongst the most powerful predictors of juvenile conducts problems and delinquency. Factors such as parents' marital status, parental criminality, parental discipline, parental health and parental absence were also of significant, but weaker influence on the development of conduct problems and delinquency. They also found that sibling behaviour – specifically, sibling delinquency, sibling aggression or sibling covert conduct problems - increased the likelihood of child delinquency. Interestingly, though, they found no evidence of gender differences. Ethnic differences were included in their review; however, the authors were silent on the issue of whether family effects were the same or different for differing ethnic groups.

Uniquely, Loeber and Stouthamer-Loeber (1986) organised family risk factors into four "heuristic paradigms" (sets of hypotheses) – the neglect paradigm (i.e. the neglect of children by parents), the conflict paradigm (unusual levels of conflict between parents and children),

the deviant behaviours/attitudes paradigm (the influence of parents' deviant behaviour/attitudes on children) and the disruption paradigm (disruptions to family functioning such as death, illness or divorce). Having reviewed the available evidence, they concluded that the neglect paradigm was most strongly associated with conduct problems and delinquency, while the disruption paradigm was the least correlated. This suggested that some (neglect-oriented) factors were more important that others in influencing conduct problems and delinquency. However, the fact that all four paradigms were associated with delinquency led them to conclude that distinctly different processes were contributing to the same outcome.

In the next sections, I focus on aspects of parenting and the family. I use the evidence put forward by Loeber and Stouthamer-Loeber as a starting point and then update this information with more recent research findings, where appropriate.

Child neglect and abuse

An accumulation of research indicates that serious lack of parental care (neglect) and child maltreatment are strong predictors of delinquency (Maxfield and Widom, 1996; Thornberry et al., 2004; Smith and Thornberry, 1995; Stewart et al., 2002; Stouthamer-Loeber et al., 2002; Heck and Walsh, 2000; Verrecchia et al., 2011; Malinosky-Rummell and Hansen, 1993). Heck and Walsh (2000) demonstrated that a significant relationship exists between maltreatment and delinquency even when other factors such as family structure, verbal IQ, family size and birth order are taken into account. A study by Verrechia and colleagues (2011) found similar evidence of maltreatment influencing offending, even in the presence of other delinquency related risk factors. Verrechia et al (2011) further demonstrated that maltreatment type, maltreatment frequency and maltreatment severity each produced direct

effects on delinquency, net of other factors. Their findings are consistent with other studies finding associations between 'dimensions' of maltreatment and 'dimensions' of offending (Stewart et al., 2002). In terms of *types* of maltreatment, Stewart and colleagues (2002) found that physical abuse and neglect, but not sexual abuse nor emotional abuse, were predictive of offending.[9] Further, they found that the more *frequent or intense* the maltreatment, the more likely children were to offend in the future. The link between physical abuse and delinquency should not surprise, as it has been suggested that the child physical abuse is more reflective of general family context than sexual abuse (Fergusson et al., 2008).

An important finding by Verrechia et al (2011) was that the relationship between maltreatment 'dimensions' (type, frequency and severity) and youth offending was confounded by other individual (i.e. behaviour and academic risk) and environmental factors. These results are consistent with other studies indicating that the relationship between maltreatment and delinquency is moderated by a variety of individual and family factors (e.g. Stouthamer-Loeber et al., 2002). Another important finding from Verrechia et al (2011) was that, even though maltreatment recurrence and severity were significant predictors of chronic delinquency, parental supervisory neglect actually produced effects that were three times more predictive.

A number of studies have further explored the impact of the *timing* of maltreatment on delinquency (Smith and Thornberry, 1995; Thornberry et al., 2001; Stewart et al., 2002; Verrecchia et al., 2011). Early research evidence from the Rochester study showed, for

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[9] However, see Felson et al (2009) for a different result though their methodology may be limited.

example, that children maltreated before age 12 were at increased risk of becoming involved in offending, especially serious and violent offending (Smith and Thornberry, 1995). However, a later re-examination of the same longitudinal data determined that children maltreated later in life (i.e. at 12 years or older) were at significantly greater risk of delinquent involvement than those maltreated earlier (Thornberry et al., 2001). Other studies suggest more subtle links between the timing of maltreatment and offending. Research from Australia suggests that maltreatment at "transition points" (i.e. in the transition from early childhood to childhood and from childhood to adolescence) has the most serious impact on future offending (Stewart et al., 2008). Other studies suggest that maltreatment timing is most predictive of offending when the time gap between the two is relatively proximate (Smith et al., 2005; Jonson-Reid and Barth, 2000).

Explanations for the causal link between maltreatment and delinquency vary. Heck and Walsh (2000) provide a sociological explanation, that is, that maltreatment affects delinquency by preventing attachment to parents and other social institution, and through the development of low levels of self-control, and low levels of self-esteem, self-blame, hostility, and distrust of others. However, both maltreatment and delinquency have been shown to be multi-dimensional in nature, and there is evidence of confounding effects. This suggests that alternative, ecological theories may be more appropriate (Verrecchia et al., 2011).

Large family size

Loeber and Stouthamer-Loeber (1986) identified several studies in which large family size was either predictive of, or associated with, conduct problems and delinquency. Subsequent studies have continued to find family size a predictor of involvement in crime (Farrington and

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West, 1990; Fischer, 1984; Kolvin et al., 1988; Nagin and Smith, 1990; Sampson and Laub, 1993; Phythian et al., 2008).

Loeber and Stouthamer-Loeber (1986) posit several potential explanations for this association. First, parents with large families have fewer opportunities for one-on-one interactions with their children and have more difficulty disciplining and supervising them. Second, some parents delegate child rearing to older siblings, who are not necessarily skilled for the task. Third, large families tend to be poorer or be located in poor areas with fewer resources for child rearing. Fourth, larger family may foster delinquency through greater exposure to delinquent siblings (they admit that the processes influencing the transmission of delinquency from sibling to sibling are unknown). Farrington (1997) argues that the theoretical links between large family size and offending are not entirely clear. He contends that family size could, in fact, be a proxy measure for other constructs such as socio-economic status (poverty) and/or poor parenting (insufficient supervision, for example).[10]

Family structure

A substantial body of evidence has repeatedly demonstrated that family structure is associated with delinquency. Investigations typically distinguish between single-parent and two-parent households and find that the risk of delinquency increases for children from single-parent families (Farrington, 1997; Perez-McCluskey and Tovar, 2003; Sokol-Katz et al., 1997).

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[10] A number of theoretical models could, therefore, be applied to explain any observable relationship e.g. strain theory (competition for scarce family resources), control theory (diminished parental supervision, etc.) and social learning (learning from siblings, for example). Each theory provides a mechanism by which large family size could influence delinquent behaviour.

Control theory and strain theory have been used to explain these relationships (Leiber et al., 2009). Control theory posits that the absence of a parent in single-parent families hampers the ability to supervise, control and socialise children. This affects attachment, lessens bonds to conformity and increases the risk of delinquency (Sampson and Laub, 1993). The strain model argues that the link between family structure and delinquency is related to the socio-economic status of the household. Thus, although delinquency may be more common in single-parent households, this is because of the connection between poverty and single parenthood, not because of the structure of the family itself. Indeed, Leiber and colleagues (2009) found exactly this - that once family processes and economic factors were controlled, family structure itself was no longer predictive of delinquency.

However, a major criticism of this literature is that it often fails to consider family dynamics (Heck and Walsh, 2000). There is evidence that the relationship between family structure and delinquent behaviour is explained, in part, by differences in parenting practices (Simons et al., 2005). Demuth and Brown (2004) showed that family structure is much less important than family processes in relation to encouraging delinquency among youth. Sokol-Katz, Dunham, and Zimmerman (1997) also found that family structure was indirectly related to minor and serious delinquency through its impact on family attachment.

The term "broken home" often features in the literature on family structure. A meta-analysis by Wells and Rankin (1991) identified that the prevalence of delinquency was 10-15% higher in children from "broken homes" than in children from "intact" homes. However, there has been criticism of this term. As Heck and Walsh (2000) explain:

'[H]ow a home was broken may be more important in the explanation of delinquency than the brute fact that it is broken. A home broken by divorce reveals a certain

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amount of familial discord prior to the fracture but possibly less than a home broken by desertion. On the other hand, a home broken by death reveals nothing about prior family dynamics.' (2000: 180)

Juby and Farrington (2001) argue similarly and point to further statistical implications:

'A dichotomous variable (broken vs. intact; two-parent vs. lone-parent) ignores many important pre-disruption (e.g. reasons for disruption, timing of disruption, gender of the lost parent, level of conflict) and post-disruption (e.g. gender of the custodial parent, subsequent family reconstitution) characteristics of complex family disruption processes. As a result, families with very different experiences, many of which may perhaps cancel out in statistical analyses, are classified together.' (2001: 23)

Increasingly, studies of the relationship between delinquency and family structure have explored the role of family disruption. Kolvin and colleagues (1988) found that divorce or separation in families with children aged up to 5 years predicted offending. Fergusson, Horwood and Lynskey (1992), too, found evidence to suggest that the process of breaking up (i.e. parental conflict), rather than the (residual) nature of the family structure, was predictive of child offending. In a re-analysis of data from the Cambridge study, Juby and Farrington (2001) found that both family disruption *and* family conflict increased the likelihood of offending. Interestingly, though, the delinquency rates for disrupted families was the same as for intact but conflict ridden families. Other findings from the study were that:

- The loss of a mother was more damaging than the loss of a father (of note, was that the delinquency risk for boys in disrupted families who lived with their mothers was the same as that for boys who lived in harmonious, intact families)

- Disruption arising from conflict was more criminogenic that disruption caused by parental death; however, the effect of parent death varied depending on which parent died

- Delinquency rates were highest for disruptions at ages 0-4 and 10-14 years and lowest for disruptions at age 5-9 years

A number of these findings, but not all, were replicated in a Swiss study (Haas et al., 2004). Like the Cambridge study, the Swiss study found that both family disruption *and* family conflict increased the likelihood of offending, and that the delinquency rates for disrupted families was about the same as for intact but conflict ridden families. Both studies found that the loss of the mother to be more damaging than the loss of the father. However, unlike the Cambridge study, Haas and colleagues (2004) found that the delinquency risk for boys in disrupted families who lived with their mothers was greater than for boys who lived in harmonious, intact families. Both of these studies suggest a link between "broken" homes and delinquency; however, the negative impact of family break-ups can be mitigated by a warm and loving post-disruption home and the involvement of extended families or foster families.

Siblings

Until recently, the influence of siblings on the conduct problems and delinquency of children had not been extensively studied. Loeber and Stouthamer-Loeber's early review (1986) uncovered some evidence of the link between sibling criminality and delinquency in children. They found some evidence, too, that sibling conflict and aggression also linked to delinquency. The authors tentatively suggested that early, persistent sibling conflict appears to provide a training ground for aggression. Loeber and Stouthamer-Loeber also found that family size and sibling conflict were correlated, suggesting that conflict among siblings may

often be more intense and more difficult to control for parents in large families than in smaller ones.

Some researchers have argued that the connection between sibling criminality and child delinquency has more to do with poor family circumstances (and poor quality parenting). In other words, the link is indicative rather than causal (Pezzin, 2004). Others have suggested that it is an outcome of social learning or differential association. In essence, delinquency is either the result of modelling deviant behaviour from siblings or an outcome of socialising with deviant siblings. However, evidence to support such models is scant and often conflicting. For example, in their re-analysis of the Glueck's data, Sampson and Laub (1993) found that sibling delinquency had no influence on child delinquency. Interestingly, though, they found that both parental criminality and large family size increased the risk of both child delinquency and sibling delinquency. These results accord somewhat with those of Loeber and Stouthamer-Loeber (1986) and suggest an *indirect* relationship between sibling and child criminality. In contrast, however, Lauritsen (1993) found that sibling delinquency not only predicted male (and female) delinquency but was also independent of other individual, peer and family predictors. In a later study, Slomkowski and colleagues (2001) not only showed that sibling delinquency is highly correlated but that siblings promote each other's delinquency through *direct* interaction. The authors examined 164 brother and sister pairs over a 4-year period. They found that high levels of hostile–coercive sibling relationships and older sibling delinquency predicted younger sibling delinquency in both brother and sister pairs. Older sibling delinquency and relationship quality were shown to predict change in younger sibling delinquency through adolescence. Some twin studies have also revealed shared environmental effects on oppositional and conduct problems for both brothers and sisters in childhood and adolescence (Eaves et al., 1997; Thapar and McGuffin, 1996). As

evidence of "sibling effects" accumulates and consolidates, the role of social interaction between siblings as a risk factor in the development of delinquency will be better understood.

Parental stress

A further factor which relates to parenting practices and parental efficacy is stress. There is evidence that parents with high stress levels are less affectionate to their children and more likely to use harsher forms of punishment (Guajardo et al., 2009). There is also research to suggest that parental stress caused through inter-parental conflict results in a transfer or 'spill over' of conflict and emotion from parent-parent relationships to parent-children relationships, which also has detrimental effects on the development of self-control, partly mediated through the use of discipline and display of approval (Higgins et al., 2011).

Parental death and ill-health

The impact on delinquency of loss of a parent through death was first examined by Gregory (1965). A subsequent review by Loeber and Stouthamer-Loeber's (1986) identified seven further studies which demonstrated that parental ill-health (physical illness, but more frequently, mental health problems) has a significant impact on juvenile conduct problems and delinquency. Interestingly, their review identified that a mother's physical illness was more predictive of delinquency than a father's ill health. Empirical evidence of the relative importance of a mother's death/absence over a father's death/absence have been reported by criminologists (e.g. Juby and Farrington, 2001; Haas et al., 2004) and by researchers in other domains (e.g. Case and Ardington, 2006).

Since Loeber and Stouthamer-Loeber's 1986 review, the evidence of the link between parent ill-health (including mental health and substance abuse) and delinquency has grown

(Stouthamer-Loeber et al., 2001; Hoge et al., 1994; Paternoster and Mazerolle, 1994; Aseltine et al., 2000; Offord et al., 2010; Leinonen et al., 2003; Conger et al., 1994; Stouthamer-Loeber et al., 1993). The primary mechanism by which these factors are argued to act on delinquency is via disruptions to parenting (Weatherburn and Lind, 2006); however, elements of strain theory also feature in many causative explanations (Paternoster and Mazerolle, 1994; Aseltine et al., 2000). For instance, Agnew's exposition of strain theory (Agnew, 1992) posits that negative experiences and relationships result in specific negative affective states (anger, frustration, disappointment) which in turn lead to delinquency. In a test of this theory, Paternoster and Mazerolle (1994) included death or serious injury of family members in measures of negative life events and found that these factors had a positive and significant effect on delinquency, net of other factors.

In a more recent study, Aseltine et al (2000) measured the causal effects of family stresses, which included sibling health problems, as well as parental death, on deviant behaviour. While they found family stress to be positively and significantly related to adolescence deviance, they found only limited support for the proposition that anger mediated this relationship. Aseltine et al (2000) point out that the validity of the core hypothesis in strain theory – that anger mediates the association between diverse measures of strain and a variety of deviant behaviours – needs to be investigated, as supporting empirical evidence of this is scant. Their findings indicated that anger mediates the impact of negative events on behaviour only in the case of violent or aggressive behaviour. On this basis, they concluded that Agnew's strain theory could not be generalised. Nevertheless, they saw merit in the development of the theory, particularly in its efforts to draw from other perspectives such as from the sociology of mental illness and from the stress and coping paradigms. Bio-social frameworks provide yet another perspective on the link between parental mental illness and

child delinquency. Brennan, Mednick and Mednick (1993), for example, showed that birth complications interacted with parental mental illness to predict violent behaviour in their children.

Parental criminality

Research evidence has consistently shown that parental criminality is positively associated with child delinquency. Loeber and Stouthamer-Loeber's review (1986) identified more than a dozen studies in which parent criminality either predicted or was (concurrently) associated with child delinquency. Subsequent studies continue to confirm these findings (Farrington, 2005a; Farrington et al., 2001; Smith and Farrington, 2004; Higgins, 2009; Hoge et al., 1994).

Some researchers argue that this association is a (direct) result of poor quality parenting (Smith and Farrington, 2004). Others have argued that the link between criminal parents and delinquent children is genetic and there may be some biological transmission of traits (Wilson and Herrnstein, 1985; Beaver and Wright, 2005a; Eysenck and Gudjonsson, 1989). A number of authors make the argument that self-control levels are mostly biological (Beaver and Wright, 2005a); however, others guard against these statements. Higgins et al (2011), for example, contend that it is the conflict filled environments in which the children of criminal parents live that provide the grounds for "improper socialisation or tutelage". Increasingly, there is evidence that the association is indirect and that deviant behaviour is modelled from parents through social learning (Besemer and Farrington, 2012).

1.6.3 School based factors

Learning difficulties and educational achievement

A number of studies have established that school related factors such as student attitudes, performance/achievement and level of involvement/attachment are strongly linked to delinquency (Silberberg and Silberberg, 1971; Glueck and Glueck, 1950; Blumstein et al., 1986; Maguin and Loeber, 1996; Cox et al., 1995; Drapela, 2005; Turner et al., 2005). Various theories propose differing *causal* relationships between learning difficulties, school failure, attachment and delinquency (Hawkins and Lishner, 1987). Smith (2000) describes how three theories - labelling, strain and control theory - implicate school factors in the development of delinquency. According to Smith (2000), labelling theory suggests that when schools label certain individuals as delinquent, these labels are often internalised and then 'acted out' by them. Strain theory, on the other hand, posits that the pressure from school failure can lead young people to engage in delinquent behaviour in order to reach culturally prescribed goals. Control theory, in contrast, hypothesizes that learning difficulties and school failure result in a lack of "bonding" to the school environment which loosens overall bonds to conventional society, facilitates delinquent behaviour.

Some researchers have suggested, however, that school failure and delinquency are correlated but *not causally* related. In other words, the relationship arises from shared antecedent factors, such as early disruptive behaviour, attention deficit, cognitive deficits and low IQ (Hinshaw, 1992; Tremblay et al., 1992). There is considerable empirical support for this position (Fergusson and Horwood, 1995; Broidy et al., 2003; Bhutta et al., 2002).

Other authors argue that the nature of the relationship between delinquency and education is complex and not fully understood. They assert that personal experiences and the environmental conditions that may mediate the link between school and delinquency need to be further unravelled (Reynolds et al., 2004). Notwithstanding these differing explanatory positions, measures that improve school performance and retention have been shown to reduce the risk of juvenile participation in offending (MacKenzie, 2002).

1.6.4 Community based factors

Socio-economic disadvantage

There is considerable evidence in the literature that social/community context plays a role in the development of delinquency. Numerous studies, using different sources of data and measures of social context (some looking only at socio-economic deprivation) have confirmed links between social/community factors and delinquency (Leventhal and Brooks-Gunn, 2003; Oberwittler, 2004; Elliott et al., 1996; Wikstrom and Loeber, 2000; Aber et al., 1997; Bursik and Grasmick, 1993).[11]

What has been less understood and more often disputed is the *mechanism or causal processes* by which disadvantage leads to elevated levels of offending. Rutter et al (1998) suggest that the link between disadvantage and offending may be mediated by "the adverse effects of prolonged economic (and associated) stresses on family functioning." (1998: 201) In other words, they posit structural disadvantage to be a *distal* risk factoring in the causal pathway

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[11] It should be noted, however, that community based factors should not only be seen as increasing the risk of offending. It has been argued that strong community support mechanisms can offer protection from the effects of poor parenting (Weatherburn and Lind, 2006). Evidence from Sub-study 5 (Chapter 7) supports this view.

leading to offending. Explanatory models from the developmental domain support this position. Aber, Gephart, Brooks-Gunn and Connell (1997) argue that the effect of neighbourhood on child development in early childhood is primarily through influence on parents (and secondarily through other major caregivers). This view is consistent with Bronfenbrenner's (1979) conceptualisation of the domains of influence on the individual – that an individual's activities have a *direct* (proximal) influence on development, while community context has an important *indirect* (distal) influence through its impact on shaping the form and content of those activities.

There is evidence which supports this view. For example, Fergusson et al (2004) demonstrated that more proximal factors (such as those relating to parenting and peer associations) contributed to linkages between socio-economic disadvantage and offending. Using data from the Christchurch Health and Development study (comprising a 1977 birth cohort of 1,265 children), the researchers found evidence that higher rates of offending among children from socially and economically disadvantaged families were mediated by adverse family (mostly), individual, school and peer influences.

Weatherburn and Lind (2006) demonstrated that economic and social disadvantage within a community leads *indirectly* to juvenile delinquency through disruption to child rearing process and increased child neglect. Their study examined the links between a number of structural factors (poverty, geographic mobility, ethnic heterogeneity and family dissolution/disruption) and delinquency. The authors' main interest was in looking at the causal mechanism by which these factors influence crime. In challenging the proposition that structural factors are mediated *solely* by informal social control or collective efficacy, the authors included other family based variables in their models. Their aim was to show that

other factors (such as parental efficacy - measured through aggregate, area level estimates of child neglect) might also mediate the effect of these factors. In a full regression model, 71% of variation was accounted for by the full set of factors (parenting and three structural factors); however, parenting alone accounted for most of this (65%). Using evidence from both regression and path analysis, Weatherburn and Lind showed that much of the influence of structural factors is mediated through parenting. The researchers asserted that factors like poverty, geographic mobility and ethnic heterogeneity influenced crime, not because they erode the level of collective efficacy in an area, but because they a) increase the level of stress on families and b) reduce the level of social support that parents can call on to buffer the effect of that stress.

1.7 Gender based differences

In this and the next section, attention is focussed on two of the most important correlates of offending – gender and ethnicity. Gender has been shown to be the most significant predictor of involvement in crime. Males consistently outnumber females in involvement in crime, usually by a factor of five. This finding has led to the widely held view that the gender gap in crime is universal (Steffensmeier and Allan, 1996).[12] Given the extent of this difference, understanding both its nature and cause are of fundamental interest to criminology, and are of primary importance to the empirical studies of this thesis. Documenting the nature and extent of gender difference feeds directly into the development of theories on the underlying causes of crime and criminal behaviour and has implications for crime prevention and criminal justice policy making. Trends in female offending over the past decades - specifically, rising

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[12] Though see Greenberg (1991) for contrary evidence that places gender differences in a historical and societal context.

rates of violent crime amongst girls, a narrowing of the gender gap and an increased focus on relational and alternative forms of aggression – have added impetus to the need to explore and account for differences both between and within gender groups (Odgers et al., 2007; Fitzgerald et al., 2012).

Among studies that have compared male and female offending patterns, there is a lack of consensus about *the cause* of observable gender difference. Some researchers maintain that the same underlying factors and processes are at work and that the observable differences are due to differing levels of exposure. Researchers favouring this kind of explanation typically draw on traditional theories of crime to establish causal mechanisms. For example, social control theory accounts for lower female participation in crime by way of females having stronger social bonds and being subjected to greater supervision. General strain theory, on the other hand, accounts for the gender gap in offending by acknowledging a wider variety of strain sources and more diverse adaptations to strain (e.g. internalising rather than externalising behaviours). Theories such as differential association and social learning argue that female delinquency is lower than male delinquency largely because girls are less exposed to delinquent peers. Other theories, such as routine activity and rational choice, account for lower rates of female delinquency through reduced opportunities to commit crime. Developmental theories, too, account for gender difference by way of differential exposure to the same underlying risk factors. For example, Moffitt and her colleagues (2001) provide three reasons for the observed difference between male and female delinquency: i) neuropsychological disorders are rarer among females than males, ii) childhood onset conduct problems are very rare in girls, and iii) female delinquency lacks stability in relation to male delinquency.

However, an alternate line of reasoning argues that male and female delinquency rates are different because they have different underlying causes (i.e. different explanatory variables and different underlying processes). Researchers who support this line of reasoning often call into question the generalisability of traditional theories of crime. As Belknap and Holsinger (2006) articulate, "'malestream' criminological theories have questionable applicability to girls' offending largely because they were developed to understand boys' delinquency and even then, almost always fail to explain the role of gender in boys' lives (e.g., masculinity)" (p. 49). Not surprisingly, the notion of "gender" features strongly in these alternative accounts of male-female differences in delinquency. Feminist theories of crime, paternalism and gender specific pathways also feature in this alternative discourse (Carrington, 2006; Smart, 1990; Daly, 1994; Adler, 1975; Mann, 1984; Steffensmeier and Allan, 1996; Belknap and Holsinger, 2006).

Empirical evidence supporting the view that female delinquency has a different aetiology to male delinquency has steadily accumulated (Lanctot and Le Blanc, 2002; Steffensmeier and Allan, 1996; Belknap and Holsinger, 2006; Odgers et al., 2007; Herrera and McCloskey, 2001), as has the evidence of a narrowing of the gender gap (Zahn-Waxler et al., 2008). Some have argued that this narrowing of the gender gap reflects an increase in female aggression (Alder and Worrall, 2004); however, others have argued that the gap reduction is due to changes in policing practices or systemic factors such as the increased criminalisation of certain behaviours (Carrington, 2006: described in more detail in Chapter 3). Irrespective of cause, questions about the existence and possible implications of a reduced gender gap underscore the need for more investigation of gender differences in offending (Fitzgerald et al., 2012).

Odgers et al (2007) argue strongly for gendered investigations of individuals 'at the deep end of the system'. They provide evidence supporting the view that differential selection mechanisms guide girls versus boys into the juvenile justice system. They contend that gender neutral models of offending do not translate directly into high risk settings and support the need for research which tests for heterogeneity with high risk samples. As Fitzgerald et al (2012) also note, 'without a clear way to differentiate female serious juvenile offenders, it is not possible to effectively target treatment programs, which are frequently based on gender neutral strategies' (p. 243).

Notwithstanding such arguments, the evidence for gender specific models remains far from compelling. A substantial body of empirical evidence shows that the risk factors and processes associated with male and female delinquency are more similar than different (Piquero et al., 2005a; Tibbetts and Piquero, 1999; Mazerolle, 1998; Lanctot and Le Blanc, 2002; Fitzgerald et al., 2012). The notion of "gendered pathways" has been challenged also. For example, Johansson and Kempf-Leonard (2009) recently assessed a 'stepping stones' approach, originally put forward by Howell (2003), as a possible female specific pathways model for offending.[13] Johansson and Kempf-Leonard analysed the independent and cumulative effects of these factors on each of three offender groups (serious, violent and chronic offending), acting across gender. Four of the five risk factors (mental health problems, running away, gang involvement, and secure detention) were found to be associated with serious, violent and chronic offending, for both males and females. The fifth factor, child

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[13] Howell (2003) proposed five distinct but interrelated risk factors for serious, chronic offending in girls: child abuse victimisation, mental health problems (including substance abuse), running away (being thrown away), gang involvement and juvenile justice involvement. Howell labelled these as "stepping-stones" and suggested that a chronological ordering of these risk factors leads to increased seriousness in female offending behaviour.

abuse and maltreatment, was found to be insignificant for both males and females. Interestingly, they found that ethnicity was a risk factor only for boys. They did not discuss the latter finding to any great extent, except to say that the effect may have been due to omitted variable bias and that by controlling for socio-economic status at the neighbourhood level, the effect of ethnicity on offending may have reduced (as it did in previous research by the same authors). The authors concluded that the five factors were not differently associated with female delinquency and so Howell's proposition was not supported. Like Johansson and Kempf-Leonard, several other studies have found insufficient evidence that certain risk factors (such as child abuse and maltreatment) operate differentially across gender (e.g. Stewart et al., 2002; Fitzgerald et al., 2012).[14]

Slowly, studies are producing evidence that identifies both shared *and* gender specific risk factors. A recent review by Wong and colleagues (2010) is illustrative. Wong and her fellow researchers reviewed 30 European studies, summarising what is known about the risk factors associated with male and female delinquency in that continent. They argue that findings from U.S. studies on gender differences may not be generalisable to the European context owing to

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[14] Interestingly, the study by Fitzgerald and colleagues (2012) found that, for both males and females, maltreatment was associated with a greater likelihood of membership in more serious offender classes. However, and contrary to expectations, the study found that females who had been maltreated had a higher probability of membership in the least serious class, while maltreated males had much higher probabilities of falling into the most serious offender class. The study concluded that there are more similarities than differences in patterning and relationships across gender. At the same time, there was evidence to indicate that some subsets of female offenders followed potentially different pathways. There were also indications that responses to abuse may differ across gender groups.

differences in gun usage, gang involvement, drug laws, income inequality and concentrations of poverty. On the basis of European evidence, then, they found a considerable number of shared risk factors, suggesting a common aetiology (Table 1.2). However, gender specific risk factors were also identified - mainly in the individual and family domains. Females and males appeared to differ less in school and peer risk factors. The authors concluded that as studies focus more on specific domains of risk factors or specific types of delinquent behaviour, more differences appear to emerge between males and females.

Consistent with the findings of Wong and colleagues, other researchers have recognised that the risk factors associated with male and female delinquency are neither all shared, nor all different. This has enabled movement toward more integrated perspectives (Lanctot and Le Blanc, 2002) and a realisation that mainstream theories could be enhanced by findings on gender specific risk factors. Some empirical studies have since been adapted to include a broader set of risk factors (e.g. self-harm, self-esteem, sexual identity) and consideration of how life events (e.g. sexual abuse events) play a part in shaping the delinquency risks of both girls *and* boys (Belknap and Holsinger, 2006).

Table 1.2: Summary of shared and gender specific risk factors - assembled from Figures 1, 2, 3 & 4 in Wong et al (2010)

Domain	Female only risk factor	Shared risk factor	Male only risk factor
Individual	High number of life events Disobedience High self-esteem Depressions Suicidal behaviour	Victimisation Being harasses by an adult Low self-control Aggression Low IQ Low self-esteem Being unashamed towards parents, friends and teachers Positive attitiude towards delinquency Substance abuse	Birth complications Psychological well-being
Family	Maternal parenting style Low child disclosure Being seldom at home Physical abuse by parents Low parental trust Low maternal support Low-quality mother-child relationship	Inadequate parenting (father or both parents) Paternal parenting style Overall parental monitoring Low involvement of parents in school Small number of rules at home Harsh discipline Low parental warmth Conflicts within family Low-quality father-child relationship Convicted father Delinquent sibling Living in a disadvantaged neighbourhood	High parental knowledge about friends Convicted mother Single parenthood
Peers	Extent of delinquency of friends	Having delinquent friends Having negative friends Problematic youth group membership Having a romantic partner Many activities with friends Having friends disliked by parents	
School	Low-quality relationship with teachers	Low school commitment	Low school achievement

1.8 Ethnicity and offending

Like gender, ethnicity has been shown to be a significant risk factor in predicting delinquent and criminal behaviour. U.S. studies show that minority groups have increased rates of delinquency and disproportionately high levels of involvement in the justice system (Kempf-Leonard, 2007). In Australia, too, there is a substantial body of evidence demonstrating that the Aboriginal population is vastly over-represented in official offending (Ferrante and Loh,

2001; Blagg et al., 2005; Luke and Cunneen, 1995; Skrzypiec and Wundersitz, 2005; Harding et al., 1995).

The extent to which the over-representation of Aboriginal people is reflective of increased rates of offending amongst Aboriginal Australians has been the subject of intense debate. Some commentators have argued that systemic or institutional bias accounts for a large part of the observed ethnic disparity (Cunneen, 2001; Blagg et al., 2005; Cunneen, 2006). Others have produced evidence to challenge this view (Snowball and Weatherburn, 2006). (See Chapter 7 for a more detailed account).

A body of empirical evidence has steadily accumulated drawing attention to a range of factors that are argued to affect Aboriginal offending. Included in these are individual characteristics, the high rates of Aboriginal violence and high recidivism rates (Harding et al., 1995; Weatherburn et al., 2003; Snowball and Weatherburn, 2006; Walker and McDonald, 1995). Several studies based on the National Aboriginal and Torres Strait Islander Surveys (Australian Bureau of Statistics, 1995; Australian Bureau of Statistics, 2004b) data have found that the most important risk factors associated with Aboriginal contact with the justice system are being male, aged less than 25 years, drug and alcohol abuse and unemployment (Weatherburn et al., 2006; Weatherburn et al., 2008; Hunter, 2001; Hunter, 2006). Wundersitz (2010) recently reviewed the research on risk factors for Aboriginal offending and suggested that an ecological systems approach may be an effective way of understanding the many variables that contribute to Aboriginal offending. Wundersitz investigated a range of characteristics thought to be linked with violence and offending behaviour among Aboriginal people but concluded that the evidence for most of the links was "relatively scant". One

exception was alcohol abuse where Wundersitz found the evidence linking alcohol abuse and Aboriginal violence to be "persuasive".

Disputes concerning the reasons for the over-representation of the Aboriginal population in the justice system in Australia mirror similar debates in the U.S. regarding minority over-representation in crime. In a recent paper, Piquero and Brame (2008) draw on the work of Hindelang (1978) and others, to describe three of the most prominent explanations for the ethnic disparities observed in the US. These are labelled as the "differential involvement" hypothesis, the "system selection" hypothesis and a combined "differential involvement and selection" hypothesis. The first hypothesis, the "differential involvement hypothesis", asserts that the ethnic differential is due to African-Americans committing more crime and more of the types of crime that lead to official criminal justice processing. Various criminological theories including sub-culture theory, social control theory, strain theory and social disorganisation, are used to support this position.

For example, Hirschi's theory of social control (1969) argues that patterns of offending are the product of differing social bonds and ties to conventional society. Factors such as poverty, unemployment, family disruption, violence and social isolation impede the formation of strong attachments, commitments, involvement and belief in conventional institutions. Ethnic disparities in offending arise as a result of ethnic groups living in communities with these characteristics and so are more likely to have weaker social bonds. Notice that Hirschi's theory does not explicitly address the issue of ethnicity, rather he argues that the theory is invariant across social characteristics including ethnic grouping. His argument, then, is that minorities are more exposed to the factors that "cause" low social control and increased criminal behaviour.

The second hypothesis - the "differential criminal justice system selection" hypothesis - posits that differential policing and discriminatory practices by the courts and correctional systems lead to more African-Americans being arrested, convicted and imprisoned. Labelling theory is often used to support this position. Piquero and Brame's third hypothesis asserts that the ethnic disparities are due to a combination of differential involvement *and* different selection.

Piquero and Brame (2008) note a lack of consensus amongst researchers about the validity of these competing explanations. They draw attention to a recent National Academy of Sciences panel report which concludes that debate between these completing explanations had led to a "conceptual and methodological impasse" (McCord et al., 2001: 229, cited in Piquero & Brame, 2008). In Australia, discourse and research on Aboriginal over-representation has followed an uncannily similar path – one need look no further than the stand-off between Weatherburn and Cunneen (Weatherburn, 2006; Cunneen, 2006). Nevertheless, Piquero and Brame (2008) assert that "the relevant question is not whether race group differences can be attributed solely to differential involvement or selection. Rather, the key analytic task is to document the contribution of both mechanisms to the patterns observed in different populations at different time points." (Piquero and Brame, 2008: p. 395) On this point, a considerable amount of empirical research in the U.S. has devoted itself to "unpacking" the so called 'race-crime' relationship.

1.8.1 Ethnicity, risk factors and delinquency

A quantum of evidence (almost exclusively from the U.S.) demonstrates that race or ethnicity aligns with other factors – particularly, socio-economic disadvantage, neighbourhood factors and family functioning - in ways which amplify the risk of delinquency.

Ethnicity and disadvantage

Sampson, Morenoff and Raudenbush (2005), for example, analysed the effect of a collection of individual, family and neighbourhood factors on rates of violence and assessed the extent to which these factors accounted for the gap in ethnic disparities. They found that most of the gap between African American and White levels of violent offending, and all of the gap between Latino and White levels of offending, could be explained by four factors - marital status of parents (note, not family structure), immigration generation and elements of neighbourhood context (specifically, being in an African American neighbourhood and length of residence). The study found that individual factors (IQ and early risk factors for impulsivity) were significant predictors of violence but weak explainers of the *difference* between ethnic groups. Neighbourhood factors, on the other hand, explained a large percentage of the ethnic gap and, for this reason, the authors argued that generic interventions at neighbourhood level may affect reductions in the ethnic gap in violence. The authors noted that their findings were consistent with the hypothesis that "Blacks are segregated by neighbourhood and thus differentially exposed to key risk and protective factors, an essential ingredient to understanding the Black-White disparity in violence" (Sampson et al., 2005: 231).

Peeples and Loeber (1994), too, found that the association between ethnicity and offending was highly dependent on type of neighbourhood. They found that this relationship existed only in the most disadvantaged of neighbourhoods. African American youths living in middle-class neighbourhoods experienced the same rate of delinquency as White youths. Once individually measured factors (such as hyperactivity and parental supervision) were taken into account, living in disadvantaged neighbourhoods but not ethnicity was significantly

related to delinquent behaviour. The study pointed to the importance of including the neighbourhood context when addressing the social problems of African American youths.

Just as Peeples and Loeber (1994) found, a number of other U.S. studies have shown that white and black neighbourhoods are starkly contrasted in terms of level of disadvantage (Sampson, 1997; Sampson and Wilson, 1995; Massey, 1995). Piquero, Moffitt and Lawton (2005b) argue that it is this different 'ecological context' between groups that creates the cultural barriers and adaptations (such as segregation) that undermines social organisation and increases the risk for delinquency. They further argue that because of the greater clustering of disadvantage among African-Americans (i.e. segregation), institutional and economic resources are reduced, which in turn takes a toll on collective efficacy, that is, on the communities' ability to supervise and regulate the behaviour of their children.

Ethnicity, family functioning and delinquency

Piquero and colleagues (2005b) highlight the fact that ethnic differences in 'ecological context' refers also to differences in family structure, as well as to differences in community and neighbourhood context. Factors such as single parent families, births to young mothers, LBW (owing to young mothers) and de facto relationships (owing to the shrinkage of 'marriageable' i.e. economically stable men), for example, have been found to vary by ethnicity. The researchers argue that a by-product of these different family structures across ethnic group is likely to be "reduced supervision and, ultimately, failed socialization" (p.212). The study by Sampson et al. (2005), described earlier, confirms some of this. Recall that the stability of marriage was one factor that differentiated between the level of violence perpetrated by poor Latinos and poor African-Americans. Moffitt (2005), too, argues that institutionalised racism and poverty selectively affect African-Americans. These factors are

argued to have a negative effect on early life socialisation and development (e.g. poor neurological health in childhood) and on the quality of parenting, leading to difficulty in 'attaining roles of consequence and respect' and, ultimately, leading to life-course persistent (LCP) offending. In other words, there is an accumulation of adversity that starts early and accelerates over the life-course.

Findings from the study by Piquero et al. (2005b) support this proposition. The study found that, for Whites, sex and peer delinquency (only) predicted prevalence and frequency of offending, while for Blacks, sex, peer delinquency and family adversity predicted both offending prevalence and offending frequency. It is notable that neighbourhood disadvantage was not significant for either ethnic group. When biosocial interaction was added to the model, all individual and family factors were significant for African-Americans; however, only sex was significant for Whites. In other words, the interaction between individual and family factors (including family poverty) and their impact on offending were found to be stronger for African-Americans than for Whites. The study then went on to subdivide the ethnic groups into two sub-groups – those from disadvantaged areas and those from non-disadvantaged areas. The only group showing significant associations between risk factors and frequency of offending were African-Americans who lived in disadvantaged neighbourhoods. As the researchers noted, "among African-Americans, individual and familial risk are exacerbated in disadvantaged neighbourhoods in such a way as to predict life-course persistent styles of offending some twenty years later" (Piquero et al., 2005b: 229).

It is notable that the study identified a number of similarities between the ethnic groups, as well as differences. From the authors' point of view, this was significant as it argues for a common causal process underlying patterns of behaviour across ethnic groups (which in turn

supports the 'differential involvement' hypothesis, described earlier in this Chapter). According to Piquero and colleagues (2005b), it is the ecological context that the different ethnic groups live in that gives rise to more pronounced anti-social behaviour in one group.

Consistent with Piquero and colleagues (2005b), a number of other American studies have demonstrated that the relationship between delinquency and some family related factors operate differently across ethnic groups (Perez-McCluskey and Tovar, 2003; Cernovich and Giordano, 1987; Vazsonyi and Flannery, 1997; Smith and Krohn, 1995). Perez-McCluskey and Tovar (2003) examined data from the 1997 National Longitudinal Survey of Youth and found that the relationship between family process variables (specifically, three factors - attachment to parents, parental supervision and family involvement) and delinquency were not the same across ethnic (and gender) groups. The researchers found while each of these family variables predicted delinquency for Whites, only attachment to parents was statistically significant for African-Americans and only parental supervision was significant for Latin Americans. Further, it was found that family structure (specifically, living with two parents) significantly reduced delinquent involvement for Whites and Latinos, but not for African-Americans. The researchers then stratified the data by gender *and* ethnic group, and again found differences across groups. Parental supervision was the only significant family measure that inhibited delinquency for White males, whereas parental attachment and family involvement were significant for White females. Similarly, among African-Americans, attachment was significant for males; however, none of the family process measures were significant for females. For Latinos, delinquency among males was inhibited by family involvement, whereas female delinquency was impacted by parental supervision. Given these findings, the researchers concluded that family processes, as operationalised by parental

attachment, parental supervision, and family involvement, do *not* have the same effect on delinquency across gender and ethnic groups.

The findings on ethnic disparities by Perez-McCluskey and Tovar (2003) accord with earlier findings by Cernovich and Giordano (1987). The earlier study found that several dimensions of family attachment had a greater influence on delinquency among Whites than African-Americans. The authors concluded that "these differences offer further support for the contention that it is important to distinguish among various dimensions of family interaction and attachment so that one can specify which ones operate similarly and which operate differently across particular groups" (Cernovich and Giordano, 1987: 315).

Interestingly, Holsinger and Holsinger (2005) investigated the role of ethnicity in a study of violent behaviour amongst girls (only). Using data collected on a wide range of variables such as abuse, antisocial attitudes, drug use, parenting, self-esteem and mental health, the researchers found that some of these variables differed quite significantly by ethnicity. They concluded that girls respond to abuse differently based on ethnic group and that this has consequential effects on behaviour.

The differences uncovered by the various studies suggest that ethnicity and, to some extent, also gender are important considerations when estimating the influence of the family and other ecological contexts on delinquent behaviour. Also important to this study is whether (and how) these findings and explanations be generalised to Australia and to the Aboriginal/non-Aboriginal populations within.

1.8.2 Aboriginal status, risk factors and offending

As described earlier, a number of Australian studies have also endeavoured to "unpack" the relationship between Aboriginal status and offending. Snowball and Weatherburn (2006), for example, demonstrated that the influence of socio-economic factors on Aboriginal offending is distal rather than proximate (i.e. that disadvantage affects delinquency *indirectly* through disruptions to parenting) and that more immediate focus should be given to the specific conditions that put young Aboriginal Australians at risk of involvement in crime. The researchers advocate tackling factors known to be associated with increased involvement in crime and that are particularly acute in Aboriginal communities – specifically, child neglect and abuse, parental psychiatric problems (particularly maternal depression), family dissolution and violence, poor school performance, early school leaving and drug and alcohol abuse.

Snowball and Weatherburn's (2006) position aligns with the "differential involvement" hypothesis put forward by Piquero and Brame (2008). Moreover, the fact that they defer to a standard or mainstream set of risk factors suggests that they support a more generalised theory/explanation of Aboriginal offending. In other words, their view is that the differences between Aboriginal and non-Aboriginal offending are more likely to be accounted for by differing levels of exposure to *the same underlying (proximal) factors and processes*. Homel and colleagues (1999), on the other hand, favour a combined differential involvement-differential selection hypothesis. Using data from the Queensland Sibling Study and supplementary data from interviews with Aboriginal community workers, the researchers identified both shared *and* culturally specific risk factors which included systemic racism and differential policing practices. Shared factors included child abuse, school failure, the quality of parenting and the supportive family and social environments as shared factors. Culturally

specific factors included, among other things, forced removals, (welfare) dependence, systemic racism, under-policing, some forms of substance use, and some cultural practices (e.g. public drinking). Homel et al's identification of systemic racism as a risk factor aligns with Piquero and Brame's (2008) "differential selection" hypothesis and ties in with the sociological and structural perspectives put forward by others (e.g. Cunneen, 2001; Hawkins, 2011).

There are differing international and Australian perspectives, then, on the causes of ethnic differences in offending. While some researchers favour application of traditional theories of crime (along with the 'usual suspects' of risk factors) and generally support a "differential involvement" hypothesis, others support a "differential selection" hypothesis in which other unique and culturally specific factors (inclusive of systemic bias) are at play. Further, and again not unlike developments in the gender domain, there is growing recognition of the inter-relatedness of risk factors and of the need for more integrated models of Aboriginal offending (Homel et al., 1999; Broadhurst, 2002). As Hawkins (2011) articulates, "…within the realm of theory and explanation for ethnic differences, a perspective that acknowledges the possible simultaneous operation of both phenomena and, even more importantly, their inter-connectedness, is needed and preferred. That is, we must be open to the idea that both differential offending and bias are at work, and more importantly, […] we must be open to the possibility that they may actually interact in ways that we immediately recognise and in ways that we do not realise at first." (2011: 17-18)

1.9 Connection between risk factors

Our review thus far has looked at a range of factors at various levels – individual, family and community – that increase the risk of involvement in offending. However, despite the breadth of the review there has been no discussion of how these factors connect or interact with each other. Gaining an insight into the interconnection between factors is important in developing an understanding of causal pathways and is especially important in the development of more integrated perspectives of offending.

Explanatory models of the connections between risk and protective factors over time have been summarised as being one of three types: i) those that propose process or 'carrier mechanisms' (mediating factors) affecting the predisposition or propensity within individuals; ii) those that argue that they are part of interactions between individual and others/environment and iii) those that consider some kind of continuity in the conditions being encountered (National Crime Prevention, 1999).

The term 'causal pathway' is often used to describe the interconnection of factors over the life course that, cumulatively or otherwise, leads to delinquency and other poor developmental outcomes (such as depression and suicide). Loeber et al (1993) investigated pathways to problem behaviour and delinquency in boys and identified three possible pathways – an overt pathway, a covert pathway and an authority conflict pathway. In Australia, researchers at the Telethon Institute for Child Health Research have put forward more generic cumulative risk pathways, indicating the progression from early childhood to suicide, violence and crime (Zubrick and Robson, 2003). Given the complexity of these causal pathways, they have argued that attention should focus on factors which *modify* (rather than just be *associated*

with) the risk of offending. Conceptually, these factors can be differentiated into those that are proximal and, thus, have a direct impact on individuals and families (e.g. poor parenting, drug and alcohol abuse) and those that are distal (e.g. market deregulation, regional levels of poverty). Interestingly, Sanson and colleagues (2002) note that, despite the paradigm shift towards more 'transactional' (pathway) models in which development is seen as an outcome of continuous influences and interactions over the life-course, research in many disciplines sheds 'little light on the influence of powerful distal factors such as poverty, social stress and exclusion' (p.10).

Researchers attempting to identify pathways and disentangle risk factors have been challenged by a number of issues and complications:

- Realisation that risk factors tend to operate in 'bundles'. In other words, they are inter-related and they interact with each other and combine to form pathways to offending generally and/or to certain types of delinquent behaviour (e.g. violence) (National Crime Prevention, 1999);

- It is not only the existence of certain risk factors but the *timing* of these factors which has been shown to be critical (e.g. Stewart et al., 2002);

- In some instances, it is the *accumulation* of factors that increases the likelihood of delinquency outcomes (National Crime Prevention, 1999; Vimpani et al., 2002; Fergusson et al., 2004). A number of criminologists (Catalano and Hawkins, 1996; Loeber and Farrington, 2001) have articulated explanations of youth offending built on the idea of the accumulation of various risks;

- The existence of protective factors and the *number* of these factors may moderate or attenuate the influence of certain risk factors (Stouthamer-Loeber et al., 2001;

Huffman et al., 2000). Yoshikawa (1994) coined the term 'cumulative protection' to describe this effect;

- Realisation that risk factors may vary across groups, for example, for males and females, or by Aboriginal status, or by offender types (e.g. chronic versus low rate offenders).

Notwithstanding these challenges, the availability of longitudinal data and the development of more sophisticated multi-level statistical methods are enabling researchers to begin the task of addressing these complications and to extend the risk factor paradigm beyond simple sets of risk factors.

1.10 Summary of literature

This review of the literature provides a suitable backdrop for the remainder of this thesis. The review indicates that important aspects of the individual, family and community need to be identified and included in explanatory models of offending. The review also identifies the need for, and value of, disaggregating offending into its constituent criminal career parts (participation and frequency), as the aetiology of each of these dimensions of criminal behaviour may differ. The review identifies theories and models of offending which propose different groups or classes of offenders, each with distinctive pathways and associated risk factors.

The review also identifies gaps in research, particularly in relation to gender and ethnic differences in offending. On the issue of gender, debates have often been polarised and, for many, the ability of mainstream theories to explain gender disparities has been found wanting. This has led to the emergence of alternative explanatory models that differentiate female

offending from male offending. The review found, however, that greater empirical testing of these alternative models is required. The review points to the need for more integrated perspectives and for a broader set of risk factors to be included in empirical models so that the influence of life events on offending can be better understood both *for girls and for boys*.

The review also identifies gaps in research relating to ethnic disparities in offending. The issue of ethnic disparity is of particular relevance in Australia because of the persistently high level of contact between Aboriginal people and the criminal justice system. As to the causes of ethnic disparities (as evidenced in Australia and elsewhere), the review has shown that debates have been polarised and there are different, often competing, perspectives put forward to account for the differences observed (e.g. differential exposure versus selection bias). This review has identified the need for a more integrated approach (rather than polemical debate) and for improved empirical models that better capture the spectrum of factors which may affect offending by different groups (e.g. community context, cultural factors).

This research hopes to address these issues by investigating patterns in the prevalence and frequency of offending in WA, by exploring group based differences in these patterns and by identifying the risk factors associated with offending by different offender groups. By maintaining a focus on gender and ethnic based differences, the research hopes to inform theoretical debates on gender and ethnic disparities and to provide empirical evidence to inform the development of gender and ethnic specific 'pathways' to delinquency. The research findings should provide the evidence base for more targeted interventions to prevent and reduce crime.

1.11 Research questions

To help guide the research, the following research questions are posed which are then addressed in subsequent chapters of this thesis. Chapter 3 (Sub-study 1) focuses on participation in offending and asks the following:

- *What proportion of the population participates in crime?*

- *How does participation in crime vary between (demographic) groups?*

- *How has participation in offending changed over time?*

Chapter 4 (Sub-study 2) addresses a different criminal career dimension – individual frequency of offending – and seeks answers to the following:

- *How does frequency of offending vary with age?*

- *Is there evidence of group based variations in the frequency of offending?*

Chapter 5 (Sub-study 3) extends the exploration of the individual frequency of offending and examines life-course offending through trajectory models. Questions addressed by the study are:

- *What kinds of trajectories can be ascribed to offending patterns over the life-course?*

- *How do these trajectories vary across gender and ethnic group (Aboriginal status)?*

- *What are the factors associated with such trajectories?*

- *And, do such factors also vary across gender and ethnic group (Aboriginal status)?*

Chapter 6 (Sub-study 4) returns attention to the criminal career dimension of 'participation in offending' and addresses the following:

- *What are the individual, family and community risk factors for juvenile delinquency in Western Australians?*

- *How do these associations vary by gender and Aboriginal status?*[15]

As with Sub-study 4, the final study in Chapter 7 (Sub-study 5) also investigates the risk factors for offending. However, its focus is solely on the Aboriginal population. Questions explored by the study are:

- *What are the individual, family and community risk factors for Aboriginal offending?*

- *How do these associations vary across the criminal career dimensions of participation and frequency?*

As is evident, a recurring question throughout the thesis is *'How does [an aspect of offending] vary by gender and Aboriginal status?'* Answers to this question help us assess the extent of differences between gender and ethnic groups. This, in turn, will help us assess whether general or group-specific models of offending are required. Exploring "group differences" in offending not only improves our theoretical understanding of the heterogeneity of criminality but also informs the design and practical application of interventions.

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[15] At a statistical level, there are various ways of exploring gender-ethnic differences. The simplest model tests whether the same models with the same risk factors and the same coefficients can predict participation by all gender-ethnic groups (i.e. MN, MA, FN, FA). It may be that differences in *exposure* would explain differences in participation for all. The second simplest model would include the same factors, but each would carry different *weight* (or coefficients) for sub-groups (MN, MA, FN, FA). The most complex model involves the testing of models with different risk factors for the different sub-groups, as well as potentially different coefficients. This thesis is interested in exploring the most complex of these models.

2. Data and Methodology

The main datasets and methodologies used in the research are described in this Chapter. With the exception of Chapter 7, which uses self-reported data on offending, all other investigations are undertaken using administrative data sourced from various Western Australian government collections which have been brought together using data linkage (DL) methods. The data is population based and longitudinal, with information collected on individuals from 1980 to 2005.

2.1 Use of population level, linked, administrative data

The use of *longitudinal, population level* data provides a number of design advantages compared to survey based studies. They allow study of large/whole-population samples and extensive longitudinal research.[16] Population level data also reduces problems relating to loss to follow-up, recall, selection, response and reporting bias. At population level, there is also less sampling or reporting bias, as large sample sizes enable robust analyses. Whilst survey data can potentially give more in-depth information, they can exclude the most vulnerable and at risk populations. Similarly, longitudinal studies often suffer from high attrition rates, again, often losing marginalised populations. Administrative datasets however, contain information on all individuals who have been involved with government agencies, over time. When investigating developmental pathways, it is extremely important that potentially at risk populations are included in analyses, as these groups are often excluded from or poorly captured in survey samples. Sourcing longitudinal data from administrative datasets is also

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[16] In the case of this research, some individuals are followed for more than 20 years.

time- and cost-efficient. As the data have been collected for the administrative purposes of delivering and monitoring services, use for research is secondary.

The use of *linked* data provides additional advantages. Firstly, they provide unique opportunities to interrogate a multiplicity of factors to determine which, if any, has an influence on offending behaviour. Data that is linked *across different government sectors* significantly expands the types of research questions that can be investigated and answered, particularly around causal pathways. Researchers are able to investigate complex pathways and inter-relationships between variables which are not normally available from a single agency source. Knowledge derived from this kind of research is better able to inform whole-of-government policy making and prevention and intervention initiatives. Moreover, the availability of information on certain sub-groups in the population, such as girls and Aboriginal youth, affords the opportunity to study more complex and possibly different (that is, gender specific or culturally specific) models of human behaviour.

2.2 Data Linkage methods

Data linkage (DL) methods are commonly used in public health and medical research. Typically, DL brings together administrative data from disparate sources and matches them through various approaches (e.g. probabilistic, deterministic and/or fuzzy logic methods), creating a 'linked' dataset which is then used to study individuals and their health outcomes over extended periods of time. A critical feature of linked datasets is that, once assembled, they are stripped of name identifying information so that researchers work only with de-identified data. The power and utility of such methods are well recognised, facilitating studies at population level and providing opportunities to explore a range of antecedent factors that

influence the development of human health and wellbeing and the progression of disease (Sibthorpe et al., 1995).

The benefits arising from DL based research in the health sector have been significant. They have led to improvements in patient care and reforms in health policy and law (Holman et al., 2008; Brook et al., 2008); improvements in the cost-efficiency of research; the conservation of patient privacy; community development; and commercial and competitive benefits (Holman et al., 2008). In more recent times, DL methods have been used to combine datasets from multiple sectors enabling research into the social aspects of developmental and health problems (Marmot and Wilkinson, 2006; World Health Organization Commission on Social Determinants of Health, 2008).

Despite technological advances and the growing utilisation of DL methods in medical research, uptake by criminologists and other social scientists has been poor. Ferrante (2009b) attributes this to several reasons, the most important being that there are legislative constraints on the release of personal information. DL in Australia operates principally through exemptions in the *Commonwealth Privacy Act (1988)* and similar state-based laws. The exemptions apply *only* to medical and health related research. Other forms of human research are not exempt and, thus, the capacity of researchers in other disciplines to use DL methods has been limited.

Only a handful of DL based criminological studies have been undertaken in Australia (Ferrante, 2009b). The majority of these have originated in WA where state privacy laws are not in place and where purpose built DL infrastructure (the INOIS system) was established in the early 1990s to support criminological and criminal career research (Ferrante, 1993). (See

Appendix D for more information about the INOIS system). Studies that have used data linkage for collaborative, cross-disciplinary research include a study of schizophrenia and offending; a study of the crash risks of drink driving offenders; and a study of the morbidity and mortality of imprisoned offenders (Jablensky et al., 2004; Rosman et al., 2001; Hobbs et al., 2006). The Developmental Pathways Project (DPP; Stanley et al., 2004) is the latest and most ambitious research initiative to use cross-sectoral data linkage for research purposes.[17]

2.3 Strengths and limitations of using administrative data

The use of data from administrative collections immediately raises a number of questions about the validity of the data as a suitable measure of offending behaviour. In the criminological domain, there has been some debate about the validity of self-reports and official records of crime as measures of offending behaviour. It is generally accepted that neither measure is perfect and that there are strengths and weaknesses in using either type of data (Farrington et al., 2003; Maxfield et al., 2000; Dirk, 2006). The main criticism of using official records to measure offending is that they undercount true crime and are subject to the

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[17] The DPP collaboration is a research initiative between university and government aimed at pioneering the use of cross-sectoral data linkage for human research (Stanley et al., 2004). The project involves the University of Western Australia (Telethon Institute for Child Health Research and the Crime Research Centre) and seven government agencies in Western Australia (the Departments of Health, Education and Training, Child Protection, Communities, Corrective Services, Attorney-General, and Disability Services Commission). The main aims of the project are to i) test the feasibility of linking population level data between WA's population health databases and information held by other sectors of government; ii) use the data in a de-identified format to describe temporal, regional, socio-economic and ethnic patterns of developmental outcomes, key risk and protective factors; and iii) identify pathways to health and wellbeing, educational achievement and delinquency outcomes among WA children.

influences of systemic factors (e.g. policy initiatives, legislative changes, resource (re)allocation). Differences in participation, frequency, age of onset and continuity of offending, have been identified by a number of studies (e.g. Farrington et al (2003), Kazemian and Farrington (2005), Thornberry and Krohn (2003), Brame et al (2005), Dirk (2006)). However, the same studies have also found a high degree of concordance between measures when other aspects of offending are investigated. Brame et al (2005) found evidence across data sources for both population heterogeneity and state dependent explanations for continuity in behaviour. Dirk (2006), too, demonstrated that despite significant differences across two measures of crime on many criminal career dimensions, the effects of family supervision, parent-child conflict and neighbourhood disadvantage operated similarly across the data sources. Such findings have led many to conclude that official records are a valid and reliable indicator of offending behaviour, to the extent that their use in criminological research is well established (Dirk, 2006; Maxfield et al., 2000; Farrington et al., 2003).

The used of administrative data raises an important issue about migration into and out of the state and the impact that this has over time on the data and on the interpretation of results. In WA, as elsewhere in Australia, statistics on population flows are limited and researchers must rely solely on aggregated statistics of net migration published by the ABS. Population movements at an individual level are not generally available and are extremely difficult to quantify. This not only impacts on research data, but also on denominator statistics such as population figures used in the calculation of prevalence estimates. It should also be noted that the data are collected for administrative purposes and often are used as proxies for the risk and protective factors identified in the literature.

2.4 Administrative datasets

The administrative datasets used in the study fall into one of two categories - those that relate to offenders and those that relate to the whole of population (including offenders, as well as non-offenders). The datasets that describe offenders and their offending patterns are collectively referred to as "Offender Datasets" and are sourced from various data collections from *within* the Western Australian criminal justice system. The nature of these datasets and the manner in which they have been linked and assembled for this study are described in Section 2.5 below.

The datasets that describe the whole population (offenders and non-offenders) include details of life events for each individual (e.g. birth, health status, education, death) and are referred to as "DPP Datasets" since they were sourced from the data holdings of agencies who participated in the Developmental Pathways Project (DPP; Stanley et al., 2004). The nature of these datasets and the manner in which they were linked to each other and to the Offender Datasets is described in Section 2.6 below. The linkage of Offender Datasets to DPP Datasets not only facilitated access to a broader range of potential risk factors related to offending, but also enabled detailed investigation of the non-offender population. Longitudinal information about the non-offending population is not usually available to criminological researchers and provides a powerful tool for identifying protective factors and for exploring resiliency in otherwise vulnerable populations (Roos et al., 2010).

2.5 Offender datasets

2.5.1 Operational definition of offending

Unless otherwise stated, "offending" in this thesis refers to official offending, that is, criminal behaviour that is known to and recorded by agencies within the criminal justice system. In the context of the WA criminal justice system, "official offending" is operationalised as follows:

- Being arrested and charged by WA Police for a criminal offence, or

- Being summonsed by WA Police to appear in court on a criminal charge,[18] or

- If the offender is a juvenile, being dealt with via a formal diversionary process (caution or referral to a Juvenile Justice Team). Formal juvenile diversionary processes are described in more detail in an Appendix A.

2.5.2 Sources of offending data

Data on offending were sourced from the administrative data collections of the WA criminal justice system. At present, the justice system in WA comprises the Police Department, the Department of the Attorney-General and the Department of Corrective Services.[19]

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[18] Note that I am not counting court appearances/finalisations *in addition to* police contacts as this would double count people who are charged by police (and subsequently appear in court). As a consequence, persons charged with a criminal offence by agencies other than WA Police (e.g. railways, fisheries, health, customs and taxation authorities) are excluded from the study. Also note that the definition used for offending i.e. having been charged or summonsed by police includes instances where the court outcome for the matter was *not* guilty.

[19] Government departments often change names and re-structure. Since 1990, a number of agencies have been part of the WA criminal justice system but are now defunct, their role being subsumed into other government agencies. These include the Department of Justice, the Ministry of Justice, the Crown Law Department, the Department for Community Services and the Department for Community Development.

De-identified, unit record data from these administrative systems were made available through the Crime Research Centre (CRC) at the University of WA. Since 1990, the CRC has routinely received research datasets from agencies within the WA criminal justice system. The data is supplied without names or addresses but contain, instead, a unique INOIS identifier which distinguishes one offender from another. Each offender has a different INOIS identifier and every event record for that offender is allocated the same INOIS identifier. The INOIS identifier is a product of the INOIS data linkage system which is described in more detail in the following section.

Using the de-identified, *INOIS-linked* data supplied to the Crime Research Centre, the study constructed a criminal career database containing the criminal justice event history of every offender who had formal contact with the justice system (as defined above) between 1 January 1984 and 31 December 2005 (the study 'observation window'). The following types of events were recorded for every offender who was registered in the database:

- police arrests – summons and/or charge; adult and juvenile (from 1984 onwards)

- juvenile court appearances (1984 onwards)

- various forms of formal juvenile diversion (from 1984 onwards)

Owing to some major structural changes in the juvenile justice system in WA over the period from 1984 to 2005, it was necessary to source the offending event data for the study from multiple datasets. Appendix B describes the datasets utilised and the period for which they were relevant.

Once completed, the offender database comprised 122,517 offenders born between 1977 and 1995 who had had contact with the WA criminal justice system between 1984 and 2005. From this group, it was possible to construct nineteen birth cohorts. The 1977 birth cohort was able to be followed for the longest period (21 years), from 1984 (age 7) to the end of 2005 (age 28), while the 1995 birth cohort could only be followed for a year, while age 10 in 2005.

Minimum age of criminal responsibility

Note that the youngest age at which a person can be dealt with by the WA criminal justice system is 10 years. This was raised from 7 years to 10 years in 1988.[20] The change in minimum age of responsibility impacted the study in that some of the earliest birth cohorts (i.e. offenders born in 1977, 1978 1979, 1980 and 1981) had offending records from age 7 onwards, while later cohorts had offending records only from age 10 years and over. Because of this variation, some adjustments in analyses were required. These are noted in the relevant chapter(s).

2.5.3 Offending datasets

As Figure 2.1 shows, the final Study Offender Population (SOP) comprised approximately 122,000 offenders who were born between 1977 and 1995. For each offender in the SOP, the study maintained a record of every offending event (police apprehension and/or juvenile

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[20] Refer to the *WA Criminal Code s.29* on immature age. This section was amended in 1988 (*No. 49 of 1988 s. 44.)* to read as follows:

 "A person under the age of 10 years is not criminally responsible for any act or omission.

  A person under the age of 14 years is not criminally responsible for an act or omission, unless it is proved that at the time of doing the act or making the omission he had capacity to know that he ought not to do the act or make the omission."

diversionary option) from 1984 to the end of 2005. In parts of this thesis (for example, Chapter 3), distinctions are made between offending measured solely through police apprehensions and offending measured through a combination of police apprehensions and diversionary options. The distinction between measures enables the differential effects of reforms to the juvenile justice system during the 1990s to be assessed.

Figure 2.1: Study Offender Population (SOP) and the study observation window
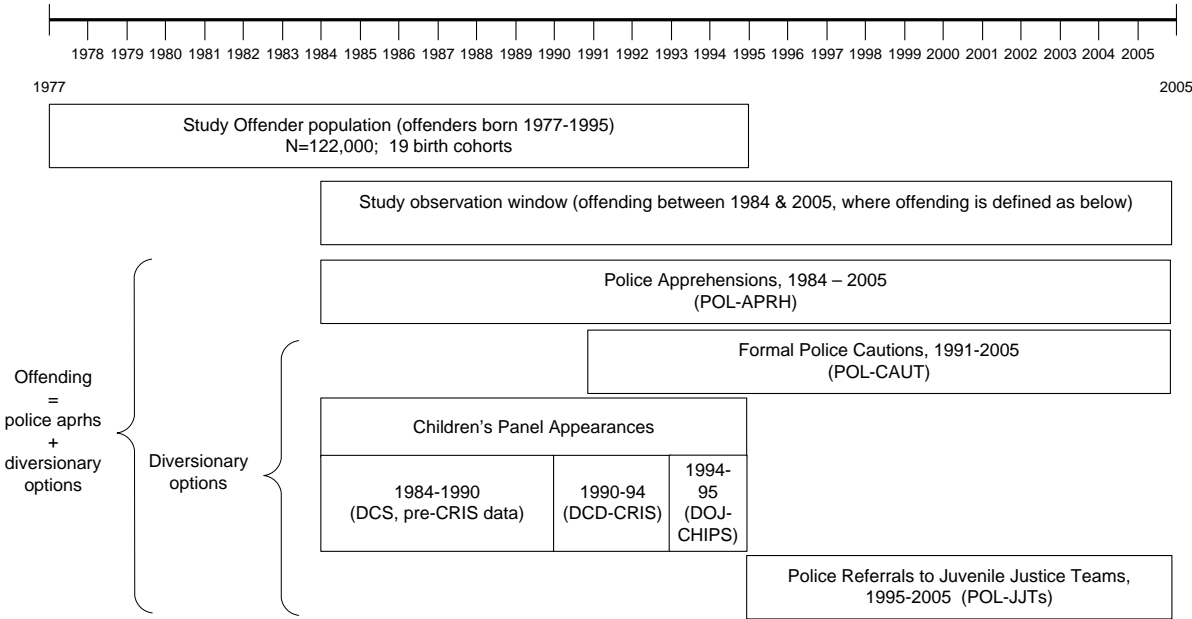
Data for the study were stored in an INGRES relational database management system. To reduce complexity, all of the offending data from the disparate sources were re-formatted, standardised and stored in two relational tables which were labelled Juvmaster and Juvevents. See Appendix C for further information about these tables.

2.5.4 Data integration via the INOIS data linkage system

Individual offenders in the criminal career database could be tracked longitudinally and from one criminal justice agency to another using their unique INOIS identifier. Every offender has

a different INOIS identifier and every event record for that offender is allocated the same INOIS identifier. This unique identifier is allocated by the INOIS (integrated, numerical offender identification system) Record Linkage System – a probabilistic data matching system which was developed and implemented in the WA criminal justice system in the early 1990s. The aim of the system is to link records that are believed to belong to the same person from two different criminal justice datasets in order to facilitate criminological and criminal career research (Ferrante, 1993). See Appendix D for more information about the INOIS system.

2.6 DPP Datasets

2.6.1 Purpose of linking offender data to data from other sources

The main purpose of linking offender data to other data sources was to construct a detailed longitudinal, multi-source, population based research dataset to facilitate investigation of the influences of a multiplicity of factors on offending. Cross-sectoral data linkage was enabled through the DPP study (described earlier; see also section 2.6.4).

2.6.2 Creation of non-offender datasets

The linkage of offender data to other datasets not only facilitates access to a range of potential risk factors related to offending, but also enables analysis of the non-offender population. Such information is not normally accessible to criminologists. Traditionally, it is information about offenders, usually drawn from the criminal justice system, which is used to study offending behaviour. Population level data which contains information about offenders as well as non-offenders is an invaluable resource. Among other things, it provides an opportunity to identify the protective factors for offending and to investigate resiliency amongst vulnerable population groups. Access to population level data also enables case-

control studies to be undertaken, since controls can be drawn from the non-offending population. The study design is employed in the study of risk factors described in Chapter 6 of this thesis.

2.6.3 Approval for linking offender data to data from other sources.

The process for linking offender data to other administrative datasets was approved by three Human Research Ethics Committee (HRECs) – that of the University of WA, the HREC within the WA Department of Health and the WA Aboriginal Health Information Ethics Committee. It additionally required amendments to the *Young Offenders Act 1994* to allow legal disclosure of demographic data to the Health Department (for linkage purposes) by the Department of Corrective Services (DCS). It was *not* possible within the study timeframe to obtain approval from the WA Police Service for the release of data for the purpose of linkage to non-criminal justice datasets. Hence, only a portion of the records in the Offender Datasets were eligible to be linked to the DPP datasets by the Data Linkage Branch. This latter limitation created some issues in assembling linked datasets and undertaking some analyses (discussed in a later section of this chapter).

2.6.4 DPP datasets and linkage process

The Data Linkage Branch of the WA Department of Health (DLB) undertook the linkage of offender data to the DPP datasets using the WA Data Linkage System (WADLS) (Holman et al., 1999). The WADLS is a production linkage system which routinely creates and maintains links within and between the State's core population health data collections.[21] The core health

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[21] The WADLS system of links is augmented through 'extra' links to an extensive collection of external research and clinical datasets. The WADLS does not contain any clinical or service data, but consists of groups (or chains) of links. Each link is associated with a particular record in one of the original data sources. All the

data collections comprise: midwives notifications, cancer registrations, mental health clients, hospital admissions and emergency presentations. Electoral, birth and death records are also linked routinely under a special arrangement with the WA Electoral Commission and the Registry of Births, Deaths and Marriages.

As part of the DPP project, several 'new' administrative datasets were linked to the WADLS. These included child maltreatment and neglect data, as supplied by the Department for Child Protection (DCP), and educational achievement data (WA Literacy and Numeracy Assessment scores for Years 3, 5, 7 and 9), as supplied by the Department of Education and Training (DET), and intellectual disability data, as supplied by the Disability Services Commission of WA. Data from the WADLS was augmented with DCP, DET and Disability data *before* the linkage to Offender data was undertaken. The DPP datasets are described in more detail in Appendix E.

As with the INOIS system, the DLB uses probabilistic data matching techniques to determine if records in different datasets belong to the same person. The DLB also uses a best practice two-stage linkage model in which the linkage process is separated from the processes required

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links in a particular chain have been associated with the same individual through the process of probabilistic linkage. This method of linkage relies on the availability of similar demographic information (e.g. name, sex, date of birth, address) in each data source. Manual review of links is a routine part of the linkage process and maintains quality. Approximately 5-10 percent of records are checked by Data Linkage staff. The linkage process depends on access to personal demographic information derived from each of the contributing data sources. Clinical or service information is ***not*** used in the linkage process.

to deliver de-identified data to researchers (Kelman et al., 2002). This model is also described more fully in Appendix F.

Information about the quality of linkage results pertaining to this specific project were not released to the researcher; however, data linked routinely by the WADLU has been shown to be of very high quality (Boyd et al., 2012). Significant expertise has been developed within the WA DLU and WA links have been developed and checked over a long period of time, with extensive manual clerical review performed (Rosman et al., 2002). These links have been validated by researchers who have used them widely (Holman et al., 2008).

Once the linkage task was completed, de-identified research datasets were created and released for the study. Following the best practice two-stage model, these research datasets were created by the data custodians (not the DLB) and then released to the researcher. The research datasets were stripped of any identifying data and assigned linkage keys to be used by the researcher to connect or "link" the relevant data items for each individual together. The linkage keys were issued to the data custodians by the DLB. The keys were project-specific and encrypted, so they could not be shared with other researchers or used for any purpose other than the present study.

2.6.5 What offender data was extracted for linkage to DPP datasets?

As noted earlier, *it was not possible to obtain approval from the WA Police Service to release data for the purpose of linkage to DPP datasets*. Thus, not all of the Offender records that made up the Study Offender Population (SOP) could be linked to the DPP datasets. Only a portion of records in the Offender Dataset – namely those sourced by the Department of

Corrective Services (DCS) (henceforth referred to as the DCS Offender data) - were able to be supplied to the DLB for linkage to the DPP datasets.

It is important to understand that not all offenders who are known to WA Police are known to DCS. Attrition can and does occur at various points in the justice system. Two important factors that have a bearing on this level of attrition are:

- First, and most importantly, not all offenders who are diverted via juvenile justice mechanisms (ever) return to the system or travel deeper into the justice system and are subsequently managed by DCS. A study of juvenile pathways through the justice system in WA found that 61percent of first offenders had no further contact with the system after two year (Ferrante et al., 2004);

- Second, many offenders who are charged or summonsed by police are dealt with by way of fines and, thus, do not fall under the management of DCS. Many of these offenders, too, never return to the justice system and, therefore, are never known to DCS.

Hence, the total number of offenders *ever* known to DCS will always be significantly less than the total number of offenders *ever* known by police. In other words, the size of the DCS Offender population will always be significantly smaller than the size of the Study Offender Population.

The next sections describe the nature of offender records that were sent for linkage, the relationship of that data to the larger Study Offender Population and the impact that this had on subsequent analyses.

DCS Offender data

The DCS Offender data were extracted from several electronic collections of the DCS, including the TOMS system (which stores information on offenders serving terms of imprisonment and those on parole), the CBC system (which stores information on offenders serving community based orders) and the CHIPS system (which stores information about offenders appearing before the Children's Court, the Magistrates' Courts and those referred to Juvenile Justice Teams). Only the demographic data of persons born from 1 January 1980 onwards were extracted and sent to the DLB for linkage. The DCS Offender dataset comprised 41,504 records.

The relationship between DCS Offender data that was extracted for linkage and the Study Offender Population (SOP; described earlier) is best illustrated by Figure 2.3 As the figure shows, only 25,583 persons in the DCS dataset – labelled as DSC-SOP - could be identified in the SOP dataset. The DCS-SOP group thus accounted for just 20% of offenders in the SOP dataset and 28% of offenders in the SOP 1980+ dataset. Of the 25,583 persons identified in the DCS dataset as being part of the Study Offender Population (DSC-SOP), 18,949 (74%) were linked to DPP datasets by the DLB.

Figure 2.3: Relationship between DCS data to SOP datasets

Offenders in CRC data holdings

Study Population (SOP)

SOP 1980+

DCS-SOP

DCS – Part B

DCS – Part C

DCS Offenders 1980+
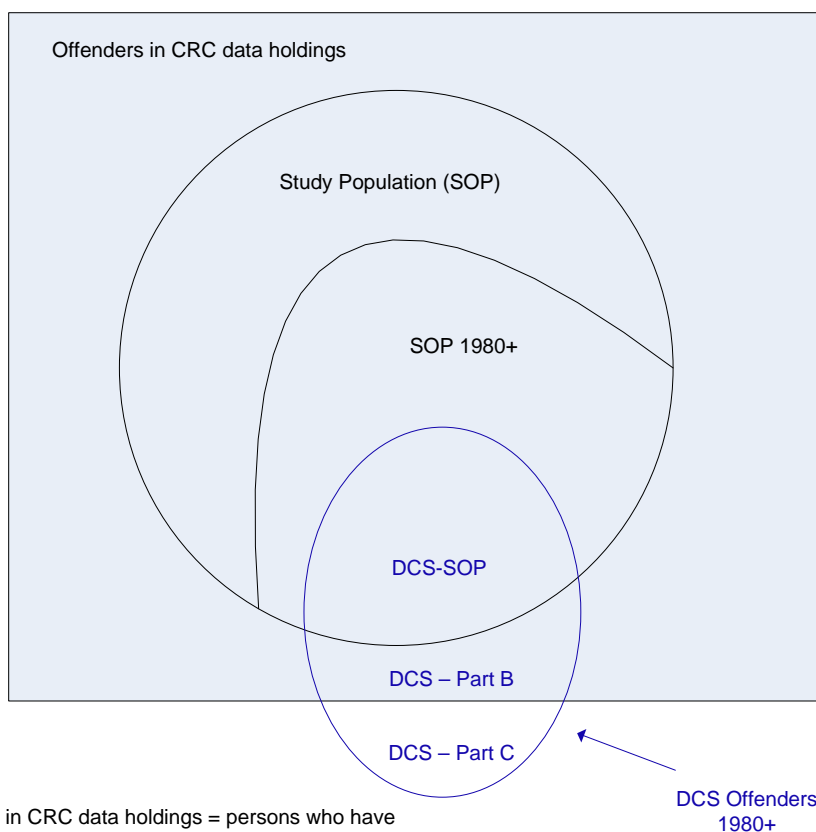
Offenders in CRC data holdings = persons who have been apprehended and charged by WA police (since 1984) or dealt with via juvenile diversion (since 1984) or imprisoned (since 1975) or spent time in police lockups (since 1989) or served community service orders (since 1979) or appeared as defendants in WA criminal courts (since 1993).

SOP = persons born 1977-1995 who have been apprehended and charged by police or dealt with via juvenile diversion between 1984 & 2005. N = approx. 120,000

SOP 1980+ = persons born 1980-1995 who have been apprehended and charged by police or dealt with via juvenile diversion between 1990 & 2005. N = approx. 90,000

DCS Offenders 1980+ = persons born 1980-1995 who have been imprisoned (TOMS) or who have served community service orders (CBC) or who have had contact with juvenile justice system (Interim Field System). N= 41,504 persons

DCS-SOP = DCS offenders that are known to have been apprehended and charged by police or dealt with via police juvenile diversion. N = 25,583 persons

DCS – Part B = DCS offenders that appear in CRC data holdings but who have NOT been apprehended and charged by police nor dealt with via police diversion (eg charged by other authorities such as taxation, fisheries, transport, then prosecuted and/or processed by DCS) N = 7,732 persons

DCS – Part C = DCS offenders that have been dealt with by DCS but are not known to the CRC. These people have never been apprehended and charged by police nor dealt with via police diversion, nor prosecuted in criminal courts, nor imprisoned or served community orders. Could include children dealt with by juvenile justice system but not initially processed by WA police. N = 8,189 persons

Relatively small size of the linked offender group

It is significant that of the total study offender population born between 1980 and 1995 (i.e. SOP 1980+, comprising approximately 90,000 persons), only a relatively small proportion (25,583 persons in DCS-SOP) could be identified as belonging to the DCS Offender group. Of these, almost three-quarters (18,949) were successfully linked by the DLB.

There were, thus, 6,634 DCS-SOP cases (25%) that failed to be linked by the DLB. There are a number of (legitimate) reasons why some DCS-SOP records did not link to DPP data:

i)   the record was of a person who was not born in WA between 1980 and 1995 (recall that the DLB linked data only for persons born in WA between 1980 and 1995);

ii)   no other administrative records exist for this person (e.g. the birth may not have been registered);

iii)   there was insufficient information in the administrative records to link the records with sufficient certainty.

2.6.6 Relationship between SOP, DPP and DCS offender datasets

It is evident that the linkage of Offender data to DPP datasets for this study brought with it considerable complexity. Understanding the complex relationship between the SOP, DPP and DCS data was important for two reasons. Firstly, to determine if, and how, the various linkage processes may have affected the representativeness of the resultant study datasets of offenders in WA. Secondly, to determine which parts of the resultant study datasets should be included or excluded in the ensuing Sub-studies (reported in Chapters 3-6).

Figure 2.4 illustrates the relationship between the three types of datasets. It is important to note that the data used to create the SOP was sourced largely from police records, which were *not* able to be released for linkage to DPP datasets. The dataset supplied by DCS thus played an important role of bridging the connection between DPP and the SOP datasets[22] *as well as* in determining the extent of overlap between SOP and DPP datasets.

Representativeness of linked offender dataset

Given the use of DCS data in the linkage to offender to DPP data, a critical question to arise was: *How representative of all offenders is the linked offender group resulting from that linkage?* The answer to this question has most relevance to the Sub-study 4 (Chapter 6) which investigates the risk factors associated with offending. The representativeness of the linked datasets has a direct and significant impact on the generalisability of those results.

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[22] A strict privacy-preserving protocol was implemented for bridging between WADLS-based links and INOIS-based links: First, a complete list of INOIS-based keys from the criminal career database that was constructed for the study and sent to DCS by the Crime Research Centre. To these, the DCS attached project-specific linkage keys. These had been assigned by the DLB and sent to DCS at the completion of the DPP linkage. DCS were then able to construct a concordance file between INOIS-based and the project-specific linkage keys from the DLB. The concordance file was then sent to the researcher and used as a bridge between the two linked collections. The data custodian (DCS) remained in control of identifying data through this process; at no time did the researcher have access to name identifying data.

Figure 2.4: Relationship between DPP, SOP and DCS data

DPP Population = born in WA 1980-1995
N=388,000

Study Offender Population = born 1980-1995 with formal contact with WA CJS
N=approx. 120,000

DCS Offenders = born 1980-1995 and "known" to Dept of Corrective Services
N=approx. 41,000
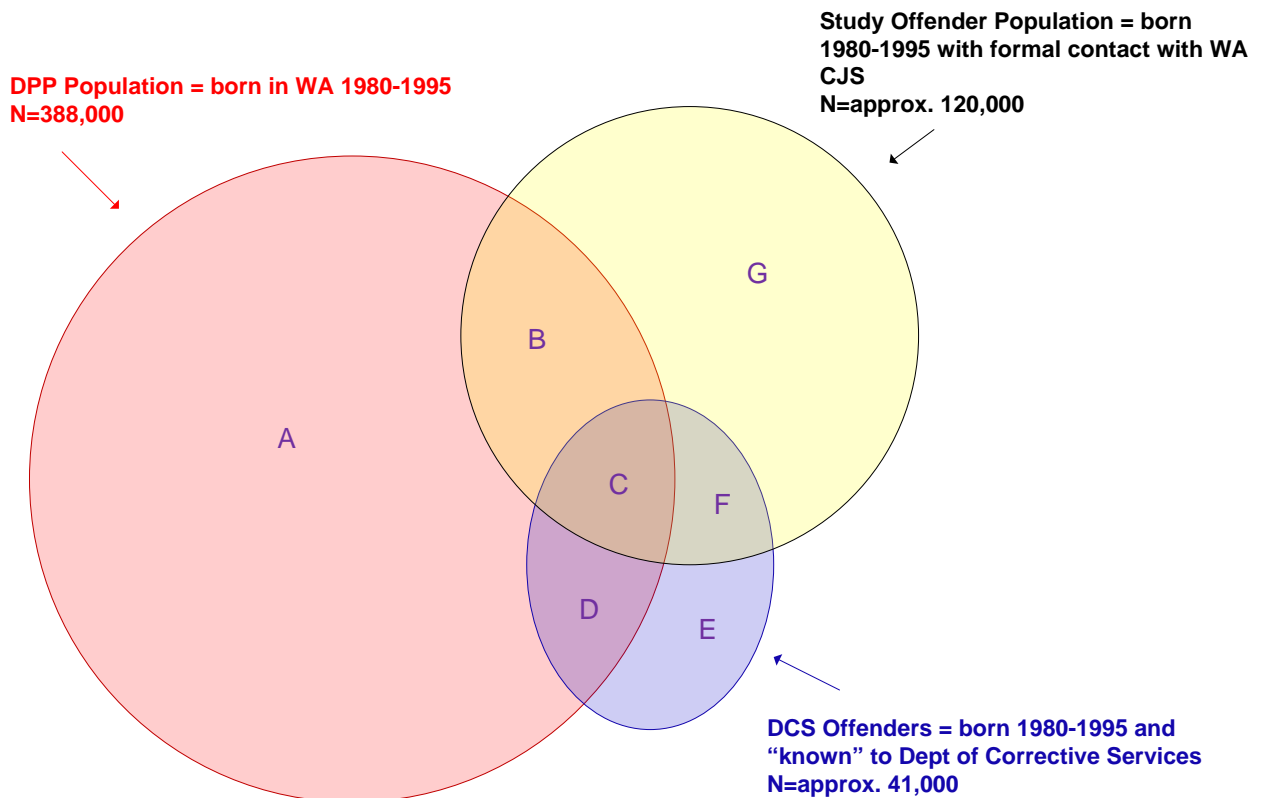
Notes:

- D and E are not in SOP so are excluded from any SOP-based analyses. It is not possible to describe E since no details of cases Are available (from either DPP or SOP side), but it is possible to describe D from DPP data (demographics only). Dn=11,191. En=4,730.
- B & C are highly researchable groups (i.e. linked offenders); however, B are unknown to the current study and so can not be distinguished from either A or G. Bn=unknown. Cn=18,949.
- F comprises unlinked DCS offenders. It is possible to identify and describe these from SOP data. Fn=6,634.
- A should represent all non-offenders; However, in reality A comprises the DPP population that has *not* linked to any DCS record. Since B is indeterminate, A is contaminated with B cases (so not a true representation of non-offenders in population). In analyses, we will refer to A* - meaning A with unknown level of B contaminants.
- G should represent all unlinked offenders; However, in reality it is SOP data that is not in DCS data. Like A, G is contaminated with an unknown number of Bs, so any analyses using G will refer to G* - meaning G with unknown level of B contaminants.

Data used to construct the Study Offender Population (SOP) was sourced from WA Police. Unfortunately, police data was not released for linkage, so size and status of the intersect group (B) could not be ascertained.

The question of representativeness can be answered through consideration of Figure 2.4 and by a comparison of group C (linked offenders) with groups G, C, F and B combined (i.e. all offenders). The differences between linked offenders (group C in Figure 2.4) and the total offender population (SOP = G+C+F+B) are presented in the first two columns of Table 2.1.

Table 2.1: Profile of the total offender population, the general population and the linked

offender group

Characteristics	Total offender population (SOP)	Linked offenders ("C")	General population (DPP)
Gender			
Male	70.7	76.3	51.5
Female	28.3	23.4	48.5
Unknown	1.1	0.3	0.0
Indigenous Status			
Indigenous	15.6	29.6	5.5
Non-Indigenous	81.5	68.4	94.5
Unknown	3.0	2.0	0.0
Year of birth			
1980	11.4	11.1	5.4
1981	11.7	12.3	5.8
1982	10.8	10.7	5.8
1983	10.8	10.8	6.0
1984	10.2	10.2	6.0
1985	9.5	9.4	6.0
1986	8.7	8.5	6.2
1987	7.5	7.6	6.3
1988	6.3	6.6	6.5
1989	4.6	4.8	6.6
1990	3.8	3.7	6.7
1991	2.3	2.0	6.5
1992	1.5	1.3	6.6
1993	0.7	0.5	6.6
1994	0.4	0.3	6.6
1995	0.1	0.1	6.6
Place of birth			
Western Australia	32.1	69.7	100.0
Elsewhere	13.3	6.5	0.0
Unknown	54.6	23.7	0.0
Length of Criminal career			
1	56.1	18.8	-
2	16.5	14.6	-
3	8.0	11.3	-
4	4.6	8.7	-
5 or more events	14.8	46.7	-
Mean # events	3.1	7.2	-
Median # events	1.0	4.0	-
Total Number of Cases	91,107	19,071	383,221

As Table 2.1 illustrates, linked offenders were more likely to be male and to be Aboriginal

than the general offender population. Moreover, they were more likely to be born in WA and

to have a more extensive criminal career than the overall offender population. However, there was no discernible difference in the age (year of birth) of linked offenders compared to total offenders. These differences are consistent with the biases that are hypothesized to have been introduced through the linkage of DCS data to WADLS data – specifically that DCS data was only linked to WA born individuals in the WADLS system. DCS data, too, is itself a biased collection of offender data, as only more serious offenders tend to become known to and/or managed by the Department. Less serious cases are generally dealt with by police and are often diverted from the formal processes of the WA justice system. Not surprisingly, then, the profile of the linked offender group more closely resembles that of more serious offenders, rather than the general offender population.

Table 2.1 also illustrates differences between the linked offenders and the general WA population. Researchers in the criminal justice sector would be familiar with some of the differences observed, that is, that offenders are more likely to be male and, in Australia, more likely to be Aboriginal than the general population. The over-representation of Aboriginal people in the Australian criminal justice system is well documented (see Chapter 7 for more).

What data to use in which Sub-study?

As identified earlier, understanding the relationship between the SOP, DPP and DCS data was important for determining which parts of the resultant study datasets should be included (or indeed, excluded) in the ensuing sub-studies. On the basis of the relationships illustrated in Figure 2.4, the following decisions were made:

- For Prevalence-related research questions – comparison should be made between C cases and (A* and *not* Ds). Recall that A* recognises that there are B "contaminants" in A.

- For Frequency research questions, an extended range of independent variables (sourced from DPP data) is only available for C cases. D cases should be excluded from Frequency Analyses, since they are not part of SOP.

- The C group represents a very unique and highly researchable group of offenders i.e. in SOP, known to DCS and with richness of independent variables from DPP datasets. Cn=18,949.

- Comparisons between G* and C are useful for determining if there is any bias in C. In other words, a comparison of G*, C and F would determine how representative C is of the general offending population.

2.7 Other sources of data – survey data

While the majority of the analyses undertaken in this thesis were based on linked administrative data, one Sub-study used an alternative, survey based dataset. Chapter 7 presents a study of the risk factors associated with Aboriginal offending using data from the National Aboriginal and Torres Strait Islander Social Survey 2002 (Australian Bureau of Statistics, 2004b). More detailed information about the nature of that data is contained in Chapter 7.

The use of multiple methods and/or multiple sources of data to study a phenomenon is referred to as 'triangulation' (Bogdan and Biklen, 2006). By combining multiple methods or data sources, the weakness or bias that might arise from using a single method or source is overcome (or, at least, mitigated). Triangulation techniques are often used to validate results. In the criminological literature, findings derived from official records are frequently

compared against those based upon self-reported data. Farrington (2003) suggests that together, both sources of data produce "comparable and complementary results" on the dimensions of a criminal career.

2.8 Statistical methods

A number of methodological approaches were used throughout this thesis. The choice of analytical method varied depending on the type of data used and the nature of the research question being addressed. More detailed information about the methods used by each Sub-study is contained in the relevant Chapter. In summary, the following methods and measures were used:

- Chapter 3 (Participation in offending) – age-period-cohort (APC) analysis and multiple regression, using aggregated, longitudinal offending data (prevalence) and multiple cohorts;

- Chapter 4 (Frequency of offending) – descriptive statistics (age-crime curves) using aggregated, longitudinal offending data (lambda);

- Chapter 5 (Frequency of offending) – semi-parametric group based modelling methods (Nagin and Land, 1993) using longitudinal data; multiple birth cohorts;

- Chapter 6 (Risk factors associated with offending) – a series of logistic regression models using longitudinal, DPP linked offender data;

- Chapter 7 (Factors associated with Aboriginal offending) – multiple regression and logistic regression, using cross-sectional, survey data (self-report).

3. Sub-Study 1 - How has the prevalence of offending changed over time?

An analysis of age, period and cohort effects, and identification of group differences.

Abstract

The aims of this study are to document the prevalence of official offending in WA and explore changes in prevalence of offending over time. Using multiple birth cohort data drawn from linked records of offending, the study estimates the prevalence of official offending for specific sub-groups within the population (i.e. males, females, Aborigines and non-Aborigines). For each group, the study investigates whether changes in prevalence estimates over time can be accounted for by underlying changes in the age structure of the population, period effects and/or cohort variations. The study finds evidence of age and period effects but little evidence of cohort effects. Period effects are shown to emanate from the juvenile justice area, suggesting that the juvenile justice reforms of the 1990s have had a net-widening effect. However, effects have not been uniformly felt. While the study finds evidence of period-related shifts in Aboriginal prevalence levels, there is little to suggest that the prevalence of female delinquency has changed significantly over time. This finding challenges the widely held belief that female delinquency is on the rise.

3.1 Introduction

3.1.1 The importance of prevalence

From the earliest days, proponents of the criminal career framework have argued that structuring knowledge around the fundamental "dimensions" of crime (i.e., prevalence, frequency, duration, specialisation, escalation) is of fundamental importance to the development and testing of criminological theories and to the development of effective social policies (Blumstein et al., 1988; Tillman, 1987). Offending prevalence, defined as the proportion of the general population who become involved in crime, is the most basic of these constructs.

Empirical research on prevalence has tended to be centred on three critical questions: *What is the overall prevalence of offending in the population? How does prevalence vary between groups? How does prevalence vary over time?* The answers to these questions provide essential knowledge about the extent and distribution of offending in the population. Among other things, this information enables researchers to develop a thorough understanding of the underlying "causes" of crime and it enables policymakers to assess the impact of crime prevention and other social policies.

As the review in Chapter 1 found, answers to the first two of these questions can be found in the criminological literature, although for Australia answers are limited (and, for WA, this information is non-existent). The third question is arguably more complex because it explores prevalence along a further dimension – time. Studies which explore this issue are primarily concerned with understanding the nature of change in offending levels over time.

Understanding patterns of temporal variations in data and determining the reasons for such variations is a complex undertaking and researchers from many disciplines have contributed to the science and challenge of the task. Epidemiologists, for instance, have engaged in the analysis of prevalence trends in a range of diseases and other health-related conditions (e.g. suicide trends, mental illness) (Palmore, 1978). Sociologists, too, have engaged in studies of various social phenomena such as variations in long term voting patterns and generational shifts in smoking habits (Smith, 2008).

3.1.2 Cohort analysis

The growing availability of multiple cohort data has provided researchers with opportunities to investigate multi-factorial explanations of temporal change (Sanson, 2002). Cohort analysis has emerged as a particularly useful method for disentangling the separate effects of three important time-dependent elements: age, period and cohort effects. Age effects usually refer to variations associated with different age groups within a population. Period effects refer to changes in environmental or structural factors that occur and affect all age groups over a given time period. Cohort effects usually refer to (generational) factors that affect one group more than any other and operate over the long term. All three factors are said to be fundamental to understanding temporal trends in data on health and human behaviour (Fabio et al., 2006).

Different techniques have been developed to estimate the simultaneous effect of age, time (period) and cohort on an observed trend (Yang and Land, 2004; Stockard and O'Brien, 2006; e.g. Mason et al., 1973; Fabio et al., 2006). New and improved techniques continue to emerge (see, for example, the Journal of Sociological Methods and Research, Volume 36, which describes a number of 'state-of-the art' statistical methods for age-period-cohort analysis).

3.1.3 Cohort analyses in criminology

A number of criminological studies have assessed the impact of age, period and cohort effects on offending levels (O'Brien, 1989; Menard and Elliott, 1990b; Steffensmeier and Streifel, 1991; Smith, 1986; Maxim, 1985; Fabio et al., 2006; Francis et al., 2004a; O'Brien et al., 1999). From these studies, age emerges as having a strong influence on long term prevalence trends. Period effects are also present though to a lesser extent, while the evidence of a strong or significant cohort effect is mixed.

Wilkins (1960) is recognised as having undertaken one of the earliest criminological studies of cohort effects on offending prevalence. He tested the hypothesis that the lack of a father figure during the World War II influenced the delinquent behaviour of children. The study identified strong cohort effects in the prevalence of offending in post-war United Kingdom. Males who were aged four or five during World War II were found to be more delinquent than others, both in childhood and later in life. Some researchers have been sceptical of Wilkins' so called 'delinquent generations' (e.g., Carr-Hill et al., 1972: cited in Francis, Ranalli and Soothill, 2002), however, subsequent re-analysis of the data using improved statistical techniques confirm the original findings (Francis et al., 2002). Stockard et al (1999), too, found enduring effects of cohort characteristics on homicide rates over a 35 year time frame. In contrast, a recent investigation of age, period and cohort effects on violence trends by Fabio et al (2006) found no evidence of a cohort effect but significant age and period effects.

The importance of teasing out and understanding the separate effects of age, period and cohort effects is critical to our understanding of shifts in offending levels. Often, temporal

changes are assumed to be solely the result of social, environmental or practice changes (period effects) when in fact they may be partly or entirely due to generational differences (cohort effects) or to changes in the age composition of the population (age or aging effects) (Palmore, 1978). To illustrate, consider a study by Carrington (2006).

Carrington engaged in an analysis of official records (specifically, statistics of convictions from the criminal courts of New South Wales from 1960 to 2004) and identified a rising trend in female delinquency in Australia. The study includes a thorough and thoughtful review of theoretical issues and developments in juvenile justice. From the evidence, the study concludes that legislative reforms, policy shifts and changes in practices in the juvenile justice system have caused a narrowing gender gap in official statistics. The contention is that secular changes have moved the administration of juvenile justice from a welfare model toward a justice model causing a greater criminalisation of girls. Other Australian research supports this assertion (Oglivie et al., 2000: as cited in Carrington, 2006, p. 48).

The logic of Carrington's argument is sound; however, her analytical approach fails to include any other explanatory factors in the analysis which might otherwise account for the patterns of change observed. Only period effects are included in the analysis; the possibility that cohort and/or age effects may have had an influence on female delinquency patterns over time is not explored in the analysis. The analysis is further limited by the cross-sectional nature of the data (i.e. annual incidence data) which is drawn only from court records. Data structured in this way precludes analysis along longitudinal, criminal career dimensions (Blumstein et al., 1988; Menard and Elliott, 1990a). As a consequence, Carrington is unable to disaggregate the data into its constituent elements: 'prevalence' (or participation) and 'frequency'. Thus, it remains unclear whether the rise in official levels of female offending

observed in the data is the result of an increase in the number of girls becoming involved in crime (i.e. an increase in participation levels) or an increase in the frequency of offending of active female offenders, or both. The point here, though, is not to be critical of the study *per se* but to demonstrate that it, like many others, fails to examine long term trends in an appropriate way; that is, without distinguishing between prevalence and frequency and without adequately accounting for the three 'basic' temporal elements that are known to affect such patterns – age, period, and cohort (APC) effects.

3.1.4 What is meant by "cohort effect"?

Sociologists have had a particular interest in identifying what cohort effects, if any, might exist and, indeed, contribute to social change. Issues of cohort replacement and succession have been central to sociological discourses of structural and social change. Ryder (1965) provided one of the earliest commentaries on cohort effects. He noted that "the annual infusion of birth cohorts […] provided the opportunity for societal transformations" (p. 843). More recently, Smith (2008) observes that the distinction between "period change" and "cohort change" , rather than age effects, have been of central interest in sociological research. However, within the APC framework, the notion of "cohort change" has been particularly difficult to conceptualize and measure (Smith, 2004; Palmore, 1978; Glenn, 1974).

Researchers have used various cohort characteristics (e.g. family structure and relative cohort size) to represent cohort effects. The theoretical basis for these approaches derive largely from strain theory (Agnew, 1992) and the work of Easterlin (1987). Easterlin theorised that the larger the size of the cohort, the greater the competition for various personal, family and social resources (e.g. income, parental attention, employment opportunities), which, in turn,

yield greater social problems including crime. Some researchers have drawn on other theoretical perspectives, such as social control and Coleman's (1990) notion of social capital, to make these connections. Stockard and O'Brien (2006), for example, suggest that family structure and relative cohort size "reflect 'cohort related social capital' and influence the social integration and regulation that birth cohorts experience." They describe three ways in which these factors exert a cohort effect: 1) reduced financial resources due to more children in a cohort and/or fewer adults within a household 2) less attention and supervision of children, owing to adult resources being spread more thinly among children and 3) a stronger influence of peers. The researchers further argue that these effects may not affect all groups within a population equally. Their study found that males were more likely to be affected by larger cohort size than females. Cross-cultural differences were also identified. The authors hypothesized that the effects of cohort related social capital may be reduced in cultures that provide more supportive atmosphere for families and children. Where communities provide high levels of support for families and children, the effects of larger cohort sizes may be expected to be smaller.

3.1.5 Aim of this study

The aims of this study are two-fold: first, to estimate and document the prevalence of official offending for the general WA population and for specific sub-groups within the population (i.e. males, females, Aborigines and non-Aborigines); and second, to investigate changes in the prevalence of offending over time, assessing the impact of age, period and cohort (APC) effects on long term trends. APC analyses are undertaken for the whole population and for each population sub-groups, as such analyses are rarely, if ever, found in the literature (Piquero et al., 2003).

The study addresses three fundamental questions about offending: What is the overall prevalence of offending in the population? How does this prevalence vary between (demographic) groups? How does prevalence vary over time? Answers to these questions provide essential knowledge about the extent and distribution of offending in the population. This enables policymakers to both target crime prevention and other social policies and subsequently assess their impact. It also enables researchers to develop a thorough understanding of the underlying "causes" of crime.

3.2 Analytical Strategy

Guided by these objectives, the study proceeds as follows. First, the age-specific prevalence rates are estimated for each of the four sub-groups in the population – as defined by gender and Aboriginal status. Second, prevalence rates are estimated for each population sub-group across multiple and successive birth cohorts using official records (as is possible from the available data – see below). Prevalence rates are estimated in two ways, so as to capture different features of official offending (described more fully below). Third, having obtained suitable estimates of prevalence, descriptive analysis is undertaken to examine differences between sub-group prevalence levels and to investigate how the prevalence level for each group may have changed over time. Finally, for each population sub-group, APC analysis is undertaken to simultaneously assess the impact of age, period and cohort effects on long-term prevalence trends. This is done through the use of ordinary least-squares regression.

3.2.1 Hypotheses of the present study

Based on the research evidence of previous studies, it was hypothesized that the APC analysis of offending prevalence levels would be highly influenced by the age composition of

the population. Adjusting for these age effects and in line with the research evidence on period effects, it was hypothesized that some period effects would also be present in the data. This would accord with Carrington's findings and with those of other researchers (Holmes, 2010; e.g. Baker and Goh, 2004; Sarre, 1999a; Wundersitz, 1996; Sutton, 2000; Pritchard, 2010) that reforms to criminal justice systems throughout Australia during the 1990s have had net-widening effects. As to cohort effects, results from previous studies have been mixed and so did not guide the study to any particular hypothesis.

3.3 Data

3.3.1 Source and structure of data

Data for the study were sourced from official records obtained from WA Police and the WA Departments of the Attorney-General (DotAG) and Corrective Services (DCS). The data is population based and includes all records of formal police apprehension (arrest and charge or summons) and all records of juvenile diversion since 1984 to 2005. The data were linked using an integrated, numerical offender identification system (INOIS) developed in the early 1990s (Ferrante, 1993). The INOIS linkage key enabled the study to uniquely identify individuals over time and across the various data sources. Data linkage also enabled us to derive information about the Aboriginal status of offenders where this was not known or of poor or inconsistent quality.[23]

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[23] The strategy used for improving the quality and completeness of data on Aboriginal status has been described elsewhere (Fernandez and Loh, 2003, p.111). These efforts significantly strengthened the study's capacity to explore demographic differences in participation. Aboriginal status was based primarily on police assessment of the ethnic appearance of the offender. Although subjective, this method of identification has been shown to be

The final dataset for the study was substantial, comprising 122,517 offenders, born between 1977 and 1995, and having contact with the criminal justice system between 1984 and 2005. Nineteen birth cohorts were constructed from the data - commencing with the cohort of persons born in 1977 and ending with the cohort of individuals born in 1995. The 1977 cohort was followed for the longest period (21 years), from 1984 (age 7) to the end of 2005 (age 28), while the 1995 birth cohort could only be followed for a year – while age 10 in 2005.

3.3.2 Estimation of prevalence rates

Age-specific prevalence rates were calculated by dividing the total number of known offenders in a birth cohort at each age (numerator) by the total number of residents of the same age who were born in the same year (denominator). The denominator figures were based on population estimates sourced from the Health Department of WA (HoDWA) which were, in turn, derived from Australian Bureau of Statistics (ABS) estimated resident population (ERP) figures for the years from 1981 to 2005.[24]

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remarkably reliable, with more that 98% of offenders correctly classified as either Aboriginal or non-Aboriginal (Maller, 2000).

[24] Population data at geographical level (statistical local areas - SLA) were mapped to 2001 SLA boundaries by the ABS (for the period 1991-2005) and by HoDWA for the earlier years. Aboriginal estimates were based on the SLA usual place of residence information from the 2001 Census and then adjusted both backwards and forwards based on SLA level births and deaths.

An important methodological issue arises when prevalence rates are estimated using this method. Because of migration flows, there is a tendency to overestimate the prevalence of offending. This arises because interstate/overseas migration patterns are factored into the estimation of resident population figures by the ABS (denominator figures) but not in tallies of offenders derived from offender databases (numerator). Offender databases typically continue to maintain records of offenders even when these individuals leave a jurisdiction. Thus, counts of offenders will tend to be over-inflated. Fortunately, migration flows to/from WA are relatively low. For example, in the ten-year period from 1996-97 to 2005-06, WA recorded the lowest average annual net interstate migration of only +147 persons (Australian Bureau of Statistics, 2007). Thus, the extent of overestimation is assumed to be small for WA compared to other states.[25]

3.3.3 Using official records to measure prevalence

The present study, like others, uses administrative records as an indicator or measure of offending. The main criticisms of data sourced from official records are that they are likely to produce a limited and potentially distorted view of the number of people participating in crime. Official records will undercount the 'true' number of individuals who participate in crime since not all crimes (and not all offenders) become known to the police or result in arrest and charge (Maxfield and Babbie, 1998). Prevalence estimates based on police arrest tend to be higher than those based on recorded convictions since not all police contact results in formal charge (as is the case with juveniles who are diverted from the formal elements of the justice system) or result in conviction. Records sourced from administrative systems are

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[25] Note, however, that low net migration may still mask large inflows and outflows. In this case, prevalence estimates may be significantly inflated and, correspondingly, frequency figures would deflate.

also subject to the influences of systemic factors such as policy initiatives, legislative changes, and the practices and resources of agencies in the criminal justice system (Farrington et al., 2003; Maxfield and Babbie, 1998). These factors often feature in explanations of the over-representation of Aboriginal people in criminal justice systems (see later discussion). However, official records do have strengths. For instance, legal definitions of what constitutes an offence are consistently applied across individuals and over time, and the large population-base from which records of crimes are drawn ensures the data is representative. Official records of offending are particularly useful in longitudinal studies, as they often contain detailed criminal histories of individuals from earliest ages (age 10 onwards). In short, the use of official records is an imperfect but nevertheless valid and reliable measure of offending.

3.4. Method

3.4.1 Calculation of prevalence estimates

Our study estimated prevalence in two different ways. This was done for several reasons. First, it was considered important to distinguish between different forms of offending and to capture the variability in offence seriousness that often exists within official records. Second, multiple measures of prevalence provides a broader basis for comparison with other studies. Third, multiple measures of prevalence provides the cohort analyses with at least two (dependent) variables with which to assess age, period and cohort effects.

The first measure of prevalence (hereafter referred to as PM1) includes all types of contact with the criminal justice system. This comprises police apprehension (and charge) and

juvenile diversionary options (caution and JJTs).[26] The remaining measures capture more serious albeit somewhat different forms of offending. Prevalence Measure 2 (PM2) comprises only police apprehensions (i.e. formal arrest and charge, or summons) and thus excludes all forms of juvenile diversion. Consequently, many of the trivial offences for which children are cautioned (e.g. graffiti, property damage) are excluded. This alternative provides a more comparable and arguably more robust measure of offending which is less sensitive to the idiosyncrasies (ideological and administrative) of juvenile justice systems in Australia. Prevalence estimates based on PM2 can be directly compared against those estimated elsewhere e.g. Hua et al. (2006).

3.4.2 Cohort or APC analysis

The study adopted the approach taken by Menard and Elliott (1990b) to assess the impact of age, period and cohort effects on prevalence rates.[27] This approach involves the use of a simple equation in which the aggregate, age-specific prevalence rate (the dependent variable) is assumed to be made up of a linear and additive combination of three independent variables that each measure age, period and cohort.[28] It must be stated that while this approach is

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[26] The types of offences dealt with by police apprehension and/or juvenile diversion include against person offences, property offences, drug offences, public order offences and serious traffic offences, that is, those which result in criminal conviction and imprisonment. These comprise: driving under the influence of alcohol or drugs, dangerous driving, reckless driving and driving without a valid licence.

[27] As such, the current study inherits many of the same strengths and weaknesses of their study.

[28] Note that Menard and Elliott (1990b) also modelled the logarithmic transformation of their prevalence variable but found results were ambiguous. They additionally modelled the logarithmic transformation of a dependent variable based on the frequency of offending. Results for the latter were markedly improved probably because of the skewness of the underlying distribution for the frequency of offending.

neither the most recent nor the most statistically advanced APC technique, it has been shown to be an adequate and robust model for APC analysis (Menard and Elliott, 1990b). Moreover, it has the advantage of accessibility, in that the methodology is relatively easy for non-statistical readers to follow.

3.4.3 Methodological issues

A recurring problem in cohort or APC analysis is the "identifiability problem", that is, that any one of the three age, period and cohort variables can be perfectly predicted by a linear combination of two other variables (e.g. cohort = period – age), resulting in no unique set of regression parameters (Glenn, 1974). Researchers have overcome this problem either by using dummy variable regression models (as per Mason et al., 1973), by introducing proxy measures for each of the constructs (as per O'Brien, 1989) or by using more advanced techniques. Menard and Elliott's approach (1990b) falls into the middle category.

As a proxy measure for age, Menard and Elliott (1990b) used absolute deviation from the age of maximum offending, |age-(age of max offending)|. This substitution helps to overcome the identifiability problem since the absolute deviation from some specified age bears no fixed, linear relationship to cohort and year. This approach also linearises what would otherwise be a (non-linear) quadratic relationship between age and crime (as per the inverted U-shape of the classic age-crime curve).[29] As a measure of period, Menard and Elliott (1990b) used

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[29] The effect of chronological age on delinquency has been shown to be quadratic - as evidenced through the inverted U-shape of the age-crime curve (see Sub-study 2 for more). This would make any assumption of a linear relationship between the dependent variable and chronological age incorrect. However, because the proxy measure for age (i.e. the absolute deviation from age of max offending) is, by definition, V-shaped, this has the

calendar year. Note, though, that they also considered substituting calendar year with the absolute deviation from the calendar year of the year of maximum offending, |year – (year of max offending|, as this also reduces the linear dependence between factors. As a proxy for cohort, Menard and Elliott (1990b) used a range of measures, including both relative and absolute cohort size, which was consistent with their interest in testing Easterlin's hypothesis.

3.4.4 Method

For this study, ordinary least-squares (OLS) regression was used to calculate the magnitude and statistical significance of age, period and cohort size effects on prevalence rates. Both measures of prevalence - PM1 (all crimes) and PM2 (police apprehension only) - were modelled separately. Moreover, owing to the recognised difference in participation levels in offending by demographic sub-groups, these were also modelled separately. The two gender groups (males, females) and two ethnic groups were separately modelled (Aboriginal, Non-Aboriginal), as were the four separate groups (MA – male Aboriginal, MN – male non-Aboriginal, FA – female Aboriginal, FN – female non-Aboriginal). Statistical analyses were undertaken using SAS Proc GLM and included a principal components test for collinearity and the Durbin-Watson test for autocorrelation. Variables representing all three effects were entered into the regression equation simultaneously so as to gauge the relative strengths of the age, period and cohort effects.

Like Menard and Elliott, the study used |age-(age of max offending)| as the proxy measure for age. Note, however, that since Aboriginal people are 'known' to become involved in the

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effect of producing a linear relationship between the dependent variable (prevalence) and the independent variable (proxy age).

criminal justice systems of Australia at a younger age (see, for example, Ferrante et al., 2004), the age of maximum offending for Aboriginal subgroups was adjusted downwards. Indeed, to allow for the possibility that different proxy measures might work better for different demographic subgroup, a range of age, period and cohort proxies were tested for each group. Only the best fitting proxy measures were retained in the final model(s). For period, a number of measures were tested, including calendar year. However, the absolute deviation from the maximum year, |year-1999|, provided the best fit for all groups. A number of alternative measures of cohort were also considered, including absolute and relative cohort size. Absolute cohort size was computed as the estimated resident population (ERP) of the relevant birth cohort at age 10, while relative cohort size was measured as (ERP of relevant birth cohort at age 10)/(ERP of smallest birth cohort within group at age 10)*10.

3.5 Results

Table 3.1 presents cumulative, age-specific estimates of the prevalence of offending for the earliest cohort included the study population, those born in 1977. As the table shows, 8% of the cohort (523/24,547 persons) were identified as having had contact with the WA justice system by age 15, 18% (1,764/24,971) had contact by age 18, and by age 29, 38% of the cohort (7645/26,304) had participated in offending. Based on these figures, it appears that about one in ten residents of WA becomes involved in official offending by age fifteen and that just over one third of residents become involved by their late twenties. Table 3.1 also presents prevalence rates using an alternative measure of official offending. As one would expect, the estimates provided for PM2 is significantly lower than PM1. Less than one-third (29%) of the 1977 birth cohort were formally arrested and charged by police by age 29 (as compared with 38% who had had any contact with police by age 29).

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Table 3.1: Cumulative prevalence of offending at selected ages for a single birth cohort (those born in 1977), using three alternative measures of official offending

1977 Birth cohort

Prevalence Measure 1: Police apprehension or juvenile diversion, all criminal offences

	By age:				
	15	18	21	26	29
Male	10%	25%	39%	52%	54%
Female	5%	12%	17%	21%	22%
Aboriginal	25%	45%	61%	75%	83%
Non-Aboriginal	7%	17%	26%	33%	35%
Male Aboriginal	31%	57%	78%	94%	100%
Female Aboriginal	19%	34%	44%	57%	63%
Male Non-Aboriginal	9%	23%	36%	47%	49%
Female Non-Aboriginal	4%	11%	15%	18%	19%
Total Population	8%	18%	28%	37%	38%
Male:Female ratio	2.0	2.1	2.4	2.4	2.5
Ab:non-Ab ratio	3.8	2.6	2.3	2.3	2.4

Prevalence Measure 2: Police apprehensions only

	By age:				
	15	18	21	26	29
Male	3%	11%	29%	41%	44%
Female	1%	3%	9%	14%	14%
Aboriginal	16%	29%	49%	63%	70%
Non-Aboriginal	1%	6%	17%	24%	26%
Male Aboriginal	21%	39%	65%	80%	89%
Female Aboriginal	11%	20%	34%	46%	52%
Male Non-Aboriginal	2%	10%	26%	37%	39%
Female Non-Aboriginal	0%	2%	7%	11%	12%
Total Population	2%	7%	19%	28%	29%
Male:Female ratio	3.3	3.7	3.3	3.1	3.1
Ab:non-Ab ratio	10.7	4.8	2.8	2.6	2.7

Variations in prevalence rates by gender and Aboriginal status are also presented in Table 3.1. The prevalence of offending for males is significantly greater than that for females at all age levels. By age 15, one in ten boys born in 1977 had had contact with the justice system, as compared with one in twenty girls. By age 29, more than half (54%) of the males in the cohort had had contact with the justice system, as compared with 22% of females.

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Differences between Aboriginal and non-Aboriginal prevalence estimates were greater. By age 15, one in four Aboriginal persons in the cohort had had contact with the justice system, as compared with only 7% of the non-Aboriginal population. By age 29, 83% of the Aboriginal birth cohort had had contact, as compared with 35% of the non-Aboriginal cohort. Most conspicuously, the prevalence rate of Aboriginal males reached 100% by age 29. In other words, by age 29, it appears that *all* of the Aboriginal males born in 1977 had had contact with the justice system.

This finding highlights some important issues about the data and the methodology used in the study. It has already been noted that prevalence rates are likely to be overestimated because they cannot fully account for in/out migration in offender counts. Further, for the Aboriginal population which accounts for approximately 3% of the total WA population, prevalence estimates are likely to be subject to greater measurement error owing to smaller numbers and because the data is often incomplete and identification of Aboriginal status at birth and death is problematic.

In terms of the differential ratio between the prevalence rates of males and females, this increased from a factor of two (in the mid-teens) to a factor of 2.4 (by age 21) and remained stable thereafter. Aboriginal prevalence also exceeded non-Aboriginal prevalence by a factor of 2.3 by age 21. However, through adolescence, the difference between Aboriginal and non-Aboriginal prevalence rates was much greater – by a factor of 3.8 (in the mid-teens). Ethnic and gender differentials were also computed from the different measures of prevalence. These differentials increase substantially as the measure of prevalence captures more serious forms of offending.

3.5.1 Prevalence levels of successive birth cohorts

Next, age-specific prevalence estimates of successive birth cohorts were estimated for each of the nineteen cohorts. "By age 18" prevalence estimates for selected birth cohorts (and for the demographic sub-groups within those cohorts) are shown in Table 3.2. Note that estimates at each age level were calculated but only those for age 18 are shown. Estimates based on PM1 vary somewhat from cohort to cohort; however, as can be seen these variations are not uniform across demographic groups. Aboriginal males and Aboriginal females, in particular, exhibit the greatest variation in prevalence rates from one cohort to another (further illustrated in Figure 3.1) and there appear to be peaks in participation levels for cohorts born in the early 1980s. Prevalence estimates based on PM2 do not show this trend, however. PM2 levels show only modest variation from one cohort to the next (see Table 3.2 and Figure 3.2 also). Indeed, significant cohort variations are evident only for Aboriginal males.

Table 3.2: "By age 18" prevalence of official offending using both measures of

prevalence, for selected birth cohorts

"By Age 18" Prevalence Estimates

Prevalence Measure 1: Police apprehension or juvenile diversion, all criminal offences

	Selected Birth Cohorts					
	1977	**1979**	**1981**	**1983**	**1985**	**1987**
Male	25%	28%	34%	33%	31%	27%
Female	12%	12%	13%	13%	14%	14%
Aboriginal	45%	56%	65%	67%	71%	65%
Non-Aboriginal	17%	19%	22%	21%	19%	17%
Male Aboriginal	57%	69%	82%	83%	86%	77%
Female Aboriginal	34%	44%	48%	51%	55%	52%
Male Non-Aboriginal	23%	26%	31%	30%	27%	23%
Female Non-Aboriginal	11%	11%	12%	11%	11%	11%
Total Population	18%	20%	24%	24%	22%	20%

Prevalence Measure 2: Police apprehensions only

	1977	**1979**	**1981**	**1983**	**1985**	**1987**
Male	11%	10%	11%	11%	9%	9%
Female	3%	3%	3%	3%	2%	2%
Aboriginal	29%	27%	34%	33%	34%	32%
Non-Aboriginal	6%	5%	5%	5%	4%	4%
Male Aboriginal	39%	36%	48%	46%	48%	43%
Female Aboriginal	20%	19%	20%	21%	20%	21%
Male Non-Aboriginal	10%	9%	9%	8%	6%	6%
Female Non-Aboriginal	2%	2%	2%	2%	1%	1%
Total Population	7%	6%	7%	7%	6%	6%

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Figure 3.1: "By age 18" prevalence rates (PM1) of successive birth cohorts
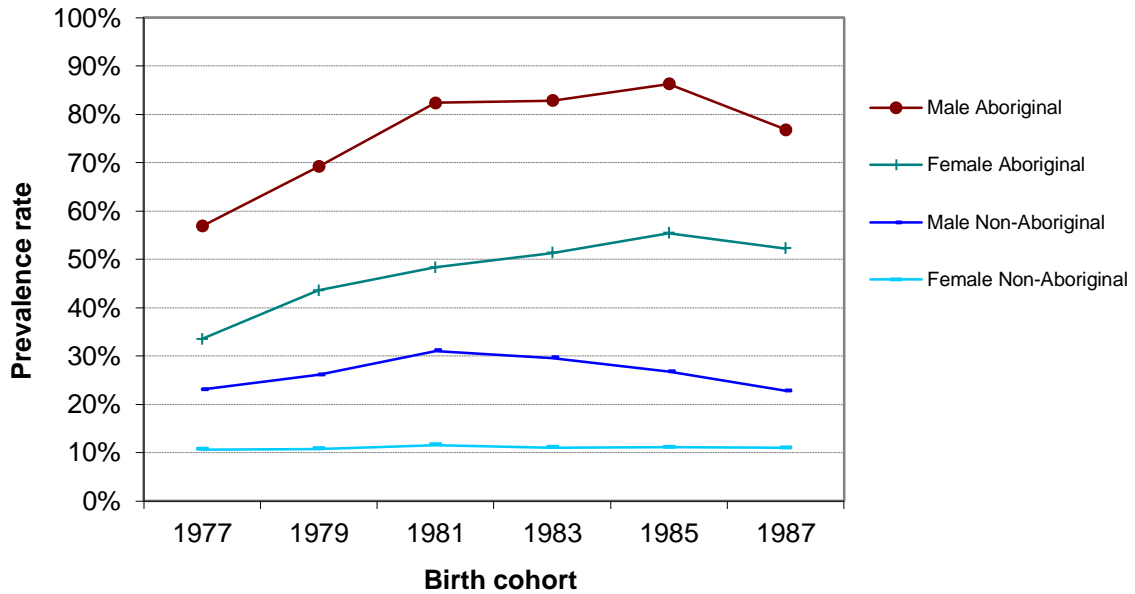
Figure 3.2: "By age 18" prevalence rates (PM2) of successive birth cohorts
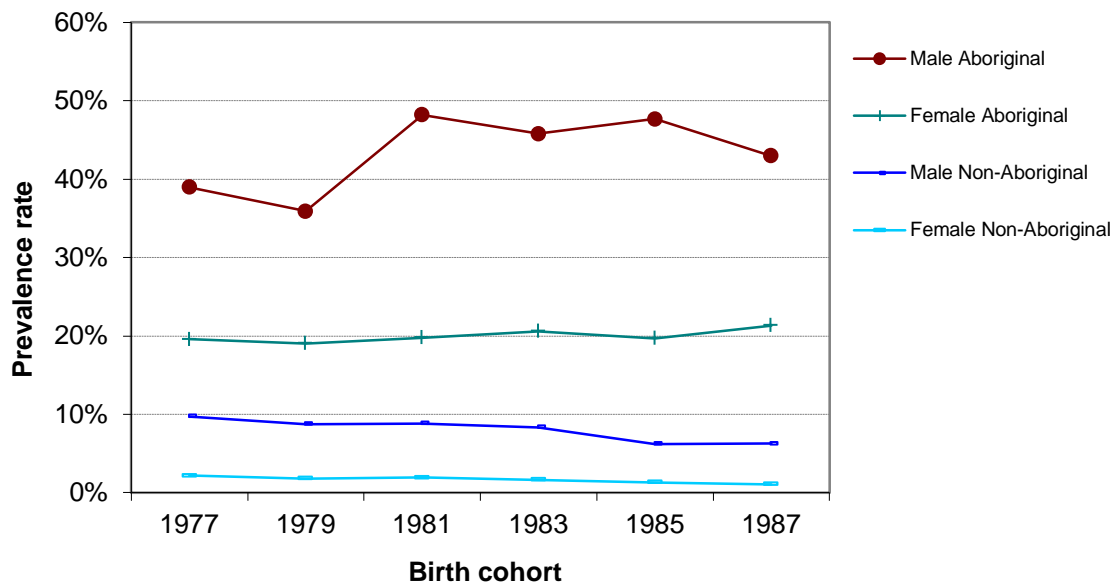
Statistically significant variations in cohort prevalence levels (i.e. across all age levels, not just at age 18) were assessed using the Kolmogorov-Smirnoff (KS) test (Siegel and Castellan, 1988). The test was systematically applied to the cumulative, age based prevalence levels of

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successive pairs of cohorts. Results are summarised in Table 3.3. The results show general consistency with those described above, namely that temporal variation in prevalence rates were most significant for Aboriginal groups. KS tests were also systematically applied to prevalence estimates based on the PM2 measures, however, results were equivocal. Only for Aborigines, did both prevalence measures exhibit significant temporal variation.

Two further findings emerged from the conduct of the KS tests. First, and as can be seen in Table 3.3, the prevalence estimates based on PM1 demonstrate the most significant variation. Given that the definition of PM1 includes of a broad range of juvenile justice contacts (which are not included in PM2), this suggests that activity in the juvenile justice area may have been responsible for much of the variation observed. Second, regardless of which measure of prevalence was used, there appeared to be little discernible change in female prevalence levels over time. Indeed, all evidence points to the relative stability of non-Aboriginal female prevalence estimates. This lies in stark contrast to the findings from other studies – a point which will be picked up in later discussion.

Table 3.3: Significance of Kolmogorov-Smirnoff tests applied against cumulative prevalence estimates of pairs of birth cohorts. Prevalence levels estimated for gender and Aboriginal/non-Aboriginal sub-groups; tests applied against both measures of prevalence

KS-test applied to pairs of birth cohorts	Prevalence Measure 1 (all crimes)				Prevalence Measure 2 (aprh only)			
	Male	Female	Ab	Non-Ab	Male	Female	Ab	Non-Ab
1977 → 1978	.	.	↑↑	.	.	.	.	.
1978 → 1979	↑↑	.	.	.	.	.	.	.
1979 → 1980	↑↑	.	↑↑	.	.	.	.	.
1980 → 1981	↑↑	.	.	.	.	.	.	.
1981 → 1982	↓↓	.	↑↑	↓↓	↓↓	.	.	.
1982 → 1983	.	.	↓↓	.	.	.	.	.
1983 → 1984	.	.	↑↑	.	.	.	.	.
1984 → 1985	.	.	.	.	.	.	.	.
1985 → 1986	.	.	.	.	.	.	.	.
1986 → 1987	.	.	.	.	.	.	.	.
1977 → 1982	↑↑	.	↑↑	↑↑	↓↓	.	↑↑	↓↓
1982 → 1987	↓↓	.	.	.	↓↓	.	↓↓	.

Up arrows indicate that there is a significant increase (at $\alpha=0.01$) in prevalence
        between the two years indicated
Down arrows indicate that there is a significant decrease (at $\alpha=0.01$) in prevalence
        between the two years indicated
Dot means no significant change is detected between the two indicated years

The findings to date have been useful in illustrating (and substantiating) some temporal variation in the offending prevalence levels within sub-groups of the WA population. It is clear from several findings that some groups appear to have experienced more change than others. However, what is not yet clear is to what extent these changes have been brought about by period specific factors or longer term and as yet undefined cohort effects. To explore these aspects, the study moved away from the largely descriptive treatment of data to APC analysis.

3.5.2 Age-period-cohort analysis

Table 3.4 summarises the results of the various ordinary least squares (OLS) regression analyses for both measures of prevalence, and for each demographic sub-group within each

measure. Model fit and parameter estimates (coefficients) of the best fit model(s) are provided. Note that the use of absolute cohort size instead of relative cohort size as a measure of cohort effect produced different (much smaller) parameter estimates but otherwise had no impact on the explained variance of each subgroup model. Also note that the initial measure of period effect (i.e. calendar year) proved to be unsuitable as this generated collinearity problems so an alternative measure of period effect was adopted – the absolute deviation from the peak year of offending (i.e. |year-1999|). This eliminated the collinearity problem and was used in all sub-group models.

Table 3.4: Results from OLS regression analysis

Prev. Measure	Dep. Variable	Group	R-sq	Intercept	proxy_age		proxy_period (p4)		proxy_cohort (c3)		DW	Note
All_crime (PM1)	age_specific	MALE	0.85	115.65	-6.76	**	-0.81	**	-4.68	**	0.43	1
	prevalence rate	FEMALE	0.74	61.54	-2.95	**	-0.68	**	-3.04	**	0.49	2
	(ar_1000)	AB	0.69	119.21	-10.19	**	-2.48	**	-0.70		-0.20	3
		NON-AB	0.82	92.59	-4.75	**	-0.44	**	-4.66	**	0.41	1
		MA	0.63	125.30	-11.53	**	-2.27	**	0.14		-0.17	3
		MN	0.83	139.33	-6.76	**	-0.67	**	-7.31	**	0.33	1
		FA	0.62	99.52	-8.00	**	-2.74	**	-0.57		-0.05	3
		FN	0.73	68.56	-2.68	**	-0.64	**	-4.07	**	0.39	2
					proxy_age		proxy_period (p4)		proxy_cohort (c3)			
APRH (PM2)	age_specific	MALE	0.73	103.06	-4.93	**	-0.28		-5.28	**	0.29	4
	prevalence rate	FEMALE	0.75	38.82	-1.49	**	-0.33	**	-2.21	**	0.07	4
	(aprh_ar_1000)	AB	0.75	86.13	-7.53	**	-0.63		-0.81		0.00	5
		NON-AB	0.74	80.29	-3.12	**	-0.30		-4.92	**	0.14	4
		MA	0.66	93.98	-8.80	**	-0.69		-0.12		-0.01	5
		MN	0.73	119.55	-5.01	**	-0.33		-7.14	**	0.19	4
		FA	0.70	82.75	-6.35	**	-0.96	**	-1.76	**	0.11	5
		FN	0.74	45.95	-1.47	**	-0.33	**	-3.11	**	0.10	4

Notes:

**	statistically significant at 0.01
*	significant at 0.05
1	best fit proxy_age was |age-17|
2	best fit proxy_age was |age-16|
3	best fit proxy_age for all Aboriginal groups was |age-15|
4	best fit proxy_age for aprh prevalence for non-Abs, males and females was |age-19|
5	best fit proxy_age for aprh prevalence for all Ab subgroups was |age-18|
6	best fit proxy_age for violence prevalence was |age-18|
7	best fit proxy_age for violence prevalence was |age-16|
8	best fit proxy_age for violence prevalence was |age-17|
p4	=|year-1999|
c3	best fit proxy measure for cohort was *relative* cohort size at age 10
DW	Durbin-Watson correlation co-efficient (autocorrelation errors)

3.5.3 Modelling PM1 (all crimes) data

As the table shows, for males, the best fit model for PM1 accounted for about 85% of the variance in general crime prevalence. All three factors (age, period and cohort) were statistically significant, with age being the most significant factor to influence prevalence over time. The proxy measure for age that provided the best fit for males was |age-17|. Controlling for age, period effects still influenced male prevalence rates but to a lesser degree. (Since the variables used to measure age and period effects are on the same scale, it was possible to directly compare the relative size of these parameter coefficients.) As expected, age had a much more significant effect on prevalence than any period effects. This is true not only for males but for all other sub-groups. Regarding the impact of cohort size, the parameter coefficient for males was negative, indicating that as cohort size increased the prevalence of offending decreased. This finding contradicts Easterlin's hypothesis of a direct (not inverse) relationship between cohort size and delinquency.

The final model for female prevalence did not fit the data as well as that for male prevalence but was acceptable (cf. R-sq = 0.74 to 0.85). As with males and in keeping with expectations, age was the most important factor influencing prevalence levels. The best age proxy for females was |age-16|, suggesting that females may be initiating into crime at a slightly younger age than males.

The final model for Aboriginal PM1 did not fit that data as closely as the models for other groups (males, females and non-Aborigines) but was considered adequate (R-sq=0.69). The best age proxy for Aborigines was |age-15|, indicating an earlier onset of official delinquency amongst

Aboriginal offenders. It is notable that in modelling the Aboriginal data, age and period effects were significant but cohort effect was not. In contrast, all three factors were significant in influencing non-Aboriginal prevalence levels. Also of note is that the period effect, while being significant for both Aboriginal and non-Aboriginal groups, had a larger influence on Aboriginal prevalence levels than on non-Aboriginal levels.

3.5.4 Modelling PM2 (Police apprehensions only)

Reasonable model fits of PM2 were achieved for all demographic sub-groups (R-sq ranged from 0.66 to 0.75). Age proxies were adjusted upwards slightly to account for the older peak age at which individuals are arrested and charged by police. Once again, the influence of age on the prevalence of offending (arrest) was larger than either period or cohort effects. Indeed, it is notable that, after adjusting for age, period effects generally were not significant in the prevalence of arrest. Only for females was there some period effect on prevalence levels. These were larger for Aboriginal females than for non-Aboriginal females. As to cohort effects, once again, these appeared to have no influence on the arrest prevalence levels of Aboriginal people but were of some significance for non-Aboriginal groups.

3.5.5 Summary of APC analysis

In summary, the APC analysis was able to adequately fit simple linear models to various measures of prevalence using a combination of age, period and cohort proxy measures. The results show strong age effects for all demographic groups and across both measures of prevalence. Adjusting for age effects, period influences were also significant but only for prevalence measure PM1. As PM1 includes juvenile justice contacts (which are excluded in PM2), it can therefore be inferred that the period effects observed in the data are a consequence

of increased period specific juvenile justice contacts. Further, where period effects were significant, they had a larger effect on Aboriginal prevalence estimates than on non-Aboriginal estimates.

After controlling both for period and age effects, statistically significant cohort effects were also observed in the data. However, these were difficult to interpret. For both non-Aboriginal males and non-Aboriginal females, the effect was significant but ran counter to expectations. According to the study findings, as relative cohort size increases, prevalence levels decline. This contradicts the effect predicted by Easterlin's hypothesis and, more broadly, by strain theory and/or social capital theory. It is possible that the decreasing prevalence levels with increasing cohort size might be related to police capacity. Police operating at maximum or near maximum capacity over a period when cohort sizes are on the rise would not result in significant increases in arrest levels.

3.6 Discussion

The aim of this study was two-fold: first, to estimate the prevalence of official offending for multiple birth cohorts and for specific sub-groups of the population, and then, to use these estimates to assess age, period and cohort effects on long term trends in prevalence levels. As to the first objective, the study assembled and integrated longitudinal data from a variety of sources and, from these, derived age based prevalence estimates for nineteen birth cohorts. While not computationally difficult, this exercise in itself represents something of an achievement, as it is the first time in Australia that prevalence estimates based on multiple cohorts have been derived. Moreover, it is also one of the few occasions that multiple cohort prevalence estimates have been

derived for both gender and ethnic sub-groups (Piquero et al., 2003). However, the most important aspect of this study is its simultaneous assessment of age, period and cohort effects on longitudinal data on official offending. To this end, the use of Menard and Elliott's OLS regression approach was found to be an appropriate and adequate method for analysing age, period and cohort effects, given the level(s) of variance explained and the absence of autocorrelation errors or collinearity issues.

3.6.1 Age effects

The study shows age to have the strongest influence on temporal variations in prevalence rates. At first glance, this finding may hardly seem surprising. The age-crime relationship is, after all, one of the most studied relationships in criminology. However, the point is not that there is an age-crime relationship but rather that this relationship should not be assumed to remain constant over time. From an analytical point of view, the age composition of the underlying population must to be taken into account when investigating prevalence trends over time. Failure to do so may mean that temporal changes in prevalence levels may be inadvertently and incorrectly attributed to other factors, when in reality they are symptomatic of changes in the underlying age distribution of the affected population. While this may seem an obvious point to make, it is surprising to note how few studies actually 'adjust' for age when looking at offending trends over time. Carrington's study (2006), for example, did not.

3.6.2 Period effects

Having adjusted for age, the study found strong period effects which appear to emanate from within the juvenile justice system. These findings are consistent with Carrington's assertion that activities in juvenile justice have been a major cause of changes to official offending patterns

over time. In WA, as in other parts of Australia, the juvenile justice system underwent significant structural change during the late 1980s and early 1990s. Legislative reforms culminated in the introduction of the *Young Offenders Act (WA) 1994* and the establishment of 'new' diversionary schemes[30] (formal cautions and referrals to juvenile justice teams). An unintended consequence of restructuring (or 'destructuring' as it is often referred) is net-widening, that is, that the number of people and range of behaviours normally subject to intervention increase when the original intention was to reduce numbers (Blomberg, 1980; Sarre, 1999a). As Sarre (1999a) has noted,

> There is a constant danger with diversionary programs that people who are diverted from formal agencies of social control are more often directed into a less formal – but no less bureaucratic - apparatus rather than away from the system entirely. Indeed, some people who would have avoided [intervention] altogether may nevertheless be drawn into it by well-meaning 'diversionary' practices. This has become known as the 'net-widening' effect. (p 5)

Researchers have found net-widening to be associated with a raft of justice reforms concerning diversion, incarceration and the administration of "due process". There is an accumulation of evidence of net-widening in Australia. In South Australia (SA), Wundersitz (1996) suggested that systemic changes and the extension of the Children's Aid Panel in 1979 had a net-widening effect. Sarre (1999b) cites three examples of net-widening effects in South Australia: decriminalisation of public drunkenness; the introduction of suspended sentences; and family

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[30] From a criminal justice viewpoint, diversion typically means diversion *away* from the formal elements of the system. However, from a health perspective, diversion often refers to the channeling of clients *into* treatment programs (Roberts and Indermaur, 2007).

conferencing for youth offenders under the *Young Offenders Act (SA) 1993*. Net-widening has also arisen from reforms to cannabis laws (decriminalisation) in both SA (Sutton, 2000) & NSW (Baker and Goh, 2004). Both of these jurisdictions experienced increased recruitment into schemes immediately following their introduction. In other areas of justice administration (e.g. drugs courts, drug diversion) the net-widening effects are less understood but still evident (Roberts and Indermaur, 2007).[31] Carrington's (2006) contention that a significant number of juveniles, especially females, who previously would have been dealt with under a welfare model were drawn into a remodelled NSW juvenile justice system also falls into the definition of net-widening.

The period effects which emerge from the APC analysis are consistent with net-widening effects following the transition to the *Young Offenders Act (WA) 1994*. This finding accords with a number of other Australian studies that have noted similar net-widening effects following criminal justice reforms during the 1990s (Holmes, 2010; Baker and Goh, 2004; Sarre, 1999a; Wundersitz, 1996; Sutton, 2000; Pritchard, 2010). However, where this study differs from others is with regard to the *differential* impact of these effects. The current study found that female prevalence levels did not shift significantly over time and that period effects for females were small. This finding appears to contradict Carrington (2006) and, indeed, also a substantial body of evidence asserting an increasing involvement of women in crime.

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[31] In contrast, Skrzypiec and Wundersitz (2005) found *decreases*, not increases, in the participation rates of two birth cohorts. Although they speculated that structural changes in the South Australian juvenile justice system could have led to this "net-thinning" effect, they did not describe the changes in any detail.

However, the lack of observable increase in female prevalence does not necessarily mean that female crime levels have remained static. One possible explanation is that the frequency of female offending may have increased, while prevalence remained at the same level. This would give rise to increases in the number of crimes committed by females without increased numbers of female offenders. Clearly, further research is warranted to help resolve these ambiguities and inconsistencies.

The "bigger story" to emerge from the current study, however, is the link between changes in prevalence levels, large period effects and Aboriginal status. The study clearly demonstrates that the largest temporal shifts in prevalence levels and the largest period effects have been felt by the Aboriginal population. On the evidence, it would appear that the structural reforms on the 1990s (achieved through various 'destructuring' initiatives within the juvenile justice system) gave rise to net-widening which has impacted on the Aboriginal population to a far greater extent than on any other demographic group. Given the already elevated level of contact that Aboriginal people have with the criminal justice system, any evidence that reforms have led to expanded (and not reduced) involvement gives rise to considerable concern. It is somewhat ironic that a number of reforms implemented during the 1990s arose from the recommendations of the Royal Commission into Aboriginal Deaths in Custody (Johnston, 1991) and were originally designed to keep Aboriginal people (and particularly, youth) out of the justice system. On the evidence, however, juvenile justice reforms appear to have acted in precisely the opposite direction – bringing more Aboriginal youth into contact with police and increasing the opportunity for repeated and potentially more serious contact with the justice system.

3.6.3 Cohort effects

After adjusting for age and period effects, the study found some evidence that changes in offending rates over time were due to 'cohort effects'. However, the effects do not appear to operate in the manner proposed by Easterlin's hypothesis (or, more generally, by strain theory or social capital theory). As such, they are an enigma to the current study. It is also not clear why the cohort effect should differ between population subgroups, such as between Aboriginal and non-Aboriginal groups. Some researchers have attributed cause to cultural differences in social capital. Stockard and O'Brien (2006), for instance, suggest that the effects of cohort related social capital are reduced in cultures that provide more supportive atmosphere for families and children. Where communities provide high levels of support for families and children, the effects of larger cohort sizes are anticipated to be smaller.

However, I am reluctant to make similar interpretations for a number of reasons. First, and most critically, the direction of the effect runs opposite to that proposed by any theory. Second, the difference between Aboriginal groups may have more to do with the accuracy and reliability of the cohort measure for Aboriginal people. Recall that the measure of cohort effect (i.e. relative cohort size) is based on single year population estimates. For the Aboriginal population, these prevalence estimates are particularly vulnerable to measurement error because they are based on smaller numbers, and are often incomplete because of differential Aboriginal identification in births and deaths (Australian Bureau of Statistics, 2005). In short, the cohort measure used in the study may not be as robust a measure for Aboriginal people as it is for non-Aboriginal people. Third and finally, on a theoretical level, it is also not yet clear what role social capital plays in understanding and dealing with Aboriginal disadvantage and high levels of offending. Some

commentators (e.g. Hunter (2004) and Brough et al (2007)) have been critical of developments to date. Hunter argues that the lack of clarity in the conceptualisation of social capital is what makes it potentially dangerous. Hunter advocates for a more modest conceptualisation and a clearly formulated theory of social networks because, for Aboriginal Australians, "the composition of social networks is likely to be crucially important" (p.19). Brough and colleagues, too, question the applicability of the social capital framework to Aboriginal Australians. In a critique of the ABS Framework on Social Capital (Australian Bureau of Statistics, 2004a), the authors warn that the framework "will need to be looked at critically, taking into account the complex issues of [social organisation and] kinship before applying these empirical measures of social capital to Aboriginal and Torres Strait Islander peoples" (Brough et al., 2007: 199). For these reasons, judgement on cohort effects and on any potential difference between ethnic groups is reserved.

3.6.4 Strengths and weaknesses

This study has both strengths and weaknesses. On the plus side, it is based on a large, population level dataset which provides greater analytical power than studies of smaller, less representative groups of offenders. On the minus side, the APC analysis suffers from a number of shortcomings. Some of these have already been discussed. For example, the choice of a general linear model assumes that the explanatory variables are linear and additive, which in truth they may not be (see p. 901 in Glenn, 1974).

The use of proxy measures to solve the identifiability problem also raises questions about the construct validity of the various measured used (O'Brien, 2000). The use of relative cohort size as

a measure of cohort effect is well established in the literature, although the cross-cultural validity of this measure has yet to be properly established (Stockard and O'Brien, 2006).

That the model does not include any other explanatory variables that might better or more fully explain variations in prevalence trends over the long term may be perceived as another shortcoming. However, it must be said that it was not the purpose of the study to construct a full causal model of the factors affecting temporal variations in offending prevalence. The model, as presented, certainly does not purport to be a "general" solution to the age-period-cohort effects conundrum.[32] Rather, the intention was to provide a simple yet robust approach which would supplement the largely descriptive methods currently used and which begins the task of disentangling the effects of age, period and cohort effects on longitudinal data.

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[32] Indeed, when compared to the latest APC methods, it is rather crude. These latest advances provide exciting opportunities for further research. A number of these make use of repeated measure, unit-record data, HLMs, mixture of fixed and random effects, even a semi, nonparametric approach e.g. Yang and Land (2004), Stockard and O'Brien (2006) and Fabio et al. (2003).

4. Sub-Study 2 - Group differences in the frequency of offending of WA offenders

Revisiting the age-crime relationship

Abstract

Using linked, population level data sourced from official records of police arrest and juvenile justice diversion in WA, this study examines how the frequency of offending varies not only within individuals (i.e. with age) but also between distinct groups of individuals. 'Age-crime' curves plotted for the total population and for sub-groups of the population (as defined by offence type, gender, Aboriginal status, geographic locations, age of onset and birth cohort) demonstrate significant group based differences in the frequency of offending. The findings reaffirm the need for age-specific, or at least, age sensitive, crime reduction strategies and interventions which target the specialised needs and associated risk factors of specific offender groups.

4.1 Introduction

This Chapter moves away from *participation/prevalence* of offending and focusses on the *frequency* of offending. It seeks answers to questions posed earlier: *How does frequency of offending vary with age? And, is there evidence of group-based variations in the frequency of offending?*

4.1.1 Age and crime

When offending activity is plotted against age, it shows a peak in activity during mid-adolescence. This pattern of life-course or age related offending is often referred to as the 'age-crime curve' and, although readily observed, it presents as a significant phenomenon for criminological theories to explain.[33] Researchers from a variety of disciplines (e.g. criminology, child development, psychology, sociology) have provided plausible explanations for the rise in offending behaviour during adolescence. Although there are subtle differences in theoretical perspectives, the overriding view is that there are a range of individual, family and broader social and environmental factors related to the transition from childhood to adulthood (e.g. biological forces, strong peer influences, increasing social responsibilities, diminished parental supervision and control), which affect (increase) the *motivation* and *opportunity* for crime in adolescence (Agnew, 2005).

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[33] And it is arguably the principle phenomenon explained by developmental and life-course theories of offending (Farrington 2005).

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4.1.2 Frequency of offending

Empirical investigations of 'age-crime' curve flourished in the early 1990s, due to the availability of extensive datasets, improved statistical methods and the emergence of the criminal career paradigm (Blumstein et al., 1986). One of the earliest debates to emerge following the articulation of the criminal career perspective was whether the peak in the age-crime curve was the product of a peak in the prevalence of offending (participation) or a peak in the individual frequency of offending (intensity) (Gottfredson and Hirschi, 1990; Farrington, 1990). In other words, is the peak in the age-crime curve because many more individuals engage in crime during adolescence or is it that offenders simply commit more crime during their adolescent years (or, possibly, both)?

Subsequent research has established a strong link between prevalence and age, however the evidence for age related effects on the *frequency* of offending has been somewhat equivocal (Piquero et al., 2003). A number of studies have reported the peaking of offending frequency during mid to late teens (e.g. Loeber and Snyder, 1990; Wikstrom, 1990; Nagin and Land, 1993), however, other studies have found little evidence of age effects on the frequency of offending (Farrington and West, 1990). This has led some commentators to conclude that the age-crime curve is the product of changes in participation rates in crime *only* and not the result of age based variations in the individual frequency of offending (Farrington, 1997).

Some researchers adopt a more nuanced view and argue that age and adolescence strongly influence the frequency of offending *for some offenders only*. Moffitt's dual taxonomy (1993) (described in Chapter 1) posits two types of offenders – those dubbed "adolescent-limited" (ALs)

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and those labeled as "life-course persistent" offenders (LCPs). As ALs mature, their offending diminishes. Thus, there is a strong relationship between age and the frequency of offending for this group.

By contrast, the etiology of offending is argued to be different for LCPs. Moffitt (1993) contends that LCPs are more likely to start offending early, to persist with offending into adulthood, to be lone offenders and to be more violent than ALs. She argues that, once formed, the antisocial behaviour of an LCP individual is almost impossible to change. Thus, for LCPs, the frequency of offending is relatively independent of age.

4.1.3 Group differences in offending frequency

Moffitt's conceptualisation of different types of offenders is but one example of group based or taxonomic approaches to understanding and analyzing offending (Patterson, 1982; Nagin and Tremblay, 2005a). The group based approach essentially contends that there are distinct groups of individuals within a population that follow different age related patterns of development. In other words, offending frequency varies not only *within* individuals (i.e. with age) but also *between distinct groups of individuals*. Evidence of group based differences in the frequency of offending has steadily accumulated, owing, in part, to the development and uptake of statistical methods that facilitate the identification of clusters within a population and unique trajectories of development (Nagin and Land, 1993).

One of the most consistent findings to emerge from the group based modelling approach has been the identification of a small group of offenders with an elevated age related trajectory of

offending (Fergusson et al., 2000; Marshall, 2006; Nagin and Land, 1993; Nagin and Tremblay, 2005b). This group corresponds with those identified by Moffitt as life-course persistent offenders. Their presence also accords with criminal career findings that a small group of offenders, so called 'chronic offenders', with a high frequency of offending, account for a disproportionate amount of all crime (Piquero et al., 2003; Cohen, 1986).

4.1.4 Gender and ethnic differences in offending frequency

Researchers and policymakers have also been interested to know whether groups defined *a priori* by demographic characteristics (e.g., gender, ethnicity), social factors or other environmental attributes (e.g., geographical location) *also* follow similar age related patterns of offending. Gender and ethnicity based offending patterns have been of particular interest because they emerge so strongly as correlates of crime and because the explanatory models that have been put forward to account for them vary so widely (see Chapter 1 for more on this). A number of early studies have provided evidence to suggest that age based patterns of offending *do* vary with gender. Some of these studies demonstrated that females offend less frequently than males (Office of Juvenile Justice and Delinquency Prevention, 1986; Tarling, 1993; Wikstrom, 1990); while others observed that females reach their peak levels of offending earlier in the life course and desist sooner than males (Elliott, 1994; Moffitt et al., 2001; Fagan and Western, 2005; Graham and Bowling, 1995).

Fewer longitudinal studies have examined whether ethnic based differences exists in the frequency of offending (Elliott, 1994; Fergusson et al., 1993). Australian studies of ethnic differences in offending frequency are scant, although there have been numerous cross-sectional

and recidivism studies that confirm higher rates of re-offending amongst Aboriginal groups in Australia (e.g. Broadhurst and Loh, 1995; Ferrante et al., 2004).

Although research examining gender and ethnic based differences in offending frequency has been limited, the advent of trajectory modeling techniques has spurred interest and the number of studies assessing gender and ethnic differences in offending trajectories has increased. (A detailed review of the trajectory literature is contained in Chapter 5).

4.1.5 Relevance to policy

That offending frequency varies not only *within* individuals (i.e. with age) but also *between distinct groups of individuals* has implications for policy as well as criminological theory. At a policy level, age based variations in offending frequency suggest the need for age-specific, or at least, age sensitive, crime reduction strategies. Policies aimed at reducing recidivism, which are implicitly based on an understanding that the individual rate of offending can be affected, need to make greater allowance for age related factors. The evidence to date suggests that such strategies need to be closely tuned to the factors and life events that influence criminal activity at *different* life stages.

Substantial group differences in offending also suggest the need for interventions which more specifically target clusters of offenders (such as chronic or life-course persistent offenders) and the specialised needs and/or risk factors associated with such groups.

That said; some researchers have been critical of precisely this kind of approach (e.g. Sampson and Laub, 2005; Raudenbush, 2005; Osgood, 2005). Sampson and Laub (2003) have argued that the existence of distinct groups of offenders may be more imagined than real and have warned against the 'reification' of certain groups of offenders by policymakers and practitioners. They have challenged the view that certain distinct groups of offenders can be predicted early in the life-course, or, indeed, be successfully 'treated' by intervention efforts.

4.1.6 Purpose of this study and hypotheses

The purpose of this study is two-fold: first, to examine if and how the frequency of offending varies with age within an Australian context (i.e., to plot the age-crime curve for a large Australian offender population), as this has not been done previously; and, second, to determine whether there is evidence of *group based* variations in the size and shape of this curve. The groups specifically considered were those defined by i) offence type; ii) gender; iii) Aboriginal status; iv) geographical locations; v) offenders with differing ages of onset, and, finally, vi) offenders selected from different birth cohorts.

The choice of these classifications was limited by the range of available data items; however, the defined groupings were sufficient to explore possible gender and ethnic differences, contextual differences (as may be determined from variations in location), and differences that may relate to cohort membership. Recall that the findings from Chapter 3 suggested that some cohort effect may be evident in long term prevalence trends. Including cohort membership in the current analysis enables us to test if there have been changes in offending frequency over the study period and whether this may be attributed to similar cohort effects. The salient point of interest

here is whether there were changes in offending behaviour (or, possibly, policing practices, since official records were used as a measure of offending) over the study period – in other words, can all cohorts be considered to be equal in terms of their likelihood of committing a crime or being detected for the same offending behaviour?[34]

4.2 Method

4.2.1 Source of data

Data for the study were sourced from the official records of the WA Departments of Police, the Attorney-General and Corrective Services. The data is population based and includes *all* records of formal police apprehension (arrest and charge or summons) and *all* records of juvenile diversion in WA since 1984. The population level data provide greater analytical power and make the findings of the study more representative than those based on smaller groups of offenders. As in other parts of Australia, the WA criminal justice system includes diversionary options for juveniles. The current system of juvenile justice was established in 1995 through the *Young Offenders Act (WA) 1994*.

4.2.2 Data integration, Aboriginal status and cohort structure

Individual offenders were tracked longitudinally in the datasets through their INOIS identifier. The INOIS (integrated, numerical offender identification system) system was developed to

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[34] Detection of cohort variation suggests that there may be factors affecting the offending behaviour or policing of one offender birth –group that is not shared by offenders in other birth-groups (see Sub-study 1 for more on cohort effects).

uniquely identify and track individual offenders across various criminal justice system data collections in WA (Ferrante, 1993).[35] The final dataset for the study comprised 122,517 offenders who were born between 1977 and 1995 and had contact with the criminal justice system between 1984 and 2005. Nineteen birth cohorts were constructed. The 1977 birth cohort was followed for the longest period (21 years), from 1984 (age 7) to the end of 2005 (age 28), while the 1995 birth cohort could only be followed for a year – while age 10 in 2005.

4.2.3 Estimating the frequency of offending (lambda)

The individual frequency of offending at each age (often referred to as lambda or λ) was estimated by summing the number of contact events per individual at each age.[36] The individual, age-specific lambdas were then averaged to produce a mean estimated frequency of offending at each age. This approach follows that used by other researchers (e.g., Chaiken and Chaiken (1982), Cohen (1986) and, more recently, Sampson and Laub (2003)).

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[35] The INOIS identifier was also used to derive information about the Aboriginal status of offenders where this was not known or of poor or inconsistent quality. The strategy used for improving the quality and completeness of Aboriginal status data, particularly in regard to information about court activity has been described elsewhere (Fernandez and Loh, 2003).

[36] In actual fact, lambda was estimated in two ways. One estimate was based on event counts per annum; the alternative was based on the number of offences committed per annum (as offence level information was available from official records). All analyses were performed using both estimates and the effects were found to be the same throughout. Therefore, only those based on event counts are presented here.

4.3 Results

The demographic and offence characteristics of the study population are summarized in Table 4.1 (below).

Table 4.1: Demographic & Offence Characteristics (at onset) of the Study Population

Offender Characteristics (N=122,517)					
	N	%		N	%
Gender			**Birth cohort**		
Male	87,164	71.1%	1977	10,027	8.2%
Female	34,283	28.0%	1978	10,110	8.3%
Unknown	1,070	0.9%	1979	10,068	8.2%
			1980	10,251	8.4%
Indigenous status			1981	10,615	8.7%
Aboriginal	17,310	14.1%	1982	9,777	8.0%
Non-Aboriginal	101,927	83.2%	1983	9,879	8.1%
Unknown	3,280	2.7%	1984	9,382	7.7%
			1985	8,799	7.2%
Onset age			1986	8,159	6.7%
V_early 7-9	679	0.6%	1987	7,152	5.8%
Early 10-12	15,184	12.4%	1988	5,971	4.9%
Mid 13-15	44,423	36.3%	1989	4,350	3.6%
Late 16-18	37,811	30.9%	1990	3,352	2.7%
Adult	24,235	19.8%	1991	2,150	1.8%
Unknown	185	0.2%	1992	1,364	1.1%
			1993	643	0.5%
Onset offence			1994	370	0.3%
Against Person	9,129	7.5%	1995	98	0.1%
Drugs	11,438	9.3%			
Good Order	15,388	12.6%	**Onset location**		
Other	6,108	5.0%	North	9,172	7.5%
Property	52,493	42.8%	Other	22,264	18.2%
Traffic/Veh	24,896	20.3%	Perth	75,619	61.7%
Unknown	3,065	2.5%	South	15,462	12.6%

The mean frequency of offending (mean lambda) at each age for all offenders is illustrated in Figure 4.1a). The plot describes mean lambda *for all offences* and shows the classic age-crime

curve shape - a steep rise in activity in childhood, a peak in frequency between the ages of 15 and 17 years, followed by a decline in activity into adulthood.

Additional age-crime curves for selected types of offences are also shown in Figure 4.1b). These denote the mean frequency of offending for property crime, violence (against person offences) and drug offences (possession, use, dealing and trafficking). The property age-crime curve describes the mean frequency of property offences committed by offenders at each age. This curve peaks earlier in life (at age 14) and reflects the types of offences typically committed by young offenders. The mean frequencies for drug-specific and violence-specific offending at each age are significantly lower than the mean frequency for property offending; however, a peak age for each offence type is still observable, albeit at significantly older ages for drug and violent crimes than for property offending.

Figure 4.2 illustrates how the age-crime curve varies with gender and Aboriginal status. Figure 4.2a) shows that up to age 14, the frequency of offending (inclusive of all types of offences) amongst boys and girls is indistinguishable. However, between age 14 and 17 there are marked differences between the sexes. The rate of offending amongst girls peaks at age 14 and then declines, while the rate for boys peaks at age 17 before it begins to recede. For both sexes, the decline in offending frequency occurs throughout adulthood, although there appears to be some convergence in levels by the time offenders reach their late twenties.

Figure 4.2b) illustrates the difference between Aboriginal and non-Aboriginal rates of offending. At all ages, the mean frequency of offending by Aboriginal offenders is substantially higher than

the frequency of offending of non-Aboriginal offenders. Moreover, the Aboriginal rate peaks at a much younger age (13 years) than the non-Aboriginal rate (17 years). Differences based on Aboriginal status are further explored in Figures 4.3a) and 4.3b). These figures illustrate how the age-crime curve varies not only along ethnic lines *but also along* a *geographical dimension*. This kind of analysis represents a shift away from individual factors to structural and ecological influences on crime levels.

As Figure 4.3a) shows, there is some variation in the mean frequency of offending for Aboriginal offenders across parts of the state of WA.[37] The age-crime curve for offenders living in the North of WA is different in shape to that derived for offenders living in the Southern, Central or Perth Metropolitan regions. Specifically, the usual peak in adolescent delinquency is absent amongst Aboriginal offenders in the North. For this group, offending is spread between the ages of 18 and 24 years, before some decline is observed. Figure 4.3b) plots equivalent distributions for the non-Aboriginal population. Unlike their Aboriginal counterparts, the adolescent peak in offending frequency is evident for offenders in each of the four regional areas. Note, though, that the mean frequency of offending is lowest amongst offenders located in the Northern part of the state.

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[37] Offenders were assigned to geographical regions on the basis of their location at first offence/contact. Locations were allocated to one of four categories: North (consisting of the Pilbara and Kimberley ABS statistical divisions), Perth, South (comprising Upper Great Southern, Lower Great Southern and South West statistical divisions) and Central (all other ABS WA statistical divisions)

Finally, Figure 4.4 illustrates group differences in the frequency of offending based on two other factors: the age of onset of offending and birth cohort. Figure 4.4a) shows that very early onset offenders (i.e. those who committed their first official crime between the ages of 7 and 9) demonstrated a higher rate of offending than offenders who initiated offending at later stages – a rate which was sustained throughout their life-course. Note, however, that all groups, irrespective of onset type, show post-adolescent decline in their frequency of offending. Indeed, the mean frequency distributions for all but the earliest onset group appear to converge to almost negligible levels by age 28.

Figure 4.4b) illustrates how the age-crime curve also varies with birth cohorts. Offenders in the oldest cohort (i.e., those born in 1977) had the lowest mean frequency of offending at each age, while those in the youngest cohort (born in 1992) had the highest. Differences between groups were found to be statistically significant (at alpha=0.05).

Figure 4.1: Mean frequency of offending (mean lambda) for all offences and for selected offence types (violence, drugs, property)

a) All offences
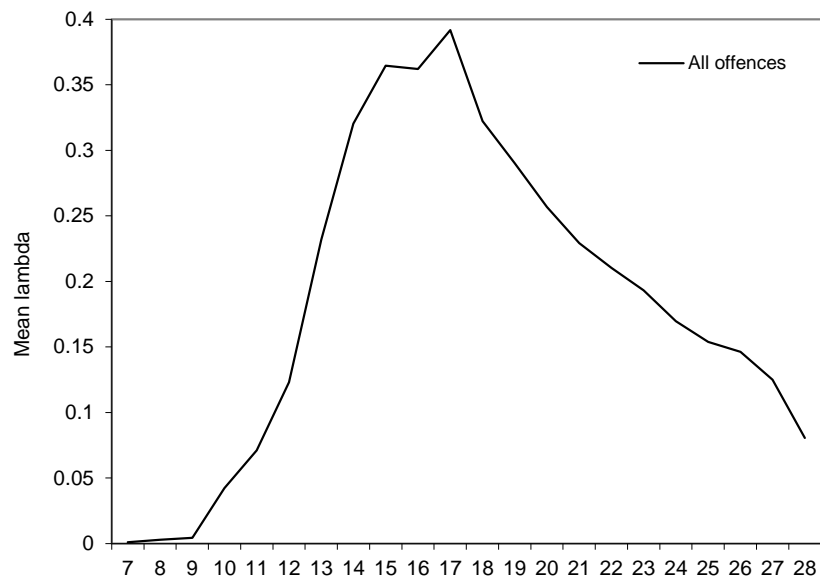
Age

b) Selected offence types

Age

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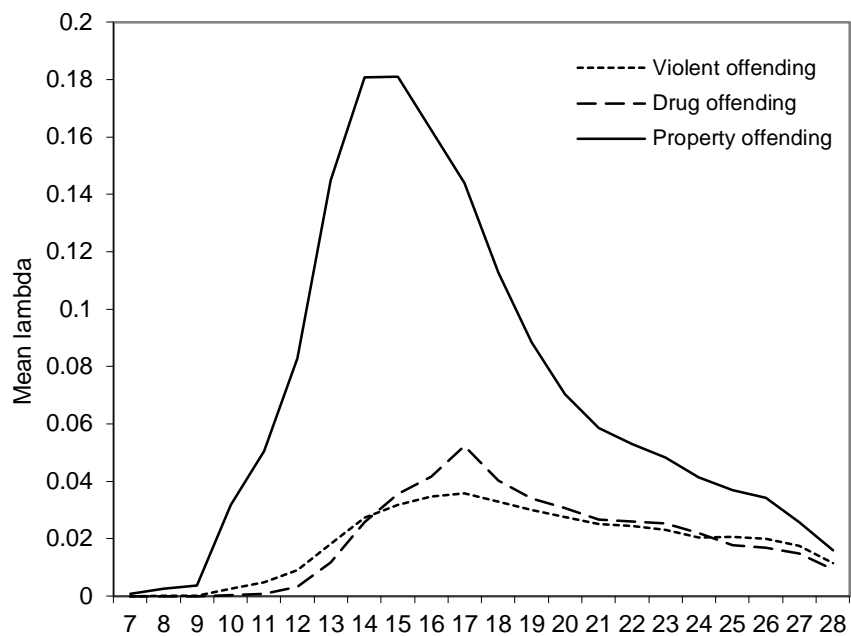
Figure 4.2: Mean frequency of offending, by gender and Aboriginal status

a) Gender
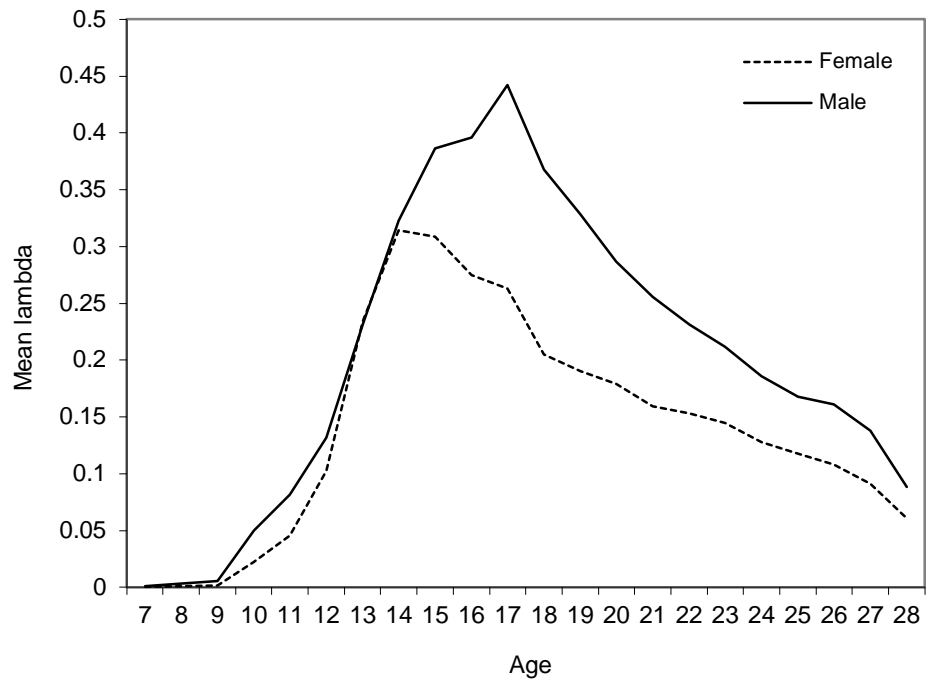
b) Aboriginal status
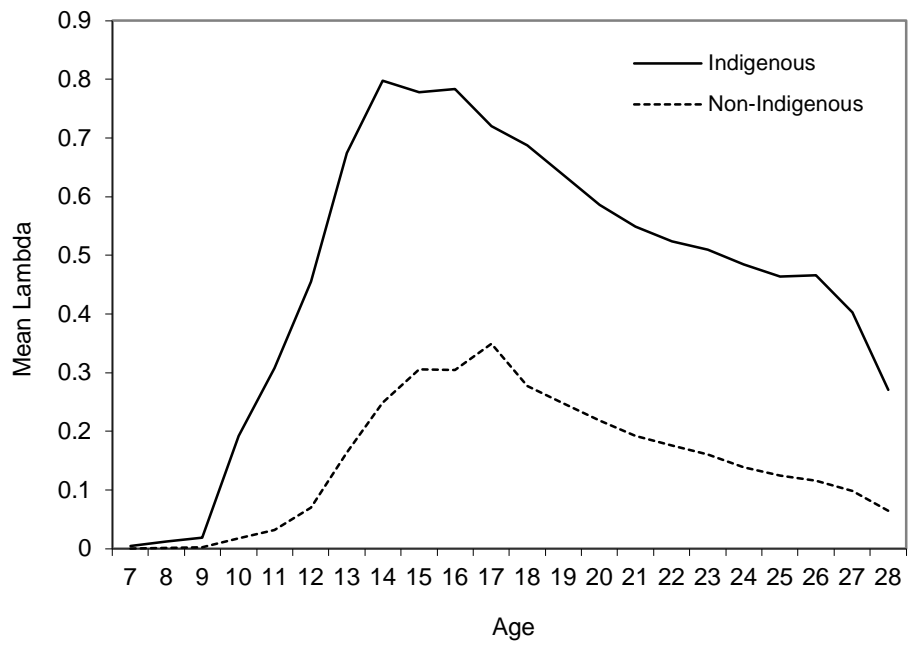
Figure 4.3: Mean frequency of offending by geographical region

a) Aboriginal
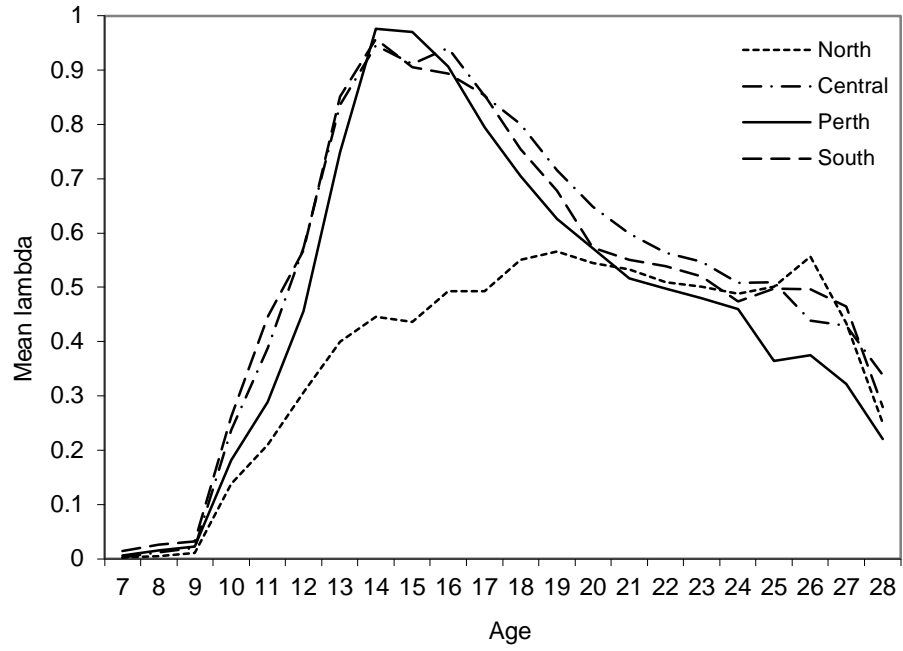
b) Non-Aboriginal
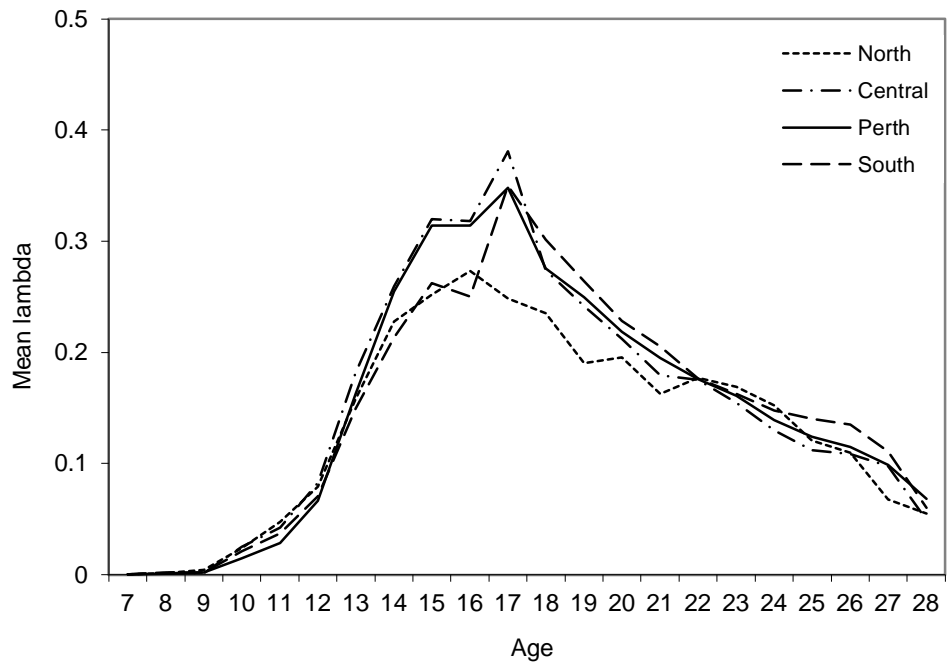
Figure 4.4: Variations in the mean frequency of offending, based on other factors

a) Age of onset
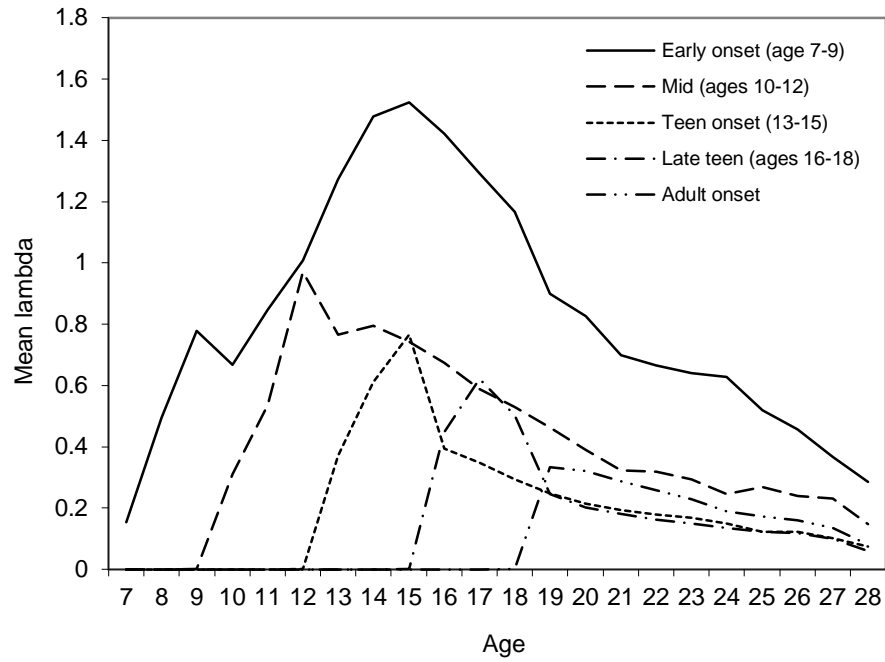
b) Birth cohort
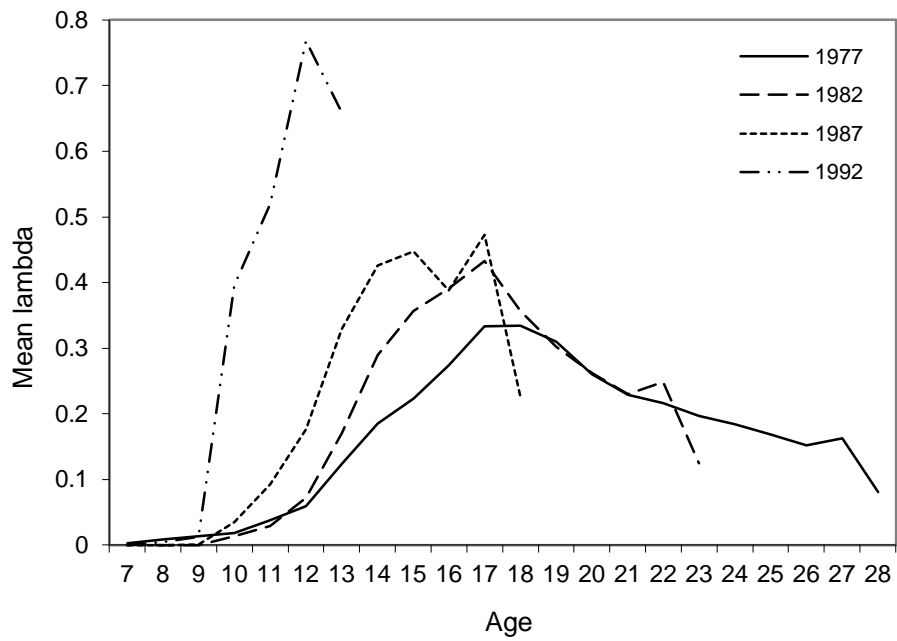
4.4 Discussion

The patterns of offending frequency observed by this study follow the traditional age-crime curve, indicating that individual offenders in WA follow life-course offending patterns that are typical of offenders worldwide. The age-crime curves for sub-groups of offenders (as defined by demographic and other characteristics) exhibit the same general peak in frequency during adolescence, suggesting common developmental processes and structural effects during this life stage.

There were, however, significant variations in the base levels of activity between groups and in the magnitude and timing of the peak in frequency. Male and female offenders, for instance, appeared to follow identical offending trajectories until age 14, at which point female offending activity peaked, while male offending continued to rise until age 17. Some researchers have attributed the earlier peak in offending by females to the earlier onset of puberty and social maturation of women (Moffitt et al., 2001; Fagan and Western, 2005; Graham and Bowling, 1995). Females also exhibited lower levels of criminal activity than males. Explanations for this observation vary. Some argue the lower levels of female offending are related to lower levels of exposure to the same underlying factors; others attribute the effect to gender specific factors including femininity norms; other still identify physical differences between genders as being a factor, especially in relation to violent offending. (Further discussions of gender differences in offending frequency and participation in offending are in Chapter 5 and Chapter 6.)

Differences between the age-crime curves of Aboriginal offenders and non-Aboriginal offenders are the most striking and arguably the most relevant for potential theories of Aboriginal crime. While both groups experience a peak in frequency during adolescence (albeit earlier for Aboriginal offenders than for non-Aboriginal offenders), the elevated level of contact for Aboriginal people across their life-course suggests that a range of other (potentially non-developmental) factors are at work in defining the relationship between the Aboriginal population and the criminal justice system in Australia. A related finding was that there were variations in Aboriginal age-crime curves across ecological space (i.e. across regions), suggesting that local or micro-level environmental factors (i.e. living conditions, lifestyles, and interactions with police and justice) may be sculpting a uniquely different age-crime relationship for Aboriginal people living in the Northern parts of WA. Regional variations in the distribution of crime in WA have been observed elsewhere (Harding et al., 1997), however, it would appear that further research is warranted.[38]

The study also found that the frequency of offending of early onset offenders was higher than that of later onset offenders across the life-course. This finding accords with a large body of evidence

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[38] While the study by Harding and his colleagues provided a geographical picture of the distribution of crime in WA, including limited insight into the social location of crime, it did not go further into causal processes. Importantly, though, the study recognised that police data represent a "tangled mix of crimes committed together with the reaction (of the public in reporting and the police in investigating) to those crimes". A further search of the literature could not identify any studies which have investigated regional variations in crime and offending in Western Australia to any greater degree.

showing that an early age of onset foreshadows a longer and more intense (higher frequency) criminal career of offending (Farrington, 1997). Such findings provide part of the standard evidence base for early intervention efforts designed to prevent (or, at least, delay) entry into the justice system. Additionally, they provide the impetus for the provision of juvenile diversionary programs that seek to limit youth contact with the justice system and avert the negative labelling effects associated with juvenile contact with justice.

Finally, the study found that the frequency of offending was raised for more recent birth cohorts, suggesting that a generational shift in the age-crime curve has occurred, possibly from either period and/or cohort effects. In the past two decades there has been great interest in early intervention in Australia and a number of reforms to jurisdictional juvenile justice systems have been instigated (e.g., the introduction of a *Young Offenders Act* in SA in 1993, in WA in 1995 and in NSW in 1997). These reforms have, among other things, expanded the nature and use of diversionary options for young offenders. However, as Sub-study 1 showed, along with such reforms have come problems of 'net-widening'. Some interventions have increased rather than decreased recruitment into systems (wider nets) and/or intensified the level of activity around existing offenders (denser nets) (Sarre, 1999a; Sutton, 2000; see, for example, Baker and Goh, 2004; Roberts and Indermaur, 2007). Results from the current study give rise to the possibility that reforms have led to more intensive involvement with the criminal justice system by existing offenders. A more detailed analysis and further discussion of this effect is taken up in the next chapter.

Future research might also engage in more sophisticated modeling of lambda. Some group based modeling of the offending frequency has been undertaken in Australia (e.g. Marshall, 2006; Fitzgerald et al., 2012; Livingston et al., 2008); however, an Australian based, population level, multivariate analysis of the factors associated with group membership has yet to be undertaken. Consequently, the opportunity for a fuller discussion about underlying causes of group differences in the offending trajectories is diminished.

Nevertheless, the results presented here demonstrate that there are significant age and group based differences in the frequency of offending. The findings reaffirm the need for age sensitive crime reduction strategies and interventions which specifically target the needs and associated risk factors of high frequency offender groups.

5. Sub-Study 3 - Assessing ethnic and gender differences in developmental trajectories of criminal behaviour

Abstract

Extant literature on life-course patterns of offending present dissenting views on the similarities and differences of gendered trajectories; moreover, there is discordance regarding whether (and how) the correlates associated with trajectories vary across and within gender groups. Similarly, the limited research on ethnic specific trajectories has produced mixed results. This study applies a semi-parametric group based modelling approach to longitudinal, population level data to determine if, and how, offending trajectories vary across gender and ethnic sub-groups. Further, the study explores whether a sub-set of risk factors associated with offending trajectories operates differently across and within gender and ethnic groups. Findings should assist in determining whether life-course patterns of offending are sufficiently different to warrant specific explanatory models. Findings should also inform policy-making and assist in determining whether gender and/or ethnic specific interventions are required.

5.1 Introduction

Gender has been shown to be the most significant predictor of involvement in crime. Understanding the nature and cause of the gender difference has been of fundamental interest to criminologists. Recent trends in female offending, such as rising rates of violent crime amongst girls, a narrowing of the gender gap and an increased focus on relational and alternative forms of aggression, have added impetus to the need to explore and account for differences *between* and *within* gender groups (Odgers et al., 2007; Fitzgerald et al., 2012).

Amongst studies that have compared male and female offending patterns, there is a lack of consensus about the cause of observed gender difference. Some researchers maintain that the processes leading to offending are equivalent and that gender differences are predominantly due to differing levels of exposure to the same underlying factors. However, an alternate and increasingly popular line of reasoning argues that female delinquency arises from some distinctively different causes and follows uniquely "gendered" pathways (Carrington, 2006; Smart, 1990; Daly, 1994; Adler, 1975; Mann, 1984; Steffensmeier and Allan, 1996; Belknap and Holsinger, 2006; Chesney-Lind, 1997). The on-going and often polarised debate between these two perspectives underscores the need for more investigation of gender differences in offending (Fitzgerald et al., 2012).

Significant ethnic based differences in offending are also manifest. U.S. studies show that minority groups have increased rates of delinquency and disproportionately high

levels of involvement in the justice system (Kempf-Leonard, 2007). In Australia, there is a substantial body of evidence demonstrating that the Aboriginal population is vastly over-represented in official offending (Ferrante and Loh, 2001; Blagg et al., 2005; Luke and Cunneen, 1995; Skrzypiec and Wundersitz, 2005; Harding et al., 1995). Explanatory accounts for ethnic disparities differ markedly[39]. Indeed, in the US, it has been claimed that the lack of consensus amongst researchers concerning explanations for ethnic disparities has led to a "conceptual and methodological impasse" (McCord et al., 2001: 229, cited in Piquero & Brame, 2008). Piquero and Brame (2008) maintain, however, that "the relevant question is not whether race group differences can be attributed solely to differential involvement or selection. Rather, the key analytic task is to document the contribution of both mechanisms to the patterns observed in different populations at different time points." (Piquero and Brame, 2008: p. 395)

Over the past decade, researchers in the life-course/developmental domain have shown considerable interest in exploring offending patterns 'in different populations

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[39] Piquero and Brame (2008), for example, describe three explanatory models for ethnic disparities in the US. These are labelled as the "differential involvement" hypothesis, the "system selection" hypothesis and a combined "differential involvement and selection" hypothesis. The "differential involvement hypothesis", asserts that the ethnic differential is due to ethnic groups committing more crime and more of the types of crime that lead to official criminal justice processing. The "differential criminal justice system selection" hypothesis posits that differential policing and discriminatory practices by the courts and correctional systems lead to more people from ethnic minorities being arrested, convicted and imprisoned. The third hypothesis asserts that the ethnic disparities are due to a combination of differential involvement *and* different selection.

at different [life] time points'. Their interest has been driven by a confluence of theoretical considerations about the existence, or otherwise, of distinct groups (or typologies) of offenders with differing individual or environmental characteristics[40] and the advent of trajectory modelling techniques. The result has been a plethora of trajectory studies exploring offending over the life course. Piquero (2008) reviewed more than 80 trajectory based studies of criminal activity undertaken between 1993 and 2005. The semi-parametric group based method (SPGM; Nagin and Land, 1993) emerged as an especially popular method of analysis. Piquero found the vast majority of trajectory studies were located in the U.S. (Eggleston et al., 2004; Laub and Sampson, 2003; Piquero et al., 2001; Piquero et al., 2002b); however, some were based in England and the Netherlands (Blokland, 2005; Francis et al., 2004b). More than a dozen studies have applied the SPGM method to general population samples. Of these, a comparative study by Broidy and colleagues (2003) is notable because it made use of longitudinal data from six different studies in three different countries. Notwithstanding the surge in research using trajectory modelling, there remain a number of knowledge gaps in the area. In particular, few studies have examined gender differences in offending trajectories, and only a handful of studies have examined differences based on ethnicity.

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[40] The emergence of several typological or taxonomic theories of offending proposing distinct groups of individuals that follow qualitatively different age related patterns of development, with differing aetiologies (e.g. Moffitt, 1993) enlivened criminological debates during the 1990s.

5.1.1 Gendered trajectories

Females have tended to be under studied by researchers in the trajectory modelling domain (D'Unger et al., 2002). Silverthorn and colleagues (1999) undertook one of the earliest studies. Their study posited that female offending differed from male offending in that it followed a single (not dual) trajectory in which the onset of offending was delayed until adolescence. The study found evidence of 'the presence of only one developmental trajectory for antisocial girls; a trajectory that has many commonalities with the childhood onset for boys but for girls typically has an adolescent onset' (Silverthorn et al., 1999: 114). A number of studies have subsequently been undertaken but results have varied.

Fergusson and Horwood (2002) fitted five different trajectory groups to a general population sample and then tested for gender difference. They labelled the groups: 'low risk offenders', 'early onset adolescent limited offenders', 'intermediate onset adolescent limited offenders', 'late onset adolescent limited offenders' and 'chronic offenders'. The researchers found that trajectories were similar for males and females, as were the correlates associated with trajectory membership. However, females offended at a lower rate than males and were more likely to follow low offending risk and early adolescent-limited pathways. Males, on the other hand, were more likely to follow later adolescent-limited or chronic offending pathways. From the evidence, they concluded that the general developmental factors associated with female offending were similar to the development and aetiology of male offending.

Consistent with Fergusson and Horwood, though in contrast to Silverthorn and colleagues (1999), Eggleston and Laub (2002) found that the *same* trajectory groups existed for boys and girls; however, they found that the proportion of offenders following each of the distinct trajectories varied across gender. A different set of findings emerged from a study by D'Unger and colleagues (2002). The researchers investigated gendered trajectories among a random sample of females and males in a re-analysis of the Second Philadelphia Cohort study (3,000 females; 1,000 males). They identified three offending trajectories that were common to both boys and girls – non-offenders, high rate adolescent peak offenders and low rate adolescent peak offenders; however, they identified an additional 'chronic offender' group for boys only. They also found that: i) female offenders exhibited a later onset of offending and a lower offending frequency than male offenders (irrespective of trajectory group); ii) low rate females peaked earlier than the high rate females; iii) high rate females peaked later that their male counterparts; and iv) low rate females desisted earlier than their male counterparts. On the basis of this evidence, the researchers concluded that the typologies applied to male offender could not be generalised to include females and that the differences found could be reflecting 'differing attachments to various social institutions through various stages of the life course' (D'Unger et al., 2002: 353).

Piquero and colleagues (2005a) also found variation in male 'conviction experiences' when compared to females. Their study identified three male trajectories but only two female trajectories. Yet, like Fergusson and Horwood (2002), their results suggested a high degree of similarity between males and females in terms of the stability of offending from adolescence to early adulthood. More recently, Cohen et al (2010)

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identified four male trajectories (non-offenders, low rate offenders, adolescent peaked offenders, and low steady chronic but declining offenders), but only three female groups. Consistent with other studies, the research found that the group based offending rates were noticeably higher for the male groups than for female groups. Weaver (2010), too, investigated gendered trajectories using a large U.S. sample of 10,021 males and 5,938 females who committed their first offence in 2000 and who were followed to 2007 (i.e. up to age 18). She found that six trajectory groups fitted male offenders, while only three trajectories fitted female offenders. Some of her findings were consistent with those of D'Unger et al (2002). Both studies identified three trajectory groups for girls and both studies found that, when compared with males, female offenders exhibited a later onset of offending and a lower offending frequency. However, some of Weaver's results conflicted with those of D'Unger and colleagues. In particular, Weaver found that low rate females peaked later (not earlier) than the high rate females, while high rate females peaked earlier (not later) than their male counterparts. She attributed some of the difference to differing data collection methodologies.

Only one study has examined gender differences in offending trajectories *within* a specific (minority) ethnic group. Jennings and colleagues (2010) examined the gendered offending trajectories of Puerto Rican youth in two different cultural contexts.[41] The study found that offending trajectories were similar across males and females, though males exhibited a higher frequency of offending (i.e. greater

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[41] The study only looked at offending within the Puerto Rican sample. It did not compare the offending trajectories of this group with any other ethnic groups.

trajectory levels) and had higher risk factor estimates than females. Overall, the study identified more similarities than differences in how risk factors relate to patterns of offending across male and female youth.

To better understand similarities and differences in trajectories, a summary is provided in Table 5.1. Research findings have been classified according to the specific trajectory attributes to which they refer. Trajectory attributes typically comprise the *number* of trajectory groups, the *shape* and *size (average height & timing of peak)* of each trajectory, and the *proportion* of offenders within each group. The *factors* associated with group membership are also included in the table.

Table 5.1: Summary of Research Findings on Gender Differences, classified by Trajectory Attribute

Trajectory Attribute	Research evidence
Number of trajectory groups	Mixed results: Some studies find fewer groups for females than for males (e.g. D'Unger, 2000; D'Unger et al, 2002; Weaver, 2010; Silverthorn & Frick, 1999; Piquero et al, 2005; Jennings et al, 2010; Cohen et al, 2010); other studies identify the same number of trajectory groups for each gender (e.g. Fergusson & Horwood, 2002; Eggleston & Laub, 2002; Jennings et al, 2010; Broidy et al, 2003)
Shape of trajectories	General agreement that gender trajectories follow same basic shape (Piquero, 2008)
Size (magnitude/height)	General agreement that female trajectories are lower than those of male counterparts.
Size (peak)	Mixed results. Some studies find female trajectories peak

	earlier than male counterparts (e.g. Moffitt et al, 2001; Weaver, 2010; Block et al, 2010); other studies find female trajectories peak later (e.g. D'Unger et al, 2002)
Proportion of offenders in each group	General agreement that a greater proportion of female offenders are members of low rate trajectory groups i.e. that girls are more likely to fall into low or early adolescent pathways (D'Unger, 2002; Eggleston & Laub, 2002; Fergusson & Horwood, 2002; Weaver, 2010; Block et al, 2010; Broidy et al, 2003 ; Cohen et al, 2010; Jennings et al, 2010)
Factors associated with group membership	Mixed results. Some studies suggest factors are the same across gender (Fergusson & Horwood, 2002; Jennings et al, 2010, Weaver, 2010; Odgers et al,2008). Caudy (2010) provides a useful review of the evidence on trajectory risk factors.

A review of the studies shown in the table indicates that there is some consistency of evidence regarding the magnitude and shape of gender trajectories and on the proportion of offenders that "belong" to each group. However, there is some inconsistency in the number of trajectory groups for each gender. The evidence is inconclusive on the issue of factors associated with group membership. Some studies suggest that, in addition to a general set of risk factors, there are some specific risk factors that distinguish between offending trajectories; however, no consistent pattern has emerged (Caudy, 2011).[42] In summary, the extant literature on gendered

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[42] Some of the variation in findings have been attributed to methodological differences such as differing definitions of the response variable (e.g. offence frequency/severity scale), differences in

trajectories suggests that there are many similarities but also some differences in male and female trajectories; however, there is still debate regarding the correlates associated with these trajectories and whether or not these vary by gender.

5.1.2 Ethnicity specific trajectories

Only a handful of empirical studies (all U.S. based) have explored ethnicity specific trajectories (Cohen et al., 2010; Piquero et al., 2005b; Reitzel, 2006; Maldonado-Molina et al., 2009; Caudy, 2011). Piquero and colleagues (2005b) were the first to examine ethnic based differences in life-course-persistent pathways. They found differences between Black and White levels of chronic offending but, interestingly, concluded that the developmental processes predicting chronic offending were the *same* across ethnic groups. In reaching this conclusion, the researchers found deficiencies with current theories and suggested that 'a serious theory ought to address […] race and sex difference' (p.68). They further suggested that 'future research with the taxonomy, as well as other developmental/life-course theories should compare development, risk factors and life events for different ethnic groups as well as for males and females' (p. 68). Only four subsequent studies have investigated ethnic based differences in offending trajectories in any detail (Reitzel, 2006; Caudy, 2011; Maldonado-Molina et al., 2009; Cohen et al., 2010). Amongst these, opinions differ not only in regard to the number and nature of trajectories but also as to whether or not the risk factors that distinguish between them vary across

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study samples (offender versus general population), differences in data collection methods (self-report versus official records) and differences in the length of follow-up period (Piquero, 2008; Block et al., 2010; Weaver, 2010).

ethnic group. Reitzel (2006) examined ethnicity specific trajectories of a sample of 524 high risk offenders who were tracked for seven years following release from the California Youth Authority (CYA). The study found both similarities and differences across ethnicity specific trajectory models. Despite finding one less group in the Hispanic sample, the patterns of offending were very similar across all the ethnicity specific models. The study also found that a larger proportion of Whites were classified as chronic offenders; however, Blacks in the chronic group committed about one more offence per year relative to Whites in the chronic group. Reitzel (2006) assessed how various childhood factors distinguished between offending trajectories across ethnicity. He found that IQ, age at first arrest, parental criminality and sibling criminality significantly distinguished overall offending trajectories for Whites, while family structure and family welfare distinguished overall offending trajectories for Blacks. Only juvenile drug use distinguished overall offending trajectories among Hispanics. In the ethnicity specific models, some additional individual level and family level risk factors emerged as significant predictors of group membership, but overall, the study found little consistency in the factors that distinguished between offending trajectories across ethnic groups.

Maldonado-Molina and colleagues (2009) compared offending trajectories across two samples of Hispanic youth (one born in the U.S. and the other born in Puerto Rico). Despite some differences in the number of offending trajectories per group, their study found that the risk and protective factors that distinguished between trajectories were more similar than different across the two samples. These results are at odds with those of Reitzel (2006).

A later study by Cohen and colleagues (2010) also estimated the trajectory models for White, African-American and Hispanic groups and tested whether findings replicated across ethnicity. The study identified a number of similarities and differences. A three group model best fitted African-Americans and Hispanics, while a two group model best accommodated Whites. There were also different peak ages across ethnic groups.[43] Cohen and colleagues (2010) looked at gender differences as well, and found that four trajectories best fitted males, while only three trajectory groups fitted females. The researchers concluded that the low prevalence and frequency of female offending most likely affected trajectories by downward biasing offending patterns. The study did not examine whether the factors associated with trajectory membership varied across ethnicity.

Recently, Caudy (2011) used data from the National Longitudinal Survey of Youth 1997 (NLSY97; 3,416 persons: 51% male, 52% White, 27% Black, 21% Hispanic) to examine whether or not risk factors distinguish offending trajectories across ethnic groups. The study identified four trajectories for Whites and Blacks, and three trajectory groups for Hispanics. Consistent with Moffitt's (1993) developmental taxonomy, the study found that an adolescent peaked and a chronic offending trajectory emerged across all four models. Additionally, a late-onset chronic trajectory

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[43] The study identified two essential differences between the African-American only and White only models. First, while a two-group model provided the best fit among Whites, a three-group model provided the best fit among African-Americans. Specifically, there was an extra offender group among the African-Americans which demonstrated more moderate but steady offending over time. Second, African-Americans demonstrated a higher rate of offending over time than did Whites.

(labelled 'adolescent escalators') was identified in three of the four models. The study identified patterns of offending in the models that were more or less invariant across ethnicity. These, it was argued, were consistent with what has been observed in previous applications of the trajectory methodology across a diverse array of samples (Piquero, 2008). Contrary to expectations, though, the study did *not* find evidence to suggest that African-Americans and Hispanics were more likely to be classified in the more serious offending trajectories. This was a surprise finding which was attributed, in part, to data source and definitional issues. In terms of risk factors, the study did not find much variation in the risk factors that were associated with each trajectory; rather, they differed 'in degree' rather than 'by type'.

5.1.3 Applications of the group based approach in Australia

Research mapping out gender and/or ethnicity specific trajectories and associated risk factors is still in its infancy in Australia. Only a handful of published studies have investigated Australian offending trajectories using either SPGM or latent class analysis (LCA) (Marshall, 2006; Livingston et al., 2008; Fitzgerald et al., 2012). Two of the studies used data from a single birth cohort of offenders. Marshall (2006) applied the SPGM to a single birth cohort of offenders in South Australia (those born in 1984). She identified six distinct juvenile offending groups and constructed profiles of the persons most likely to be in each of these groups. Similarly, Livingston and colleagues applied the SPGM techniques to an offender 1983/84 birth cohort from Queensland. In both studies, gender and Aboriginal status were identified as risk factors (covariates); however, neither study engaged in separate gender and ethnic specific modelling of life-course offending patterns. Risk factor variations within gender and ethnic specific models were also not explored.

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A recent study by Fitzgerald and colleagues (2012) applied LCA to assess gender differences *only* in a cohort of 1,503 serious juveniles offenders serving supervised orders in Queensland during 1994-95. Consistent with a range of other studies (see Table 5.1), the study found that female offenders were characterised by fewer groups than males (three classes, not four) and that a greater proportion of female offenders fell into the less serious class of offending than males. The study concluded that there were more similarities than differences in the patterning across gender. In terms of risk factors, the study explored the relationship of one factor *only* (child maltreatment) to trajectory/class membership and found evidence that abuse was experienced differentially across gender. This led to the researchers to conclude that some subsets of offenders may, indeed, follow potentially different and 'gendered' pathways.

5.2 Purpose of study

As is evident from the literature, research effort on gender and ethnicity specific offending trajectories has been limited and results are mixed. There is the need for improved understanding of the nature and extent of diversity within offender populations. Evidence is required that not only documents variations in offending patterns between males and females, but also between different ethnic groups. Such evidence is vital not only for informing the development of an adequate (and, potentially, blended) theory of offending but also to guide the development and effective crime prevention policies and the design and targeting of interventions.

The purpose of this study, then, is to fill a number of knowledge gaps (particularly in relation to Australian research). Questions that are of fundamental interest are: *What kinds of trajectories can be ascribed to offending patterns over the life-course? How do these trajectories vary across gender and ethnicity (Aboriginal status)? What are the factors associated with such trajectories? And, do such factors vary across gender and ethnicity (Aboriginal status)?*

5.3 Data and Method

Data was sourced from the official contact records of the WA criminal justice system. Offending records are population based, comprising *all* records of formal police apprehension (arrest and charge, or summons) and *all* records of juvenile diversion in WA since 1984 (including formal police cautions and referrals to Juvenile Justice Teams). The data for each individual were brought together and linked using the INOIS system (Ferrante, 1993). The study dataset comprised 122,517 offenders who were born between 1977 and 1995 and had had contact with the criminal justice system between 1984 and 2005. Summary demographic and offence characteristics of the study population are described in Table 4.1.

The SPGM was used to develop trajectory models of offending (Nagin and Land, 1993; Jones et al., 2001). The dependent variable in the analysis was the individual frequency of offending at each age (often referred to as lambda or λ). This was estimated by summing the number of contact events per individual at each age. Modelling consisted of three stages – specifying trajectory models, selection of a final (best fitting) model, and determining the factors associated with trajectory group

membership. The modelling sequence was repeated for each gender and ethnic group.[44]

5.3.1 Trajectory Model Specification

A zero inflated Poisson model was used throughout, owing to the use of count data with a large number of zeros (Jones et al., 2001). Due to the non-parametric nature of the SPGM approach, it was necessary to specify the *number* of trajectory groups being modelled. It was also necessary to specify the polynomial order or *form* of each trajectory that was being modelled (specified as linear, quadratic, cubic or quartic).

Testing model fit – multiple diagnostics

A number of diagnostic tools were used to determine the goodness of fit of the various models. Diagnostics comprised the Bayesian Information Criterion (BIC), the probability of group membership (APP) and the odds of correct classification (OCC). BIC is a statistic that provides a measure of the fit of the model, taking into account the number of groups specified. APP is determined after a model has been created. For every person in the study, the SPGM procedure estimates the probability of belonging to each of the specified groups. Each person is then 'assigned' to the group for which they have the highest APP. The more distinctive the trajectory, the higher the APP will be. APPs above 0.7 indicate good precision in the assignment of individuals to offending trajectories (Nagin, 2005). The OCC compares the average probability of group membership (which is just the average of the highest probability

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[44] A further, separate modelling exercise was also undertaken to explore offending trajectories for selected offences (e.g. violent offences only; drug offending only). Again, the modelling sequence was repeated for each gender and ethnic group. Results for this component are not reported here.

scores for each individual) with the model estimate of group size. According to Nagin (2005), an OCC of less than five for any group within the model suggests some instability within the model.

Final Model Selection

Utilising an iterative process, the model selection process fitted models with varying numbers of groups and functional shape (i.e. trajectory form). Final model selection was guided by a review of BIC, APP and OCC values, as well as by some subjective assessment similar to that advocated by Nagin and used by others (e.g. Blokland, 2005; Weaver, 2010; Livingston et al., 2008; Caudy, 2011; Cohen et al., 2010). Unlike some studies, no adjustment was made to the dependent variable (lambda) for time spent in custody or for mortality, as recent evidence suggests that this degree of fine tuning is not required when estimating re-offending rates for the general population. (Ferrante et al., 2009).[45]

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[45] Ferrante and her colleagues (2009) assessed both the impact of time spent in custody and the impact of mortality on the estimation of recidivism. They used data from the same jurisdiction and same time periods as the current study, comparing adjusted and unadjusted recidivism rates for different offender populations and for different follow-up periods. In contrast to other studies, their research found that the adjustments made little difference to the two-year recidivism rates of large offender groups. This result was attributed to the low prevalence and relatively small magnitude of time spent in custody by each of the groups. However, for certain categories of offenders (e.g. violent, Aboriginal offenders) and over shorter follow-up periods (six months), the under-estimation of recidivism was more marked (up to 12% difference). The study concluded that current methods of estimating population-level recidivism rates were adequate and did not require wholesale re-calibration to account for either factor.

5.3.2 Determining factors associated with trajectory group membership.

To explore whether certain risk factors can distinguish between trajectories of offending *within* that population sub-group, trajectory groups were simultaneously regressed onto a set of risk factors drawn from the available data. Separate logistic regression models were run for each of the gender/ethnic groups. The set of risk factors included in the regression models were limited, due to the restricted nature of the source data; however, the set includes a number of factors related to the individual (gender, Aboriginal status, birth year), the environment (geography, disadvantage), and some criminal justice variables (see below). Although the range of risk factors is narrow, the findings provide a useful, initial insight into factors that may (or may not) discriminate between groups of offenders.

Personal variables

Gender was included as a risk factor when ethnic specific trajectories were modelled. Almost three quarters (72%) of the offender population was male. *Aboriginal status* was included when gender specific trajectories were modelled. About one in seven (14%) of the total offender population was Aboriginal. To capture potential cohort effects, a variable (*Birth_year*) was created which divided the data into four cohort groups based on birth year.[46]

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[46] Recall that the data comprised all offenders born 1977-1995 and followed 1984-2005. This meant the data contained multiple birth cohorts with varying follow-up times. Offenders in later birth cohorts had shorter follow-up times. For modelling, the study combined all birth cohorts into a single group. This approach may lead to biases – trajectories estimates at later ages will tend to be influenced by the

Criminal justice variables

Early_onset indicated whether the offender first started offending between the ages of 7 and 12 years. *Early_violence, Early_drug* and *Early_good_order* were variables which indicated whether the offender had committed (respectively) i) at least one violent offence in his/her first year of offending, ii) at least one drug offence in his/her first year of offending, and iii) at least one good order offence in his/her first year of offending. *Early_violence* and *Early_drug* were used as indicators of more serious offending. These variables and *Early_onset* were included in the models because criminal career research has established that both early-onset and serious offending at a younger age are predictive of a longer and more intense criminal career (Farrington, 1997).

Onset_diversion. A variable was derived which indicated whether the first offence was dealt with via diversionary processes. Diversionary processes aim to reduce the effects of labelling and stigmatisation that are associated with juvenile offending. *Onset_diversion* was therefore hypothesized to have a protective effect.

Environmental/ecological variables

A number of ecological or environmental variables were derived from offence location and neighbourhood level socio-economic data sourced from the Australian Bureau of Statistics (ABS SEIFA; Australian Bureau of Statistics, 2006). *Onset_north*

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offending patterns of older offenders, since lambda for younger cohorts will be missing for ages not yet reached. However, prior to combining the birth cohorts, the study separately modelled individual birth cohorts. Despite variations in follow-up times, the number of trajectories to emerge for each birth cohort did not vary substantially.

was derived from the statistical local area of first offence. If the area was in the North of WA (i.e. Kimberley and/or Pilbara region) then *onset_north*=1. *Onset_city* was derived from the statistical local area of first offence. The Perth Metropolitan area was flagged as *onset_city*. Both of these variables were included in the model to capture/test potential geographical/environmental influences. An earlier study had previously detected lower rates of offending amongst Aboriginal people living in the North of WA (Harding et al., 1997).

A number of socio-economic variables or indices were included in the models to explore relationships between disadvantage and offending. *Onset_disadv* was derived from ABS SEIFA data from 1986 to 2006 and applied at the postcode level. This index represents the neighbourhood level socio-economic disadvantage, taken at the time of first offence (onset of offending). It is derived from Census variables related to disadvantage, such as low income, low educational attainment, unemployment, and dwellings without motor vehicles. *Onset_edocc* was also derived from the ABS SEIFA data from 1986 to 2006. It is a variant of the socio-economic index which places greater emphasis on educational and occupational disadvantage. As with *onset_disadv*, it is a measure at neighbourhood (postcode) level, taken at the time of first offence. *Onset_resource* was used as an alternate measure of socio-economic status. Derived from the ABS Census data, it includes Census variables relating to the educational and occupational characteristics of communities.

5.4 Results

Characteristics of the study offender population are presented in Table 5.2. Some differences across gender and ethnic cohorts are immediately apparent - more than a third (35%) of Aboriginal offenders are identified as early onset offenders (having been first arrested by police on or before the age of 12), compared with one in ten (9.7%) non-Aboriginal offenders.

5.4.1 Stage 1: Model fitting

Models comprising two, three, or more trajectories were fitted to the data and then reviewed using various diagnostics (BIC, APPs and OCCs). Goodness of fit indices are summarised in Tables 5.3 and 5.4.[47] The polynomial order of each trajectory was also modelled – this included estimating groups with linear, quadratic, cubic and quartic forms.[48] At each fit, polynomial terms were assessed and if higher order terms were found not to be significant, the order of the trajectory was reduced.

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[47] At no time did BIC scores achieve a local maximum. Rather, the BIC improved as groups were added to models; however, some of the other diagnostics began to indicate a lack of precision in group assignment. Where this occurred (and where it was observed that adding additional groups did not add substantively to findings), simpler models were preferred.

[48] A number of other researchers have fitted cubic age functions to offending trajectories; however, the preference in this study was to avoid the cubic form because, although this polynomial form may provide a better fit to the data over a limited age-range, there is little theoretical justification for its use. After the adolescent peak in offending, most theories predict a general decline (not rise) in offending. Preference was given to modelling quadratic age functions, occasionally moving to quartic forms for some groups. Though more complex, quartic polynomials are better at capturing the second offending

Table 5.2: Key Offender Characteristics

Characteristic	Total offender population	Male offenders	Female offenders	Indigenous offenders	Non-Indigenous offenders
	%	%	%	%	%
Male	71.6	-	-	60.7	73.3
Indigenous	14.3	12.1	19.6	-	-
Cohort					
1977-1981	42.4	43.1	41.5	29.3	44.2
1982-1986	37.5	38.2	36.5	36.1	37.9
1987-1991	18.2	16.9	20.5	27.8	16.7
1992-1996	2.0	1.8	1.5	6.8	1.1
Early onset (age 7-12yrs)	13.1	13.7	11.5	35.0	9.7
Early violence	8.4	8.6	7.9	13.3	7.7
Early drugs	11.6	12.9	8.4	4.1	13.1
Early good order	16.5	17.4	14.3	21.9	15.6
Onset_north	7.4	7.3	7.8	31.3	3.4
Onset_city	61.7	61.5	62.5	29.3	67.0
Onset_neighbd_disadvantage	8.0	7.5	9.3	23.8	5.5
Mean # events (from age 10 to 28)	3.6	4.0	2.5	9.2	3.1
Median # events	1	2	1	4	1
Number of cases	120,133	85,247	33,864	16,747	100,165

'peak' often evident in the early- to mid-20s and which arises from exposure to adult only offences e.g.

drinking driving and other driving/licensing offences (at 18 years or over in Australia).

Table 5.3: Model Fit Indices for Male and Female Offending Trajectories (all cohorts, all offences)

Male - All cohorts, all offences

# of groups	Polynomial order*	BIC1 n=1100478	BIC2 n=82,935	APPs					Overall APP	OCCs					Preferred model
2	2	-626,250.0	-626,238.4	0.99	0.94				0.98	8.4	129.4				
2	4	-621,652.8	-621,636.0	0.99	0.93				0.98	8.6	111.5				
3	2	-616,628.3	-616,610.2	0.96	0.86	0.93			0.95	4.8	39.7	433.4			2
3	3	-612,212.4	-612,190.4	0.87	0.96	0.93			0.95	42.4	5.0	457.2			
3	4	-611,858.8	-611,832.9	0.96	0.87	0.93			0.95	5.0	44.5	409.2			1
4	2	-611,606.9	-611,582.4	0.80	0.67	0.84	0.93		0.76	3.5	4.2	38.6	453.1		
5	2	-608,197.3	-608,166.3	0.80	0.66	0.78	0.80	0.92	0.75	54.8	4.4	3.2	53.6	449.8	

* Higher order terms were statistically significant in every model (probably because of large n);however, corresponding parameter estimates were often very small.

When there was choice, preference was given to lower order polynomials forms.

Female - All cohorts, all offences

# of groups	Polynomial order*	BIC1 n=434,922	BIC2 n=35,536	APPs				Overall APP	OCCs				Preferred model
2	2	-197,105.0	-197,093.5	0.99	0.93			0.98	6.1	150.6			2
2	4	-193,560.8	-193,544.1	0.98	0.92			0.98	5.9	130.4			1
3	2	-193,542.2	-193,524.3	0.86	0.73	0.92		0.79	7.3	2.9	172.6		
3	3	-192,831.9	-192,810.1	0.81	0.75	0.91		0.78	6.2	2.7	155.6		
3	4	-191,839.7	-191,814.0	0.86	0.95	0.91		0.94	40.4	3.1	458.2		
4	3	-191,147.4	-191,117.9	0.84	0.71	0.80	0.91	0.75	55.2	2.9	5.0	583.5	

* Higher order terms were statistically significant in every model (probably because of large n);however, corresponding parameter estimates were often very small.

When there was choice, preference was given to lower order polynomials forms.

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Table 5.4: Model Fit Indices for Aboriginal and Non-Aboriginal Offending Trajectories (all cohorts, all offences)

Aboriginal - All cohorts, all offences

# of groups	Polynomial order*	BIC1	BIC2	APPs				Overall APP	OCCs				Preferred model
		n=195,600	n=17,099										
3	2	-176,283.0	-176,266.0	0.92	0.84	0.93		0.90	6.0	15.6	112.1		**2**
3	3	-175,200.7	-175,179.9	0.92	0.86	0.92		0.91	6.0	18.1	108.2		
3	4	-174,926.9	-174,902.5	0.92	0.87	0.92		0.91	6.1	20.7	113.2		**1**
4	2	-174,573.1	-174,549.9	0.88	0.82	0.83	0.91	0.86	4.5	21.3	26.7	166.5	
4	3	-173,367.6	-173,339.6	0.88	0.83	0.86	0.92	0.87	4.4	25.2	31.9	171.9	
5	2												no converge

* Higher order terms were statistically significant in every model (probably because of large n);however, corresponding parameter estimates were often very small.

When there was choice, preference was given to lower order polynomials forms.

Non-Aboriginal - All cohorts, all offences

# of groups	Polynomial order*	BIC1	BIC2	APPs				Overall APP	OCCs				Preferred model
		n=1339870	n=99503										
2	2	-636,151.7	-636,140.0	0.98	0.91			0.98	4.7	114.5			**2**
2	4	-628,604.9	-628,588.0	0.98	0.91			0.98	4.6	109.3			**1**
3	2	-630,572.1	-630,553.9	0.83	0.95	0.89		0.94	37.8	3.1	421.8		
3	3	-625,091.9	-625,069.8	0.92	0.67	0.90		0.78	8.3	4.1	116.4		
3	4	-624,600.4	-624,574.4	0.83	0.67	0.91		0.78	3.3	4.1	120.4		
4	2	-623,381.4	-623,356.7	0.67	0.82	0.80	0.89	0.75	3.8	50.3	3.3	463.3	
4	3												
5	2												

* Higher order terms were statistically significant in every model (probably because of large n);however, corresponding parameter estimates were often very small.

When there was choice, preference was given to lower order polynomials forms.

5.4.2 Stage 2: Final trajectory solutions

The final trajectory solutions for males, females, Aboriginal and non-Aboriginal offenders are displayed in Figures 5.1 – 5.4 respectively. Figure 5.1 displays the trajectories for male offenders (solid lines show actual offending, while dotted lines show offending estimated through modelling). The best fitting model for males identified three trajectories of offending:

- G1 (red) – a low rate offending group, comprising 83% of the male offender population (n=70,743)

- G2 (green) – a mid-range group, 13.4% of male offenders (n=9,783)

- G3 (blue) – a high rate offending group, 3.1% of male offenders (n=2,409). This last group is characterised by a high, early-onset rate of offending, peaking at age 14.

It is notable that offending levels for all groups decline during adulthood.

The best fitting model for females comprised two offending trajectories (Figure 5.2):

- G1 (red) – a low rate offending group, 91% of female offenders (n=30,587)

- G2 (green) – a mid-rate offending group, 8.5% of female offenders (n=2,540).

The two female trajectories closely resemble the low rate and mid-rate trajectories for males. There is similarity in trajectory shape as well as in magnitude (although the latter may be more difficult to observe because of the difference in the vertical scale of each figure). However, a greater proportion of female offenders fell into the low rate offending group. The most important difference between male and female

offending trajectories, however, is the absence of a high rate offending group among female offenders. In terms of the timing of trajectory peaks, the adolescent offending trajectory peaked at age 15 for females and at age 17 for males.

Figure 5.1: Trajectories of Offending – Male
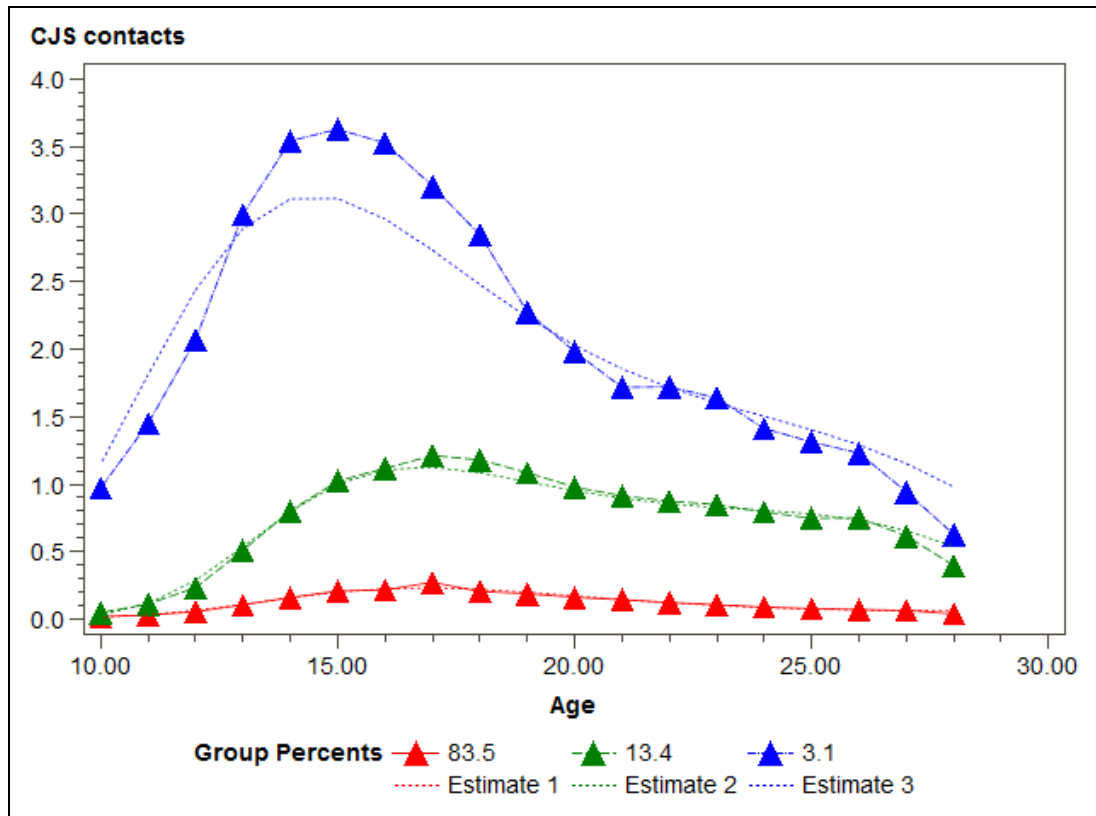
Figure 5.2: Trajectories of Offending – Female
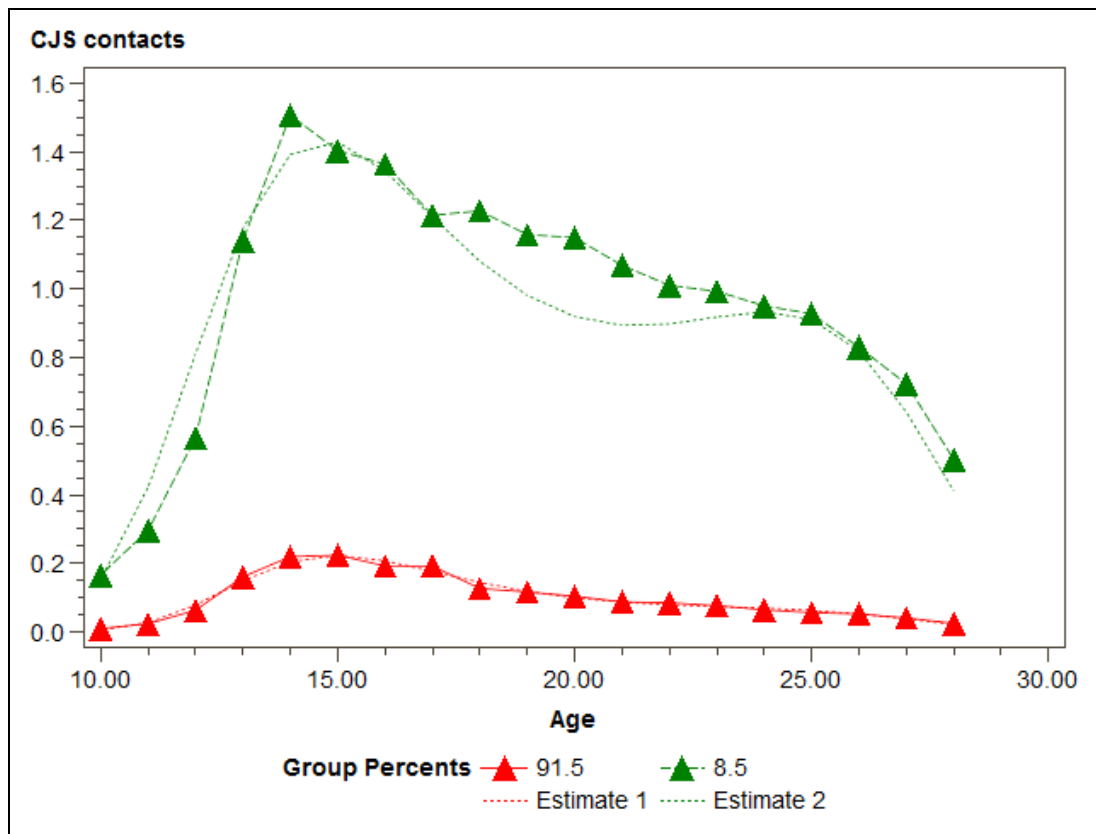
Figure 5.3 displays the trajectories for Aboriginal offenders (solid lines show actual offending, while dotted lines show offending estimated through modelling). The best fitting model for the Aboriginal cohort identified three trajectories of offending:

- G1 (red) – a low rate offending group, 66% of offenders (n=11,896)

- G2 (green) – a mid-rate offending group, 24% of Aboriginal offenders (n=3,633)

- G3 (blue) – a high rate, early-onset group, 9.4% of Aboriginal offenders (n=1,570).

As with male trajectories, offending levels for all Aboriginal groups decline during adulthood, with mid-rate and high rate groups almost converging by age 28.

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Figure 5.3: Trajectories of Offending – Aboriginal
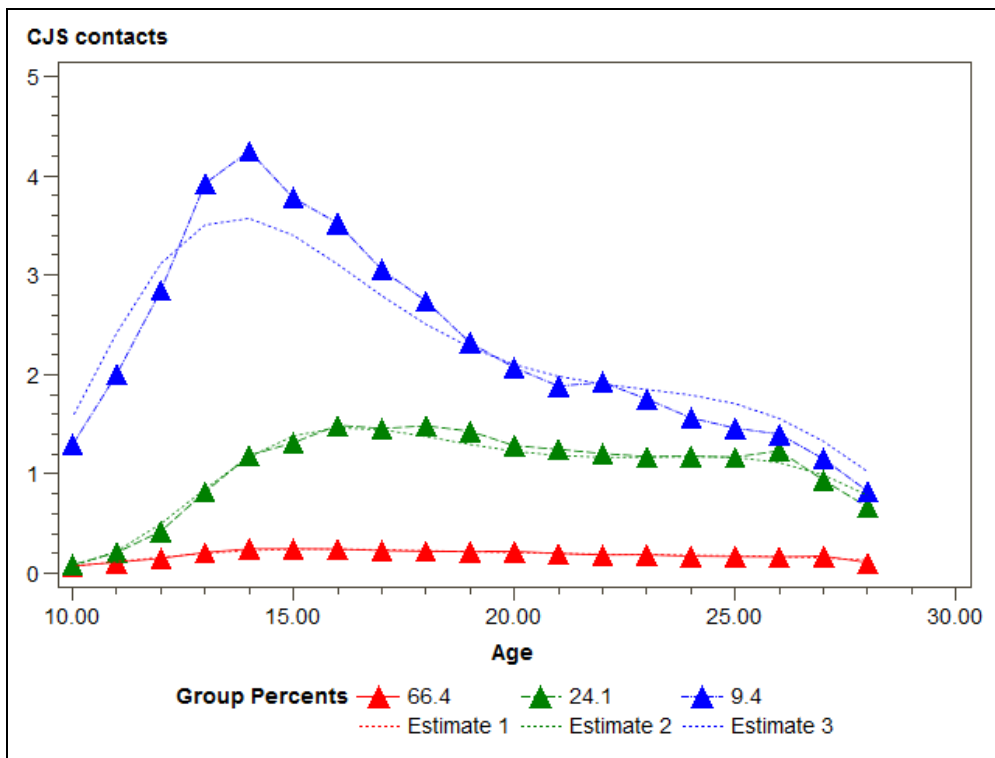
Figure 5.4: Trajectories of Offending – Non-Aboriginal
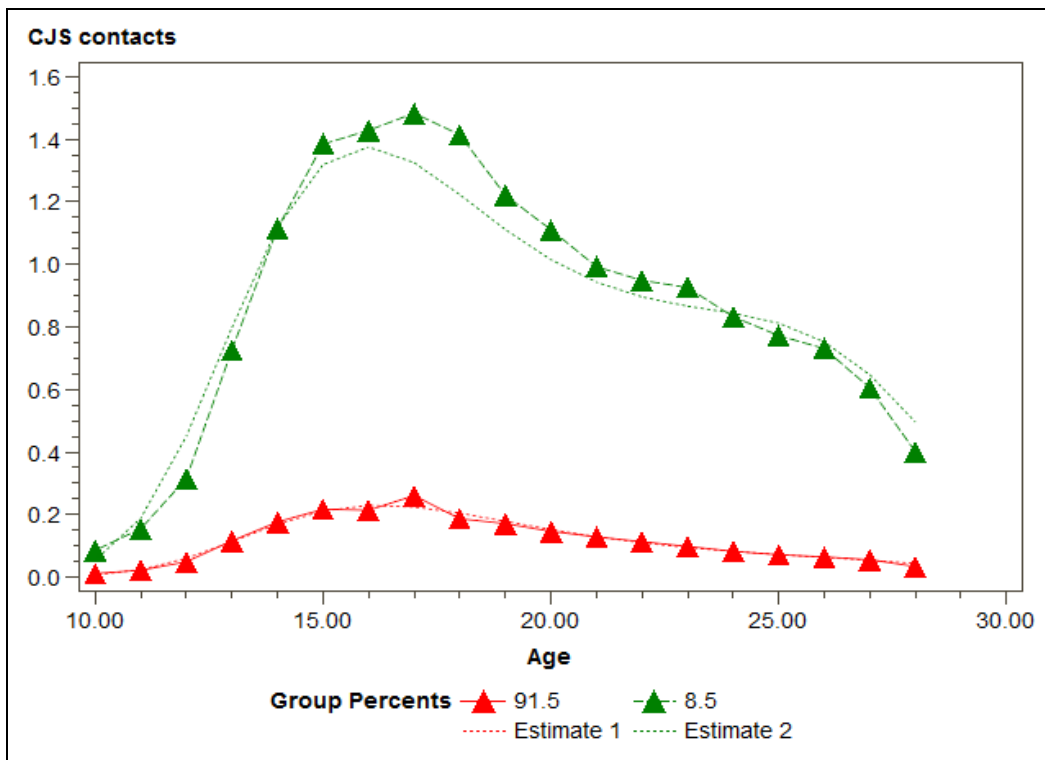
Figure 5.4 displays the trajectories for non-Aboriginal offenders. Unlike the Aboriginal cohort, the best fitting model for the non-Aboriginal cohort comprised just two trajectories:

- G1 (red) – a low rate offending group, 91.5% of offenders (n=92,101)

- G2 (green) – a mid-rate offending group, 8.5% of non-Aboriginal offenders (n=7,402).

There is a striking resemblance between the non-Aboriginal trajectories and the trajectories for females – both show consistency in the shape and size of trajectories, and in the proportion of offenders who comprise each group. However, there is slight variation in the peak age of offending - females appear to peak marginally earlier.

Table 5.5: Risk factors for trajectory group membership – males, females

MALE MODEL	G2* Mid-rate N = 9,783 R_sq = 0.1165		G3* High-rate N = 2,409 R_sq = 0.4444		G3 compared to G2 R_sq = 0.3463		FEMALE MODEL	G2* Mid-rate N = 2,540 R_sq = 0.2397	
Dependent var traj grp membership							Dependent var traj grp membership		
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI		Odds ratio	95% CI
Risk factors							**Risk factors**		
aboriginal status	3.97	(3.73,4.23)	11.60	(10.41,12.92)	3.57	(3.19,4.00)	aboriginal status	6.68	(6.04,7.39)
gender	N/A		N/A		N/A		gender	N/A	
early_onset	2.42	(2.28,2.57)	19.29	(17.03,21.85)	8.29	(7.32,9.39)	early_onset	4.86	(4.35,5.42)
early_violence	2.05	(1.92,2.20)	3.33	(2.89,3.83)	1.83	(1.59,2.12)	early_violence	2.56	(2.26,2.90)
early_drugs	1.59	(1.49,1.69)	2.34	(1.94,2.83)	1.34	(1.10,1.64)	early_drugs	2.31	(1.98,2.70)
early_good_order	1.67	(1.58,1.77)	2.74	(2.41,3.12)	1.79	(1.56,2.04)	early_good_order	2.60	(2.34,2.90)
onset_diversion	1.83	(1.73,1.93)	1.50	(1.29,1.75)	ns		onset_diversion	ns	
onset_north	0.91	(0.84,0.99)	0.52	(0.44,0.61)	0.54	(0.46,0.63)	onset_north	0.66	(0.57,0.78)
onset_city	0.93	(0.89,0.98)	0.90	(0.81,1.00)	ns		onset_city	1.19	(1.07,1.32)
onset_disadv	ns		ns		ns		onset_disadv	0.75	(0.64,0.88)
onset_edocc	1.32	(1.22,1.44)	ns		0.84	(0.69,1.01)	onset_edocc	ns	
onset_resource	ns		1.16	(0.98,1.39)	1.28	(1.06,1.55)	onset_resource	1.33	(1.13,1.56)
cohort	0.86	(0.83,0.88)	ns		1.22	(1.15,1.29)	cohort	0.88	(0.83,0.93)

* G1 (low-rate group) is reference group. N= 70,743   * G1 (low-rate group) is reference group. N= 30,579

Table 5.6: Risk factors for trajectory group membership – Aboriginal, non-Aboriginal

ABORIGINAL MODEL	G2* Mid-rate N = 3,633 R_sq = 0.0695		G3* High-rate N = 1,570 R_sq = 0.3640		G3 compared to G2 R_sq = 0.3230		NON-ABORIGINAL MODEL	G2* Mid-rate N = 7,400 R_sq = 0.1042	
Dependent var traj grp membership	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Dependent var traj grp membership	Odds ratio	95% CI
Risk factors							**Risk factors**		
aboriginal status	N/A		N/A		N/A		aboriginal status	N/A	
gender	2.01	(1.85,2.18)	2.49	(2.16,2.86)	1.50	(1.28,1.77)	gender	2.46	(2.29,2.64)
early_onset	1.83	(1.67,2.00)	22.50	(19.03,26.62)	11.47	(9.54,13.80)	early_onset	4.37	(4.11,4.66)
early_violence	1.64	(1.47,1.83)	2.37	(1.99,2.83)	1.62	(1.33,1.96)	early_violence	2.68	(2.49,2.88)
early_drugs	1.30	(1.08,1.57)	2.75	(1.95,3.87)	1.90	(1.32,2.75)	early_drugs	1.87	(1.75,2.00)
early_good_order	1.39	(1.26,1.53)	2.64	(2.25,3.09)	2.06	(1.72,2.46)	early_good_order	2.14	(2.01,2.27)
onset_diversion	1.44	(1.30,1.58)	ns		ns		onset_diversion	1.71	(1.61,1.82)
onset_north	0.72	(0.66,0.79)	0.46	(0.40,0.54)	0.53	(0.44,0.62)	onset_north	0.77	(0.66,0.89)
onset_city	0.86	(0.79,0.94)	ns		ns		onset_city	ns	
onset_disadv	ns		ns		ns		onset_disadv	ns	
onset_edocc	ns		0.67	(0.54,0.83)	0.77	(0.61,0.98)	onset_edocc	1.45	(1.32,1.60)
onset_resource	ns		ns		ns		onset_resource	1.22	(1.10,1.36)
cohort	0.82	(0.78,0.85)	ns		1.28	(1.19,1.38)	cohort	0.87	(0.84,0.90)

* G1 (low-rate group) is reference group. N= 11,891   * G1 (low-rate group) is reference group. N=92,081

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5.4.3 Stage 3: Risk factors associated with group membership

Results from the regression modelling are presented in Tables 5.5 and 5.6. Unless otherwise stated, the low rate offending group was used as the reference group to which all others were compared.[49]

Risk factors associated with male trajectories

For males, two risk factors - Aboriginal status and early onset offending – emerged as the strongest factors which distinguished between low rate offending and all other trajectories (see Table 5.4). Being Aboriginal not only increased the likelihood of membership of the mid-rate G2 trajectory (by a factor of 3.97), but also increased the likelihood of the high rate G3 membership (by a factor of 11.6). Early onset of offending was especially predictive of membership of the high rate trajectory. It increased the likelihood of membership of the G3 group by a factor of 19.3. Other factors which distinguished between low rate offending and other trajectories included early indicators of violence, drug use and public order offences. The highest levels of risk (odds ratios) were consistently observed for the higher-rate offending trajectory.

Some factors were found to act in a negative direction, that is, they *reduced* the likelihood of being in a higher offending trajectory. Living in the North of WA or

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[49] For males and the Aboriginal cohort, which had three-group solutions, an additional set of regression models were estimated with the mid-rate trajectory as the reference group. This comparison helps to identify the factors that may distinguish between the mid-rate and high-rate offender trajectories. The results of these models are also shown in the tables.

living in the city (Perth) acted as protective factors, reducing the likelihood of higher rate offending. Being a member of an earlier birth cohort also reduced the risk of being in a higher offending trajectory. One factor, *onset_diversion*, appeared to operate contrary to expectations. The model indicated that being diverted from the system at first offence *increased,* rather than reduced, the likelihood of more serious offending.

Few, if any, factors *uniquely* distinguished between male trajectories. With the exception of some environmental or ecological variables, none of the factors included in the model *uniquely* differentiated one male offending trajectory from the others. Rather, higher levels of the same risk factor (odds ratios) were observed for higher-rate offending trajectories. Neighbourhood educational/occupational disadvantage emerged as a risk factor for the mid-rate (G2) trajectory *only*; neighbourhood resource deficiency was a risk factor for the high rate (G3) trajectory *only;* however, neither were particularly strong factors. General neighbourhood disadvantage (*onset_disadv*) did not emerge as a risk factor for any trajectory group.

Risk factors associated with female trajectories

As Table 5.5 shows, the same risk factors that distinguished between the low and higher rate trajectories for males also distinguished between the trajectories for females. Note, though, that Aboriginal status represented a greater trajectory risk factor for females (odds ratio=6.68) than for males (odds ratio=4.97). As with males, higher offending trajectories were generally associated with higher levels of these risk factors (greater odds ratios).

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There were some differences in the way that environmental or ecological factors affected membership of female trajectories, however. The general measure of socio-economic disadvantage appeared to reduce the risk of being in the higher offending group for females; while specific resource deficiency served to increase this risk (yet neither factor was significant for male trajectories). Further, while educational/occupational disadvantage increased the risk for males, this was not significant for females.

Risk factors associated with Aboriginal trajectory membership

Not surprisingly, one of the most significant factors distinguishing between Aboriginal trajectories was gender (see Table 5.6). Early onset offending also increased the likelihood of membership of the G2 group by a factor of 1.8, *and,* significantly, increased the likelihood of G3 membership by a factor of 22.5.

Factors that distinguished *between* Aboriginal trajectories were the same as those that distinguished between male trajectories and female trajectories. As with males and females, higher-rate trajectories for Aboriginal offenders were generally associated with higher levels of these risk factors (greater odds ratios). Protective factors also operated similarly across Aboriginal trajectories, as across male and female trajectories. Again, as with males and females, few factors differentiated between Aboriginal trajectories; rather, the same factors but with differing risk levels distinguished between trajectory groups.

Risk factors associated with non-Aboriginal trajectory membership

The risk and protective factors distinguishing between non-Aboriginal offending trajectories were the same as those distinguishing between the offending trajectories of the Aboriginal cohort, and of males and females (see Table 5.6).

5.5 Discussion

Research on diversity in offending patterns is crucial given ongoing polemical debates concerning the relationship between gender, ethnicity and crime. Competing theoretical perspectives, limited supporting evidence and inconclusive or inconsistent findings from previous research all point to the need for more empirically-grounded, generalisable research (i.e. based on large population samples), which compares and contrasts offending patterns *across* and *within* gender and ethnic groups.

The current study uses a large, longitudinal population base and the SPGM approach to model age related offending trajectories for males, for females, for Aboriginal offenders and for non-Aboriginal offenders. The SPGM technique has been used to examine the heterogeneity and homogeneity among offenders and for identifying the number of groups following distinct developmental pathways. Consistent with the majority view from international research on trajectories (Piquero, 2008), the study found that either two and three offending trajectories adequately described life-course offending for each gender and ethnic cohort. For each gender/ethnic cohort, the trajectories comprise a low rate group, a moderate offending group, and for some, a high rate group. The same basic shape - an inverted U typical of the age-crime relationship – was evident in trajectories for all groups.

5.5.1 Gender differences in trajectory models

A key aim of the study was to determine if, and how, offending trajectories varied with gender. As noted in the literature review, there is some divergence of opinion regarding some aspects of gendered trajectories. Consistent with findings from a majority of research studies, the results from the current study indicate that the shape of male and female trajectories are similar; that male trajectories are higher than female trajectories and that the proportion of offenders in the low rate group is larger for females than for males. Taken together these findings suggest stability in offending and are generally supportive of the view that there are common developmental sequences/pathways shared by both boys *and* girls. The elevated nature of male trajectories further supports a 'differential exposure' perspective which maintains that underlying factors and processes are the same for males and females[50]; however, males are exposed to greater levels of these factors than females. That *fewer* trajectory groups are required to describe female offending than male offending also accords with results elsewhere (e.g. D'Unger et al., 2002; Weaver, 2010; Silverthorn et al., 1999; Piquero et al., 2005a; Jennings et al., 2010; Cohen et al., 2010). This trend has been attributed to the low prevalence and frequency of female offending

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[50] It is possible that the effects could be explained by other hypotheses. For example, the differential susceptibility hypothesis (Belsky, 2005) maintains that some individuals, due to their biology, temperament and/or behavioural traits are more vulnerable to the effects of some experiences or risk factors, while others are relatively resilient to them. Moreover, individuals differ in their responsiveness to their environment (i.e. developmental plasticity). It is plausible that even with the same level of exposure to the same underlying factors, males and females may have differing responses to them. This perspective does not fit neatly into the 'differential exposure' class of theories put forward by Piquero and Brame (2008).

which downwardly bias female offending patterns. The study also found that offending trajectories generally peak earlier for females than for males. Again, this accords with results elsewhere (e.g. Moffitt et al., 2001; Weaver, 2010; Block et al., 2010) and has been attributed to the earlier onset of puberty and social maturation of women.

5.5.2 Ethnic based differences in trajectory models

The current study's exploration of ethnic based differences in offending trajectories contributes to a small but growing body of research documenting the extent of heterogeneity of offending trajectories across ethnic subgroups (Cohen et al., 2010; Reitzel, 2006; Caudy, 2011). The findings confirm both similarities and differences in offending trajectories across ethnic group. Similarities were observed in the shape and height of (low rate and mid-rate) trajectories, and in the risk factors associated with trajectory membership. However, there were distinctive features of the Aboriginal model that were not evident in the non-Aboriginal model: the Aboriginal model had a greater number of trajectories (3); the trajectories peaked at earlier ages; and a greater proportion of the Aboriginal cohort made up the high rate offending group.

It is difficult to compare ethnicity specific results with those from elsewhere, particular from the U.S., owing to differences in the ethnic constitution of the respective countries. In Australia, neither Livingston et al (2008) nor Marshall (2006) modelled the trajectories of Aboriginal offenders separately from those of non-Aboriginal, so direct comparison of findings is not possible. However, there are commonalities with those studies. Both prior studies found that Aboriginal status and gender (masculinity) were risk factors for high rate or chronic offender groups. As

with those studies, the current study found that Aboriginal and male youths were highly overrepresented in trajectory groups characterised by moderate to high frequency, early onset and serious offending.

Note that the study did not model the four gender-race groups but rather modelled gender separately from race. This was a pragmatic decision made to reduce complexity – recall that the primary analytical task was to identify clusters of offenders *within* the sex and race groups showing similar developmental patterns of offending. Disaggregation into the four gender-race groups is preferable, as this approach provides a more complete picture of effects and makes interpretation of findings clearer, that is, similarities/differences can be attributed to factors can be more easily identified and discussed without the problem of overlap. Note, though, that there are theoretical challenges associated with this method, as there are few criminological theories which adequately incorporate the joint effects of gender and race on offending. Moreover, disentangling race and gender from other factors such as social disadvantage, cultural difference and geography – provides additional theoretical and analytic challenges.

5.5.3 Risk factors

In addition to fitting gender and ethnicity specific trajectory models, the study also sought to identify the gender and ethnicity specific risk factors that may be associated with trajectory group membership. Although the set of risk factors included in the regression models were limited, the findings from the analysis provide a useful, initial insight into factors that may discriminate between groups of offenders.

Of the risk factors included in the models, the study found that a common sub-set consistently distinguished between trajectories *within* a gender or ethnic group. In other words, irrespective of which gender or ethnic group was being modelled, the majority of factors that distinguished between low- and mid-rate offenders also distinguished between low- and high rate offenders. Put another way, the evidence suggests that the included risk factors varied 'in degree' rather than 'by type'. The highest levels of risk were consistently observed for the trajectories with high probability of involvement in offending (high-level groups), while lowest levels of risk (of the same factors) were consistently observed for the lower rate group.

Finding that a common sub-set of risk factors predicts all offending trajectories resonates with findings elsewhere. A number of studies in recent times have found that risk factors generally "fair better" at distinguishing offending from non-offending trajectories than distinguishing *between* offending groups (Chung et al., 2002; Fergusson et al., 2000; Jennings et al., 2010; Laub and Sampson, 2003; Piquero et al., 2002a; Caudy, 2011). This observation has led some researchers to question the validity of taxonomic theories of crime. Caudy (2011), for example, argues that the existence of a core set of risk factors contradicts the predictions of theories which posit that chronic and adolescent peaked offending trajectories have unique aetiologies. Consequently, he argues in favour of the "parsimony of general theories [of crime] over the complexity of developmental theories like Moffitt's dual taxonomy" (p. 163).

Although the evidence from the current study suggests that a common sub-set of risk factors predict all offending trajectories, it would be premature to conclude that there

are common underlying developmental processes or that taxonomic theories of development are somehow flawed or inadequate. The reason for this is simple – the study's ability to determine which factors distinguish between trajectories (or not) was seriously limited by the range of available data items. The study's risk factor analysis included only a narrow set of factors.[51] Studies show that many other variables that were not part of the current study *do* distinguish between trajectories. Reitzel (2006), for example, identified a number of childhood variables (IQ, parent and sibling criminality) that distinguished trajectories for Whites and some family variables (family structure, welfare) that distinguished between Black trajectories. A broader set of risk factors – inclusive of early childhood variables and characteristics from later periods and from other domains (family, community) - may well reveal differences in the aetiology of each offending trajectory, giving renewed support to explanatory models that propose unique causal mechanisms and developmental pathways. In other words, although trajectories may be similar, there may be very different reasons for them – in particular, the context that different groups live in may give rise to more pronounced involvement with the justice system or criminal behaviour by one group. Once again, the narrow range of risk factors limited the study's ability to more fully explore the 'context' in which the offending patterns of sub-groups of the population

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[51] The study has other limitations, too. In exploring the diversity of the offender population and delving into Aboriginal and gender groups, many issues remain open to debate e.g. whether existing (mainstream) theoretical frameworks apply to sub-groups; whether constructs and measures are equivalent across different sub-groups; the additional problems of disentangling ethnicity and gender from each other (i.e. gender-ethnicity interactions) and from other factors such as social disadvantage and geography.

develop. Of course, the task of collecting a full complement of variables, either from administrative collections or other sources, presents a huge challenge to researchers; however, some pioneering efforts are being made to collect and link data from multiple sectors of government to facilitate such research (Glauert et al., 2008).[52]

So, are there any gender differences?

Looking *across* the gendered trajectories, the study found more similarities than differences in the risk factors associated with trajectory membership. *Few factors operated for one gender and not for the other.* For both gender groups, membership of higher-rate trajectories was found to be largely predicted by early-onset offending, Aboriginal status and more serious offending (as evidenced through early violence and early drug use). While not subscribing to any particular theory, the study offers some tentative support to life-course theories of offending. The risk factors identified by the current study, for example, are consistent with those predicted by Moffitt (1993). Her theory posits that early onset of offending and serious offending are indicative of persistent life-course offending (higher-rate trajectories), as are gender (being male) and ethnicity (being African-American).[53]

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[52] In fact, data from the current study has since been linked to health, education and child protection data. The resultant dataset contains vastly enriched data items (including early childhood variables and information about parents and siblings) and makes an enhanced version of the risk factor analysis now possible. Data linkage was an onerous task, however. The process took more than three years to complete, and required the use of trusted third parties, ethics approvals and legislative amendments.

[53] With regards to ethnicity, Moffitt's theory posits that offending will be more prevalent amongst African-Americans due to adverse structural conditions that operate to restrict the life chances of poor minority (e.g. less access to prenatal care, more exposure to environmental toxins, attenuated familial

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Different risk factors

Few risk factors were found which operated differently across gender. In almost all cases the effect of these factors was not particularly strong. The role of neighbourhood disadvantage seemed to vary depending on how it was measured. Perhaps it should not surprise that community-level disadvantage does not emerge as a significant factor, as environmental/neighbourhood effects are often indirect/distal and are overshadowed by more direct and proximal factors in statistical analyses.

Protective factors

The study found that some factors operated to protect against or reduce the likelihood of higher-rate offending. Living in the North of WA was one such factor. Ecological variations in offending have been identified elsewhere (Harding et al., 1997); however, the root cause of these variations is not entirely clear. It may be that local or micro-level environmental factors (i.e. living conditions, lifestyles, interactions with police and justice, or even police and justice resource allocations) may be sculpting a unique set of conditions for offenders living in the North of the state. Some have argued that levels of informal control may be different in some communities than in others. In any event, it is clear that further research in this area is warranted. The study also found that being part of an earlier birth cohort tended to reduce the likelihood of being in a higher offending trajectory. While generation shift and/or net-widening are put forward as the likely cause, further research in this area is obviously warranted.

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bonds due to socioeconomic stress, more exposure to disadvantaged schools, fewer employment opportunities).

The study also found that being part of an earlier birth cohort tended to reduce the likelihood of being in a higher offending trajectory. This effect may be a by-product of including multiple birth cohorts in the study, each with varying follow-up times and, so, varying statistical influence. It is likely, though, that such results may also be the product of specific period or cohort effects. There is some literature that shows that persons born during different times are subject to period and/or cohort effects. In the US, for example, variations in the level of violence across birth cohorts has been attributed to period effects – notably, the crack-trade 'epidemic' of the late 1980s (Fabio et al., 2006). In Australia, there is considerable evidence that reforms to the juvenile justice system during the mid-1990s gave rise to wider and denser nets which not only drew more individuals into the justice system (i.e. increased prevalence) but also increased the frequency of offending amongst existing offenders (Carrington, 2006; Sarre, 1999a; Wundersitz, 1996; Holmes, 2010; Pritchard, 2010; Sutton, 2000; Baker and Goh, 2004; Ferrante, 2009a). A closer analysis of these effects was beyond the scope of the study; however, further research is warranted as it is important to understand the full range of effects caused by large structural reforms.

Interestingly, one factor which acted contrary to expectations was early diversion from the criminal justice system. It was expected that diversion would act to reduce the likelihood of higher-rate offending (for males and for females). However, the factor was found to operate for males only and in the opposite direction – being diverted early in the criminal career acted to *increase* the likelihood of higher-rate offending amongst boys. It is not clear why this would be so. Perhaps this suggests agency. Alternatively, knowing someone had offended in such a way as to attract a diversion option could be seen as a marker or predictor of subsequent offending. In

any event, the finding raises questions about the intent, and functional impact, of juvenile diversionary options. There is need for improved understanding of what is involved in diversionary processes and how these may lead to net-widening and net-tightening outcomes.

And, are there any ethnic differences?

The purpose of separately modelling (and then comparing) the Aboriginal and non-Aboriginal groups is to see whether models and associated risk factors operate similarly across different cultural settings. Looking *across* Aboriginal and non-Aboriginal trajectories, the study found more similarities than differences in the risk factors associated with trajectory membership.

5.5.4 Theoretical implications

Although it was not the purpose of the study to 'test' the robustness of taxonomic theories of crime, it is nevertheless evident that the findings present a challenge to such theories. On one hand, the fitting of models to the life-course offending patterns of males, females, Aboriginal and non-Aboriginal offenders, and the emergence of two or more distinct trajectories for each cohort, supports a view that offending is heterogeneous and categorical in nature. This finding is consistent with taxonomic theories of offending. On the other hand, the study could not identify risk factors that *uniquely* distinguished between one offending trajectory and any other. This result appears to contradict taxonomic theories - which propose different aetiologies (and so, different risk factors) for each taxonomic group. Recall, however, the factors included in the study were limited. There is no doubt that a more detailed study, *with a full complement of risk and protective factors*, would likely shed more light on this issue.

5.5.5 Practical implications

Taxonomies of offenders are particularly appealing to policymakers and practitioners because they suggest that different interventions may be designed and targeted at distinct groups or "types" of offenders. The possibility that there may be gender and/or ethnicity specific variation to these classifications further adds to the appeal as this suggests that gendered approaches or culturally specific interventions should be considered. It is somewhat discouraging, then, that the current study did not find as much difference as similarities in the offending trajectories across gender or ethnic group. Nor did it find great variation in the risk factors associated with these trajectories. Instead, the lack of difference suggests that more general approaches to crime prevention may be more appropriate.

Although the predictive utility of taxonomies may be limited, the trajectory groupings may be useful in other ways, however, particularly in developing post hoc responses to certain patterns of offending. Weaver (2010), for example, suggests that the SPGM may be useful in the design of screening and assessment instruments to more accurately distinguish between low, medium and high risk (first time) offenders. Cohen et al (2010), too, demonstrates the utility of gender and ethnic specific classes of offending by applying econometric models to SPGM trajectories in order to estimate the differential costs associated with gender and ethnic specific classes of offending. Quantifying the costs and benefits associated with any number of interventions (each matched to a specific trajectory within a model) could become an effective way of comparing and prioritising them.

5.6 Conclusion

The research adds to a limited body of research on gender and ethnic differences. It is one of few studies - and the only Australian study - to document gender *and* ethnicity related differences in trajectories of offending. In developing an understanding the relationship between gender, ethnicity and offending patterns over the life-course, it is hoped that the study can inform current theoretical debates and contribute to improved criminal justice interventions.

6. Sub-Study 4 - Differences in risk factors for delinquency across sub-populations in WA

Abstract

Although there is general acceptance amongst criminologists that gender and ethnicity are two of the most important predictors of offending behaviour, much less is known about how other individual, family and community based risk factors for offending vary within these population groups. The purpose of this study is to identify the risk factors associated with participation in offending in the WA population. The study uses data linkage methods to bring together for analysis administrative data from a number of government sectors, including juvenile justice, health, education and child protection. The study identifies a range of delinquency risk factors for the total population, as well as for subgroups of that population (males, females, Aboriginal, non-Aboriginal). The findings suggest that there are common factors as well as some different risk factors that operate across groups. Implications of these findings are discussed.

6.1 Introduction

This Chapter moves away from examining the *frequency* of offending and returns focus to *participation in offending*. The study contained herein seeks answers to the following questions: *What are the individual, family and community risk factors for juvenile delinquency in Western Australians? And, how do these associations vary by gender and Aboriginal status?* Using population level data that has been linked cross-sectorally, the risk factors or correlates associated with involvement in offending are explored. Identification of risk factors is an important step toward a deeper understanding of what influences or predicts the development of criminal behaviour.

As reviewed in Chapter 1, an abundance of studies have identified risk factors that are "associated" with delinquent behaviour. Individual based risk factors include LBW, hyperactivity, early risk factors for impulsivity, low IQ, mental health problems, drug use, gender (being male), ethnicity and early age of onset of offending. Family factors linked to offending include lack of parental supervision, neglect, physical abuse, violent behaviour, parental criminality and parental or family drug use. Delinquent peers and neighbourhood poverty have also been linked to offending. Extensive reviews have identified the key risk and protective factors associated with offending (Loeber and Farrington, 1998a; Huffman et al., 2000; Wilson and Dunne, 1998).

Despite this evidence, there has been little investigation of *how* risk factors vary from one sector of the population to another. Gender and ethnicity, in particular, are two of

the most important predictors of offending, yet there is surprisingly little data which demonstrates how individual, family and community based risk factors vary *between* the male and female populations, and *between* one ethnic group and another.

6.1.1 Gender, risk factors and delinquency

A number of empirical studies of gender differences have been undertaken but the evidence to date has been equivocal. As noted in Chapter 1, some of the studies indicate that female delinquency has a different aetiology to male delinquency (Lanctot and Le Blanc, 2002; Steffensmeier and Allan, 1996; Belknap and Holsinger, 2006), while others support common or shared sets of risk factors (Piquero et al., 2005a; Tibbetts and Piquero, 1999; Mazerolle, 1998; Lanctot and Le Blanc, 2002). Increasingly, however, there are studies producing evidence of both common *and* gender specific risk factors. For example, Wong and colleagues' (2010) meta-analysis of 30 European studies found a considerable number of common *and* different risk factors, suggesting that the pathway to offending for girls may not be entirely different to that for boys.

6.1.2 Ethnicity, risk factors and delinquency

Also noted in Chapter 1 was that far fewer studies have investigated ethnic variations in the risk factors associated with offending. Much of the research which has delved into ethnic disparities in offending has attributed 'cause' to socio-economic factors and to inter-group inequality (Hawkins et al., 2000). However, and as with the "gender issue", findings of ethnic variation in risk factors are mixed. Competing explanations and intense debate have led some to comment that has led to "conceptual

and methodological impasse" (McCord et al., 2001: 229, cited in Piquero & Brame, 2008).

There are few empirical studies which have examined differences in the risk factors amongst Aboriginal and non-Aboriginal offending in Australia (Homel et al., 1999). The issue of ethnicity is of particular importance in Australia because Aboriginal over-representation in the criminal justice system stands as one of the most serious issues facing modern Australian society.

6.2 Purpose of this investigation

The objectives of the current study are two-fold. The first aim is to identify and describe the risk factors associated with participation in offending in WA. Uniquely, the study uses linked population level data sourced from multiple administrative sources to determine participation risk factors. The approach exploits the value of administrative data and is seen as a first step towards gaining a deeper understanding of what influences the development of criminal behaviour, particularly within an Australian context.

Second, given the extent of gender and ethnicity disparities in crime involvement and in light of limited research findings and ongoing debate in this area, the study's secondary objective is to explore how gender and ethnicity influence the relationship between risk factors and delinquency. The limited research to date suggests that both of these factors are important considerations when estimating the influence of the family and other ecological contexts on delinquent behaviour. As the review in

Chapter 1 identified, gender and ethnicity often combine with socio-economic disadvantage neighbourhood factors and family functioning in ways that amplify the risk of delinquency.

6.3 Methods

6.3.1 Data

The study makes use of de-identified, linked records of all children born in WA from 1980 to 1995, and followed till 31 December 2005. Routinely collected, administrative data from a number of government agencies were linked by the Data Linkage Branch of the WA Health Department (DLB), then stripped of identifying information and made available to the researcher (the process is described in more detail in Chapter 2). The data were sourced from a number of health and non-health data collections (also described in more detail in Chapter 2). In summary, these comprised:

- Midwives Notifications and Birth Registrations, which include information on maternal characteristics, pregnancy conditions, delivery details and infant outcomes for all births in WA.

- Death registrations, which contains information on all persons who have died in WA.

- Hospital Morbidity data, which contains information on all admissions into public and private hospitals in WA, with corresponding diagnostic and procedural information using the International Classification of Diseases (ICD) coding system recorded for each episode of care for all persons

(children and adults). ICD-9 and ICD-10 codes were both re-coded to a single classification to maintain consistency.

- Mental Health data, which covers inpatient admissions and outpatient/ambulatory care contacts in public mental health services in WA, as well as inpatient admissions in private hospitals.

- Child Protection data, containing information on child maltreatment allegations (and subsequent substantiations, if confirmed), including information on the nature of the abuse (physical, sexual).[54] Also included in the collection are the details of children placed in out-of-home care.

- Education data, comprising educational outcomes test scores) sourced from the Western Australian Literacy and Numeracy Assessment (WALNA). WALNA is a curriculum-based assessment that tests students' knowledge and skills in numeracy, reading, spelling and writing. Up until 2008, it was administered annually to all children attending WA schools (public and private) in Years 3, 5, 7 and 9. It was replaced by a national assessment system (NAPLAN) in 2008.

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[54] Note that Child Protection data used in this study includes allegations, as well as substantiations, of child maltreatment. This may seem to set the net too wide in regard to child abuse/maltreatment; however, there is evidence that children with substantiated allegations have similar outcomes to those with unsubstantiated outcomes (Spivey et al, 2009). O'Donnell and colleagues (2010) argue that from a preventative perspective research that includes both allegations *and* substantiations of child maltreatment is highly appropriate and desirable.

- Juvenile justice data, comprising records of all juvenile offenders (children aged 10 to 18) who had been dealt with by the Department of Corrective Services in WA.

6.3.2 Linkages

Demographic information from each of the datasets was linked by the DLB using a probabilistic record linkage process. A 'best practice' governance model was adopted for all data transfer and linkage processes (Kelman et al., 2002) – see Appendix F for more detail.

6.3.3 Analytical approach

A case-control design was implemented for this study. Cases comprised all children born in WA between 1980 and 1995 who had had contact with the Department of Corrective Service (juvenile justice) between the study period (to 31 December 2005). These cases were labelled 'offenders'.

Controls were drawn from the remaining population of children born in WA between 1980 and 1995. Five controls were selected for each case using random sampling methods. These were labelled 'non-offenders'. Controls were matched to cases on birth year. This ensured that 'exposure time' between birth and end of study period (2005) was roughly the same for both groups, making count variables such as accumulated hospital admissions, mental health service usage, etc (described below) comparable between the two groups.

6.3.4 Explanatory factors

The explanatory or independent variables included in models were drawn from the available data and were selected on the basis of extant research on the causes and correlates of offending (as reviewed in Chapter 1). A number of variables in the models were operationalised to represent adverse life experiences and relationships. For example, chronic illness of a parent – a variable drawn from the hospital admissions of parents - was included in analyses on the basis of it being a potential proxy measure of disrupted parenting and/or family stress.

It should be noted that no formal evaluation of construct validity was undertaken of such variables. It should also be acknowledged that there may be other variables that better or more fully explain variations in the data but their absence from the administrative datasets used in the study precludes inclusion.

The explanatory variables were either drawn directly from the administrative datasets described above or derived from them. Given the range of datasets, the list of available variables was extensive. To the extent possible, the variables were organised into those describing individual characteristics, those related to the family (including parent- and sibling-related variables) and those related to community (census district level) in which individuals were born. A full description of each variable is provided in Appendix G (refer to Table G1).

The explanatory variables listed in Table G1 included a number of 'count' and 'quantum' variables such as a count of the number of hospital admissions (per person)

and the total length of time (days) spent in hospital for anyone who had been admitted to hospital. Unless otherwise stated, count and quantum variables were calculated, per person (cases and controls), from date of birth to the end of the study period. For parents and siblings, these were calculated for whole study period, not just from date of birth of the study participant.

'Count' and 'quantum' variables were used to signal some potential explanatory factors (e.g. the existence of mental health issues) and the likely severity of these factors. Repeated admission to hospital for a particular condition (mental health or self-harm, as examples), or long periods of stay in hospital for these conditions, were treated as severity indicators. 'Count' variables included a count of mental health hospital admissions; a count of mental health out-patient treatment services; a count of child maltreatments (allegations and substantiations); counts of specific forms of child abuse (sexual, physical); counts of periods of out-of-home care. Quantum variables included, for example, counts of the number of days spent in hospital (for general hospital admissions, as well as for mental health reasons, self-harm, drug and alcohol, and violence victimisation).

To the extent that I wished to explore the potential influence of family functioning on individual participation in offending, a range of family-oriented factors were operationalised. Proxy measures were created for disrupted family dynamics, family stress and/or disrupted child rearing within the family. As shown in Table G1 (Appendix G), these were drawn from the exhaustive list of data items which formed part of this study.

A number of explanatory variables capture notions of family stress as these have, at various times, been shown to be associated with involvement in crime. As discussed in Chapter 1 and elsewhere (Chapter 7), family financial stress and economic stress have been shown to affect participation in offending. However, other aspects of family stress have also been implicated in explanations of offending. Indeed, the results from other analyses (on Aboriginal offending; Chapter 7) confirm that family stress operates independently from economic stress and has an effect on involvement in offending in its own right. A substantial body of evidence has established that the health and wellbeing of family members has a significant impact on the overall functioning of families (discussed earlier). Given the ready availability of hospital morbidity and mental health data, I derived a number of factors that could be considered indicators of family stress. Such variables relate to both parents and siblings e.g. repeated hospital admissions (for any type of illness) and long lengths of stay in hospital. Specific types of hospital admissions were considered to have a more direct impact on family functioning, such as admissions for mental health issues and/or drug and alcohol issues and/or self-harm, and so variables were created specifically for these.

6.3.5 Statistical analysis - univariate and logistic regression modelling

Descriptive (univariate) analyses of demographic and other explanatory variables were undertaken both for cases (offenders) and for the control group (non-offenders). A preliminary exploration of differences between offenders and non-offenders was undertaken through comparison of means and t-tests - see Appendix G, Table G2.

Logistic regression analysis was then used to estimate the independent effects of these factors on the likelihood of becoming an offender.[55] Factors included in the model consist of variables drawn directly from Table G1 (in Appendix G), as well as some transformed (usually, categorical) variables derived from those variables (e.g. mother's age -> mum_age). Such derived variables are identified and described in Table G1 also.

A binary logit regression model was fitted using backwards, stepwise elimination methods. Results are presented using odds ratios (ORs) and 95% confidence intervals (CIs) – see Table 6.1. ORs can be interpreted as the relative increase in odds of participation in offending for a particular factor, compared with a specified base level, after adjusting for all other factors. The SAS statistical package was used to conduct all analyses.[56]

Given our interest in examining gender and ethnic differences (as per research questions), separate regression models were fitted for males and females (Table 6.2) and for Aboriginal and non-Aboriginal persons (Table 6.3). Further models were also separately fitted for Aboriginal males, Aboriginal females, non-Aboriginal males and non-Aboriginal females (Table 6.4). This approach enabled us to determine whether

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[55] In this way, the study can be considered a study of 'participation' in offending.

[56] Note that odds ratios rather than risk ratios are estimated. It is possible to calculate the risks in a normal population sample, however, such an approach is not required in this instance because the study uses a case-control design and through logistic regression the odds ratios for risk factors work in the same way as if a population sample had been taken. In case-control studies, the odds of all risk factors are unaffected, though the constant in the model is meaningless.

different factors have an influence on participation in offending within subgroups of the population. The approach maintains consistency with other analyses within this thesis.

6.4 Results

There were 18,098 "offenders" in the case group. These comprised individuals born in WA between 1980 and 1995 who had contact with the juvenile justice section of the Department of Corrective Services and had not died by the end of 2005. "Controls" in the study comprised 94,950 individuals born between 1980 and 1995 who were "non-offenders" and who had not died up until the end of 2005.

6.4.1 Univariate statistics

The likely significance of explanatory factors was initially tested through a simple comparison of means (see Appendix G, Table G2). T-tests were significant for almost all variables. It should be noted that these tests are univariate statistics which make assumptions about the distribution of each variable and do not account for the interaction between variables.

Results from the preliminary comparison of means (Table G2) suggest that, compared with controls ("non-offenders"), cases ("offenders") were more likely to:

- be male; Aboriginal; born to a younger mother;
- have lower birth weight; experience more obstetric complications; be admitted to hospital for obstetric complications; have early risk factors for impulsivity;

- be admitted to hospital for any reason, and have longer stays in hospital when admitted;

- be admitted to hospital for mental health reasons;

- receive more mental health public out-patient services;

- be admitted to hospital for assault victimisation, and have longer stay in hospital when admitted;

- be admitted to hospital for self-harm reasons;

- be admitted to hospital for drugs/alcohol issues, and have longer stay in hospital when admitted;

- become a teenage parent;

- experience (reported allegations of) child maltreatment, including both physical and sexual abuse;

- experience periods of out-of-home care, and a greater number of placements within that period of care;

- come from larger families and be first born;

- have a mother who changes address more frequently;

- experience death of a parent;

- have parents (both mother and father) who are more frequently admitted to hospital for any reason, and who stay longer in hospital when admitted;

- have parents who are more frequently admitted to hospital for mental health reasons and who receive more mental health out-patient services (public);

- have parents who are more frequently admitted to hospital for assault victimisation or for self-harm or for drug and alcohol reasons;

- experience the death of a sibling;

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- have a sibling who was also involved in offending;

- have siblings who are more frequently admitted to hospital for any reason, and who have longer stays in hospital when admitted;

- have siblings who are more frequently admitted to hospital for mental health reasons and who receive more mental health out-patient services (public);

- have siblings who are more frequently admitted to hospital for assault victimisation or for reasons of self-harm;

- have siblings who themselves experience (reported allegations of) child maltreatment, including both physical and sexual abuse;

- have siblings who themselves experience periods of out-of-home care, and a greater number of placements within that period of care;

- attain lower educational outcomes in reading, writing and numeracy at Year 3;

- attain lower educational outcomes in reading, writing and numeracy at Year 5;

- attain lower educational outcomes in reading, writing and numeracy at Year 7;

- attain lower educational outcomes in reading, writing and numeracy at Year 9;

- experience more school absences in Years 3, 5, 7 and 9; and

- be born to mothers from very poor neighbourhoods.

6.4.2 Logistic Regression

Highly significant factors

Results from the logistic regression modelling are presented in Table 6.1. The results indicate that two variables - sex and Aboriginal status - have significant association with participation in offending. The odds ratio (OR) for sex is 5.12. This means that the odds of boys participating in offending is more than five (5.12) times higher than

for girls. The OR for Aboriginal status is 3.33. In other words, the odds of participating in crime are 3.33 times higher for Aboriginal children than for non-Aboriginal children.

A number of other *individual based* factors were also highly correlated with offending participation. Factors that were strongly associated with participation in offending (ORs >= 2.0) included being a victim of violence (which increased the odds of offending participation by a factor of 3.86); involvement with drugs and alcohol (increased the odds by 4.01) and self-harming behaviour (increased the odds by 2.31). Having been in out-of-home care (OR=4.35) and having been a teenage parent (OR=2.27) were also strongly associated with the likelihood of participating in crime.

There were several *school based* factors that were found to be strongly associated with offending participation included (i.e. ORs >=2.0):

- Low educational achievement in early primary age (Yr 3, age 8) - the lower the achievement, the stronger the association with participation in crime. The odds of participating in offending were 4.49 times higher for children in the lowest 10th percentile of reading achievement than children achieving at the highest reading level.

- Low educational achievement at middle primary level (Yr 5, age 10) – again, the lower the achievement, the stronger the association with involvement in crime. The odds of participating in offending were 3.46 times higher for children in the lowest 10th percentile of reading achievement than children achieving at the highest reading level.

- Low educational achievement at middle primary level (Yr 7, age 12) – again, but not as strongly, the lower the achievement, the greater the likelihood of involvement in crime. The odds of participating in offending were 2.59 times higher for children in the lowest 10th percentile of reading achievement than children achieving at the highest reading level.

Collectively, individual based factors contributed more to the fitted model than family or community based factors: pseudo R-square of the fitted model when only individual based factors were included was 0.20; whereas, when all variables were included, pseudo R-square increased only marginally to 0.22. One family based factor was found to have a particularly strong association with participation in offending - having siblings who were also involved in offending (OR=3.05).

Other significant factors

A number of factors were found to be associated with offending participation, but not to the same extent as those described above. These factors had ORs above 1.0 but below 2.0 (refer Table 6.1). Once again, more of these factors related to the individual than to the family or the community. They included:

Individual based factors

- Mother's age – the younger the mother, the higher the risk of involvement in offending.

- Obstetric complications at birth – complications needed to be quite serious (i.e. requiring hospital admission) before they became a significant factor. Interestingly, the alternate measure of obstetric complication

(obcomp_serious, based on a similar measure used by Hodgins et al (2001)) was found *not* to be significantly association with participation in offending.

- Serious illness (as measured through higher rates of hospital admission) or serious mental illness (also measured through admissions to hospital) – were both found to be associated with increased involvement in crime.

- Reported allegations of child maltreatment (includes allegations, as well as substantiated allegations) were also associated with increased risk of offending participation.

- Age at first maltreatment was also associated with participation in offending - interestingly, the *later* the age of first maltreatment, the *greater* the impact/influence on offending.

Family factors

- Family mobility was also correlated to offending – the *more* times the family moved house (changed address), the *greater* the risk of involvement in offending.

- Other family factors that associated with offending were:
  o Parental death increased the risk of offending, as did parental illness, and parental mental illness and/or involvement in drugs or alcohol. Interestingly, parental victimisation did not appear to have an effect.
  o Regarding sibling-related factors, only sibling criminality appeared to be correlated with involvement in crime. Most other sibling factors had ORs than were not much above 1.0.

School and community based factors

- Low education achievement in primary school (but not high school) also appeared to increase the risk of offending participation.

- Being absent from school (colloquially known as "wagging") in Yr 7 and Yr 9 also appeared to increase the risk of offending participation. Interestingly, though, "wagging" school in Yr 3 or in Yr 5 did not increase the risk.

- Living in a poor neighbourhood (measured at birth) increased the risk of involvement in crime. Indeed, the *poorer* the neighbourhood, the *greater* the risk of participating in offending (ORs increase from 1.24 to 1.89, as neighbourhood disadvantage increased).

In the next stage of the analysis, logistic regression models were applied separately to males and females. The results (presented in Table 6.2) show many similarities, but also some important differences between the groups.

In terms of similarities, a greater number of individual based factors than family and community factors were associated with participation in offending by both sexes. Involvement in drugs and alcohol, experiencing violence, and being placed in out-of-home care were three of the most significant factors associated with participation in offending by both groups. Aboriginal status and sibling criminality, too, constituted significant risk factors for both sex groups.

Table 6.1: Results from multivariate logistic regression model for full dataset, ORs and 95% CIs

Dependent variable: case_type			M1 (all cases & controls) N = 113,285 R_sq = 0.2189	
			Odds ratio	95% CI
Individual-based factors				
At birth:				
indigenous status	1	vs 2	**3.33**	(3.11,3.56)
sex	1	vs 2	**5.12**	(4.88,5.37)
mum_age	1	vs 3	1.58	(1.42,1.74)
	2	vs 3	1.05	(0.96,1.14)
low_birth_weight	1	vs 2	0.84	(0.78,0.90)
obcomp_serious	1	vs 2	ns	
oc_serious	1	vs 2	1.51	(1.38,1.65)
high_impulse	1	vs 2	0.52	(0.39,0.68)
Health-derived:				
ill_serious	1	vs 2	1.30	(1.24,1.36)
mh_serious	1	vs 2	1.56	(1.40,1.74)
assault_victim	1	vs 2	**3.86**	(3.43,4.33)
self_harm	1	vs 2	2.31	(1.99,2.68)
drugs_alcohol	1	vs 2	**4.01**	(3.47,4.64)
teen_parent	1	vs 2	**2.27**	(2.01,2.56)
Maltreatment/abuse:				
physical_abuse	1	vs 2	ns	
sexual_abuse	1	vs 2	0.73	(0.64,0.83)
maltreated	1	vs 2	1.35	(1.17,1.56)
incare	1	vs 2	**4.35**	(3.62,5.24)
poor_home	1	vs 2	0.70	(0.55,0.88)
early_maltreat	2	vs 1	1.01	(0.87,1.17)
	3	vs 1	1.45	(1.21,1.74)
Family-based factors				
Family structure:				
only_child	1	vs 2	ns	
first_born	1	vs 2	ns	
second_born	1	vs 2	0.95	(0.91,0.99)
third_born	1	vs 2	ns	
many_older_sibs	1	vs 2	ns	
Family movement:				
high_mobility	1	vs 3	1.32	(1.23,1.41)
	2	vs 3	1.21	(1.17,1.26)
Parents:				
parent_death	1	vs 2	1.38	(1.28,1.49)
mum_ill	1	vs 2	1.18	(1.13,1.23)
dad_ill	1	vs 2	1.11	(1.04,1.18)
p_mh_serious	1	vs 2	1.15	(1.06,1.25)
p_assault_victim	1	vs 2	ns	
p_self_harm	1	vs 2	1.30	(1.15,1.48)
p_drugs_alcohol	1	vs 2	1.22	(1.07,1.39)

…factors continued…			M1 (all cases & controls) N = 113,285 R_sq = 0.2189	
			Odds ratio	95% CI
Siblings:				
sib_death	1	vs 2	ns	
sib_crim	1	vs 2	**3.05**	(2.90,3.21)
big_family_2	1	vs 2	1.10	(1.02,1.18)
sib_ill	1	vs 2	1.09	(1.04,1.15)
s_mh_serious	1	vs 2	1.14	(1.04,1.26)
s_assault_victim	1	vs 2	ns	
s_self_harm	1	vs 2	ns	
s_physical_abuse	1	vs 2	ns	
s_sexual_abuse	1	vs 2	1.18	(1.08,1.28)
s_maltreated	1	vs 2	ns	
s_incare	1	vs 2	ns	
s_poor_home	1	vs 2	ns	
School factors				
read_lvl_3	2	vs 1	**2.77**	(0.61,12.62)
	3	vs 1	**2.95**	(0.71,12.29)
	4	vs 1	**3.85**	(0.92,16.19)
	5	vs 1	**4.49**	(1.07,18.84)
read_lvl_5	2	vs 1	1.37	(0.75,2.52)
	3	vs 1	**2.19**	(1.26,3.81)
	4	vs 1	**2.97**	(1.69,5.25)
	5	vs 1	**3.46**	(1.96,6.10)
read_lvl_7	2	vs 1	1.12	(0.69,1.81)
	3	vs 1	1.63	(1.06,2.50)
	4	vs 1	**2.41**	(1.54,3.76)
	5	vs 1	2.59	(1.66,4.05)
read_lvl_9	2	vs 1	0.72	(0.34,1.53)
	3	vs 1	0.73	(0.39,1.37)
	4	vs 1	0.97	(0.51,1.85)
	5	vs 1	1.65	(0.86,3.15)
wagger_3	1	vs 2	ns	
wagger_5	1	vs 2	ns	
wagger_7	1	vs 2	1.20	(1.02,1.41)
wagger_9	1	vs 2	1.15	(1.02,1.30)
Community factors				
birth_disadv	2	vs 1	1.24	(1.12,1.37)
	3	vs 1	1.45	(1.33,1.58)
	4	vs 1	1.63	(1.48,1.80)
	5	vs 1	1.89	(1.71,2.09)

As to differences in risk factors between the sexes, the study found that obstetric complications, physical abuse and low educational achievement in high school were of greater significance for females than for males; whereas, having been a teenage parent and expressions of self-harm were more strongly associated with offending amongst males than amongst females. Interestingly, for females (as for Aborigines, later), fewer family based factors were found to be associated with participation in offending.

Separate logistic regression models were then fitted for Aborigines and non-Aborigines. Once again, the results indicate many similarities but also some differences in the risk factors associated with participation in offending by the two groups (Table 6.3).

For both ethnic groups, a greater number of individual based factors were associated with participation in offending than family or community factors. For both groups, gender (specifically, being male) represented the most important risk factor associated with participation in offending (OR=4.88 for Aborigines; slightly more for non-Aborigines, OR=5.25). Three further factors - experiencing violence, involvement in drugs and alcohol and being placed in out-of-home care - were strongly associated with participation in offending (ORs >=2.0) for both ethnic groups. Age at first maltreatment was also associated with increased risk of participation in offending, with later age increasing the risk for both ethnic groups.

However, some factors – such as self-harming behaviour and having been a teenage parent appeared to be more strongly correlated with offending participation amongst non-Aborigines (OR=2.38, 2.99 respectively), than amongst Aborigines (OR=1.59, 1.70 respectively). Neighbourhood disadvantage, too, was found to be correlated with offending participation among non-Aborigines (OR=1.32) but not among Aborigines (OR=0.94). In contrast, low educational achievement in high school was more strongly associated with offending amongst Aborigines (OR=3.01) than with offending amongst non-Aborigines (OR=1.74)

Sibling criminality increased the risk of participation in offending amongst both groups – although, the effect was more pronounced for non-Aborigines (OR=3.18) than for Aborigines (OR=2.66). In terms of family factors, a greater number of these were found to be significantly associated with non-Aboriginal participation in offending than with Aboriginal participation.

As a final element of the analysis, logistic regression models were fitted for each of the four separate sex and ethnic groups - Aboriginal males (MA), Aboriginal females (FA), non-Aboriginal males (MN) and non-Aboriginal females (FN). Results presented in Table 6.4 demonstrate how the various risk factors were differentially associated with participation in offending by each group. The best fitting model was that applied to Aboriginal females (pseudo $R\_sq=0.24$), while the poorest fitting model was that applied to non-Aboriginal females (pseudo $R\_sq=0.07$).

Table 6.2: Results from multivariate logistic regression – separate models for males and females

dependent var: case_type				M8 (Males) N = 60,982 R_sq = 0.2086		M9 (Females) N = 52,303 R_sq = 0.1569	
				Odds ratio	95% CI	Odds ratio	95% CI
Individual-based factors							
At birth:							
indigenous status	1	vs	2	**3.54**	(3.24,3.85)	**3.35**	(2.99,3.74)
sex	1	vs	2	N/A		N/A	
mum_age	1	vs	3	1.67	(1.48,1.87)	1.57	(1.27,1.92)
mum_age	2	vs	3	1.03	(0.94,1.13)	1.22	(1.02,1.46)
low_birth_weight	1	vs	2	0.90	(0.83,0.98)	0.76	(0.67,0.86)
obcomp_serious	1	vs	2	ns		ns	
oc_serious	1	vs	2	0.75	(0.59,0.94)	2.12	(1.91,2.36)
high_impulse	1	vs	2	0.54	(0.40,0.74)	0.45	(0.25,0.81)
Health-derived:							
ill_serious	1	vs	2	1.31	(1.24,1.38)	1.26	(1.15,1.39)
mh_serious	1	vs	2	1.69	(1.47,1.95)	1.42	(1.19,1.70)
assault_victim	1	vs	2	**3.95**	(3.46,4.52)	**3.60**	(2.84,4.57)
self_harm	1	vs	2	**2.87**	(2.31,3.57)	1.91	(1.54,2.37)
drugs_alcohol	1	vs	2	**3.24**	(2.69,3.90)	**5.57**	(4.42,7.02)
teen_parent	1	vs	2	**4.19**	(3.27,5.36)	1.78	(1.54,2.05)
Maltreatment/abuse:							
physical_abuse	1	vs	2	ns		1.41	(1.16,1.71)
sexual_abuse	1	vs	2	0.79	(0.66,0.96)	ns	
maltreated	1	vs	2	1.22	(1.01,1.47)	1.37	(1.10,1.70)
incare	1	vs	2	**3.90**	(3.18,4.78)	**4.68**	(3.59,6.09)
early_maltreat	2	vs	1	1.08	(0.89,1.31)	0.90	(0.71,1.15)
early_maltreat	3	vs	1	1.67	(1.29,2.17)	1.22	(0.93,1.60)
Family-based factors							
Family structure:							
only_child	1	vs	2	ns		ns	
first_born	1	vs	2	ns		1.20	(1.11,1.31)
second_born	1	vs	2	ns		ns	
third_born	1	vs	2	ns		ns	
many_older_sibs	1	vs	2	ns		ns	
Family movement:							
high_mobility	1	vs	3	1.43	(1.32,1.55)	ns	
high_mobility	2	vs	3	1.27	(1.21,1.33)	ns	
Parents:							
parent_death	1	vs	2	1.40	(1.28,1.54)	1.35	(1.17,1.56)
mum_ill	1	vs	2	1.18	(1.13,1.24)	1.18	(1.09,1.29)
dad_ill	1	vs	2	1.17	(1.09,1.27)	ns	
p_mh_serious	1	vs	2	1.12	(1.01,1.24)	1.29	(1.15,1.45)
p_assault_victim	1	vs	2	ns		ns	
p_self_harm	1	vs	2	1.41	(1.20,1.65)	ns	
p_drugs_alcohol	1	vs	2	1.26	(1.08,1.48)	ns	
Siblings:							
sib_death	1	vs	2	ns		ns	
sib_crim	1	vs	2	**3.19**	(3.01,3.39)	**2.91**	(2.66,3.19)
big_family_2	1	vs	2	ns		1.29	(1.14,1.45)
sib_ill	1	vs	2	1.17	(1.10,1.24)	ns	
s_mh_serious	1	vs	2	1.16	(1.03,1.31)	ns	
s_assault_victim	1	vs	2	ns		ns	
s_self_harm	1	vs	2	ns		ns	
s_physical_abuse	1	vs	2	ns		ns	
s_sexual_abuse	1	vs	2	1.27	(1.14,1.41)	ns	
s_maltreated	1	vs	2	ns		ns	
s_incare	1	vs	2	ns		ns	
School factors							
low_ed_achieve_3	1	vs	2	1.82	(1.35,2.46)	ns	
low_ed_achieve_5	1	vs	2	1.66	(1.40,1.97)	1.63	(1.25,2.11)
low_ed_achieve_7	1	vs	2	1.70	(1.44,2.01)	1.75	(1.34,2.27)
low_ed_achieve_9	1	vs	2	1.69	(1.29,2.21)	**2.10**	(1.36,3.24)
wagger_3	1	vs	2	ns		ns	
wagger_5	1	vs	2	1.28	(1.06,1.54)	ns	
wagger_7	1	vs	2	1.28	(1.06,1.55)	ns	
wagger_9	1	vs	2	1.17	(1.02,1.35)	ns	
Community factors							
birth_disadv_serious	1	vs	2	1.32	(1.26,1.39)	1.15	(1.05,1.25)

Table 6.3: Logistic regression – separate models for Aborigines and non-Aborigines

			M2 (Ab)		M3 (Non-Ab)	
			N =	8,312	N =	104,973
dependent var:			R_sq =	0.2629	R_sq =	0.1371
case_type						
			Odds ratio	95% CI	Odds ratio	95% CI
Individual-based factors						
At birth:						
indigenous status	1 vs 2		N/A		N/A	
sex	1 vs 2		**4.88**	(4.35,5.46)	**5.25**	(4.98,5.53)
mum_age	1 vs 3		1.18	(0.85,1.63)	1.74	(1.56,1.94)
mum_age	2 vs 3		0.98	(0.72,1.36)	1.07	(0.98,1.17)
low_birth_weight	1 vs 2		0.72	(0.63,0.84)	0.87	(0.81,0.94)
obcomp_serious	1 vs 2		1.88	(1.03,3.45)	ns	
oc_serious	1 vs 2		ns		1.81	(1.64,2.01)
high_impulse	1 vs 2		0.39	(0.24,0.65)	0.53	(0.38,0.72)
Health-derived:						
ill_serious	1 vs 2		1.58	(1.41,1.77)	1.25	(1.19,1.32)
mh_serious	1 vs 2		1.51	(1.08,2.09)	1.56	(1.39,1.75)
assault_victim	1 vs 2		3.23	(2.57,4.05)	4.22	(3.69,4.82)
self_harm	1 vs 2		1.59	(1.03,2.46)	2.38	(2.04,2.79)
drugs_alcohol	1 vs 2		**3.32**	(2.13,5.16)	**4.09**	(3.51,4.76)
teen_parent	1 vs 2		1.70	(1.43,2.01)	2.99	(2.58,3.46)
Maltreatment/abuse:						
physical_abuse	1 vs 2		ns		ns	
sexual_abuse	1 vs 2		0.62	(0.47,0.81)	0.77	(0.66,0.89)
maltreated	1 vs 2		1.48	(1.10,2.00)	1.38	(1.17,1.62)
incare	1 vs 2		**3.55**	(2.49,5.06)	**4.76**	(3.84,5.90)
early_maltreat	2 vs 1		0.85	(0.62,1.16)	1.05	(0.89,1.25)
early_maltreat	3 vs 1		1.33	(0.89,1.96)	1.46	(1.18,1.80)
Family-based factors						
Family structure:						
only_child	1 vs 2		ns		ns	
first_born	1 vs 2		ns		ns	
second_born	1 vs 2		ns		ns	
third_born	1 vs 2		0.61	(0.46,0.81)	ns	
many_older_sibs	1 vs 2		1.73	(1.02,2.94)	ns	
Family movement:						
high_mobility	1 vs 3		0.71	(0.59,0.85)	1.45	(1.35,1.56)
high_mobility	2 vs 3		0.92	(0.82,1.04)	1.26	(1.21,1.32)
Parents:						
parent_death	1 vs 2		ns		1.42	(1.30,1.55)
mum_ill	1 vs 2		1.32	(1.15,1.51)	1.17	(1.12,1.22)
dad_ill	1 vs 2		1.20	(1.03,1.40)	1.09	(1.02,1.17)
p_mh_serious	1 vs 2		ns		1.19	(1.09,1.30)
p_assault_victim	1 vs 2		ns		1.84	(1.19,2.85)
p_self_harm	1 vs 2		ns		1.34	(1.16,1.54)
p_drugs_alcohol	1 vs 2		ns		1.35	(1.16,1.57)
Siblings:						
sib_death	1 vs 2		ns		ns	
sib_crim	1 vs 2		**2.66**	(2.38,2.98)	**3.18**	(3.01,3.36)
big_family_2	1 vs 2		ns		1.16	(1.06,1.27)
sib_ill	1 vs 2		ns		1.11	(1.05,1.17)
s_mh_serious	1 vs 2		1.30	(1.09,1.56)	ns	
s_assault_victim	1 vs 2		ns		1.78	(1.28,2.48)
s_self_harm	1 vs 2		ns		ns	
s_physical_abuse	1 vs 2		ns		1.14	(1.01,1.27)
s_sexual_abuse	1 vs 2		ns		1.27	(1.14,1.41)
s_maltreated	1 vs 2		ns		ns	
s_incare	1 vs 2		ns		ns	
School factors						
low_ed_achieve_3	1 vs 2		ns		1.35	(1.01,1.80)
low_ed_achieve_5	1 vs 2		1.27	(0.86,1.88)	1.65	(1.41,1.94)
low_ed_achieve_7	1 vs 2		1.64	(1.07,2.52)	1.63	(1.39,1.90)
low_ed_achieve_9	1 vs 2		**3.01**	(1.39,6.55)	1.74	(1.36,2.22)
wagger_3	1 vs 2		ns		ns	
wagger_5	1 vs 2		1.69	(1.13,2.53)	ns	
wagger_7	1 vs 2		ns		1.22	(1.02,1.46)
wagger_9	1 vs 2		ns		1.15	(1.01,1.31)
Community factors						
birth_disadv_serious	1 vs 2		0.94	(0.83,1.08)	1.32	(1.26,1.38)

Table 6.4: Results from multivariate logistic regression – separate models for four sex-ethnicity groups

dependent var: case_type			M4 (Male Ab) N = 4765 R_sq = 0.1873 Odds ratio	95% CI	M5 (Female Ab) N = 3547 R_sq = 0.2401 Odds ratio	95% CI	M6 (Male NonAb) N = 56217 R_sq = 0.1206 Odds ratio	95% CI	M7 (Female NonAb) N = 48756 R_sq = 0.0749 Odds ratio	95% CI
Individual-based factors										
At birth:										
indigenous status			N/A		N/A		N/A		N/A	
sex			N/A		N/A		N/A		N/A	
mum_age	1 vs	3	0.98	(0.62,1.55)	ns		1.75	(1.54,1.98)	1.66	(1.31,2.11)
mum_age	2 vs	3	0.75	(0.48,1.18)	ns		1.04	(0.94,1.14)	1.19	(0.97,1.45)
low_birth_weight	1 vs	2	0.79	(0.64,0.97)	0.67	(0.54,0.82)	0.91	(0.84,1.00)	0.81	(0.69,0.95)
obcomp_serious	1 vs	2	ns		ns		ns		ns	
oc_serious	1 vs	2	0.47	(0.29,0.76)	ns		ns		2.62	(2.31,2.96)
high_impulse	1 vs	2	0.46	(0.25,0.84)	ns		0.57	(0.40,0.81)	0.42	(0.20,0.92)
Health-derived:										
ill_serious	1 vs	2	1.69	(1.45,1.98)	1.52	(1.28,1.80)	1.26	(1.19,1.34)	1.16	(1.04,1.30)
mh_serious	1 vs	2	ns		1.77	(1.21,2.59)	1.73	(1.50,2.00)	1.31	(1.06,1.61)
assault_victim	1 vs	2	**3.00**	(2.11,4.28)	**3.58**	(2.67,4.81)	**4.14**	(3.59,4.78)	**4.35**	(2.98,6.35)
self_harm	1 vs	2	**4.72**	(1.63,13.69)	ns		**2.80**	(2.23,3.51)	**2.17**	(1.72,2.75)
drugs_alcohol	1 vs	2	**3.76**	(2.36,5.97)	**3.99**	(2.27,7.01)	**3.29**	(2.72,3.99)	**5.96**	(4.60,7.71)
teen_parent	1 vs	2	**3.73**	(2.34,5.95)	**1.55**	(1.28,1.88)	**4.38**	(3.28,5.83)	**2.39**	(2.00,2.86)
Maltreatment/abuse:										
physical_abuse	1 vs	2	ns		ns		ns		1.45	(1.15,1.84)
sexual_abuse	1 vs	2	ns		0.65	(0.47,0.91)	0.78	(0.64,0.95)	ns	
maltreated	1 vs	2	ns		1.73	(1.20,2.48)	1.32	(1.07,1.62)	1.41	(1.07,1.87)
incare	1 vs	2	**3.48**	(2.10,5.78)	**3.41**	(2.20,5.29)	**4.17**	(3.33,5.24)	**5.37**	(3.88,7.44)
poor_home	1 vs	2	ns		0.50	(0.29,0.87)	ns		0.57	(0.38,0.87)
early_maltreat	2 vs	1	0.78	(0.46,1.31)	0.93	(0.62,1.39)	1.15	(0.93,1.42)	0.94	(0.70,1.27)
early_maltreat	3 vs	1	2.17	(0.85,5.58)	1.38	(0.86,2.21)	1.69	(1.27,2.23)	1.22	(0.87,1.72)
Family-based factors										
Family structure:										
only_child	1 vs	2	ns		ns		ns		ns	
first_born	1 vs	2	ns		ns		ns		1.16	(1.06,1.26)
second_born	1 vs	2	ns		0.56	(0.38,0.83)	ns		ns	
third_born	1 vs	2	0.68	(0.47,0.98)	0.48	(0.31,0.75)	ns		ns	
many_older_sibs	1 vs	2	ns		ns		ns		ns	
Family movement:										
high_mobility	1 vs	3	0.59	(0.46,0.76)	ns		1.56	(1.43,1.70)	1.13	(0.96,1.32)
high_mobility	2 vs	3	0.93	(0.78,1.09)	ns		1.30	(1.24,1.36)	1.13	(1.03,1.23)
Parents:										
parent_death	1 vs	2	1.33	(1.03,1.71)	ns		1.40	(1.26,1.55)	1.52	(1.28,1.81)
mum_ill	1 vs	2	1.45	(1.21,1.74)	ns		1.17	(1.11,1.23)	1.16	(1.06,1.27)
dad_ill	1 vs	2	1.45	(1.15,1.83)	ns		1.15	(1.06,1.24)	ns	
p_mh_serious	1 vs	2	ns		ns		1.17	(1.05,1.30)	1.28	(1.08,1.51)
p_assault_victim	1 vs	2	ns		ns		ns		**2.41**	(1.11,5.20)
p_self_harm	1 vs	2	ns		ns		1.38	(1.16,1.63)	ns	
p_drugs_alcohol	1 vs	2	ns		ns		1.30	(1.09,1.57)	1.46	(1.11,1.92)
Siblings:										
sib_death	1 vs	2	ns		ns		ns		ns	
sib_crim	1 vs	2	**2.93**	(2.52,3.42)	**2.60**	(2.21,3.05)	**3.29**	(3.08,3.51)	**2.98**	(2.68,3.32)
big_family_2	1 vs	2	ns		ns		ns		1.37	(1.17,1.62)
sib_ill	1 vs	2	ns		ns		1.19	(1.12,1.26)	ns	
s_mh_serious	1 vs	2	ns		ns		ns		ns	
s_assault_victim	1 vs	2	ns		ns		1.78	(1.18,2.69)	1.88	(1.07,3.29)
s_self_harm	1 vs	2	ns		ns		ns		ns	
s_physical_abuse	1 vs	2	ns		ns		ns		ns	
s_sexual_abuse	1 vs	2	ns		ns		1.42	(1.25,1.61)	ns	
s_maltreated	1 vs	2	ns		ns		ns		ns	
s_incare	1 vs	2	ns		ns		ns		ns	
s_poor_home	1 vs	2	ns		1.61	(1.26,2.07)	0.77	(0.64,0.93)	0.64	(0.49,0.83)
School factors										
low_ed_achieve_3	1 vs	2	**3.15**	(1.34,7.38)	ns		1.59	(1.14,2.23)	ns	
low_ed_achieve_5	1 vs	2	1.49	(0.86,2.59)	1.20	(0.71,2.05)	1.65	(1.38,1.99)	**2.01**	(1.50,2.70)
low_ed_achieve_7	1 vs	2	ns		2.04	(1.15,3.62)	1.70	(1.43,2.03)	ns	
low_ed_achieve_9	1 vs	2	**4.11**	(1.47,11.47)	ns		1.68	(1.27,2.22)	**2.17**	(1.32,3.56)
wagger_3	1 vs	2	ns		ns		ns		ns	
wagger_5	1 vs	2	**3.02**	(1.53,5.97)	ns		ns		ns	
wagger_7	1 vs	2	ns		ns		1.24	(1.01,1.52)	ns	
wagger_9	1 vs	2	ns		ns		1.18	(1.02,1.37)	ns	
Community factors										
birth_disadv_serious	1 vs	2	ns		0.95	(0.78,1.15)	1.37	(1.30,1.45)	1.15	(1.04,1.27)

6.5 Discussion

6.5.1 Risk factors for the general population

The principal aim of this study was to investigate the risk factors associated with participation in offending at population level. Using data drawn from various administrative systems and linked in a way which protects the privacy of individuals, the study documents the extent to which a number of individual, family, school and community based factors within the general population increase the likelihood of involvement in crime. The study finds that a number of factors are strongly associated with increased risk of participation in offending. Sex and Aboriginality are significant (albeit static) factors and are discussed in their own right in the section which follows.

In accordance with evidence elsewhere, the risk factors identified by the study - summarised in Table 6.5 - confirm the role that individual, home and family circumstances play in the development of delinquent behaviour. In particular, the study adds to the Australian and international evidence base that a dysfunctional or unsafe family environment (measured through a range of variables including being placed in out-of-home care or being a victim of child maltreatment) are major risk factors for involvement in crime.

The timing of child maltreatment was also found to be an important risk factor for participation in offending. The study found that the *later* the age of first maltreatment, the *greater* the impact/influence on offending. This finding may seem counterintuitive but it accords with findings elsewhere (e.g. Stewart et al., 2008; Thornberry et al., 2001). Stewart and colleagues argued that the developmental effects of maltreatment were most significant

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when the maltreatment occurred at "transition points" (i.e. in the transition from early childhood to childhood and from childhood to adolescence) and that this had the most serious impact on future offending. It may well be that maltreatment at an earlier age leads to other, perhaps more significant outcomes (such as mental health problems). However, as the focus of this investigation was limited to offending outcomes, it appears that maltreatment at an older age is the more significant risk factor.

The study further confirms that the experience of violence in childhood (as measured through assault victimisation) is another risk factor for crime involvement. Further, and again consistent with much of the literature, the study finds that disruptions to parenting and family stress (as measured through factors such as parent self-harm, parent illness and death, parent mental illness, parent drug and alcohol use, sibling illness) also have significant influences on involvement in crime.

One individual based factor that emerged as being very strongly associated with involvement in crime was drug and alcohol abuse. At one level, this finding comes as no surprise as there is a large body of evidence linking drug and alcohol abuse *directly* to increased risk of involvement in property and violent crime (see South (2002) or Bennett and Holloway (2005) for detailed reviews). It is well established that drug abuse is also *indirectly* related to crime. Drug and alcohol abuse are almost always found to be a routine part of the lifestyles of most offenders, and certainly, of persistent offenders (Hough, 1996; Dobinson and Ward, 1985; Johnson et al., 1993; Wexler et al., 1990).[57]

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[57] It is worth noting here that research evidence of a direct relationship between substance abuse and offending usually associates drug and alcohol abuse to the *frequency* of offending, rather than to offending onset (or

Table 6.5: Summary of risk factors associated with participation in offending – general population

Domain	Strong risk factor	Weak risk factor	Not a risk factor
Individual	*Sex* *Drug and alcohol use* *Assault victimization* *Aboriginal status* *Self-harm* *Being a teen parent* Born to young mother Obstetric complications_1	Mental illness Serious illness	High prf_impulsivity Low birth weight Obstetric complications_2
Home	*In out-of-home care* Maltreatment in adolescence	Maltreatment in childhood	Physical abuse at home Sexual abuse at home Poor home environment
Family	*Sibling criminality* Parent death Parent self-harm Family mobility	Parent illness Parent mental illness Parent drug and alcohol use Large family size Sibling illness Sibling mental illness Sibling sexual abuse	Family structure (only child; birth order; having older siblings) Parent assault victimisation Sibling death Sibling assault victimisation Sibling self-harm Sibling physical abuse Sibling maltreatment Sibling in out-of-home care Sibling poor home environment
School	*Low school achievement in early primary (Yr 3)* *Low school achievement in mid-primary (Yr 5)* *Low school achievement in middle school (Yr 7)*	Low school achievement in middle school (Yr 9) School absenteeism (high school)	School absenteeism (primary)
Community	Socio-economic disadvantage (at birth)		

Notes:

Bold italics indicates OR greater than 2.0

Any factor with OR 95% CI on or near 1.0 was classified as a weak risk factor

participation) as has been found here. This may be an artefact of poor temporal ordering of variables - a limitation of the study which is recognised and discussed in more detail further on.

However, what also emerges is that drug and alcohol abuse features as a strong risk factor for *both* Aboriginal and non-Aboriginal offending. These results serve as a useful reminder that the effects of substance and alcohol abuse are not limited to any particular segment of the population and wide application of initiatives to address drug and alcohol abuse are likely to have broader, population level benefits.

Another strong finding to emerge from the study is that sibling criminality is associated with participation in offending. This, too, accords with a body of literature on sibling links. As previously discussed, some researchers have argued that the connection between sibling criminality and child delinquency has more to do with poor family circumstances (and poor quality parenting) than anything else. If the link with poor family circumstance is causal, then it follows that other indicators of poor family functioning and poor parenting would also be strongly associated with involvement in crime. Indeed, this is exactly what the current study shows - other indicators of a poor family environment *were,* in fact, associated with increased involvement in offending. However, few of those "other" variables were as strongly associated with offending as sibling criminality. This suggests that other factors may be at play and, correspondingly, that other explanations are plausible. One alternative explanation for the prominence of sibling criminality as a risk factor is that either through differential association, social learning or some other mechanism, the deviant behaviour of siblings is being relayed to other children in the family. The notion of a distinct "sibling effect" is also supported by a number of researchers (e.g. Lauritsen, 1993; Slomkowski et al., 2001). In further exploring these relationships, a number of researchers have found that child offending is more strongly linked to parent criminality than to sibling criminality. However, the datasets available for the present study did not include information on parent criminality, so it was not possible to pursue this line of enquiry.

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The study found evidence that some "individual" factors operated to increase the risk of involvement in crime. Being born to a young mother was one such factor. Literature has drawn attention to the impact of adolescent childbearing on parenting quality and child development (Borkowski et al., 2002). This has been confirmed by empirical evidence demonstrating that young motherhood increases the risk of problematic outcomes in children (Brooks-Gunn et al., 1995; Belsky, 1984). Some of the literature suggests that the link between these factors is causal – that is, that by virtue of their age, young mothers may be immature and may not have acquired sufficient life skills or experience for effective parenting. This, in turn, results in poor child development. It has been further suggested that the experience of young motherhood may, in itself, create emotional stresses in young girls which may affect the quality of their parenting. Other writers have suggested that the risk factors which predispose girls toward unsafe sex, pregnancy and young motherhood (e.g. poverty, growing up in single-parent families, and limited access to services) also have negative effects on children – in other words, early motherhood and child criminality are correlated but not causally linked. The current study did not address causality; however, the link between young motherhood and crime participation in their children was well demonstrated and is consistent with research evidence elsewhere.

Another interesting finding was that, depending on how it was measured, obstetric complications was a risk factor for delinquency. As discussed earlier, there is some literature in the bio-social domain which posits a link between obstetric complications and poor behavioural outcomes. However, the research evidence to support this position is equivocal – as are the findings from this study. The study also explored the potential link between low birth weight (LBW) and crime and, further, between the early risk factors for impulsivity and

crime. Insofar as obstetric complications, LBW and early risk factors for impulsivity act as indicators of 'biological factors', the lack of significance of these factors in the statistical models suggest that strictly 'biological' explanations for offending are weak. That said, the models tested direct effects and did not allow for or include bio-social interactions. Testing for such effects may yield different results.

Do individual factors matter more than family? A consistent finding of the study was that individual based factors contributed more to the fitted models than family or community based models. Or, put differently, that a large number of family variables were weak risk factors for offending participation. Indeed, the only family based factor which showed strong association with participation in offending throughout was sibling criminality. Although it is tempting to conclude from this evidence that individual factors matters more than the family, this would be a premature conclusion to make, as there are important aspects of the study methodology that need to be addressed (e.g. improvements to temporal ordering, testing of interactions and testing of construct validity). Alternative statistical techniques (such as hierarchical or nested modelling) may be useful (see later discussion).

6.5.2 Sex, ethnicity and disparities

Arguably the most significant findings to emerge from this study are that, notwithstanding other factors, sex and ethnicity (Aboriginal status) have some of the strongest influences on the likelihood of participating in crime. Being male is singularly the most important "risk" factor associated with offending participation, increasing the odds of involvement in crime by a factor of five (5.12), while being Aboriginal also emerges as an important "risk" factor - increasing the odds of involvement in crime by a factor of three (3.33).

These two findings feed directly into two of the most important debates in criminology – *'What accounts for the gendered nature of crime?'* and *'How do we explain ethnic/minority over-representation in crime?'* As discussed in Chapter 1, debates over the causal explanations for sex and ethnic differences in offending have often been polarised. On the issue of gender, some have argued that female delinquency has an altogether different aetiology to that of male delinquency*;* others have argued the alternative: that the gender disparity is more likely due to differing levels of exposure to risk factors. The latter camp thus accounts for the gender gap in offending to the same underlying causes (risk factors and pathways), but differing amounts of these.

Surprisingly similar debates have also been had with respect to ethnic disparities in crime. On the one hand, some authors have argued that a uniquely different set of factors (including institutional bias, discrimination and welfare dependence) characterise Aboriginal offending. Others have opposed this view, arguing that ethnic disparities are mostly due to differing levels of exposure to the same underlying causes (e.g. poverty) (the "differential involvement hypothesis"). Those in this school argue it is the differing levels of exposure that are more likely to account for the increased involvement in crime by ethnic minorities. In more recent times, though, the tension between these opposing views has diminished somewhat. This may be due to mounting empirical evidence demonstrating that associated risk factors are neither all shared nor all different.

Results from the current study provide detail that is relevant to these debates and suggest merit in developing and testing alternative theories about offending pathways. Through partitioning of the data along gender and Aboriginal lines, the study demonstrates that there are many similarities, as well as some differences, in the risk factors associated with

participation in offending by males and females, and by the Aboriginal and non-Aboriginal populations. The study fits neatly into a growing body of empirical evidence which supports a blended or integrated perspective of offending pathways.

Differences between girls and boys

Our study separately fitted logistic regression models to males and females. As the summary in Table 6.6 indicates, there are many similarities but also some differences in the risk factors associated with participation in offending by males and females.

Involvement in drugs and alcohol, experiencing violence, sibling criminality and being placed in out-of-home care were some of the most significant factors associated with participation in offending by both males and females. There is some concordance of these findings with those from other studies. For example, the first three of these factors map (respectively) to 'substance abuse', 'victimisation' and 'delinquent siblings' which Wong et al (2010) also found to be risk factors shared by both boys and girls. Placement in out-of-home care was not a factor considered in Wong et al's (2010) review and therefore comparison is not possible.

As to differences in risk factors, the study found that obstetric complications, physical abuse and low educational achievement in high school were of greater significance for females than for males; whereas, expressions of self-harm and having been a teenage parent were more strongly associated with offending amongst males than amongst females. Interestingly, for males, a greater number of family based factors were found to be associated with participation in offending.

Table 6.6: Summary of gender similarities and differences in risk factors associated with participation in offending

Domain	Male only risk factor	Common risk factor	Female only risk factor
Individual		*Aboriginal status*	*Obstetric complications_1*
		Assault victimization (M>F)	
		Drug and alcohol use (F>>M)	
		Being a teen parent (M>>F)	
		Self-harm (F>>M)	
		Born to young mother	
		Mental illness	
		Serious illness	
Home		*In out-of-home care (F>>M)*	Physical abuse at home
		Maltreatment in adolescence	
Family	Family mobility	*Sibling criminality*	Large family size
	Parent self-harm	Parent death	Family structure - 1st born
	Parent drug and alcohol use	Mother illness	
	Sibling sexual abuse	Parent mental illness	
	Sibling illness		
	Sibling mental illness		
	Father illness		
School	Low school achievement in early primary (Yr 3)	*Low school achievement in middle school (Yr 9) (F>M)*	
	School absenteeism (Yr 5)	Low school achievement in middle school (Yr 7)	
	School absenteeism (Yr 7)	Low school achievement in mid-primary (Yr 5)	
	School absenteeism (Yr 9)		
Community		Socio-economic disadvantage (at birth)	

Notes:
Bold italics indicates ORs greater than 2.0
M>F indicates that male OR for this factor exceeds female OR
F>M indicates that female OR for this factor exceeds male OR
M>>F indicates that male OR for this factor greatly exceeds female OR
F>>M indicates that female OR for this factor greatly exceeds male OR

The findings discussed above can be interpreted in a number of ways. They may suggest, for example, that boys have greater sensitivity to family functioning and to parent/sibling behaviour during childhood, than girls. There is evidence elsewhere that boys may be particularly sensitive to family disruption and to the loss of a parent, especially a mother

(consider, for example, Juby and Farrington, 2001). However, given the paucity of comparable evidence, this conclusion may be premature. Moreover, not all of the differences identified here accord with evidence elsewhere. For example, while the study agrees with Wong et al (2010) on physical abuse as a female-only risk factor, it is in complete disagreement on the influence of obstetric complications and low school achievement. Wong et al found obstetric complications and low school achievement to be risk factors for boys, not for girls, while the current study found the opposite to be the case. The inconsistency of findings in this respect warrant more consideration and far greater analysis and scrutiny of data than has been attempted so far.

Overall, though, the fact that there are similarities as well as differences in risk factors between boys and girls is a significant finding. This accords with the evidence assembled in the meta-analysis by Wong and her colleagues (2010) and, as indicated previously, supports an integrated or blended perspective of the gender difference in crime.

Ethnic differences

As with gender, the results of the current study indicate that there are many similarities, as well as some important differences, in the risk factors associated with participation in offending by Aboriginal and non-Aboriginal sections of the population (summarised in Table 6.7). The existence of common as well as culturally specific risk factors accords with much of the empirical evidence on ethnic disparities emerging from both the U.S. and from Australia (albeit to a lesser extent) (e.g. Homel et al., 1999).

In terms of common factors, the current study found that gender, assault victimisation, drug and alcohol use, being placed in out-of-home care and being maltreated at a later age are all

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factors which increased the risk of participation in offending amongst both groups. Sibling criminality, too, increased the risk for both groups – although, the effect was more pronounced for the non-Aboriginal population than for the Aboriginal population.

Table 6.7: Summary of common and different risk factors associated with participation in offending - by Aboriginal status

Domain	Aboriginal only risk factor	Common risk factor	Non-Aboriginal only risk factor
Individual	Obstetric complications_2	*Sex (N>I)*	Obstetric complications_1
		Assault victimization (N>>I)	
		Drug and alcohol use (N>I)	
		Self-harm (N>>I)	
		Being a teen parent (N>>I)	
		Mental illness	
		Serious illness	
		Born to young mother	
Home		*In out-of-home care*	
		Maltreatment in adolescence	
Family	Many older siblings	*Sibling criminality*	Parent assault victimisation
	Sibling mental illness	Mother illness	Sibling assault victimisation
		Father illness	Family mobility
			Parent death
			Sibling sexual abuse
			Parent drug and alcohol use
			Parent mental illness
			Parent self-harm
			Large family size
			Sibling physical abuse
			Sibling illness
School	School absenteeism (Yr 5)	*Low school achievement in middle school (Yr 9) (I>>N)*	Low school achievement in early primary (Yr 3)
		Low school achievement in middle school (Yr 7)	School absenteeism (Yr 7)
		Low school achievement in mid-primary (Yr 5) (N>I)	School absenteeism (Yr 9)
Community			Socio-economic disadvantage (at birth)

Notes:
Bold italics indicates ORs were greater than 2.0
N>>I indicates that Non-Aboriginal OR greatly exceeds Aboriginal OR
I>>N indicates that Aboriginal OR greatly exceeds Non-Aboriginal OR
N>I indicates that Non-Aboriginal OR exceeds Aboriginal OR
I>N indicates that Aboriginal OR exceeds Non-Aboriginal OR

In terms of differences, some factors – such as self-harming behaviour and having been a teenage parent - appeared to be more strongly correlated with non-Aboriginal offending participation than with Aboriginal offending participation. Neighbourhood disadvantage, too, was found to be correlated with non-Aboriginal offending participation but not with Aboriginal offending participation. In contrast, low educational achievement in high school was more strongly associated with Aboriginal offending than with non-Aboriginal offending.

Within the family domain, the current study found that a greater number of family factors were associated with non-Aboriginal participation in offending than with Aboriginal participation. How do we interpret this finding? Does it suggest that Aboriginal children are less susceptible to the influences of parent and/or sibling behaviour than non-Aboriginal children? If so why? Could this be on account of wider kinship and shared child rearing amongst Aboriginal families? Or does the data suggest greater resiliency in Aboriginal children – in other words, could it be that Aboriginal children are more tolerant of – and resistant to – the negative influences from parents/siblings? And could the reason for this be on account of the same "cultural aspect" – that Aboriginal children may have access to a wider family network (beyond the immediate, nuclear family that is more typical of non-Aboriginal families) from which to draw support? Answers to these questions lie beyond the scope of the current study but clearly need to be explored further.

What the study does show, however, is that the relationship between delinquency and family based factors operates differently across ethnic groups. This, in itself, is consistent with findings from a number of American studies (Perez-McCluskey and Tovar, 2003; Smith and Krohn, 1995; Vazsonyi and Flannery, 1997; Cernovich and Giordano, 1987). In explaining the differences in their study, Perez-McCluskey and Tovar (2003) argued that traditional

conceptualisations of family processes may not be as relevant for Latinos and African-Americans. The researchers noted that notions of "familism", of extended family networks and of kinship were distinctive cultural elements within minority groups (i.e. Latinos and African-Americans) that did not appear to fit neatly into traditional conceptualisations of family processes. Perez-McCluskey and Tovar (2003) argued that, as a consequence, such factors were not adequately incorporated into empirical studies and theoretical accounts of the causes of delinquency.

Although Perez-McCluskey and Tovar (2003) were speaking of minority groups in a North American context, the same statements could be applied to the Australian context. There is convincing argument and evidence that notions of family and of family processes are conceptualised very differently by Aboriginal Australians and that these are not adequately represented in empirical studies (Morphy, 2006; Morphy, 2004). It may be argued, then, that the current study does not adequately capture notions of family within the Aboriginal population. It may be, for example, that current family variables are too narrowly defined and capture only aspects of parents and siblings and not of the wider family networks that are known to exist within Aboriginal communities. In other words our interpretation of findings, such as those reported in the present study, should be tempered with a consideration of the potential for mis-specification of models (and construct validity of the variables used in the models) – particularly around family processes. Nevertheless, what the study has effectively demonstrated is that models developed from/for one population group should *not* be blindly applied to other groups.

The role of family mobility

One further finding from the study that is worth a final comment relates to family mobility. The study found that family mobility is associated with increased participation in offending. Specifically, the *more* times a family moved house (changed addresses), the *greater* the likelihood of involvement in offending. The link between family mobility and offending can be interpreted in many ways. One explanation is that mobility is correlated with (or acts as a proxy for) other factors, such as poverty and relationship instability. From a developmental perspective, these factors are the active ingredients and operate either directly or indirectly on individual functioning. By contrast, there are some theories (e.g. social disorganisation, collective efficacy) that explain the link between mobility and offending through the mechanism of social control. Specifically, family movement disrupts ties at neighbourhood level resulting in lower attachment to the local community and reduced social bonds, lower stakes in conformity, and so on. It is on this basis that family mobility is frequently used as a measure of collective efficacy (Sampson et al., 1997). Irrespective of viewpoint, what emerges from this study is that the link between family mobility and participation in crime operates *differentially* (i.e. for the non-Aboriginal population only; and, also, for boys more so than girls) and this differential effect is not explained by any of these perspectives. Clearly, further research in this area is warranted.

6.5.3 Strengths and limitations of the study

As with all studies, this study has its strengths and weaknesses. A major strength of the study is the use of de-identified population level datasets, linked across health and other human services, to investigate the relationship between factors experienced in early childhood and adolescence and the risk of participation in offending. This whole-of-population approach not only avoids issues of cohort attrition, selection bias, recall problems and insufficient

statistical power that typically befall smaller studies, but allows us to investigate very sensitive and inter-related issues concerning personal health, family functioning and individual criminal behaviour. Importantly, the data linkage research methodology allows us to investigate these issues while protecting the privacy of research participants.

Another strength of the study is the use of a matched case-control study design which ensured that the age of participants was accounted for and that follow-up times for cases and controls with respect to count and quantum variables (e.g. the number of hospital admissions over the study period) were comparable.

The capacity to compare the characteristics of offenders against those of non-offenders, using whole of population registers is a further strength of the study. It is notable that a number of the registers used in the study have an especially broad coverage. For example, the Child Protection database includes allegations as well as substantiated cases of child maltreatment. The Mental Health Information System, too, includes outpatient contacts, as well as inpatient admissions and covers both private and public hospitals.

However, the use of administrative records also opens the study up to other biases and distortions. Under reporting and under recording are two known limitations of "official" records. Not all instances of offending come to the attention of police; similarly, not all cases of child maltreatment and abuse are reported to authorities, not all cases of mental health issues are referred to or treated by health services, not all instances of drug abuse or self-harm or violence victimisation come to the attention of treatment services (reported), let alone result in admission to hospital (recorded), and so on. There is evidence, too, that population sub-groups may be differentially affected by reporting and recording biases (Ards et al.,

2003). Notwithstanding these limitations, though, official records have been shown to be valid measures or "indicators" of such conditions/events and, as such, their use in empirical studies is justified.

A further limitation of the study is its arguably simplistic analytical approach - it used a "flat" logistic regression approach rather than multilevel or hierarchical modelling and it did not test for interactions between variables. This was not so much because the data could not support this type of analysis but rather because we elected to start the analysis of such a large and complex, linked dataset using a relative easy-to-understand statistical method. Having so many variables at hand also made it difficult to consider possible interactions between variables, as so many could be possible.[58] It is also the case that the study did not fully exploit the longitudinal (read: temporal) nature of the data. Many of the derived variables were calculated for the entire study period, rather than for different time periods within the study period. As a consequence it was not possible to disentangle correlation from prediction and causation. The data *can* support this type of approach, however, and it is anticipated that future analysis would make better use of the temporality within the linked data.[59] More

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[58] There is potential to reduce complexity of the data through Principal Component Analysis, for example. This would reduce the number of dimensions within the data (i.e. through grouping of variables that are orthogonally similar) but would make the results of analyses much harder to interpret. Similarly, it may be possible to attempt some multilevel modelling to explore the influences of nested influence of factors. A question of interest may be: How do parents and siblings, who are located within families within communities, influence the behavioural outcomes of children?

[59] For example, it may be useful to decompose independent variables into those related to, say, early childhood (0-6 years), middle childhood (6-12 years) and adolescence (13-17 years) and then tease out causation.

sophisticated treatment of the data would go some way toward unravelling the mechanism or mechanisms that account for the associations found by the current study. Having understood these, the community would be better informed and better placed to consider early interventions and more integrated crime prevention strategies.

Another potential limitation of the study is that it did not control for other (arguably important) factors such as parent age or the number of siblings (i.e. family size). Thus, some of the count and quantum variables based on parent and sibling data may not be truly comparable. For example, the count of the number of sibling hospital admissions simply summed across all siblings without taking into account the number of siblings in each family. Family effects might therefore be overstated for larger families. That said, it is not entirely clear how such effects might be mitigated.[60]

Notwithstanding these limitations, the study has taken the first step of operationalising variables that represent adverse experiences and relationships and measuring their (initial) associations with delinquency. The study findings pave the way to more complex analyses of the connection between delinquency and these experiences and relationships, and, ultimately, to more informed and integrated approaches to crime prevention and improved outcomes for children.

Similarly, it may be useful to distinguish between events/outcomes that pre-date first contact with the justice system (i.e. any event where age of child < 10) or to consider factors related to early onset of offending.

[60] For example, would dividing sibling count based variables by the number of siblings (i.e. rating or standardising the data) be reasonable? This may provide a statistical solution but does it make sense in real life? Would the trauma associated with the death of two (out of two) siblings equate to the death of a sole sibling?

6.6 Conclusion

The study has allowed us to obtain a population level, Australian perspective on the risk factors associated with juvenile delinquency. As a result, the study has the potential to provide valuable assistance in the development of effective juvenile crime prevention programs in Australia. Significantly, the study has examined gender and Aboriginal/non-Aboriginal differences. The differences uncovered by the study suggest that both gender and Aboriginal status are important considerations when estimating the influence of the family and other ecological contexts on delinquent behaviour. These contexts need to be considered in the design of effective crime prevention strategies.

From a methodological point of view, the study findings on the risk factors associated with delinquency accord with those from many other studies. This result, in itself, provides strong evidence that data linkage methods are a robust and valid method for undertaking whole-of-population research in the social and behavioural sciences. Medical and public health researchers have, for many years, embraced data linkage methods. The findings from this study should demonstrate to social scientists that the methodology has utility for them as well.

7. Sub-Study 5 - Assessing the influence of 'standard' and 'culturally-specific' risk factors on the prevalence and frequency of Aboriginal offending.

Abstract

This is an empirical study which uses a multi-factorial risk factor framework to investigate the factors which influence the prevalence and frequency of offending by Aboriginal Australians (as measured through self-reported arrest rates). The study uses regression modelling of data from the 2002 National Aboriginal and Torres Strait Islander Social Survey (NATSISS; Australian Bureau of Statistics, 2004b) to estimate the effects of a range of individual, family and community factors on Aboriginal arrest rates. The study considers a range of explanatory factors and includes both 'standard' and 'culturally specific' influences. Drawing upon the works of Homel et al (1999), Broadhurst (1997, 2002) and other Australian researchers, the study investigates the interaction between multiple risk factors (including factors such as, cultural strength and connection to community) and assesses whether these play a part in explaining the interaction between the Aboriginal population and Australian criminal justice systems.

7.1 Introduction

The over-representation of Aboriginal people in the criminal justice system has emerged as one of the most intractable social issues facing contemporary Australia. In all Australian states and territories, arrest and imprisonment rates of the Aboriginal population far exceed those of the non-Aboriginal population. In 2011, the national Aboriginal imprisonment rate was 14 times greater than the non-Aboriginal rate (Australian Bureau of Statistics, 2011). The rate differential was greatest in WA, where the imprisonment rate of Aboriginal adults was more than 18 times that of non-Aboriginal adults. Arrest rates also vary markedly. In 2006 in WA, the annual arrest rate for the Aboriginal population was 15 per 100 residents, compared with 2 per 100 for the non-Aboriginal population (Fernandez et al., 2009).

Researchers have made repeated attempts to identify and explain the reasons for this disparity. Cunneen and Robb (1987) provided a dual explanation for the over-representation of Aboriginal people. They argued that the salient explanatory factors of the over-representation were a combination of socio-economic factors and over-policing (or, at least, *differential* policing that in turn led to higher contact levels) and argued that both of these factors were influenced by "a strong historical continuity in the position of Aboriginal people in white society" (Cunneen and Robb, 1987). The landmark Royal Commission into Aboriginal Deaths in Custody (RCIADIC; Johnston, 1991) also attributed cause to systemic factors as well as to higher rates of offending. Both of these factors were, in turn, underscored by underlying social and economic circumstances. According to the RCIADIC:

> The single significant contributing factor to incarceration is the disadvantaged and unequal position of Aboriginal people in Australian society in every way, whether socially, economically or culturally (Johnston, 1991: , volume 1, p.15).

Although disadvantage (social and economic) is popularly viewed as the most dominant 'cause' of ethnic disparities in arrest rates, some scholars have argued that drug and alcohol abuse are more important and contemporary causes of Aboriginal contact with the justice system (Weatherburn et al., 2008; Homel et al., 1999; Pearson, 2001).

7.1.1 Theoretical explanations for Aboriginal over-representation

There are disputes at a theoretical level concerning the mechanism(s) through which disadvantage and other factors lead to over-representation in the justice system. At least three traditional criminological theories - strain theory, social control and social disorganisation - attribute *different* connective processes between disadvantage and crime. Other theoretical perspectives (e.g. labelling theory, subculture theory and conflict theory) have also been used to provide an explanation for the over-representation of Aboriginal people in the justice system. Some, like conflict theory, concentrate less on social disadvantage and more on power relations, while others focus on the interaction effects of dealing with formal criminal justice interventions (labelling; systemic bias; net-widening).

Broadhurst (1997; 2002) is one of few researchers to have tested one theory of Aboriginal offending (culture-conflict) against another (socio-economic/strain theory). Using a comparative, cross-jurisdictional approach, he assessed various measures of "cultural strength" (e.g. population size, land occupation, language and land retention) and measures of socio-economic "stress" (e.g. unemployment, poor housing, low incomes, alcohol problems) against a range of crime measures. Indicators for each theory were found to be highly correlated with state punitiveness (i.e. arrest rates and imprisonment rates). In his earliest work, Broadhurst (1997) found cultural strength and stress to be highly correlated to the extent that "either index could be regarded as interchangeable" (Broadhurst, 1997, p. 461).

He concluded that an *integrated* conflict-stress model is more useful in explaining Aboriginal criminalisation than the more singular models.

Broadhurst's (1997; 2002) synthesised, multi-factorial explanation is constructive in that it considers a range of inter-related issues which define the context of modern Aboriginal life. These issues include the effects of social and economic marginalisation, the effect of discrimination and systemic bias within the justice system, the history of colonisation and links between welfare intervention and criminalisation.

Other Australian researchers have also recognised the inter-relatedness of factors associated with Aboriginal offending. Using a developmental/risk-factor framework, Homel and colleagues (1999) drew on a variety of data sources (including data from the Queensland Sibling Study and supplementary data from interviews with Aboriginal community workers) to enumerate a number of 'standard' risk/protective factors that Aboriginal people share with the mainstream community (such as child abuse, school failure, the quality of parenting and the supportive family and social environments), as well as other factors that were argued to be specific to Aboriginal Australians. The researchers hypothesized that a number of other 'culturally specific' factors were likely to be associated with Aboriginal offending. These included forced removals; (welfare) dependence, systemic racism, substance use and some cultural features. As protective factors against offending, they identified aspects of cultural resilience, personal controls and family controls. The work by Homel and colleagues did not include statistical analyses, though it called for such work to be done so as to make "explicit the many connections between such phenomena as forced removals or institutionalised racism on the one hand, and specific community characteristics, family processes or oppositional behaviours on the other" (Homel et al., 1999: 192).

7.1.2 Quantitative studies

Few empirical studies of Aboriginal offending have successfully included the sorts of 'standard' and 'culturally specific' factors that Homel and his colleagues have advocated. One important reason for this has been the lack of suitable datasets; another obstacle is the challenge of defining suitable/valid measures for each of the proposed explanatory factors.

Walker and McDonald (1995) undertook one of the earliest post-RCIADIC studies which linked Aboriginal interaction with the justice system with some of the more traditional or 'standard' risk factors associated with higher offending rates. Linking imprisonment data to education and employment, the researchers reasoned that crime was problematic in Aboriginal communities because of a lack of employment and educational opportunities. They argued that policies aimed at improving social and economic conditions were likely to have a substantial effect on reducing Aboriginal imprisonment rates. Subsequent research has confirmed a strong association between Aboriginal arrest rates and employment status and there have been repeated calls for improvement to Aboriginal labour force participation (Borland and Hunter, 2000; Hunter, 2001).

Three subsequent quantitative studies have made further inroads into the inclusion of a broader range of 'standard' and 'culturally specific' factors in the analysis of the causes of Aboriginal offending. Making use of self-report data collected by the ABS through the National Aboriginal and Torres Strait Islander (NATSI) surveys, Hunter (2001) and Weatherburn, Snowball and Hunter (2006; 2008) engaged in multivariate statistical analyses to model the influence of a range of factors on Aboriginal contact with the justice system. In the earlier study, Hunter (2001) used data from the 1994 survey to estimate a model of arrest

rate (i.e. the likelihood that a person being arrested in the previous 5 years). Of the variables included in the model, six were identified as having major significance: gender, age, labour force status, alcohol consumption, whether a victim of an assault and educational attainment. Hunter's results were robust in that the findings did not change substantially when the analysis was applied to sub-groups of the population. There was little difference between sexes, between young and old, and between those who had been imprisoned and not.

Weatherburn and colleagues (2006) used data from NATSISS 2002 survey to estimate two models of Aboriginal contact with justice – one which modelled (ever) being charged by police and the other which modelled being imprisoned. Like Hunter (2001), Weatherburn and colleagues found that alcohol and substance misuse, employment options and educational attainment were three of the most significant factors to influence both outcomes. Other factors, such as financial stress, overcrowded living conditions and being a member of the 'stolen generation', were also found to increase the risk of being charged or imprisoned.

The same researchers undertook a further study of the correlates of Aboriginal arrest, again using the 2002 NATSISS (Weatherburn et al., 2008). Their models included factors such as economic stress, welfare dependence and unemployment. They found that these factors were strongly correlated with whether or not an Aboriginal respondent has been arrested and with the number of times an Aboriginal respondent has been arrested in the past 5 years. Alcohol abuse was identified as the strongest correlate.

7.1.3 Limitations of previous studies

Each of these NATSISS based studies represents an advance on past empirical studies of Aboriginal over-representation. The works complement the sociological analyses provided by

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Homel et al (1999) and Cunneen (2001) and provide the statistical rigour and empirical evidence base needed to drive policy changes. Notwithstanding, these studies have been incomplete in that the range of 'standard' and 'culturally specific' risk and protective factors included in analyses has been limited. Apart from the inclusion of variables on forced removal and welfare dependence, the range of risk/protective factors included in the analyses are fairly typical of those known to affect delinquency (Farrington, 2001; Loeber and Farrington, 1998b)

7.1.4 What kinds of 'culturally specific' factors?

Homel et al (1999) propose a range of 'culturally specific' factors that could and should be added to the 'standard' lists typically used in risk factor research. Practices such as the structured use of fighting and swearing behaviours, congregating (and drinking) in public spaces, and the separation of authority between parents and police were identified as cultural practices that either directly or indirectly increase the likelihood of coming to the attention of the police. However, not all cultural practices are seen as risk factors. Other aspects of culture, such as factionalism, negotiability and mobility, are argued to offer resilience or protection from police and justice system contact. Land claims, too, are argued to offer protection. According to the researchers, the existence of land claims "strengthen Aboriginal communities by giving them a voice, coalescing individuals and groups, and giving rise to strong Aboriginal organisations which in turn provide sites of resistance and stronger definitions of community" (Homel et al., 1999: 190).

Broadhurst (1997; 2002), too, identifies land occupation/recognition, language retention and participation in Aboriginal cultural activities as 'cultural factors' which have links to Aboriginal over-representation. In his earlier work, Broadhurst (1997) argues that cultural

strength (or 'cultural identity'), as identified by these factors, acts as an indicator of the degree of resistance and potential conflict between Aboriginal people and the dominant society. Under a conflict-stress model, cultural strength is seen as a risk factor rather than a protective factor, acting on Aboriginal-justice relations in the same direction as socio-economic and related stress factors. Broadhurst (1997) demonstrates that cultural stress and socio-economic stress are highly correlated – both with each other and with high levels of involvement in the justice system. In his later work, however, Broadhurst (2002) explores the concept of 'frontier' and presents a more nuanced argument where cultural strength (the best proxy for this was land retention) is seen to have a protective effect against crime, if not criminalisation. In other words, cultural strength is seen as having a dual role – as a form of social capital and as an indicator of stress and culture-conflict.[1]

Community strength

Broadhurst's recognition that cultural strength may also have a protective effect fits into broader notions that community strength works in a positive direction and leads to improvements in wellbeing. Various disciplines have investigated the notion of community strength and its ability to maintain and enhance individual and collective wellbeing (Black and Hughes, 2001). Notions of community sustainability, community resilience, community capacity and health all point to the 'capabilities' of communities to maintain and enhance positive outcomes. Community strength, in terms of the ability to meet community challenges or to act within communities for the wellbeing of its members, depends largely on the relationships which members have with each other, the relationships they have with other groups, the ways in which they are able to access resources, and their confidence in dealing with them. Relationships between people, organisations and systems are recognised as important ingredients of community strength (Black and Hughes, 2001).

Social capital and Aboriginal communities

Although there is consensus that social relationships are good for individuals and communities and help to reduce crime, the mechanism (theory) by which this occurs and extent to which this occurs, remain hotly debated amongst researchers. For example, there has been great debate about the notion of social capital. It has been criticised for being too vague a concept and for having inadequate measurement tools (Hunter, 2004; Brough et al., 2007). Some scholars have also recognised that there is a 'dark side' to social capital (as in mafia networks, for example). It is not yet clear whether social capital has a role to play in understanding and overcoming Aboriginal disadvantage in Australia. Hunter (2004) argues that 'the lack of clarity in the conceptualisation of social capital […] is what makes it potentially dangerous' (p.18). He advocates for a more modest conceptualisation and a clearly formulated theory of social networks because, for Aboriginal Australians, "the composition of social networks is likely to be crucially important" (Hunter, 2004: 19).

7.2 Purpose of the study

The principal objective of this study is to investigate influences on Aboriginal offending using self-reported data. The study uses the 2002 NATSISS to estimate the influence of various individual, family and community factors on both participation and frequency levels. Given the richness of the survey,[61] it was possible to identify and/or construct a number of 'culturally specific' risk factors in order to explore the role that these factors may play in the interaction between Aboriginal people and the Australian justice system.

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[61] The survey also had limitations which are described later in this chapter.

7.3 Method

The study employs a multi-factorial framework in which a range of personal, family and community factors are included in statistical models. 'Culturally specific' risk factors have been identified through reference to works by Homel et al (1999) and Broadhurst (2002). A number of these risk factors (e.g. cultural strength and community connectedness) have not previously been included in empirical studies.

7.3.1 Analytical Strategy

Regression models are used to estimate the effects of the various explanatory factors on the level of Aboriginal "offending", as measured through self-reported arrest rates. Arrest rates in this study are partitioned along two criminal career dimensions - prevalence and frequency of arrest - each being modelled separately. Modelling of the prevalence of arrest distinguishes between individuals who have *ever* been arrested by police and those who have not. Modelling of the frequency of arrest, on the other hand, differentiates between individuals on the basis of the number of arrests that accumulate over a given period. A number of studies have demonstrated that different sets of risk factors are associated with participation in offending versus frequency offending (Patternoster and Triplett, 1988; Nagin and Smith, 1990; Smith et al., 1991).

7.3.2 Data

The data for this study are sourced from NATSISS 2002 (Australian Bureau of Statistics, 2004b). NATSISS 2002 was an interview based survey conducted in 2002-2003 and administered Australia wide to Aboriginal people aged 15 years and over. A total of 9,359

persons and 5,887 households located in various urban, rural and remote settings responded to the survey.

Explanatory factors

Many of the explanatory variables included in the model were selected on the basis of extant research on the causes and correlates of offending (Office of Juvenile Justice and Delinquency Prevention, 1986; Loeber and Farrington, 1998b). As with any analysis, the 'choice' of explanatory factors was restricted by data availability. Of particular relevance is the impact of systemic factors (e.g. police harassment, discriminatory practices/treatment by police and/or other elements of the criminal justice system). While there is no doubt that these factors play an important part in determining the nature and extent of relationships between Aboriginal people and the justice system, the size of that impact cannot be assessed by the present study because no data was collected about these factors. It is worth noting that the NATSISS 2002 survey contained never before collected information on individual and family level stress factors. This reflects increased community and research interest in the effects of stress on human development and family functioning.

Dependent variables

Separate measures of the prevalence and frequency of arrest were derived from survey questions. As a measure of prevalence, the study used responses as to whether an individual had ever been formally charged by police. As a measure of the frequency of contact, the study used individual responses to the number of times a person had been arrested by police in the last 5 years. As Table 7.1 shows, the distribution of the frequency of arrest is highly skewed, with almost 60% of cases having a count of zero indicating that they had not had any

contact with police during the last 5 years. However, in 6% of cases, individuals stated that they have been arrested 5 or more times in the last 5 years.

Table 7.1: Prevalence and Frequency of police arrest

Prevalence: Ever charged	n	%	Frequency: Number of arrests in 5yrs	n	%
Ever charged by police	3,264	34.9%	0	1,919	59.2%
Never charged	6,095	65.1%	1	568	17.5%
Total	**9,359**	**100.0%**	2	313	9.7%
			3	149	4.6%
			4	92	2.8%
			5 or more	198	6.1%
			Total	**3,239**	**100.0%**

Excludes 25 cases of unknown arrest counts

Independent variables

Independent variables for the models were derived from the responses to various survey questions and are organised into personal/individual characteristics, factors that related to family or family context and those related to community, or neighbourhood contexts in which individuals live.

Personal factors

Sex. Of the 9,359 respondents, 43% were male and 57% were female.

Age. Age ranged from 15 to 75 years. One-quarter of respondents were below 25 years of age. A categorical variable was created which comprised individuals aged under 20 years (YOUTH=1).

Early onset. Respondents were asked about the age at which they were first formally charged by police. 21% said that they were first charged between the ages of 8 and 14 years. These individuals were flagged as early onset offenders (EARLY_ONSET=1).

Alcohol misuse. Respondents were asked about alcohol consumption level during the last 12 months. Those who reported high risk consumption levels (as per relative risk levels stipulated by NHMRC guidelines) were flagged as being alcohol misusers (ALCOHOL=1).

Substance misuse. Two variables were derived from questions about substance use – SUBEVER and SUB12. SUBEVER was based on responses to a question about whether a person had 'ever used substances for non-medical purposes'. The type of substances in this question included illicit drugs, medicated drugs, petrol and other inhalants. SUB12 was based on a question about whether a person had used these substances (for non-medical purposes) during the last 12 months. 22% of respondents admitted to *never* abusing substances in this way and 13% reported substance misuse *in the last 12 months*. Note, however, that for a large proportion of respondents (44%), i.e. those living in remote areas, the extent of substance misuse could not be ascertained because the ABS did not release substance use survey responses for this group. This was because prevalence rates for people living in remote areas were deemed too low to permit publication. As a consequence, the large and non-random nature of missing cases for the SUBEVER and SUB12 variables required special consideration in the analysis (described in more detail in a later section).

Unemployment. Respondents who indicated that they were in the labour force but were 'unemployed' were flagged as such (UNEMP = 1). Just over 10% of respondents were unemployed.

Education. Respondents with post-secondary qualifications were coded as EDUC = 2 (23%); respondents who reached Year 11 or Year 12 were coded as EDUC = 1 (17%), and those with education levels below Year 10 were coded as EDUC=0 (60%).

Acute financial stress. A number of questions about financial stress were used to determine whether respondents were subject to *acute* financial stress. Respondents with three or more of the following were deemed to have experienced acute financial stress: being unemployed;

living in a single parent family; cash flow problems; having experienced days without any money in the last 12 months; having used strategies to meet basic living expenses in the last 12 months. In total, 28% of respondents fell into the acute group.

Victimisation. Respondents who reported being the victim of a physical or threatened violence in last 12 months were flagged accordingly (VICTIM=1). It was not possible to discern actual violence from threats of violence or to distinguish different forms of violence (eg family violence, sexual assaults, etc). One-quarter of respondents reported being the victim of violence.

Factors related to family context

Stolen generation. Respondents were asked if they or their family members had been removed from their natural family. Just under one in ten respondents reported that they had been removed personally and 43% had had relatives removed.

Acute family stress. Respondents were asked about whether they had been stressed by a range of family/community events during the last 12 months. Stressors included divorce/separation, death of family member or someone close, serious illness or disability, serious accident, alcohol or drug problems, mental illness, job problems, violence, trouble with police, gambling, overcrowding at home, pressures of cultural responsibility and racism or discrimination. Responses regarding each of the stressors were accumulated. Respondents who reported eight or more stressors during the 12 month period were flagged as having experienced acute family stress (ACUTE_FAM =1). In all, 9% of respondents fell into the acute group.

Single parent family. Persons who indicated that they lived in a one-parent family were identified accordingly (SINGLEP=1).

Factors related to community

Cultural strength. In line with earlier works (for example, Broadhurst (1997; 2002) and Homel et al (1999)), an indicator of an individual's cultural strength was derived from responses to several key questions. These were: whether a person spoke an Aboriginal language; whether they identified with clan, tribal or language group; whether they recognised homelands; and whether they had attended cultural event(s) in the last 12 months. Respondents who answered positively to at least three of these questions were coded as having 'strong' culture (SCULT=1). About half (52%) of respondents fell into this group.

Community connection. Similarly, an indicator of each individual's sense of community connectedness was derived from the responses to several NATSISS questions. Pertinent questions included whether the person had support in a time of crisis; whether they participated in sport/physical activity in last 12 months; whether they were involved in social activities in last 3 months; and whether they perceived their community/neighbourhood to be relatively problem free. Respondents who answered positively to three or more of these questions were coded as having a 'strong' connection to community (SCOMM=1). Half of all respondents fell into this category.

Geographical location. Only broad geographical groupings were released with survey data. These were: Major cities, Inner regional, Outer regional and Remote/Very remote. In all, 44% of respondents were located in remote/very remote areas.

Crime problems. Respondents were asked not only about the existence of neighbourhood/ community problems but also the nature of these problems. Cases where specific crime problems were identified (i.e. where respondents stated that there was theft and/or damage to property, and/or illegal drugs, and/or family violence, and/or assault and/or sexual assault), were coded as having crime problems (CRIME=1). Neighbourhoods or communities with other problems, such as the presence of youth gangs or problems with neighbours, were not

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considered to be crime prone, however, they were included in the derivation of the community connection variable (above).

7.3.3 Statistical methods

Bivariate analyses were initially undertaken to examine the effect of each of the variables described above on i) the prevalence of arrest (Ever Charged), and ii) the frequency of arrest (Number of Arrests in last 5 years). Results are described in Table 7.2. Logistic regression models were then used to determine the relative influence of each potential explanatory factor on the prevalence of *ever* being charged by police. All 9,359 cases, unweighted, were included in the analysis. All of the explanatory variables described above were included in initial models and a method of backward selection was employed.

Missing values

Several variables (alcohol misuse, substance misuse and being part of the stolen generation) had substantial numbers of cases with missing values. In order to retain as much information as possible, the affected variables were treated and retained. Treatment consisted either of creating additional variables that accommodated the missing values or creating additional values or 'levels' within existing variables. These variables/levels were then tested for statistical significance and, where there was evidence of an effect, the additional variables/levels were retained. Of the three variables most affected by missing values, only being part of the stolen generation emerged as having significant missing value effects.

Remote area issues

Data about substance use was not available for individuals living in remote areas. This not only generated a large number of missing values in the substance misuse variable (which was handled as described above) but the systematic, non-random distribution of missing values in

the data meant that it was necessary to check whether this had an impact on other factors in the model. Using an approach similar to Weatherburn, Snowball and Hunter (2006), the study undertook a form of sensitivity analysis, running separate regression models for the total population and the non-remote cases (only) and then checking for significant deviations in parameter estimates between models.

Interactions

A number of interactions between explanatory variables were also included in the logistic regression models to test for potential *differential* and/or *moderating* effects and to assess the *inter-relatedness* of many risk factors – a point made by some researchers (National Crime Prevention, 1999; Homel et al., 1999). Included were interactions between gender and family stress, gender and financial stress, gender and victimisation, alcohol misuse and substance misuse, as well as culture and crime, culture and community.

Modelling frequency of arrest

Ordinary least squares (OLS) regression was used to model the frequency of police arrest. A total of 3,239 cases were included in the analysis. Owing to the skewed distribution of the data on frequency of arrest, the log transformation of the dependent variable (FRARREST+1) was modelled. Age was included in OLS modelling as a continuous variable. Missing values were treated in the same way as in the logistic regression models. As previously, the collinearity of potential explanatory variables was also checked and found not to be significant. This was the case for all variables, including those derived from other variables (e.g. financial stress).

7.4 Results

A descriptive summary of factors influencing both the prevalence and frequency of police arrest are presented in Table 7.2. Males were more likely than females to be arrested by police (they accounted for 43% of the original survey sample but 64% of those ever charged by police). Males also had a higher frequency of offending than females. They accounted for 76% of high-frequency offenders (i.e. those arrested three or more times in the last 5 years), as compared with just 24% for women. Young people comprised just 8% of those ever arrested by police, yet they accounted for 14% of the survey sample. This under-representation is not surprising and arises because prevalence is a cumulative and not age based measure. As individuals get older, the opportunity and thus likelihood of ever being arrested by police increases.

Table 7.2: Descriptive summary of explanatory variables in regression models

Explanatory Variables		Total survey sample	Prevalence: Ever Charged	Frequency: 3+ arrests in 5 yrs
		%	%	%
Personal factors				
Sex	Female (0)	57%	36%	24%
	Male (1)	43%	64%	76%
Youth	20 years and over (0)	86%	92%	88%
	Under 20 years (1)	14%	8%	12%
Education level	Did not reach SHS (0)	60%	63%	67%
	Reached SHS (1)	17%	14%	13%
	Post-secondary education (2)	23%	23%	20%
Alcohol misuse	Unknown usage (-1)	1%	1%	1%
	Not High-risk alcohol use (0)	84%	74%	61%
	High-risk alcohol use (1)	16%	25%	38%
Substance misuse (ever)	Unknown usage (-1)	49%	47%	44%
	Never misused (0)	29%	20%	14%
	Ever misused (1)	22%	32%	42%
Substance misuse	Unknown usage (-1)	49%	48%	44%
last 12 months	Not misused in last 12 mths (0)	38%	31%	21%
	Misused in last 12 mths (1)	13%	21%	34%
Employment status	Employed or NILF (0)	89%	84%	73%
	Unemployed (1)	11%	16%	27%
Financial stress	Non-acute stress (0)	72%	65%	56%
	Acute stress - 3+ stressors (1)	28%	35%	44%
Victim of crime	Not assaulted in last 12 mths (0)	75%	65%	47%
	Assaulted in last 12 mths (1)	25%	35%	53%
Early onset offending	First arrested at age 15yrs+ (0)	94%	82%	69%
	First arrested between 8 & 14 yrs (1)	6%	17%	31%
Family-context				
Part of stolen generation	Unknown stolen status (-1)	18%	17%	18%
	Person or relatives not taken (0)	45%	40%	35%
	Person or relatives taken (1)	37%	43%	46%
Family stress	Non-acute stress (0)	91%	87%	81%
	Acute stress - 8+ stressors (1)	9%	13%	19%
Family type	Not living in single-parent family (0)	72%	74%	71%
	Living in single-parent family (1)	28%	26%	29%
Community-context				
Cultural ties	Not strong (0)	47%	46%	47%
	Strong (1)	53%	54%	53%
Community connection	Not strong (0)	49%	54%	54%
	Strong (1)	51%	46%	46%
Region	Major cities (1)	16%	15%	19%
	Inner regional (2)	13%	14%	14%
	Outer regional (3)	27%	28%	27%
	Remote/very remote areas (4)	44%	43%	40%
Crime-prone neighbourhood	Crime not a problem (0)	38%	35%	33%
	Crime is a problem (1)	62%	65%	65%
Total cases described in this table		9,359	3,264	439

7.4.1 Prevalence of arrest

Results from the logistic regression model of the prevalence of arrest are presented in Table 7.3. The results show that gender, high risk alcohol consumption and substance misuse have the most significant influence on the prevalence of Aboriginal arrest. Odds ratios indicate that the likelihood of ever having contact with the justice system for males is about four times that of females. High risk alcohol consumption and, separately, substance misuse (ever) are factors that more than double the risk of ever being arrested by police.

Other individual factors, such as being unemployed and being subjected to acute financial stress also increase the odds of ever being arrested by police. However, the effects of these factors are somewhat smaller than those that can be attributed to gender, alcohol use and substance misuse. Being a recent victim of an assault, too, is associated with a greater likelihood of being charged by police. As the results show, the odds of police arrest for assault victims are almost twice that of non-victims.

Of lesser (but still statistically significant) influence are factors related to family circumstances, such as being part of the stolen generation and being subjected to acute family stress. Each of these factors, as well as living in an outer regional or remote location, increases the odds of arrest by a factor of 1.3-1.5.

Not all of the factors incorporated in the model operate to increase the risk of contact with police, however. A higher level of education, for instance, is associated with reduced likelihood of police arrest. It is notable that the 'protective' effect of education appears to be greatest upon reaching senior high school. As the results show, the odds ratio for individuals

reaching senior high school grades (SHS) is the same as that for those individuals attaining a post-secondary level of education. This suggesting that, at least in terms of the likelihood of ever being arrest by police, attaining tertiary qualifications may be of marginal value.

Variables which measure the strength of cultural ties and connection to community were also found to be significant factors in the model and both appear to offer separate, protective effects against police arrest. Indeed, the odds ratios associated with each of these factors appear to be comparable with those associated with educational achievement to senior high school.

Several factors were found not to be significant in the model. Neither living in a single-parent family nor in a crime prone community appeared to affect the likelihood of police arrest. Interaction terms, too, had no significant effect in the model. None of the interactions between gender and other factors, nor those between culture and crime, and culture and community were significant. Owing to issues of missing data for substance use in remote areas, interactions between alcohol misuse and substance abuse could only be tested for the non-remote sample (and not the total survey sample). Even for this group, the interaction terms did not produce statistically significant effects.

Table 7.3: Results from logistic regression modelling of the prevalence of police arrest

Explanatory Variables	Parameter Estimate	Std Error	Odds Ratio	95% CI
Intercept	-0.370	0.117	n/a	
Individual factors				
Sex				
Male v Female	0.749	0.026	4.47	(4.40,4.94)
Youth				
Under 20 years v 20 years and over	-0.532	0.042	0.35	(0.29,0.41)
Education level				
Reached SHS v Did not reach SHS	-0.114	0.047	0.72	(0.62,0.82)
Post-secondary v Did not reach SHS	-0.105	0.043	0.72	(0.64,0.82)
Alcohol use				
Unknown usage v Not high-risk user	-0.263	0.203	0.99	(0.55,1.80)
High-risk user v Not high-risk user	0.520	0.109	2.17	(1.91,2.47)
Substance misuse (ever)				
Unknown usage v Never misused	-0.069	0.080	1.45	(1.14,1.86)
Ever misused v Never misused	0.511	0.054	2.59	(2.26,2.98)
Employment status				
Unemployed v Employed or NILF	0.230	0.041	1.59	(1.35,1.86)
Financial stress				
Acute stress v Not acute	0.219	0.030	1.55	(1.38,1.75)
Victim of crime				
Assaulted v Not assaulted	0.341	0.029	1.98	(1.77,2.22)
Family-context factors				
Part of stolen generation				
Unknown stolen status v Not stolen	-0.112	0.043	0.98	(0.86,1.13)
Person/relative stolen v Person/relative not stolen	0.206	0.036	1.35	(1.21,1.51)
Family Stress				
Acute stress v Not acute	0.218	0.042	1.55	(1.31,1.82)
Family type				
In single-parent family v Not in single parent fam	n.s.			
Community-context factors				
Cultural ties				
Strong v Not strong	-0.058	0.027	0.89	(0.80,0.99)
Community connection				
Strong v Not strong	-0.164	0.026	0.72	(0.65,0.80)
Region				
Inner regional v Major cities	0.036	0.062	1.30	(1.08,1.55)
Outer regional v Major cities	0.108	0.053	1.39	(1.19,1.63)
Remote/very remote v Major cities	0.080	0.093	1.35	(1.04,1.76)
Crime-prone neighbourhood				
Crime a problem v Crime not a problem	n.s.			

N = 9359

Goodness of fit:
 -2 Log Likelihood=12104.419
 (Pseudo) R-Square = 0.2037
 Hosmer-Lemeshow = 7.7849 (df=8; p=0.4548)

7.4.2 Frequency of arrest

Results from the OLS regression modelling of the log-transformed frequency of arrest, $\log(\text{FRARREST}+1)$, are presented in Table 7.4. Variables entered into the model comprised those entered in the earlier prevalence model plus one or two other variables that according to literature are known to influence the frequency of arrest, for example, early contact with police and recent substance use.

As one might expect, gender was found to be a strong determinant of the frequency of arrest and, as the results in Table 7.4 show, it has one of the largest parameter estimates. Also highly predictive of an elevated frequency of arrest is early contact with police. As shown in Table 7.4, the frequency of arrest of "early onset" individuals (i.e. those who were first arrested by police when very young - between the ages of 8 and 14 years) is significantly higher than that of other individuals, independent of all other factors. Another influential factor is unemployment: individuals who were unemployed had a significantly higher frequency of arrest than those who were either employed or not considered part of the labour force.

There were a number of other personal factors included in the model that, like unemployment, were found to influence both the prevalence *and* the frequency of arrest. These include alcohol use, experiencing acute financial stress and being a recent victim of an assault. Substance misuse, too, influenced the frequency of arrest, though to a much lesser extent. Note, however, that it is *recent* substance misuse, not *past (ever)* misuse that has particular effect.

It is worth noting that not all factors operated on the prevalence and frequency of arrest in the same way or to the same extent. *Past* substance misuse, for instance, did not have a significant influence on arrest frequency, despite it having a large influence on the prevalence of arrest (demonstrated earlier). There were several other factors that fell into this category. Being part of the stolen generation; having strong cultural ties and geographical location were factors that, like past substance misuse, did *not* have a significant effect on the frequency of arrest, despite having a demonstrated influence on the prevalence of arrest. In other words, these factors appear to influence initial involvement with police but not the extent of contact or its continuity over time.

As Table 7.4 also shows, educational attainment and community connection are factors which independently show association with lower rates of arrest. Moreover, as protective factors, they are significant in affecting both the prevalence and frequency of arrest. Note, though, that the parameter estimate for education is smaller than that of community connection, suggesting that the protective effective of education is less than that of community connection.

Table 7.4: Results from OLS regression modelling of the frequency of police arrest -

log(FRARREST+1)

Explanatory Variables	Parameter Estimate	Std Error
Intercept	0.553	0.043
Personal factors		
Sex	0.164	0.021
Age	-0.011	0.001
Early onset	0.175	0.027
Education level	-0.033	0.012
Alcohol use	0.140	0.023
Substance misuse (ever)	n.s.	
Substance misuse (last 12 mths)	0.069	0.014
Unemployment status	0.123	0.029
Financial stress	0.068	0.022
Victim of assault	0.162	0.021
Family-context factors		
Person or family part of Stolen generation	n.s.	
Family Stress	0.086	0.030
Single parent family	n.s.	
Community-context factors		
Cultural ties	n.s.	
Community connection	-0.068	0.020
Region (ASGC)	n.s.	
Crime-prone neighbourhood	n.s.	

Unless otherwise stated, all variables are significant at 0.05 level

n.s. = not statistically significant

N = 3264

Goodness of fit:
Adjusted R-Square = 0.1782
Corrected Total Sum of Squares = 1130.8384 (df=3150)
Model Sums of Squares = 201.3582 (df=11); F-value = 61.82 (p< 0.0001)

7.5 Discussion

7.5.1 Different risk factors, different dimensions

Figure 7.1 brings together the results from the various analyses and demonstrates that there are a range of factors which have a statistically significant influence on Aboriginal arrest levels. The figure shows that some factors have an influence on just one dimension of Aboriginal "offending", while other factors have a bearing on both the prevalence *and* frequency of Aboriginal "offending". Recent substance misuse, for instance, is identified as

being a determinant of the frequency of arrest (but not of the prevalence of arrest), while past substance misuse (i.e. ever misused substances) is identified as being a significant determinant of the prevalence of arrest (but not frequency of arrest). Apart from serving as a useful reminder of the fact that there are both distal and proximal forces at work in shaping an individual's behaviour, this example also highlights the important distinction between 'prevalence' and 'frequency' of offending. This distinction has both theoretical and practical significance.

Figure 7.1: Influences on the prevalence and frequency of Aboriginal arrest - shared and different risk/protective factors

PREVALENCE OF
ARREST

Risk
Substance misuse (ever)
Stolen-generation
Remote location
Protective
Strong cultural ties *

Risk
Gender
Alcohol*
Victimisation
Unemployment
Financial stress
Family stress
Protective
Education level*
Community connection

FREQUENCY OF
ARREST

Risk
Early Contact
Recent substance
misuse

* Less significant in urban (non-remote) areas

Not significant
Crime-prone area
Single parent family

At a theoretical level, distinguishing between criminal career "dimensions" facilitates the study of potentially different underlying causes and the development of comprehensive explanations or theories of crime and offending (Piquero et al., 2003). At a policy level, the

distinction between these "dimensions" encourages a diversity of responses/action from government, providing justification for the development and provision of a variety of policy initiatives – some targeted at the *prevention* of offending (i.e. reducing participation), while others are aimed at reducing the frequency of contact among those who are already involved in the justice system. Early intervention programs are primarily focused on preventing participation in crime. Policies aimed at reducing recidivism are implicitly based on an understanding that the individual frequency or rate of offending can be affected. The distinction between crime prevention and crime reduction policies also helps to distribute responsibility for action and intervention.

7.5.2 Common risk factors

As well as identifying different risk factors for the separate "dimensions" of involvement with the justice system, the study also identifies a number of common or shared factors - gender, alcohol use, victimisation, unemployment, financial and family stress – which not only increase the likelihood of (any) contact with the system but also play a part in affecting the intensity or frequency of that contact over the life course.

Alcohol abuse

Alcohol abuse emerges from this analysis as a critical risk factor. There is an abundance of evidence which demonstrates the caustic effect of alcohol on individual, family and community functioning. Much has already been written in terms of criminal justice responses and future directions (Weatherburn, 2008; Weatherburn et al., 2006; Putt et al., 2005; Weatherburn et al., 2008; Pearson, 2001; Wundersitz, 2010). What this study further demonstrates is that any effort which addresses alcohol abuse is likely to have a dual impact on Aboriginal involvement with the justice system – reducing both the number of people who

have contact with the justice system and the frequency of contact of those who are already involved with justice.

Victimisation

The finding that victimisation also increases both the prevalence and frequency of contact with the justice system is also a useful reminder of the overlap which exists between victimisation and offending. Although this link is well established, the causal mechanisms that underlie the relationship are still poorly understood (Lauritsen and Laub, 2007). There is little doubt that the cycle of violence and abuse in Aboriginal communities and families is closely related to alcohol consumption (Wundersitz, 2010); however, it would be erroneous to attribute all cause to "grog". The connection between victimisation and offending in Aboriginal communities needs to be studied and understood in its own right, with policies to prevent Aboriginal victimisation being explicitly connected to policies designed to curb violent offending.

Financial and family stress

Both financial stress *and* family stress emerge from the study as significant shared risk factors. The link between financial hardship and increased involvement in crime is well documented in the literature. In addition, research has shown the effects of economic stress to be indirect as well as direct. For example, research by Fergusson, Swain-Campbell et al. (2004) and later by Weatherburn and Lind (2006) show that economic stress affects involvement in crime *indirectly* through disrupted social (child rearing) processes.

The findings in relation to the effects of family stress on involvement with justice are relatively new, however. The 2002 survey was the first NATSISS to collect information on

individual and family level stress factors. The inclusion of these items in the survey reflects accumulated research evidence and growing community interest in the effects of stress on human development and family functioning. Research and theory in developmental psychology and developmental health have been particularly prominent in demonstrating that stress has a negative impact on the cognitive, social, emotional, and physical functioning of individuals over the life-course (Shonkoff and Phillips, 2000). Despite these developments, researchers in the social sciences have been reluctant to accept biological explanations for the link between stress and criminal behaviour. More often than not, social scientists have tended to absorb aspects of family stress into other indicators of family functioning and, in turn, show these to be linked to involvement in crime. However, the current research differs from other studies in that it distinguishes between family stress and other aspects of family functioning (e.g. single parent family) and between family stress and economic stress. In so doing, the study findings show that family stress not only operates independently from these other factors but that it has a significant effect on involvement in the justice system in its own right.

Stolen generation

Study findings are broadly consistent with those of researchers working in the Aboriginal field who have asserted that factors related to family disruption are critical in driving high arrest rates amongst Aboriginal people. Dodson and Hunter (2006) focus not on family stress but on another family related factor - the removal of people from their natural family (i.e. 'stolen generation'). The authors identify this is as significant 'culturally specific' factor, arguing that that "while many Australian families experience disruptions to their social fabric, the experience of the stolen generation is unique to Aboriginal Australians." (Dodson and Hunter, 2006: 38) Using data also sourced from NATSISS 2002, they demonstrate that

being involved in the stolen generations – either directly or indirectly through other family members – was highly correlated with both arrest prevalence and arrest frequency.

The current study, too, tested the link between being part of the 'stolen generation' and involvement in the justice system. However, unlike Dodson and Hunter (2006), the study found that removal from family was significant only in relation to the prevalence of arrest. Being part of the 'stolen generation' did *not* significantly influence the frequency of arrest. Why do these findings differ from those of Dodson and Hunter, especially given that both studies used the same underlying dataset? There are several possible reasons. First, Dodson and Hunter only considered correlations between being part of the stolen generation and the various measures of justice involvement. They did not undertake multivariate analysis and so they did not account the potential confounding effect of other factors. Second and related, it is likely that the inclusion of 'other' factors in current models – particularly 'family stress' – may have begun the process of disentangling the effects of being part of the stolen generation. If family disruption (and associated stresses) and stolen generation are inter-related, as Dodson and Hunter claim, then one would expect some interaction of these factors to take place in statistical models. The current study did not explore these interactions in detail; however, given the divergence of findings, it is clear that further research and analysis is warranted. As Dodson and Hunter concluded, "the effects of such disruptions are demonstrably ongoing and long-lived and *need to be understood*" (p. 38, italics added).

Protective factors

As well as identifying shared 'risk' factors, the study identified two shared 'protective' factors - education and connection to community - which operated to reduce involvement with the justice system. Findings in relation to the protective effects of education are

consistent with the literature on the positive effects of education on life outcomes and accord with prior research on factors affecting Aboriginal arrest rates (Hunter, 2001; Weatherburn et al., 2006; Hunter and Schwab, 1998). Findings did show, however, that the influence of post-second/tertiary education on Aboriginal arrest levels was not as significant as that of secondary school education. This would seem to suggest that higher education is of marginal benefit in reducing involvement in justice. However, there may be other explanations for the effect observed. The findings may simply be a reflection of aging: young people attaining post-secondary qualifications are older than those in high school and are likely to have passed their 'peak' of criminal activity (as per the typical age-crime curve). Given that they are more likely to be on the downward slide of the age-crime curve, the differential effect of education (or, indeed, any factor) on criminal involvement at that stage would also be less, therefore.

While the current study examined the influence of education on involvement in justice, it is worth recalling that the link between education (and also employment) and involvement in crime is bi-directional (Hunter, 2006; Hunter and Schwab, 1998; Dodson and Hunter, 2006). A number of these studies have shown that involvement in crime, and particularly *early* involvement in crime, also has a negative effect on educational outcomes (and employment). In the language of economists, involvement in crime hinders the process of human capital accumulation.

Connection to community

The present study assessed the role that connection to community plays in influencing involvement in the justice system. The study is one of the first to construct and analyse factors of this sort from NATSISS data. On this issue, findings accord with much of the literature which suggests that high levels of social participation and connectedness contribute

to the overall wellbeing of society as well as to the resilience of individuals and communities. The findings give empirical recognition to the importance of social networks within Aboriginal communities and suggest that connection to community may be at least as influential as some of the more recognised protective factors (e.g. educational achievement) in reducing involvement in crime. While acknowledging that our understanding of social capital is still evolving (and its relevance to Aboriginal people is still the subject of much debate), the findings may be seen as tentative evidence that there are crime and justice related benefits to community connections and the accumulation of social capital which ranks equally with the accumulation of human capital.

7.5.3 Role of other culturally specific factors

Cultural strength

The study also assessed the role that cultural ties play, if any, in influencing Aboriginal involvement in the justice system. Here, the study followed Broadhurst's approach, constructing a variable representing 'cultural strength' and including it in various model(s). Overall, results indicate that 'cultural strength' is protective and tends to reduce involvement in justice. This supports the view that cultural strength is a form of social capital and contributes positively to Aboriginal communities. However, its influence appears to be patchy - affecting only the prevalence of arrest (not the frequency of arrest) and only of people living in remote areas. It is difficult to know how to interpret this finding. On one hand, finding that cultural strength is protective is at odds with notions that culture brings conflict when a minority cultural group is subject to the influences of a dominant group. On the other, it confirms its role as a form of social capital. In a manner, the study has tested the relative strength (note, not relative merits) of two differing theories of Aboriginal over-

representation - culture-conflict versus socio-economic adversity. On the evidence presented, there appears to be less of a case for culture-conflict and a stronger case for socio-economic explanations of Aboriginal over-representation in the justice system.

7.5.4 Study limitations

The study has both strengths and weaknesses. On the plus side, the study has sought to understand involvement with justice through self-reported data rather than through official records. On the minus side, some readers may be critical of the study's risk factor approach. Usual criticisms of the risk factor paradigm are that it is positivistic (Case, 2007) and that interpretations of results are difficult. Establishing causality is made more difficult, if not impossible, by the cross-sectional nature of the survey data. Moreover, issues may be raised about internal validity, that is, whether or not the measures used in analysis match up to constructs. In an evaluation of the measures used in NATSISS, however, Weston and Gray (2006) found that the 2002 survey does a 'good job' in measuring a range of aspects of family and community life. The authors acknowledge, though, that "family and community life is multi-dimensional and complex, and therefore very difficult to measure. Collecting such information in surveys is always a challenge but is particularly so for some sections of the Indigenous population" (Weston and Gray, 2006: 37).

While it is acknowledged that the study suffers from shortcomings, the study also has strengths. The risk factor paradigm is but one approach in arriving at a more sophisticated understanding of the processes that lead to crime in Aboriginal communities and to elevated levels of contact with the justice system. The study has taken heed of calls to examine an array of more culturally specific factors. To the extent that these factors (both risk and protective) could be extracted from the available data, the study has attempted to do this and

in the process, has uncovered something new. As it stands, the study's findings contribute to the growing body of empirical research which furthers current understanding of the positive and negative forces shaping interactions between Aboriginal people and the justice system. While the community continues to learn something new from this kind of research, there is both hope and opportunity of addressing the otherwise forlorn cause of reducing Aboriginal over-representation in the Australian justice system.

8. Discussion and Conclusion

The purpose of this thesis was to gain a deeper understanding of the development of offending over the life course and to explore if, and how, offending behaviour varies in ways that reflect the diversity of the general population. The research adopted a criminal career/developmental approach and sought to i) document the prevalence and frequency of offending in the WA population and ii) identify observable "group" differences in these criminal career dimensions. "Groups" of primary interest here were those defined primarily by demographic characteristics - gender and Aboriginal status. A risk factor framework and various statistical methods, including trajectory analyses, were used to identify the correlates associated with offending. While the identification of correlates *per se* do not make explicit the mechanism by which these factors affect offending, the process is seen as an important first step towards a deeper explanation of why people offend. This approach is consistent with Bernard and Snipes (2010) view that the risk factor approach provides an 'integrative' framework for criminological theories.

This thesis focussed on two important dimensions of offending: participation and frequency. As noted in Chapter 1, disaggregating offending into these criminal career components provides the most basic information about offending, namely, *who* commits crime (participation) and *how much* crime they commit (frequency). Distinguishing between participation and frequency enables better understanding of the phenomenon of offending by researchers, policy makers and the general community. This approach also aligns with current day approaches to crime prevention: primary prevention aims to prevent crime through reductions in *participation* in offending, while secondary and tertiary initiatives aim

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to reduce crime through reduction in offending *frequency*. The distinction between offending participation and frequency also has importance for theory development because it raises the possibility that different theories may be needed to explain the patterns and causes of each dimension of crime. The underlying hypothesis being that if different criminal career dimensions share that same correlates or predictors then this suggests 'generality' in crime, that is, that the underlying cause of either dimension is fundamentally the same. However, if dimensions and correlates are found to be different, then this suggests unique causal pathways and confirms the need for more complex theories about offending. Despite being of theoretical importance, empirical research into the *differential* aspects of offending participation and frequency has been limited (Petras et al., 2010). Results from studies comparing participation correlates with frequency correlates have been mixed and, to date, no clear theoretical view has emerged as to whether the causal processes underlying these dimensions are shared or unique.

The review of literature in Chapter 1 also highlighted the importance of investigating gender and ethnic differences in offending. While evidence of such differences is not disputed, the associated explanatory accounts often vary. On the issue of gender, debates have often been polarised and, for many commentators, the ability of mainstream theories to explain gender disparities has been found wanting. This has led to the emergence of alternative explanatory models that differentiate female offending from male offending. The review found, however, that greater empirical testing of these alternative models was required. There was need, too, for more integrated perspectives and for a broader set of risk factors to be included in empirical models so that the influence of life events on offending *across both gender groups* can be better understood.

The review also identified gaps in research relating to ethnic disparities in offending. The issue of ethnic disparity is of particular relevance in Australia because of the persistently high level of contact between Aboriginal people and the criminal justice system. As to causes of ethnic disparities, as evidenced in Australia and elsewhere, the review found here too that debates have been polarised and that often competing perspectives have been put forward to account for the differences observed (e.g. differential exposure versus selection bias). The review identified the need for a more integrated approach and for improved empirical models that better capture the spectrum of factors which may influence offending by different ethnic groups.

The case was made that these issues are important both in the development and implementation of effective criminal justice policies and interventions at primary, secondary and tertiary levels, and in the development of grounded theories of offending. Sets of questions were posed in an early chapter to help guide the research. These questions were answered through a series of discrete but related studies (described in Chapters 3 to 7).

In the section which follows, the major findings and conclusions from each of these Sub-studies are summarised. I then look across the studies and comment on similarities and points of difference. Throughout, I consider the theoretical, research and/or policy implications of emerging results.

8.1 Summary of major findings

8.1.1 Sub-study 1 - Prevalence of offending

Sub-study 1 (Chapter 3) focussed on the prevalence of offending and sought answers to the following question: *What is the overall prevalence of offending in the population? How does this prevalence vary between (demographic) groups? How does offending prevalence vary over time?*

Prevalence estimates varied considerably amongst the population sub-groups, indicating an uneven distribution of official offending in the general WA population. Based on the 1977 birth cohort, 25% of males, 12% of females, 45% of the Aboriginal population and 17% of the non-Aboriginal population had had contact with the justice system by age 18. As expected, the prevalence of offending was found to be greater amongst males than females (by a factor of two). Differences in prevalence levels by Aboriginal status were more marked. The prevalence of offending was greater in the Aboriginal population than in the non-Aboriginal population - by a factor of three. If an alternate measure of prevalence was used at an earlier age point (15 years), the difference between Aboriginal and non-Aboriginal prevalence level was even greater (by a factor of 10). This indicates the importance of early onset to the criminal careers of Aboriginal offenders.

Sub-study 1 also examined long term trends in offending prevalence and the effects of age, period and cohort effects on these patterns. Using two alternative measures of prevalence, the study found strong age effects for all demographic groups. Adjusting for age effects, strong period influences were found for only one prevalence measure (PM1). As PM1 included

juvenile justice contacts (while the alternative measure did not), it was concluded that the observed period effects were a consequence of increased *period specific* juvenile justice activity. The study also found that period effects had a much larger impact on Aboriginal prevalence estimates than on non-Aboriginal estimates. In contrast, female prevalence levels did *not* shift significantly over time - period effects for females were small. This finding appears to contradict a substantial body of evidence asserting increasing involvement of women in crime.

Some cohort effects were also identified but these were difficult to interpret, as they ran counter to expectations. The study found that as the size of each cohort increased, the offending prevalence levels declined. This inverse relationship contradicts that predicted by a number of criminological theories. It was also not clear why cohort effects should differ between population subgroups, such as between Aboriginal and non-Aboriginal groups. Some scholars (e.g. Stockard and O'Brien, 2006) have suggested that this may be due to cultural differences in social capital. However several findings from Sub-study 1 do not support this interpretation. First, the overall direction of the effect runs opposite to that proposed by any current theory; second, it is not yet clear what role social capital plays in understanding and dealing with Aboriginal disadvantage and high levels of offending; and, third, the difference between Aboriginal and non-Aboriginal groups may, in part, be related to the reliability of the study's cohort measure for Aboriginal people. Recall that estimates of the Aboriginal population base-population for WA were small and subject to error, particularly when broken down further by gender and year of birth. Consequently, judgement on cohort effects must be reserved.

All of these findings have implications for criminal justice practice and for research. As many commentators have noted, studies of prevalence are important because they provide essential knowledge about the extent and distribution of offending in the population. This information enables policymakers to both target crime prevention/social policies and subsequently assess the impact of those policies. As the findings from Sub-study 1 made clear, males and Aboriginal children are vastly over-represented in the offending population in WA. Further, it is evident that Aboriginal children have much earlier contact with the criminal justice system than non-Aboriginal children. There is strong evidence, too, that these patterns are long-standing, as gender and ethnic disparities were evident across a long series of consecutive birth cohorts (19 of them).

From a prevention view point, the study results suggest that primary crime prevention initiatives should be directed toward those population strata with high prevalence levels – notably, the Aboriginal population and males. However, Sub-study 1 also demonstrated a need to monitor and evaluate the impact of such policies, as these may not always operate according to expectations. Indeed, in reviewing long term trends in prevalence, the study found evidence of period effects which were consistent with net-widening following the transition to the *Young Offenders Act (WA) 1994*. Researchers in other parts of Australia have noted similar net-widening effects following comparable criminal justice reforms during the 1990s. However, where this study differs from the earlier ones is in relation to findings of *differential effects*. The current study found that while male prevalence levels increased over a period, female prevalence levels did *not* shift significantly. In other words, the *number* of female offenders did *not* increase over the study period. However, the lack of an observable increase in female prevalence does not necessarily mean that female crime levels remained static. It is possible that the frequency of female offending may have increased, while

prevalence remained at the same level. In other words, the number of females involved in crime did not change but the intensity of offending amongst those females involved in crime increased. This would give rise to increases in the number of crimes committed by females without increased numbers of female offenders. Indeed, results from Sub-study 2 and Sub-study 3, which explored the frequency of offending and their patterns over time, support this explanation.

The study also found that period effects had a much larger effect on Aboriginal prevalence levels than on non-Aboriginal levels, indicating that the structural reforms of the 1990s that were achieved through various 'destructuring' initiatives within the juvenile justice system had a much greater net-widening impact on the Aboriginal population than on other demographic groups. Given the already elevated level of contact of Aboriginal people with the criminal justice system, evidence of differential net-widening is cause for concern. It is somewhat ironic that a number of reforms implemented during the 1990s arose from the recommendations of the Royal Commission into Aboriginal Deaths in Custody (Johnston, 1991) and were originally designed to keep Aboriginal people out of the justice system. On the evidence, it appears that some of the reforms acted in precisely the opposite direction – bringing more Aboriginal youth into contact with police over a period of time, thereby increasing their opportunity for repeated and potentially more serious contact with the justice system.

8.1.2 Sub-study 2 - Frequency of offending

Sub-study 2 and Sub-study 3 (Chapters 4 and 5) both focussed on a different criminal career dimension - offending frequency. Sub-study 2 sought answers to the following questions:

How does the frequency of offending vary with age? Is there evidence of group based variations in the frequency of offending?

Answers to these questions are important for both policy-making and theory development.[62] From a policy perspective, age based variations in offending highlight the need for age-specific, or at least, age sensitive, crime reduction strategies. Policies aimed at reducing recidivism, which are implicitly based on an understanding that the individual rate of offending can be affected, need to make greater allowance for age related factors. The evidence suggests that such strategies need to be closely tuned to the factors and life events that influence criminal activity at *different* life stages. That offending frequency also varies *between distinct groups of individuals* has implications for policy, too. Group differences suggest the need for interventions which more specifically target clusters of offenders (such as chronic or life-course persistent offenders) and the specialised needs and/or risk factors associated with such groups. Gender and ethnicity-based offending patterns also have interest for researchers because they emerge as strong correlates of crime and because the explanatory models that have been put forward to account for them vary so widely. A number of early studies suggest that age based patterns of offending *do* vary with gender. Few studies, though, have examined whether ethnic based differences exists in the frequency of offending. Australian studies of Aboriginal/non-Aboriginal differences in offending frequency, particularly those based on longitudinal, population level data, are scant.

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[62] The theoretical importance of studying offending frequency and of exploring group-based differences in offending frequency was pursued in greater detail by Sub-Study 3 (see Section 9.1.3 for more). Distinctions between participation and frequency – which was a matter examined in Sub-study 5 – also have implications for theory (see Section 9.1.5 for more).

In plotting individual frequency of offending by age, Sub-study 2 found that life-course patterns of offending of WA offenders followed the classical age-crime shape, that is, a steep rise in activity in childhood, a peak in frequency between the ages of 15 and 17 years, followed by a decline in activity into adulthood. The age-crime curves for sub-groups of offenders, as defined by demographic and other characteristics, also exhibited the same general peak in frequency during adolescence, suggesting common developmental processes and structural effects during this life stage.

There were, however, variations in the base level of activity between groups and in the magnitude and timing of the peak in frequency. Female offending frequency peaked at an earlier age than male offending. Females also exhibited lower levels of criminal activity than males. Some researchers have attributed the earlier peak of female offending to the earlier onset of puberty and social maturation of women. Various explanations have been proffered for the observed lower levels of female offending. One perspective attributes the effect to lower exposure to the same underlying factors (differential exposure), while others attribute the effect to gender specific factors or to differential selection. Others still identify physical differences between genders as being a determinant of some kinds of offending, especially violent offending.

The study found striking differences between the age-crime curves of Aboriginal offenders and non-Aboriginal offenders. While both groups experienced a peak in frequency during adolescence, albeit earlier for Aboriginal offenders, the elevated level of contact for Aboriginal people *across all stages of the life-course* suggested that a range of factors may be at work in defining the relationship between the Aboriginal population and the criminal

justice system in WA. A related finding was that there were variations in Aboriginal age-crime curve across ecological space (that is, across regions), suggesting that local or micro-level environmental factors related to living conditions, lifestyles, interactions with police and justice, and so forth, may be sculpting a uniquely different age-crime relationship for Aboriginal people living in Northern WA.

Elevated levels of offending amongst early onset offenders were also observed. This accords with a large body of evidence indicating that an early age of onset foreshadows a longer and more intense (higher frequency) criminal career. Findings such as these provide the justification for early primary interventions aimed at preventing or, at least, delaying entry into the justice system. Additionally, they provide the stimulus for juvenile diversionary programs that seek to limit youth contact with the justice system and avert the associated negative labelling effects. As discussed in Sub-study 1, a number of reforms to juvenile justice systems across Australia were implemented during the 1990s, many having in net-widening effects. Based on the findings from Sub-study 2, many of these initiatives may also have made the nets denser, as the frequency of offending was found to have increased over the same period. In other words, some initiatives may have resulted in more intensive 'treatment' of existing offenders. A closer analysis of these effects was beyond the scope of the current study; however, further research is warranted as it is important to understand the full range of effects caused by large structural reforms.

8.1.3 Sub-study 3 - Trajectories of offending

Sub-study 3 extended the exploration of the individual frequency of offending commenced in Sub-study 2. The study examined offending frequency or 'life-course offending' through trajectory models to determine if, and how, these trajectories vary across gender and ethnic

sub-groups. The Sub-study also set out to identify the correlates (or risk factors) associated with different offending trajectories and to establish whether these factors operate differentially across gender and/or ethnicity. Questions addressed by the study were: *What kinds of trajectories can be ascribed to offending patterns over the life-course? How do these trajectories vary across gender and ethnicity (Aboriginal status)? What are the factors associated with such trajectories? And, do such factors also vary across gender and ethnicity (Aboriginal status)?*

As previously, answers to these questions are important at both a theoretical and practical level. Research on diversity in offending patterns is crucial given ongoing polemical debates concerning the relationship between gender, ethnicity and crime. Competing theoretical perspectives, limited supporting evidence and inconclusive or contradictory findings from prior research point to the need for more empirically-grounded, generalisable research which compare and contrast offending patterns across and within gender and ethnicity groups. As Piquero and Brame (2008) maintain, "the relevant question is not whether ... group differences can be attributed solely to differential involvement or selection. Rather, the key analytic task is to document the contribution of both mechanisms to the patterns observed in different populations at different time points." (Piquero and Brame, 2008: 395). The purpose of this thesis has been to do just this.

A review of the trajectory literature (in Chapter 5) demonstrated that research on gender and ethnicity specific offending trajectories is limited and emerging results are mixed. Australian trajectory research is still in its infancy. Only a handful of Australian studies have investigated offending trajectories. Of these, none have used longitudinal, population level data, nor engaged in separate gender *and* ethnic specific modelling of life-course offending

patterns. The purpose of Sub-study 3 was, thus, to fill a knowledge gap (particularly in relation to Australian research) and explore the issue of diversity in life-course trajectories.

As Sub-study 3 showed, differences in offending patterns across gender and ethnic cohorts were immediately apparent. Differences on the basis of ethnicity were more marked than gender differences. More than a third (35%) of Aboriginal offenders were identified as early onset offenders (that is, having been first arrested by police on or before the age of 12), compared with one in ten (9.7%) non-Aboriginal offenders. This finding was consistent with evidence from Sub-study 1 where age based prevalence estimates indicated earlier contact with criminal justice system by Aboriginal children. Early violence was also more evident amongst Aboriginal offenders than non-Aboriginal offenders. Mean and median offending events were considerably greater for Aboriginal offenders than non-Aboriginal offenders.

What kinds of trajectories can be ascribed to offending patterns over the life-course? Using semi-parametric group based methods (SPGM), the study determined that either two or three offending trajectories adequately described life-course offending for each of the four gender/ethnic groups. For each group, the trajectories essentially comprised a low rate group, a moderate offending group and, for some, a high rate group. The emergence of several distinct trajectories supports the view that offending varies *across individuals*. In other words, offending is heterogeneous. Further, the categorical nature of the trajectories is consistent with taxonomic theories of offending which propose that there are distinct clusters of individuals who longitudinally follow approximately the same developmental course.

As with Sub-study 2, Sub-study 3 found that each of the trajectories shared the same basic shape - an inverted U typical of the age-crime relationship. The finding is consistent with

prior research which indicates that across the life-course there are developmental factors or processes that affect both motivation in and opportunity for crime within individuals which result in changing age related offending patterns. That the study found the *number* and *shape* of trajectories were similar across all demographic groups indicates that life-course offending patterns and *offending pathways are, by and large, similar and shared across the entire offending population*. In other words, the clustering of offenders does not vary substantially from one gender to another or from one ethnic group to the other.[63]

Do trajectories vary across gender and ethnicity (Aboriginal status)? Although the number and shape of trajectories were essentially the same, some variations in other trajectory attributes were detected across gender and ethnicity. Most notably, male trajectories were higher than female trajectories; the proportion of offenders in the low rate group was larger for females than for males; and offending trajectories peaked earlier for females than for males. As to the first of these findings, some researchers have argued the elevated nature of male trajectories is evidence of a 'differential exposure' perspective, that is, that males are exposed to greater levels of the same underlying factors and processes as females, leading to both higher levels of offending with greater membership of the highest trajectory.

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[63] Note that the clustering of individuals into trajectory groups is based on their individual offending frequency. The trajectories actually plot the pathways *of* offending, rather than the pathways *to* offending. In other words, it is the offending patterns themselves and not any antecedent factors that determine whether individuals belong to the one trajectory group/cluster or another. It is possible that different factors may give rise to the same patterns of offending, or that the same factors influence or predict different trajectory groupings. This issue was also explored in Sub-study 3. There may be factors, too, which influence both onset and continuity in offending. This latter point is discussed in Section 1.5.3 and Section 8.1.5.

Conversely, due to less exposure, females have lower trajectory levels and greater membership of the lowest trajectories.

In terms of ethnic based variations in trajectories, the sub-study found similarities as well as differences across ethnic group. The shape and height of low rate and mid-rate trajectories were similar. However, the high rate trajectory was substantially more elevated for Aboriginal offenders than non-Aboriginal offenders. As with male-female differences, this could be explained through a 'differential exposure' argument, that is, that Aborigines are exposed to greater levels of the same underlying factors and processes as non-Aborigines, leading to higher levels of offending with greater membership in the highest trajectory. Alternative explanations are also possible, though. Unfortunately, there are few other ethnic based trajectory studies with which to compare and the results emerging from these studies are have so far been mixed.

What are the factors associated with such trajectories? And, do such factors vary across gender and ethnicity (Aboriginal status)? The study sought to identify any gender and ethnic specific risk factors that may be associated with trajectory group membership. The extent to which this could be achieved was, however, restricted by the range of available explanatory factors. Notwithstanding this limitation, the study found that few of the included factors were unique to one gender/ethnic group only. Indeed, most of the included risk factors were shared across gender/ethnic groups. Early onset of offending and early violence emerged as significant *across* all gender/ethnic groups. Neighbourhood educational or occupational disadvantage, on the other hand, appeared to act as a risk factor for some gender/ethnic groups but not for others, although it should be noted that the effects were not particularly strong and depended on how disadvantage was measured. Protective factors, too, operated

similarly across all gender/ethnic trajectories. The study found that these same risk factors (early onset, early violence, neighbourhood disadvantage) were also associated with trajectory level membership *within* each gender/ethnic group.

In sum, the set of risk factors included in Sub-study 3 was not able to discriminate between trajectories either *within* or *across* gender/ethnic groups. It may be argued that this was because the range of included factors was too limited. Perhaps with a broader set of risk factors – inclusive of situational factors, early childhood variables and characteristics from later periods and from other domains (family, community) – the sub-study might well have revealed differences in the aetiology of offending trajectories – either *within* gender/ethnic groups, *across* them, or both. Evidence of risk factors that uniquely distinguish between groups would lend support to taxonomic models of offending that propose unique causal mechanisms and distinct developmental pathways. There are studies showing that some variables, particularly those related to childhood and family functioning, *do* distinguish between trajectories. These studies generally support a taxonomic perspective of offending, that is, that there are distinct 'types' of offenders, each characterised by unique offending patterns and differing aetiologies.

However, it is also possible that the inclusion of a broader set of factors may *not* result in the identification of unique, group-specific risk factors. Evidence of invariance in trajectory risk factors across groups has emerged from a number of recent studies. Some have found that risk factors associated with offending trajectories are the same across *gender*; others have found factors to be invariant across *ethnic group*. Findings such as these counter (or, at least, challenge) the taxonomic perspective, since the existence of a core set of risk factors contradicts the predictions of theories which posit that certain offending trajectories have

unique aetiologies. A general rather than specific set of risk factors more closely aligns with general theories of crime. Finding, as Sub-study 3 did, that there are few group discriminators favours the view that there are *common* processes which underscore offending over the life-course. The fact that these risk factors varied 'by degree' and not 'by type' across trajectories favours a general theory of crime with 'differential exposure' overtones.

There may, however, be other explanations for observing risk factor invariance. One possibility is that the "wrong" factors – or, more correctly, not enough of the "right" factors - were included in the analytical models. To date, trajectory studies have tended to include factors related to early childhood and family functioning. These factors are largely developmental constructs related to population heterogeneity, that is, persistent, time stable differences between individuals, and while their inclusion in models is not disputed, it can be argued that these do not capture the more immediate 'contextual', 'situational' or 'proximal' nature of offending. In other words, the models may not include sufficient contextual or immediate, situational factors associated with offending at points over the life-course. In line with a more dynamic view of offending, it is likely that these factors – combined with underlying developmental factors – may better discriminate between trajectories and across groups.[64]

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[64] It should be noted thought that, under a taxonomic model, developmental factors and *not* situational ones are predicted to be the more significant factors for offenders in high-frequency trajectory groups. Under Moffitt's theory (1993), for example, time varying proximal factors are predicted to have a greater effect on adolescent limited (read: low trajectory) offenders, while developmental factors (acting as proxies for persistent, time stable differences) would be expected to have greater effect on life-course persistent (read: high trajectory) offenders. It is interesting to consider that, if the sub-study had used early-onset as a proxy for time stable criminal propensity (i.e. as an indicator of population heterogeneity, as other researchers have done), then the findings

This point has been made by others. For example, Wikstrom and Sampson (2003) theorised on the mechanisms linking situational to individual pathways of offending and posit a distinction between the *'context of development'* and the *'context of action'*. These two contexts are argued to influence offending *differently* depending on developmental phase. Piquero and colleagues (2005b), too, note that the way in which individual and family factors influence offending depends on the *type* of community setting. It could be argued, then, that the failure of Sub-study 3 (and, perhaps, other studies that have observed risk factor invariance across trajectories) to find uniquely discriminating risk factors may have more to do with incomplete and under-specified models, that is, they have failed to include sufficient factors related to *both* the 'context of development' *and* the 'context of action'. This, rather than alternative theoretical models, might well account for the results observed.

Despite data limitations which curtailed Sub-study 3's findings in relation to risk factors, the initial categorisation of offenders into groups using trajectory modelling remains valid and robust. As Sub-study 3 notes, although the predictive utility of trajectories is limited, the categorisation of offenders into distinct groups has application in other areas of justice administration (see Chapter 5 for more).

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would be only partially consistent with taxonomic theory. Taxonomic theory predicts early-onset to be a risk factor for high-frequency groups only. However, the study found early-onset to be a risk factor for all groups (albeit at a lower degree for the low trajectory groups). Thus, the shared nature of risk factors across trajectories and groups tends to favour a general theory of offending.

8.1.4 Sub-study 4 - Risk factors associated with participation in offending

Sub-study 4 (Chapter 6) returned the thesis' focus to the prevalence of offending. The purpose of the study was to identify the risk factors associated with individual *participation* in offending in WA and explore how these vary by gender and ethnicity. Engaging in such an exercise is important because, although there are many studies that have identified risk factors associated with offending, there is limited empirical evidence of how these risk factors vary within the offender population. Understanding variations in the risk factors associated with participation in offending is an important first step in determining causal mechanisms and answering questions about the distribution of crime in the community. Given the extent of gender and ethnic disparities in crime, investigating potential reasons for this difference is also crucial.

To date, evidence from empirical studies examining gender difference in risk factors has been equivocal. Findings of ethnic variation in risk factors are also mixed. Opposing explanations and intense debate have led some to comment that this has led to a "conceptual and methodological impasse" (McCord et al., 2001: 229, cited in Piquero & Brame, 2008). There are few empirical studies which have examined gender or ethnic differences in risk factors associated with offending in Australia. As noted previously, the issue of ethnicity is of particular importance because high levels of Aboriginal contact with the criminal justice system stands as one of the most intractable issues facing modern Australian society.

Uniquely, Sub-study 4 used linked, administrative data from a number of government sectors. Data included information from juvenile justice, health, education, child protection and the

electoral roll. The linkage of offender data to other data sources made it possible to obtain or derive measures of a broad range of developmental and contextual/situational factors. These included indicators of physical, cognitive and behavioural disabilities (such as those arising from perinatal/pregnancy complications or those indicated by LBW and pre-term birth), stress at the individual level (such as those that might be indicated through self-harm, being a victim of an assault, mental health issues, and/or problem birth), as well as factors that may be seen to disrupt family and parenting processes or which increase stress within the home. Some 'family' factors were able to be derived from the hospital discharge records such as prolonged separation (such as that which may arise from long stays in hospital or mental institutions by children or their parents), mental illness in the family (which increases overall stress), chronic illness (also increases overall stress), drug and alcohol use, violence (victimisation) and self-harm (parent or sibling). Geographical data from the various linked datasets were used to monitor the residential mobility of individuals over the study period.

The most significant risk factors to emerge from the study were: gender, Aboriginal status, assault victimisation, having been a teen parent, maltreatment (in adolescence), sibling criminality, parent death, family mobility, low school achievement and neighbourhood disadvantage (at time of birth). The study confirmed, as Sub-study 5 also did, that drug and alcohol abuse and being a victim of violence are important factors that are strongly linked to participation in crime. Disruptions to parenting and family stress also had significant influences on involvement in crime. The study found that family mobility was associated with increased participation in offending. The *more* times a family moved house, the *greater* the likelihood of involvement in offending. In all, the findings confirm the role that individual, home and family circumstances play in the onset of delinquent behaviour. It was notable, though, that "biological factors" – as measured through obstetric complications,

LBW and early risk factors for impulsivity – were only weakly associated with offending participation.

In relation to gender differences, the study found most participation risk factors were shared between boys and girls (especially the major ones – identified earlier); however, a greater number of family and school based factors were found to be associated with participation in offending amongst boys. The findings suggest that boys may have greater sensitivity to family functioning and to parent/sibling behaviour during childhood, than girls.

As with gender, the results relating to ethnic difference indicate that there were many similarities, as well as some important differences in risk factors. Common risk factors included gender, assault victimisation, drug and alcohol abuse, being placed in out-of-home care and being maltreated at a later age. Sibling criminality, too, increased the risk for both groups – although, the effect was more pronounced for the non-Aboriginal population than for the Aboriginal population.

Some risk factors differed, however. Self-harming behaviour and having been a teenage parent appeared to be more strongly correlated with non-Aboriginal offending participation than with Aboriginal offending participation. Neighbourhood disadvantage, too, was found to be correlated with non-Aboriginal offending participation but not with Aboriginal offending participation. In contrast, low educational achievement in high school was more strongly associated with Aboriginal offending than with non-Aboriginal offending. Within the family domain, the study found that a greater number of family factors were associated with non-Aboriginal participation in offending than with Aboriginal participation.

The study offered several explanations for these differences. In regard to the differential impact of some family factors, it may be argued that Aboriginal children have greater resiliency making them less susceptible to the influences of parent and/or sibling behaviour than non-Aboriginal children. Wider family networks may also provide Aboriginal children with resources and support to deal with family stress and dysfunction. Some researchers have noted that extended family networks and notions of kinship are distinctive cultural elements within minority ethnic groups that may not fit neatly into mainstream conceptualisations of family processes. There is convincing argument and evidence that notions of family and of family processes are conceptualised very differently by Aboriginal Australians and that these are not adequately represented in empirical studies. The Sub-study concluded, therefore, that notions of family within the Aboriginal population may not have been adequately captured by the study and further research may, therefore, be warranted. With regard to disadvantage, it is possible that the lack of correlation between this risk factor and Aboriginal offending may have more to do with the endemic nature of disadvantage amongst the Aboriginal population. Lack of variation in disadvantage in the Aboriginal population sample would, in turn, affect the explanatory or discriminating power of such a variable in statistical models. Further research in this area is also warranted.

Evidence also emerged that the link between family mobility and participation in crime operates *differentially* across gender and ethnicity. The link between family mobility and offending is often explained through the mechanism of social control. For example, Sampson et al.'s perspective on collective efficacy (Sampson et al., 1997), provides one perspective on this relationship but there are others. It has also been argued that mobility may be correlated to (or act as a proxy for) other factors, such as poverty, relationship instability or family stress (Weatherburn and Lind, 2006). Irrespective, what emerges from the study is that the link

between family mobility and participation in crime operates *differentially* (i.e. the link is strongest for the non-Aboriginal population and for boys). This differential effect is not adequately explained by current theories. Further research could help inform and advance theory development in this area.

So, what are the policy implications of this study? As a population level, Western Australian investigation of the risk factors associated with juvenile delinquency, the study provides valuable information to assist in the development of effective juvenile crime prevention programs in WA. In particular, the study reaffirms the important role that the home environment has on child development and behaviour. As demonstrated, a dysfunctional or unsafe home, as measured through a range of variables including being placed in out-of-home care and being maltreated, significantly increases the likelihood of becoming involved in crime. The study also provides evidence that both gender and ethnicity are important factors which moderate the influence of family and other ecological contexts on delinquent behaviour. These contexts need to be considered in the design of effective crime prevention strategies. Interventions therefore need to be targeted or made 'group-specific' where it has been shown that group differences exist and are of sufficient significance. In other words, what the study findings highlight is the importance of specificity and matching. In simple terms, prevention approaches developed for one population group should not be blindly applied to other groups. This is a particularly important point to note in Australia where interventions and programs are often imported from overseas and applied to groups comprising a large number of Aboriginal offenders. Moreover, given the different patterns of Aboriginal offending observed in regional areas of WA (as noted in Sub-studies 2 and 3), specific approaches designed for Aboriginal offending need to be developed.

In terms of theoretical significance, a number of implications arise from Sub-study 4. Firstly, in terms of which factors emerged as being correlated to participation in offending, it is significant that the correlates included a number of time varying, changeable factors (e.g. self-harm, maltreatment in adolescence, drug and alcohol use, victimisation, school achievement), as well as some developmental factors (read: time stable, persistent attributes) such as early childhood/family factors, gender and Aboriginal status. The fact that both sets of factors were correlated with offending participation counters the predictions made by static theories - that offending is invariant to state dependent effects, and that variations in offending are due to differences between individuals. Instead the evidence lends support to more *dynamic* explanations of crime. Further, the observation that there are more similarities than differences in risk factors between boys and girls, and between Aboriginal and non-Aboriginal offenders, suggests common or 'general' underlying causal processes. In other words, general theories of crime may be better descriptors of the observed patterns of offending participation than more specific theories. However, the fact that there *were* some group differences in risk factors suggests that the causal pathway to crime participation may not be singular. Under *some* circumstances (yet to be fully understood), *some* (other) factors may contribute to participation in offending by *some* individuals. The precise mechanism by which these (other) factors act on individuals so as to 'cause' the onset of offending is still to be fully articulated. This view is consistent with that put forward by Bernard and colleagues (2010) that, through the use of a risk factor framework with its focus on variables and the relationship among those variables, we can arrive at a more integrated or blended theory of crime.

8.1.5 Sub-study 5 - Prevalence and frequency of Aboriginal offending

The final study of this thesis examined both participation in, and frequency of, offending. It sought answers to the following questions: *What are the individual, family and community risk factors for Aboriginal offending? And, how do these associations vary across the criminal career dimensions of participation and frequency?*

Owing to the extraordinarily high level of involvement of Aboriginal Australians in the criminal justice system, the research focused exclusively on the Aboriginal population. As an alternative to official records and, in part, as a way of validating the use of linked administrative data, the study made use of self-reported data from the 2002 National Aboriginal and Torres Strait Islander Social Survey (Australian Bureau of Statistics, 2004b). The use of multiple methods and/or multiple sources of data (triangulation) enables us to mitigate the bias that might arise from using a single method or data source. Triangulation also enables us to validate results derived from alternative data sources. In criminological research, the use of self-reported data and official records have produced "comparable and complementary results" on the dimensions of a criminal career (Farrington et al., 2003). Further, as the survey collected much more detailed personal, family and community information than was available from official records, it was possible to explore whether "culturally specific" factors such as cultural strength have a role in the interplay between Aboriginal people and the justice system.

Disadvantage (social and economic) is popularly viewed as the most dominant 'cause' of Aboriginal/non-Aboriginal disparities in arrest rates in Australia; however, researchers from a variety of disciplines proffer alternative and often opposing perspectives. Some scholars

attribute cause to exposure effects and to contemporary issues such as drug and alcohol abuse; others favour differential selection mechanisms and systemic issues (e.g. institutional bias, racism). In recent times, there have been moves toward more synthesised, multi-factorial explanations to better account for the complexity of Aboriginal life, past and present (e.g. Broadhurst, 2002; Homel et al., 1999). To substantiate the various theories and to make "explicit the many connections between such phenomena as forced removals or institutionalised racism on the one hand, and specific community characteristics, family processes or oppositional behaviours on the other" (Homel et al., 1999: 192), empirical studies are required. To date, few such studies have been undertaken and the range of risk and protective factors included in them has been limited. Sub-study 5 was thus conceptualised to address this need and fill the information gap.

As with Sub-study 3, the Sub-study 5 used a multi-factorial risk factor framework to estimate the effects of a range of individual, family and community factors on Aboriginal arrest rates. The study used self-report data from the 2002 National Aboriginal and Torres Strait Islander Social Survey (NATSISS; Australian Bureau of Statistics, 2004b). The study identified a number of risk factors related to offending prevalence (gender, alcohol, victimisation, unemployment, past substance abuse, being part of the stolen generation, financial stress, and family stress). Some protective factors (education level, cultural strength, community connections) were also identified. It is notable that a number of these factors (gender, alcohol abuse, victimisation and family stress) were also identified as risk factors for offending prevalence by Sub-study 4 which used official records rather than self-report data. The fact that both sources of data produce comparable results suggests considerable robustness in these study findings and goes some way towards validating the use of linked, administrative data for criminological research.

The influences of alcohol abuse, victimisation and family stress on the prevalence of offending have implications for research and criminal justice practices. Alcohol abuse emerges as a critical risk factor for the Aboriginal population and there is an abundance of evidence demonstrating its damaging effect on individuals, families and communities. Drug and alcohol abuse emerged as a risk factor both for Aboriginal *and* non-Aboriginal offenders (Sub-study 4 findings), thus broad applications of initiatives to address drug and alcohol abuse across the wider Australian community should continue to be promoted. However, what might be effective to reduce alcohol abuse in specific regions or communities may differ.

Prior research has tended to focus on financial/economic stress and its effect on crime. Somewhat uniquely, this study distinguished between family stress *and* financial stress and found both factors to have significant *independent* effects on involvement in offending. The findings accord with the view that stress, in a variety of forms, has negative effects on human development, family functioning and day to day living.

As well as finding evidence that accords with/confirms those from Sub-study 4, the Sub-study 5 also identified several new, 'survey sourced' risk and protective factors. These were factors that were not, and could not, be discerned from administrative data. Identification of these influences demonstrates the utility of using data from multiple data sources as a method of complementing or supplementing existing evidence. Being part of the stolen generation was identified as a survey sourced *risk* factor. Connection to community, too, was identified as a survey sourced *protective* factor. The latter finding gives empirical recognition to the importance of social networks within Aboriginal communities and suggests that connection

to community may be at least as influential as some of the more recognised protective factors (e.g. educational attainment) in reducing involvement in crime. While acknowledging that our understanding of social capital is still evolving and its relevance to Aboriginal people is still the subject of much debate, the finding is seen as tentative evidence that there are crime- and justice-related benefits to community connections and the accumulation of social capital which ranks equally with the accumulation of human capital.

In addition to examining influences on the *prevalence* of offending, the study also identified risk factors associated with the *frequency* of offending. These included gender, alcohol abuse, financial stress, family stress, recent substance abuse and early contact with police. Education level and community connections also acted as protective factors. That early contact/onset is linked to the frequency of offending comes as no surprise, as this accords with established criminal career research and with the findings that emerged from Sub-studies 2 and 3 (both of which were based on official records of offending, not self-report data).

Many of the risk/protective factors identified by this study were found to be shared across the criminal career dimensions. Gender, alcohol use, victimisation, unemployment, financial and family stress not only increased the likelihood of initiation into offending but also played a part in the continuation of offending over the life course. This has important theoretical implications (see later). A related finding was that financial stress affects both prevalence (initiation) and frequency (continuity) of offending. Prior research has shown the effects of economic stress on crime to be largely distal and indirect - acting on child behaviour primarily through its "caustic" effects on parenting. However, findings from the current study suggest that, for Aboriginal people at least, the effect of financial stress is *also* direct and on-going – having a continuing effect on offending over the life-course. What this means from a

policy perspective is that underlying issues of poverty and financial hardship need to be addressed within a broader crime prevention strategy. Economic and financial issues need to be considered a part of any integrated strategy to reduce offending. According to the evidence emerging from Sub-study 4, this will likely have a direct and immediate effect on individual offending patterns, as well as lead to longer term improvements in parenting, in the functioning of families, and ultimately, in the growth and development of young people.

Similarly, the finding that alcohol abuse influences both the prevalence and the frequency of offending suggests that any effort targeted at reducing alcohol abuse will likely have a dual effect: reducing the number of Aboriginal people coming into contact with the justice system *and* reducing the frequency of that contact.

At the same time, the study found that not all factors operated on the prevalence and frequency of offending in the same way or to the same extent. *Recent* substance misuse, for instance, was identified as being a determinant of the frequency of offending but not the prevalence of offending, while *past* substance misuse was identified as being a significant determinant of the prevalence of offending but not the frequency of offending. Several other factors operated similarly - being part of the stolen generation, having strong cultural ties and geographical location, for example, were factors that did *not* have a significant effect on the frequency of offending, despite having a demonstrated influence on the prevalence of offending. The findings suggest that these factors have an indirect or distal influence rather than a proximal influence on offending – affecting initiation into offending rather than the continuity of offending over time. Prior research has linked being part of the stolen generation to family disruption and negative effects on human development. However, the precise mechanism(s) by which being a member of the stolen generation influences offending

is yet to be determined and may well be mediated by other factors (e.g. individual or family stress). Further research is required to disentangle the effects of being part of the stolen generation and provide a more nuanced understanding of its connection to human development, family functioning and offending over the life-course.

Sub-study 5 noted that cultural strength is seen by some sociologists as having a dual (and arguably competing) role – acting as a form of social capital (i.e. a positive, protective factor) *and* as an indicator of stress and culture-conflict (i.e. a negative, risk factor). However, Sub-study 5 determined that cultural strength (as measured by responses to questions about language, clan identification, recognition of homelands and cultural attachment) has a more positive than negative influence on crime. In other words, cultural strength acts predominantly as a form of social capital which contributes positively to Aboriginal communities. That said; its protective effect appears to be patchy - affecting only the prevalence of arrest (not frequency) and only for Aboriginal people living in remote areas. It is not entirely clear how these findings *in their entirety* should be interpreted.

In identifying the risk factors associated with both participation *and* frequency of offending, Sub-study 5 extends knowledge regarding whether the certain correlates of offending relate either *jointly* or *differentially* to the different criminal career dimensions. Distinctions of this type have theoretical importance because they raise the possibility that different theories might be needed to explain the patterns and underlying causes of crime. The logic of the argument goes something like this: if different criminal career dimensions share the same risk factors, then this suggests that there is 'generality' in crime. In other words, the underlying causes (of either dimension) are fundamentally the same. However, if correlates are observed to be different, this suggests differing causal pathways and the need for more complex

theoretical explanations. As was noted in the review in Chapter 1, only a limited number of empirical studies have jointly examined the risk factors associated with participation *and* frequency of offending. Results emerging from these studies are mixed and no clear conclusion has emerged as to whether participation and frequency of offending arise from same or different causal factors. The findings from Sub-study 5 should, thus, be seen as both informing and advancing this theoretical debate.

The study found that a significant number of risk factors were shared by both criminal career dimensions.[65] This finding suggests 'generality' in offending, that is, that there are common underlying causal processes that contribute to initiation and persistence in offending in the Aboriginal population. Moreover, as the shared risk factors comprised mostly time varying, changeable variables (e.g. alcohol use, unemployment, financial and family stress), this gives further weight to the view that a dynamic, general theory of offending may be a suitable explanatory model for Aboriginal offending.

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[65] Sub-study 3 and Sub-study 4 also *separately* examined the risk factors associated with participation and frequency of offending and each (separately) found support for a common causal process. They too present evidence of shared risk factors across criminal career dimensions (e.g. gender, Aboriginal status and drug use) which in turn supports a general theory of offending. However, the risk factors included in the Sub-study 3 were somewhat limited (especially when compared to those included in Sub-study 4) and a full examination of differential effects was not possible within the context of this thesis. A useful exercise to aid theory development would be to re-run Sub-study 3 and include the same risk factors as those in Sub-study 4. If correlates are then observed to be different, this suggests unique causal pathways and confirms the need for more complex theories of crime.

It should be noted here, though, that not all risk factors were shared between participation and frequency of offending - some correlates/risk factors related to one dimension only. Further, it is worth noting that a number of the participation-only risk factors related to distal or otherwise time stable/static factors (e.g. being part of the stolen generation, past substance abuse or living in a remote community). Once again, this is consistent with general, dynamic theories of crime which propose that both distal/developmental and proximal/situational forces are at work in shaping individual behaviour.

8.2 Methodological objective

In addition to addressing questions of criminological interest, this thesis had an additional objective of testing the feasibility of using record linkage methods for social science research. The research set out to collect data from administrative collections from a range of government sectors, and to link these at unit record level to create a unique, de-identified, longitudinal, population level dataset.

The process of gaining access to government records and linking them through trusted third party mechanisms was onerous. Although mechanism to link data *within* the criminal justice system for research purposes was already in place (via the INOIS system; see Chapter 2), cross-sectoral linkage was new and required the establishment of new technical processes and additional governance/oversight measures. The project required multiple ethics approvals and data applications to a number of government agencies. Not least, the project required changes to legislation (specifically, amendments to the *Young Offenders Act (WA) 1994)* which took several years to execute.

Except for Sub-study 5 which made use of self-reported survey data and which was useful in validating the results obtained from official records, each of the Sub-studies within this thesis made use of linked data. Some of the studies used linked offending records *only*, that is, data sourced solely from criminal justice collections that were linked via the INOIS system to create longitudinal criminal records. The linked data also included juvenile justice records and historical data from diversionary schemes that were no longer in operation. The inclusion of juvenile justice data (current and historical) ensured that the data was truly population based and fully descriptive of offending during adolescence and adulthood.

Sub-study 4, which examined the risk factors associated with participation in offending, was significant because it was the first and indeed the only study within this thesis which made use of *multi-sectoral* administrative data. As the study demonstrated, the inclusion of explanatory variables from a number of domains enabled the consideration of influences on offending at individual, family, school, and community level. Time constraints did not allow for these same explanatory variables to be attached to offending frequency data, so the current study of the risk factors associated with the frequency of offending was necessarily curtailed (see also Section 8.4.1).

8.2.1 Data linkage as an appropriate methodology for criminological research

From a methodological point of view, the study findings on the risk factors associated with participation in offending accord with those from many other studies including those based on self-report/survey data (as per Sub-study 5). This result, in itself, provides strong evidence that data linkage methods are a robust and valid method for undertaking whole-of-population research in social and behavioural sciences. Medical and public health research has for many

years embraced data linkage methods (Holman et al., 2008). The findings from the Sub-studies demonstrate that the methodology has utility, too, for research in the social sciences.

8.2.2 Value and utility for cross-disciplinary research

Research data that is linked across multiple sectors facilitates interdisciplinary research and provides unique insights into population wellbeing and social equity (Roos et al., 2010; Klein, 1990). Researchers in the health sector have argued that the causal pathways leading to problem outcomes are complex and that no single discipline is able to provide the answers about how to reverse or avert them (Stanley et al., 2002; Burns, 2011; Glauert et al., 2008). As Stanley and her colleagues point out, "simplistic research paradigms which ignore the multilevel and complex nature of pathways, and policies and interventions which focus on a limited number of "risk factors" at some point along these pathways, are not going to serve us well" (Stanley et al., 2002).[66]

Research based on longitudinal, cross-sectorally linked, population data provides policymakers with enhanced understanding of disparities. Roos and colleagues (2010) identify a number of ways in which this occurs: i) through the provision of information about people who are *not* being targeted by interventions (for example, at population level, it becomes possible to study children who are ***not*** in contact with the juvenile justice system; ii) through analysis of vulnerable groups (e.g. children who are in the child welfare system); iii) through investigations of resilience or the accumulation of 'assets' rather than 'deficiencies'

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[66] That said, the researchers admit that there are "difficulties in accurately measuring such things as societal changes and other distal risk factors [that] may explain why they have been excluded from aetiological models" (Stanley, et al., 2002: 12).

(risk factors); and iv) through studies that use multiple years of "exposure" data which also provide opportunity for examining period and cohort effects. Roos and colleagues also point to the utility of simply 'quantifying' problems and issues. In their words, "sometimes the role of research is [simply] to attach numbers to the obvious, to make it undeniable." (Roos et al., 2010: 395)

Several initiatives have been implemented to address the need for greater synthesis and integration across scientific disciplines and to focus research on early development. These include the Canadian Institute for Advanced Research, the U.S. National Research Council and Institute of Medicine and the Australian Research Alliance for Children and Youth. Smaller research programs with similar but more modest ambitions have also arisen, such as the Development Pathways Project in WA (Stanley et al., 2004). The data described and analysed in this thesis is an exemplar of the kind of information rich research resource that can facilitate interdisciplinary research and cross-sectoral responses by government and other agencies.

8.2.3 Opportunities for further criminological research

There is also potential to use information rich, linked research data to answer other criminological questions that do not directly flow from this thesis. These might include, for example:

- investigations of other dimensions of offending, such as desistance, crime seriousness, specialisation/versatility;
- an investigation of factors associated with not offending, such as a study of resilience in the non-offending population; and

- further investigations of period and cohort effects, using multiple birth cohorts and multiple years of "exposure" data.

The linkage of offending data to data from other sectors of government also enables exploration of many other issues. For example: What is the relationship between school readiness (as measured by the Australian Early Childhood Index), educational outcomes and offending behaviour?

8.3 Contributions

8.3.1 Methodological approach

The thesis' approach to the study of offending contributes to criminological research in a number of ways. First, it is the only known study in Australia to use *linked, multi-sectoral data* to examine the developmental dimensions and factors associated with juvenile delinquency. This approach enables researchers to examine a range of developmental outcomes in WA children and to approach prevention/intervention through a more holistic outlook. Second, the research uses population level, longitudinal nature to investigate the influence of a range of factors, from early childhood through to early adulthood, on offending behaviour. Population level data provides a powerful tool for identifying risk and protective factors, for evaluating research outcomes and for targeting service delivery. While linkage based methodologies are more common in epidemiological research, their use in criminological and multi-disciplinary studies is growing. A comprehensive, population level analysis of delinquency, using a developmental approach, has not previously been undertaken in Australia. Third, the availability of information on certain sub-groups in the population, such as girls and Aboriginal youth, affords the opportunity to study more complex and possibly different models of behaviour and interaction with the justice system. This is a

distinctive feature of the research and contrasts starkly with that of most other longitudinal studies of delinquent behaviour which are based predominantly on young, white males. All of the studies included in this thesis have explored offender diversity whether models/trajectories/risk factors are gender specific or ethnic specific.

8.3.2 Research findings

In addition to its approach, a number of findings from this thesis are new and have not previously been documented by researchers. These contribute to the evidence base and, as previously described, have relevance for theory development and crime prevention. These include but are not limited to:

- Age based prevalence estimates based on multiple birth cohorts. Estimates for both gender and ethnic sub-groups were also derived;

- Assessment of the simultaneous effects of age, period and cohort effects on long term trends in prevalence levels;

- Extended consideration of shared risk factors – whether these were shared across social groups (gender/ethnicity), offending trajectories or between criminal career dimensions (prevalence and frequency of offending);

- Examination of the effects of family stress on criminal behaviour, and of the separate and independent effects of financial stress;

- Consideration of 'culturally specific' factors that may be relate to Aboriginal offending. Relevant factors included connection to community, cultural strength and the effects of being part of the stolen generation. Sub-study 5 is one of the first to construct and analyse factors of this sort from self-reported survey data.

8.4 Future research

8.4.1 Priority areas

As has been highlighted throughout this thesis, it was not possible to pursue all lines of inquiry. Nevertheless, the research has demonstrated approaches that provide insights and opportunities for future research. The following are considered priority areas for future research:

- further analyses of the risk factors associated with participation in offending (including improved temporal ordering of factors, testing of interactions, testing of construct validity, etc.). As some commentators have noted, evidence of risk factors and interactions effects are not ends in themselves but the beginning of an understanding of underlying causal mechanisms. The current study has overcome many of the practical barriers associated with assembling data for such an investigation. The next iteration of analyses needs to go beyond simple effects and will need to be guided by robust theoretical perspectives;

- further analyses of the frequency of offending and associated risk factors, specifically, the inclusion of a greater number of explanatory factors in trajectory models, as per those included in Sub-study 4;

8.4.2 Other themes and issues

A number of other themes and issues emerged during the course of the research which are worthy of future research but were considered beyond the scope of the current study. These include:

- An investigation of the connection between sibling criminality and child delinquency. For example, a question that emerged from the research was: Does the relationship

between child and sibling criminality have more to do with poor family circumstances (and poor quality parenting) than "sibling effects" where delinquent behaviour is relayed from one child to another via some mechanism (e.g. social learning, differential association)?

- The testing of bio-social interactions. Although the research found that biological factors were only weakly associated with offending, there is growing literature to suggest that there are significant links between biological factors and antisocial behaviour in early childhood. There may be merit, therefore, in exploring the interaction between these factors and other early life influences and outcomes. This would provide a better understanding of underlying mechanisms and mediating effects.[67]

- An exploration of the link between family mobility and participation in crime. How does this work and why does this appear to operate differentially across gender and Aboriginal status?

- An exploration of the causal connection between victimisation, self-harm and offending. This relationship needs to be better understood.

- An exploration of the short and long term impacts of being part of the stolen generation. What is its relationship with family stress/functioning and its connection with offending prevalence and offending frequency? The current study did not

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[67] For example, if birth complications are shown to consistently interact with negative home environment in predisposing to offending, then why is this so? What processes operate to trigger these effects? Does predisposition occur via brain impairment? Or does family environment predispose to birth complications, such as through smoking or alcohol consumption effects?

explore these interactions to any great extent; however, as there was some divergence in findings, it is clear that the longer term effects of being part of the stolen generation need to be better understood.

- Refinement of definitions/notions of family and conceptualisations of family processes in the context of cultural differences. Alternative constructs also need to be defined, tested and validated.

- An investigation of geographical variations. Throughout the thesis, there emerged evidence of differing rates of participation and frequency of offending in rural areas of WA. As noted earlier, this phenomenon may be related to Aboriginal offending and to culturally specific factors, or there may be other explanations.

8.5 Conclusion

Notwithstanding some limitations with each of the Sub-studies (described earlier), they have individually and collectively taken significant steps in documenting the prevalence and frequency of offending in a large, longitudinal population sample. Each study has further charted associations between these offending dimensions and numerous risk factors at the individual, family and community level. The studies have also operationalised variables representing both positive experiences (e.g. cultural strength) and adverse experiences (e.g. family stress), and tested the relationship between these and offending. Collectively, the findings from these studies help to 'fill out' what is known about the risk factors affecting offending over the life-course, particularly at an Australian level. They provide essential information to those theorists, researchers and practitioners taking a developmental approach to crime and crime prevention. They also provide essential information about offending in Australia – these are provided on a scale not previously published. The studies pave the way

for further analyses to inform theory development and integrated approaches to criminal justice theory and crime prevention policy.

Importantly, the thesis has explored differentials in offending based on demographic characteristics (gender *and* Aboriginal status). There is much discussion in the literature surrounding group based differences in offending - in particular, differences based on gender and ethnicity; however, there is little empirical evidence which demonstrates *how* patterns and risk factors vary *across* and *within* these groups. This thesis has documented the extent of differences in offending patterns (participation and frequency of offending) by gender and by ethnic group. These findings have not previously been documented in an Australian context.

So, overall, what are the substantive findings from this thesis? How do men and women and people from Aboriginal and non-Aboriginal groups differ? How are they similar? Collectively, the studies found more evidence of similarities than differences in the patterns and risk factors associated with offending by different gender/ethnic groups. This has led to a conclusion that pathways to offending are mostly shared, reflecting common developmental processes and exposure to the same underlying developmental factors. Although there is evidence of some differences in offending patterns between groups, these are generally on a smaller scale, suggesting that gender specific and/or ethnic specific pathways may only be relevant to selected sections of the population.

The difference which emerges most consistently from all the studies in the thesis is in relation to levels of offending. These were found to be repeatedly and significantly higher for the Aboriginal population than for the non-Aboriginal population. While there are a number of theories which account for ethnic disparities in the U.S., these have been developed mainly

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for African Americans and are not necessarily generalisable to the Australian situation. Some Australian perspectives on Aboriginal/non-Aboriginal disparities have been put forward; however, these have yet to be fully expounded and the quantitative evidence to support any one theory (or to test competing theoretical models) has been lacking.

This thesis did not find evidence which overwhelming supported any particular perspective on Aboriginal/non-Aboriginal offending. Rather, several of the sub-studies found that risk factors were shared – by both the Aboriginal and non-Aboriginal populations and, additionally, by both gender groups and by the different dimensions of crime (participation and frequency). These findings thus suggest a 'generality' in offending, that is, that there are common underlying causal processes that contribute to initiation and persistence in offending in many sections of the population. That many of the shared risk factors were changeable or proximal variables, rather than persistent time stable characteristics, gives weight to more dynamic perspectives of crime.

The various studies within this thesis also extend knowledge about the positive and negative forces shaping the relationship between Aboriginal people and the Australian justice system. This is important because the over-representation of Aboriginal people in the Australian justice system remains a significant social concern. There is strong desire by government (and the broader community) to address underlying issues, as evidenced by national objectives aimed at 'closing the gap' between Aboriginal and non-Aboriginal disadvantage, including priority areas identified by the National Indigenous Law and Justice Framework (Standing Committee of Attorneys-General, 2009). In this climate of active concern, it is important that researchers continue to investigate the factors leading to Aboriginal over-representation, to identify causal pathways and processes, and to provide new insights that

may inform policies and interventions that lead to greater opportunities and better outcomes for Aboriginal Australians.

As many authors have noted, knowledge about criminal offending has been gleaned largely from U.S. studies. There has been a lack of basic descriptive criminal career information from an international perspective. The research described in this thesis, thus, plays a part in filling that gap. The thesis provides an important baseline – especially for Australia but also internationally - against which other research efforts can be compared. Comparative studies are particularly important because they either validate established findings and theories or challenge them by providing evidence that runs counter to predictions. Regardless of outcome, the end result is a more robust and international perspective of crime and offending behaviour.

It is important for Australian researchers to continue to explore criminological questions and test hypotheses through empirically grounded studies. As this thesis has demonstrated, criminological theory can be informed and advanced through detailed investigation of the causes and patterns of criminal behaviour using longitudinal, population based data.

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Appendix A: Juvenile diversionary options in WA – detail and history

A.1 Background

Schemes that divert young people away from police arrest and charge have been a fundamental part of the juvenile justice system in WA and elsewhere. At present, the juvenile justice in WA is defined by the *Young Offender's Act (YoA)*. This Act, enacted in March 1995, describes three kinds of diversionary options - formal police caution, referrals to juvenile justice teams (JJTs) by police, and referrals to juvenile justice teams by the courts. Of these, formal cautions and police referrals to JJTs represent diversion *from* police processing. Referrals to JJTs via the courts are cases where an offender has already been charged by police, brought before the Children's Court and then referred by the court to JJTs. In these cases, the record of charges laid by the police is not deleted.

Prior to the introduction of the YoA, juvenile offenders in WA were dealt with either through police apprehension (and attendance in the Children's Court) or by the Children's Panel (as per the provisions of the *Child Welfare Act 1947*). Note, however, that between 1991 and 1995, police cautions were also in use. Formal cautions were trialled in the Perth metropolitan area during 1991 and then 'deployed' to other parts of the state between 1991 and 1995. They did not become enshrined in legislation until 1995.

A.2 Record keeping

Records of formal police cautions (from 1991 onwards) and police referrals to JJTs (from 1995 onwards) were stored in a single police computer system – the Juvenile Cautioning System. Records of police arrest and charge (or summons) have been recorded in the police P18 since 1984.

Children's Panel data was recorded by the (then) Department for Community Services in the CRIS system up to mid-1994, when responsibility for juvenile justice transferred to the Ministry of Justice (now also defunct). In March 1995, the Panel was abolished as a result of the introduction of the YoA.[68]

For this study, panel data was required to be sourced from two collections: data collected prior to mid-1994 were extracted from the Department for Community Development CRIS system, while data for the period from mid-1994 to March 1995 were sourced from the (then) Department of Justice's CHIPS system.

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[68] Panel eligibility had also undergone change prior to abolition. For instance, initially only first offenders could go before the Panel if they were 16 and under, but later the panel was extended to 17 year olds. Offenders did not have to plead but had to agree to have committed the offence in order to be sent to the panel by the court. Police could also refer a young person to the panel directly. As to offence seriousness, some offences were excluded (eg traffic offences) but these were later included.

Appendix B: Offending Data – Source details and applicable date ranges

Owing to some major structural changes in the juvenile justice system in WA over the period from 1984 to 2005, it was necessary to source the offending data for the study from multiple datasets. The following list describes the datasets at the Crime Research Centre that were utilised and the period for which they were relevant:

i)   1984 – 1990:

- From Lower Court Juvenile (LCJU) records of Children's Panel cases *only* for the period from 1984 to 1990.[69]

- From APRH (P18), records of all police apprehensions (i.e. arrest or summons, and charge).

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[69] LCJU data refers to 'Lower Court Juvenile' data in the Crime Research Centre Offender Database. This data was supplied routinely to the CRC by the then Department for Community Services (DCS) between 1990 and 1994. At that time, DCS had responsibility for juvenile justice matters in Western Australia. The data contains de-identified records of all Children's Court finalisations and Panel decisions, as recorded in the Department's CRIS system. An additional archival file of data from 1984 to 1989 was supplied to the Centre just prior to the decommissioning of the CRIS system. Panel data was recorded by the Department for Community Services in the CRIS system up to mid-1994 when responsibility for juvenile justice transferred to the (then newly) created Ministry of Justice.

ii)   1991– mid-1994:

- From Children's Court Juvenile (CCJU) – record of Children's Panel cases *only* for the period from 1991 to mid-1994. These records were sourced from the DCS CRIS system but supplied in a different format to the data supplied for 1984-1990.[70]

- From APRH, records of all police apprehensions (ie arrest/summons & charge).

- From POL_CAUTION, records of all formal police cautions issued to juveniles.

iii)   mid-1994 – 15 March 1995

- From JJC_ALL_APPEAR – records of Children's Panel cases only – as recorded by the then Department of Justice in the CHIPS system.

- From APRH, records of all police apprehensions (ie arrest/summons & charge).

- From POL_CAUTION, records of all formal police cautions issued to juveniles.

iii)   March 1995 – 31 December 2005

- From APRH, records of all police apprehensions (ie arrest/summons & charge).

- From POL_CAUTION, records of all formal police cautions issued to juveniles.

- From POL_CAUTION, records of all police referrals to JJTs (these did not exist prior to the introduction of the YoA).

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[70] During the early 1990s a 'common courts data exchange format' was jointly designed and used by WA agencies involved in publishing statistics about court activity in Western Australia. The Department for Community Services, the Crown Law Department, the Crime Research Centre and the Australian Bureau of Statistics (WA) were collaborators on this project.

Appendix C: Offending Data – Database tables & record structures

A database table, labelled Juvmaster, was constructed which contains a record for each person in the study offender population (SOP; N=122,517). The table contains important identifiers, demographic data and summary offender data. Another table, labelled Juvevents, was constructed to contain event-level data. One record was created for every offending "event" for each and every offender (N=394,277). An offending event could comprise an arrest and charge, a summons, or a juvenile diversionary event (as described in Appendix B). Tables C1 and C2 describe the data items in each of these tables.

Table C1: Field description of Juvmaster table

Field name	Description
Master_id	A unique study-specific identifier for each offender
Inois	INOIS identifier
sidno	Police-sourced Identifier 1
Old_docket	Police-sourced Identifier 2
Pt_id	Justice-sourced Identifier
Child_id	Identifier used by Children's Panel
Sex	Male or Female
Race	Aboriginal or non-Aboriginal
Date_of_birth	Date of birth
Pob	Place of birth code
Pre_84_arrests	Flag to indicate if any pre-1984 arrests
Pre_84_dcds	Flag to indicate if any pre-1984 diversionary options
Nevents	Total number of events for this offender (within study period)
Aprh_events	Total number of arrest events for this offender (within study period)
Caut_events	Total number of cautioning events for this offender (within study period)
Jjtp_events	Total number of police referral to JJT events for this offender (within study period)
Mojp_events	Total number of court referrals to JJT events for this offender (within study period)
Dcdp_events	Total number of panel appearances for this offender (within study

period)

First_aprh_event	Date/id of first arrest
First_caut_event	Date/id of first caution
First_jjtp_event	Date/id of first police JJT referral
First_mojp_event	Date/id of first court JJT referral
First_dcd-Pevent	Date/id of first panel appearance
Case_type	Type of record (category of case, as per Figure 2.4)
Root	Project-specific linkage key from DPP linkage

Table C2: Field description of Juvevents table

Field name	Description
Record_id	Unique identifier for each record
Event_type	Type of event (aprh, caut, jjtp, jjtc, etc)
Seqno	
Child_id	Identifier used by Children's Panel
sidno	Police-sourced Identifier 1
inois	Police-sourced Identifier 2
Pt_id	Justice-sourced Identifier 1
CCMS_id	Justice-sourced Identifier 2
Master_id	Offender ID from Juvmaster table
Orig_sidno	Police-sourced Identifier 3
Event_date	Date of this event
Event_year	Year of this event
Age_at_event	Age of offender at this event
Mof1	Major offence code
Mof1_count	Count of Major offences
Mof1_anco	Major offence ANCO code
Mof1_serious	Major offender seriousness index
…	
Total_offences_count	Total offences associated with this event
Distinct_offences_count	Count of the different types of offences associated with this event
…	
Event_suburb	Location of this event
…	
Source_table	Source database table name
Source_id_alpha	Source database table record identifier

Figure C1 (below) summarises the database structure for the Offender datasets. Note that the figure also includes tables which provide the link between SOP, DCS and DPP datasets. The structure of DPP datasets is described in more detail in Appendix E.

Figure C1: Final Offender Database Structure
SOP & DCS OFFENDER DATA TABLES & LINK TO DPP DATASETS

Case_types:
A* = in DPP data but not in DCS (proxy for non-offender, but contaminated with B recs)
G* = in SOP data but not linked to DPP, also contaminated with B recs
C = SOP Offenders with links to DPP data (rich offenders)
D = DCS offenders with links to DPP but not in SOP
E = unlinked DCS offenders, also not in SOP
F = known unlinked SOPs

Master_ids:
N<980000 = in SOP (G*, C, F)
98xxxxxx = in DCS but not in SOP (D,E)
99xxxxxx = in DCS, not in SOP but found in TOMS, CHIPS or CBC (D,E)
100xxxxxx = in DPP but not in SOP (A* cases only)

Root:
Encrypted form = in DPP (A*, C, D?)
'0000000000000' = in SOP but not in DPP (G*, F)
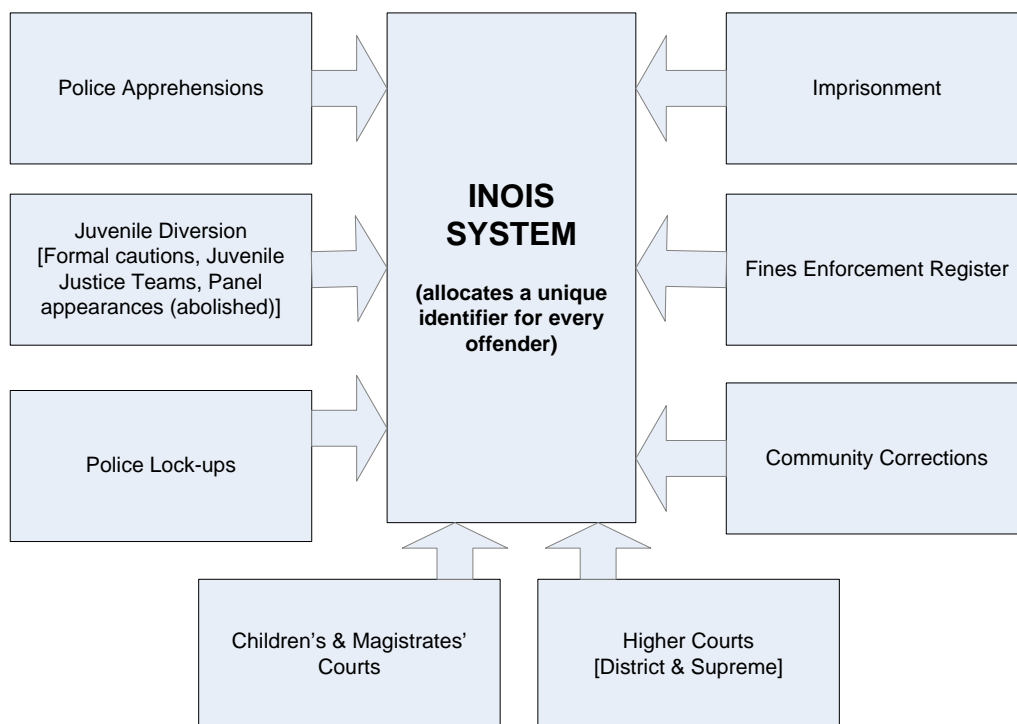'1111111111111' = in DCS but not in DPP (E only?)

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Appendix D: Summary of the INOIS linkage system

D.1 Background

The INOIS system was established in WA in 1990 as part of a unique collaboration between researchers at the University of WA and agencies within the WA criminal justice system (Ferrante, 1993).

Figure D1: Linkage of Offender Datasets by the INOIS system

D.2 Linkage methods

The INOIS data linkage system uses probabilistic record linkage techniques (Fellegi and Sunter, 1969; Newcombe and Kennedy, 1962) to determine if records from disparate sources belong to the same person. In this method, pairs of records are compared. Each record pair is given a weight based on the degree of agreement between fields on the two records. Record pairs with a weight above some upper cut-off are declared links while those with a weight below some lower cut-off are declared non-links. There are some record pairs that cannot be automatically assigned a status and are designated for clerical review. Clerical review involves human assessment of each record pair to resolve match status.

Probabilistic data linkage techniques tolerate variations in the values of key demographic variables in order to achieve optimum linkage. Variations in demographic data may arise from data processing errors and from the use of information from multiple sources. Variations also arise over time from names changes (e.g. women who marry) and from the use of aliases. Expert judgement is required in developing the linkage strategy, writing the matching rules and setting thresholds for acceptance or rejection of potential links. Some clerical review of doubtful links may also be required, particularly where the decision to accept or reject a given link relies on assessment of conflicting information drawn from several sources.

The INOIS system routinely links offender records from several police data collections (i.e. police apprehensions, juvenile cautioning, juvenile JJT referrals and police lock-up data) to records from the courts, prisons, community corrections and the fines enforcement registry (see Figure D1). When an INOIS link is made, the system returns a unique offender identifier

number which is then used to track individuals longitudinally and cross-sectionally (i.e. through the various data collections).

D.3 INOIS applications

The INOIS system has facilitated the development of the de-identified, linked Crime Research Centre Offender Database (CRCOD) which has been used in several criminal career and recidivism studies (Harding and Maller, 1997; Broadhurst and Loh, 1995; Broadhurst and Loh, 2003; Valuri et al., 2002; Ferrante et al., 2009), studies of criminal justice processes (Ferrante et al., 2004) and evaluations of various criminal justice interventions and programs (Ferrante et al., 1999; Indermaur and Roberts, 2003). The INOIS-linked CRCOD has also been used to develop an actuarial risk assessment instrument to support the decision-making processes made by practitioners in the management of offenders (Maller, 2002). The accuracy of matching results from INOIS has been reviewed on several occasions - see, for example, Ferrante (1993).

D.4 Improvements to data quality

The INOIS system has proved useful for improving the quality and completeness of data about the Aboriginal status of offenders in the WA justice system. It has been especially valuable in improving court data, where information about defendant ethnicity has been notoriously poor. The strategy for improving the quality and completeness of ethnicity data in justice-related collections in WA is described elsewhere (Fernandez and Loh, 2003, p.111).

Appendix E: DPP Datasets

The DLB undertook the linkage of DCS Offender data to DPP datasets. The DPP datasets used in this study included a number of health and non-health administrative datasets. Each of the datasets is described below.

E.1 Health datasets - derived from Department of Health WA

The DPP study population for this research was derived from the WA Birth Registration System and Midwives Notification System (MNS). The study population consisted of all persons born in WA between 1980 and 1995 (inclusive). Linked health records for this cohort were extracted from the following collections:

Health dataset(s):

Birth registrations   1980 – 1995

Midwives notifications   1980 – 1995

Hospital morbidity (separations)   1980 – 2005

Death registrations   1980 – 2005

Mental health 1980 – 2005

Mental health records were sourced from the Mental Health Information System (MHIS) and comprised inpatient hospital records, as well as records of outpatient services delivered by public hospitals. The structure and content of the health-related datasets are illustrated in Figure E1 (below).

E.2 Non-health datasets – Child protection, Education and Electoral roll

Child protection data (inclusive of cases of maltreatment, abuse and neglect, and placement orders) were extracted from the administrative records of the Department for Child Protection (DCP). Educational achievement data - based on WA Literacy and Numeracy Assessment (WALNA) scores - were extracted from the WA Department of Education and Training. Electoral roll information was also extracted from the data holdings of the WA Electoral Commission.

Other sources of data:

Child Protection data All available records

Education (WALNA scores) All records available to 2005

Electoral roll   1988 – 2005

The structure and content of these datasets are illustrated in Figure E1 (below).

E.3 Family connections datasets

A unique feature of the WA Data Linkage System (WADLS) system is its ability to create and store genealogical (family) connections (Western Australia Data Linkage Branch, 2003). These connections are established through the interrogation of birth and marriage records and additional linkages. Given the availability of the family connections data, secondary family based cohort data were extracted for the study. Birth and midwives' notification records for the main cohort (as described in E.1 above) were used to identify the parents and siblings of each person in the study cohort. For each identified parent or sibling, additional information was extracted for the study.

Parent data: The 'Parent' cohort consisted of all parents of the children in the main study cohort. Linked event-level records for 'Parent' cohort were extracted from:

> **HoDWA dataset(s):**
>
> Hospital morbidity   1980 – 2005
>
> Death registrations   1980 – 2005
>
> Mental health (MHIS record) 1980 – 2005
>
> Electoral roll   1988 – 2005

The structure and content of these datasets are illustrated in Figure E2 (below).

Sibling data: The 'Siblings' cohort consisted of all children who were siblings of the main child cohort. These siblings may, themselves, have been part of the main child cohort, or not. In the case of siblings who were *not* in the main child cohort (i.e. those born between 1974 and 1979 (inclusive) or between 1996 and 2005), event-level linked records were extracted from the following systems:

> **HoDWA dataset(s):**
>
> Birth registrations   1974 – 1979
>
> Birth registrations   1996 – 2005
>
> Midwives notifications   1996 – 1995
>
> Hospital morbidity   1980 – 2005
>
> Death registration   1980 – 2005
>
> Mental health (MHIS record) 1980 – 2005
>
> **Other sources of data:**
>
> Child Protection   All available records
>
> Education (WALNA scores) All records available to 2005

Juvenile justice contacts   All available records

The structure and content of these datasets are illustrated in Figure E3 (below).

E.4 Value-added data – socio-economic indicators

The DLB supplied additional (value-added) data with the linked records. Census-district (CD) level socio-economic indicators (SEIFA and ARIA indices) were assigned to geographic data contained in Birth registrations, MNS records, Hospital Morbidity records, Death registrations and Electoral roll records. This information was attached by the DLB through a geo-coding process which matched individual addresses to a lat-long position and then allocated these to CDs. SEIFA and ARIA indices were derived from ABS census data at CD level. The structure and content of these datasets are illustrated in Figures E1, E2 and E3 (below).

E.5 DPP datasets - database content and structure

Figures E1 – E3 summarise the database structure for the DPP datasets (main child cohort, parents and siblings. Note that the link between these datasets and offender datasets are illustrated in Figure C1 in Appendix C.

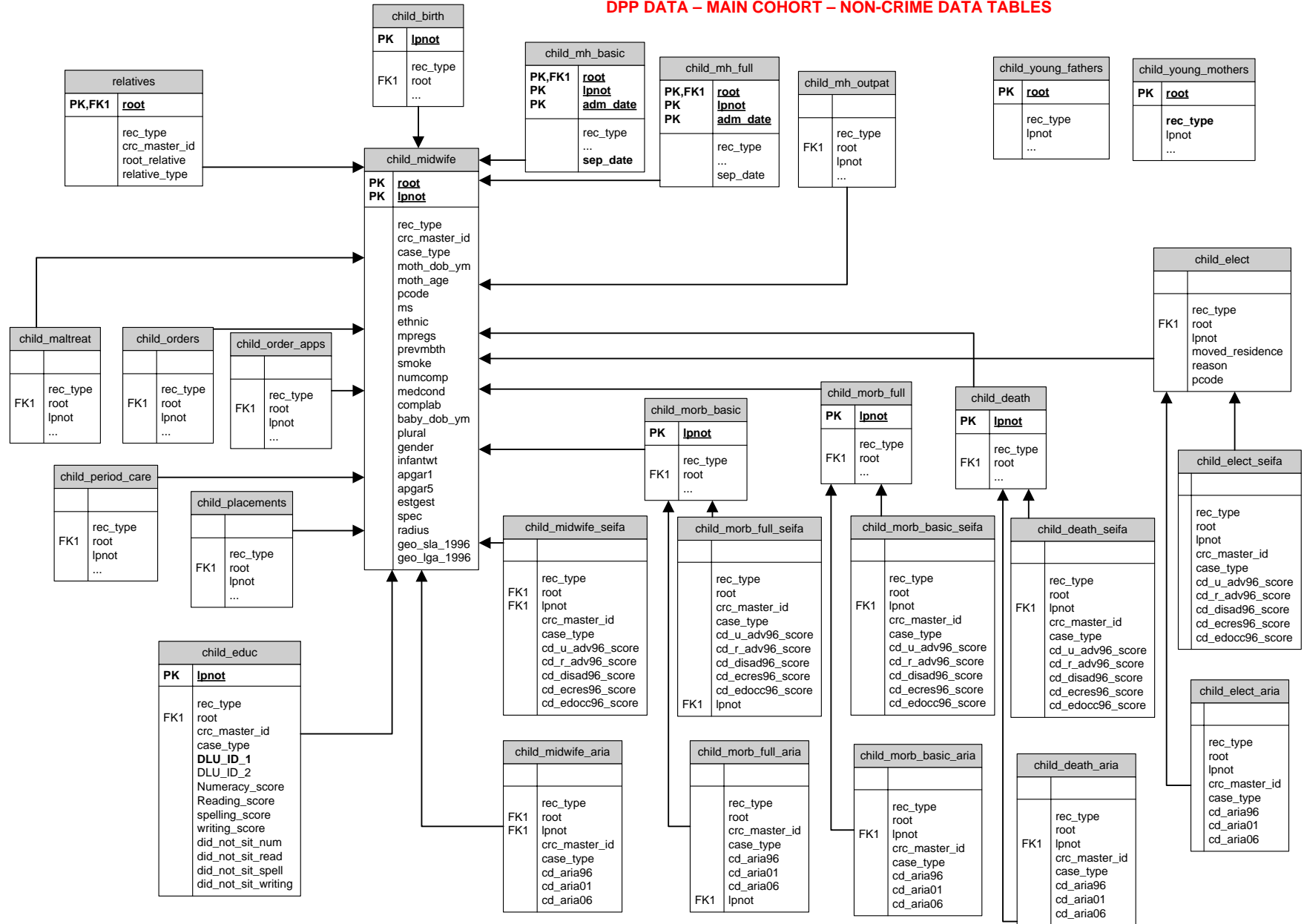**Figure E1:**

DPP DATA – MAIN COHORT – NON-CRIME DATA TABLES

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Figure E2:

DPP DATA - PARENTS OF CHILDREN IN COHORT - NON-CRIME DATA TABLES

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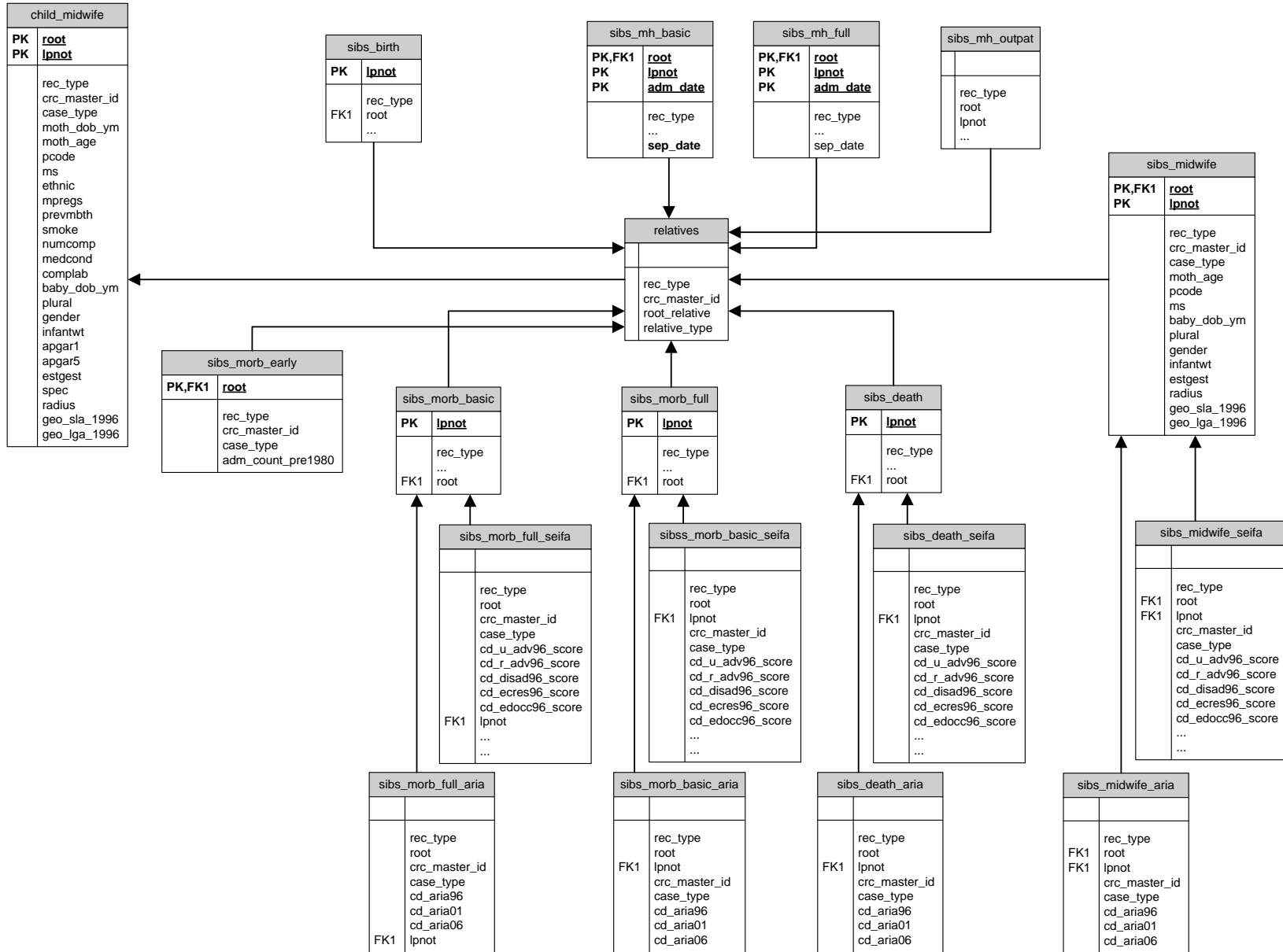
Appendix F: Best practice two-stage linkage process

The two stage, best practice data linkage model articulated by Kelman and colleagues (2002) distinguishes between the activities used to link data and those used to generate linked de-identified datasets for approved research projects. In this model, records are seen as comprising two components: the 'demographic' component and the 'content' or 'service' component. The demographic component contains information about an individual such as their name, address and date of birth. The content or service component contains information about the services delivered to that person such as the procedure they had during a hospital stay or the details of a police arrest or the outcome of an appearance in court by that person.

First stage: linkage maps using demographic data

Under the two-stage, best practice data linkage model, demographic data from administrative data collections is provided to a small linkage team located within or associated with an organisation (usually a government department). The team uses the information to create and maintain high quality linkages within and between data collections. This is an on-going process. When new records are received in an administrative data collection, the demographic components are provided to the linkage team to update the links. The linkage team do not have access to details of the service component of a record which remains under the control of the data custodian for each data collection.

Second stage: release of linkable de-identified data for approved research projects

Where a researcher has approval to access a linkable dataset, the data custodian for each data collection prepares a file containing content or service information items for a designated set of records. This does not contain the related demographic information. An encrypted project specific linkage key generated by the data linkage team is also provided. This enables the researcher to assemble the linked de-identified dataset required for the project, once they have been received.

Appendix G: Further details relating to Sub-Study 4

Each of the explanatory variables included in the study of risk factors associated with participation in offending (Sub-Study 4) is described in Table G1 (below).

Table G1: List of explanatory variables used in Sub-Study 4

Explanatory variables	Description
Individual-based factors	
At birth:	
Indigenous status	As recorded at birth. 1=Aboriginal, 2=non-Aboriginal
sex	As recorded at birth. 1=male, 2=female
moth_age	Mother's age at birth of child. Categoric variable, **mum_age**, was later derived from this variable. Mum_age =1 if moth_age < 20, mum_age=2 if moth_age<35, mum_age=3 if moth_age>=35
infant_weight	Weight as recorded at birth. **Low_birth_weight** derived from this variable. 'Low' determined by reference to the work by Blair et al (2005) which takes into account factors other than infant weight (i.e. gestational age, mother's height). Where these other factors were not available, 'low' was set using international standards i.e. very low <=1500; low <=2500. Ref = World Development Indicators, World Bank 2003. Low_birth_weight = 1 if on or below low birth weight marker; otherwise low_birth_weight = 2.
obcomp_1	Derived measure of obstetric complications, based on similar work by Hodgins et al (2001). Comprises the sum of pregnancy complications, medical conditions and complications during labour, as recorded in Midwives Data Collection. If obcomp_1 >=5 then **obcomp_serious**=1, else if obcomp_1<5 then obcomp_serious=2.
tot_oc_adm	Total number of hospital admission(s) arising from obstetric complications. Two or more of these admission types were used to signal more serious complications (**oc_serious**=1).
tot_oc_days	Total number of days in hospital for obstetric complications
prf_impulse_20	A measure of the perinatal risk factors (prf) for impulsivity was derived from obstetric complications (obcomp_1) and neonatal complications (apgar1, apgar5). This measure was based on an approach used by Hodgins et al (2001). Score out of 20. If prf_impulse_20 > =9, **high_prf_impulse** =1 ; else if prf_impulse_20 < 9 then high_prf_impulse=2
Health-derived:	
total_adm	Total number of hospital admissions to 31.12.2005. Categoric variable, **ill_serious**, derived from this variable. If tot_adm >=5 then ill_serious=1; otherwise ill_serious=2.
total_days	Total number of days spent in hospital, for those who were admitted during study period

tot_mh_adm	Total number of hospital admissions for mental illness to 31.12.2005. ICD10 diagnostic codes = F00-F99 for admissions on/after 1.7.99; ICD9 diagnostic codes = 290-319.99, 648.4-648.49, 799.2-799.29, and selected V-codes before 1.7.99. Categoric variable, **mh_serious**, derived from this variable. If tot_mh_adm >=1 then mh_serious=1; otherwise mh_serious=2.
tot_mh_days	Total number of days spent in hospital for mental illness
tot_mh_ops	Total number of mental health outpatient services received to 31.12.2005
tot_as_adm	Total number of hospital admissions for assault victimisation to 31.12.2005. ICD10 diagnostic codes = X85-Y09 for admissions on/after 1.7.99; ICD9 diagnostic codes = E960-E969 before 1.7.99. Categoric variable, **assault_victim,** derived from this variable. If tot_as_adm >=1 then assault_victim=1; otherwise assault_victim=2.
tot_as_days	Total number of days spent in hospital for those admitted for assault victimisation
tot_sh_adm	Total number of hospital admissions for self-harm to 31.12.2005. ICD10 diagnostic codes =X60-X84 for admissions on/after 1.7.99; ICD9 diagnostic codes = E950-E959 before 1.7.99. Categoric variable, **self_harm**, derived from this variable. If tot_sh_adm >=1 then self_harm=1; otherwise self_harm=2.
tot_sh_days	Total number of days spent in hospital for those admitted for self-harm
tot_da_adm	Total number of hospital admissions for drugs/alcohol conditions to 31.12.2005. ICD10 diagnostic codes =F10-F19 for admissions on/after 1.7.99; ICD9 diagnostic codes = 303,304,305,291,292 before 1.7.99. Categoric variable, **drugs_alcohol,** derived from this variable. If tot_da_adm >=1 then drugs_alcohol=1; otherwise drugs_alcohol=2.
tot_da_days	Total number of days spent in hospital for those admitted for drugs/alcohol
tot_cd_adm	Total number of hospital admissions for childhood/adolescent disorders to 31.12.2005. ICD10 diagnostic codes =F90-F98 for admissions on/after 1.7.99; ICD9 diagnostic codes = 299 before 1.7.99
tot_cd_days	Total number of days spent in hospital for those admitted for childhood/adolescent disorders
teen_parent	Teen_parent = 1 if child was idenfitied as a parent (mother or father) while age < 18 years (from birth registration records); otherwise teen_parent =2

Maltreatment/abuse:

dcp_physical_flag	Total number of child maltreatment allegations or substantiations to 31.12.2005 where nature of abuse is physical. **Physical_abuse**=1 if this flag is nonzero; otherwise physical_abuse=2
dcp_sexual_flag	Total number of child maltreatment allegations or substantiations to 31.12.2005 where nature of abuse is sexual. **Sexual_abuse**=1 if this flag is nonzero; otherwise sexual_abuse=2
dcp_maltreat_cnt	Total number of child maltreatment allegations or substantiations to 31.12.2005. **Maltreated**=1 if count is nonzero; otherwise maltreated=2
dcp_orders_cnt	Total number of orders made for this child to 31.12.2005
dcp_order_apps_cnt	Total number of order applications made for this child to 31.21.2005
dcp_period_care_cnt	Total number of periods of care experienced by this child to 31.12.2005. **Incare**=1 if count is nonzero; otherwise incare=2
dcp_placement_cnt	Total number of placements of child to 31.12.2005 (one period of care may contain a number of placements).
first_maltreat_age	Age at first allegation or substantiation of child maltreatment. **Early_maltreat**=1 if age<6; early_maltreat = 2 if age<12; otherwise early_maltreat=3

Family-based factors
  Family structure:

sib_cnt	Total number of siblings of this child. Variable derived by DLB from family connections data in birth registration records. Categoric variable measuring family size, **big_family_2**, was derived from this variable. Big_family_2=1 if sib_cnt>4. **Only_child** also derived from this variable.

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older_sib_cnt	Total number of older siblings - derived from family connection data in birth registration records. A number of other family structure/birth order variables - **first_born, second_born, third_born** - were derived from this one

Family movement:

mum_mobility	Total number of changes in mother's address from birth of child to 31.12.2005, as determined from electoral roll information. Categoric variable, **high_mobility**, derived from this variable. If mum_mobility>6 then high_mobility=1, if mum_mobility>=3 then high_mobility=2, if mum_mobility<3 then high_mobility=3
dad_mobility	Total number of changes in father's address from birth of child to 31.12.2005, as determined from electoral roll information

Parent health:

parent_death	Derived from mortality records. Parent_death=1 if one or more parents died between birth of child to 31.12.2005; otherwise parent_death=2
total_mum_adm	Total number of hospital admissions by mother during study period. Categoric variable, **mum_ill**, derived from this variable. If tot_mum_adm >=10 then mum_ill=1; otherwise mum_ill=2.
total_mum_days	Total number of days spent in hospital by mothers, for those who were admitted during study period
total_dad_adm	Total number of hospital admissions by father during study period. Categoric variable, **dad_ill,** derived from this variable. If tot_dad_adm >=10 then dad_ill=1; otherwise dad_ill=2.
total_dad_days	Total number of days spent in hospital by fathers, for those who were admitted during study period
tot_parent_mh_adm	Total number of hospital admissions for mental health reasons (as defined above) by either parent during study period. Categoric variable, **p_mh_serious**, derived from this
tot_parent_mh_ops	Total number of mental health out-patient services received by either parent during study period
tot_parent_as_adm	Total number of hospital admissions for assault victimisation by either parent during study period. Categoric variable, **p_assault_victim**, derived from this
tot_parent_as_days	Total number of days in hospital for assault victimisation by either parent during study period
tot_parent_sh_adm	Total number of hospital admissions for self-harm by either parent during study period. Categoric variable, **p_self_harm**, derived from this
tot_parent_sh_days	Total number of days in hospital for self-harm by either parent during study period
tot_parent_da_adm	Total number of hospital admissions for drugs/alcohol by either parent during study period. Categoric variable, **p_drugs_alcohol**, derived from this
tot_parent_da_days	Total number of days in hospital for drugs/alcohol by either parent during study period

Sibling health and wellbeing:

sib_death_cnt	Count of the number of siblings who died during study period - derived from mortality records. **Sib_death**=1 if one or more siblings died between birth of child to 31.12.2005; otherwise sib_death=2
sib_crim_cnt	Count of the number of siblings who had contact with justice system during study period. **Sib_crim**=1 if one or more siblings became offenders during study period; otherwise sib_crim=2
total_sib_adm	Total number of hospital admissions by all siblings during study period. Categoric variable, **sib_ill**, derived from this
total_sib_days	Total number of days in hospital by all siblings during study period
tot_sib_mh_adm	Total number of hospital admissions for mental health reasons (as defined above) by siblings during study period. Categoric variable, **s_mh_serious**, derived from this
tot_sib_mh_days	Total number of days in hospital for mental health reasons (as defined above) by siblings during study period

tot_sib_mh_ops	Total number of mental health out-patient services received by siblings during study period
tot_sib_as_adm	Total number of hospital admissions for assault victimisation by siblings during study period. Categoric variable, **s_as_serious**, derived from this
tot_sib_as_days	Total number of days in hospital for assault victimisation by siblings during study period
tot_sib_sh_adm	Total number of hospital admissions for self-harm by siblings during study period
tot_sib_sh_days	Total number of days in hospital for self-harm by siblings during study period. Categoric variable, **s_sh_serious**, derived from this
sibs_dcp_physical_flag	Total number of sibling maltreatment allegations or substantiations to 31.12.2005 where nature of abuse is physical. **s_physical_abuse**=1 if this flag is nonzero; otherwise s_physical_abuse=2
sibs_dcp_sexual_flag	Total number of sibling maltreatment allegations or substantiations to 31.12.2005 where nature of abuse is sexual. **s_sexual_abuse**=1 if this flag is nonzero; otherwise s_sexual_abuse=2
sibs_dcp_maltreat_cnt	Total number of sibling maltreatment allegations or substantiations to 31.12.2005. Categoric variable, **s_maltreat**, derived from this
sibs_dcp_orders_cnt	Total number of orders made for siblings to 31.12.2005
sibs_dcp_order_apps_cnt	Total number of order applications made for siblings to 31.21.2005
sibs_dcp_period_care_cnt	Total number of periods of care experienced by siblings to 31.12.2005. Categoric variable, **s_incare**, derived from this
sibs_dcp_placement_cnt	Total number of placements of siblings to 31.12.2005 (one period of care may contain a number of placements).

School factors

read_lvl_3	WALNA reading level score at Yr 3; **Low_ed_achieve_3** is derived from this variable. Low_ed_achieve_3=1, if read_3 in lowest 25th percentile; otherwise low_ed_achieve=2. There is a high correlation between read_3 and each of num_3 (r=0.59), writing_3 (0.49) and spell_3 (r=0.58).
num_lvl_3	WALNA numeracy level score at Yr 3
writing_lvl_3	WALNA writing level score at Yr 3
spell_lvl_3	WALNA spelling level score at Yr 3
read_lvl_5	WALNA reading level score at Yr 5; **Low_ed_achieve_5** is derived from this variable. Low_ed_achieve_5=1, if read_5 in lowest 25th percentile; otherwise low_ed_achieve=5. High correlation between read_5 and each of num_5 (0.61), writing_5 (0.51) and spell_5 (0.53).
num_lvl_5	WALNA numeracy level score at Yr 5
writing_lvl_5	WALNA writing level score at Yr 5
spell_lvl_5	WALNA spelling level score at Yr 5
read_lvl_7	WALNA reading level score at Yr 7; **Low_ed_achieve_7** is derived from this variable. Low_ed_achieve_7=1, if read_7 in lowest 25th percentile; otherwise low_ed_achieve=7. High correlation between read_7 and each of num_7 (0.64), writing_7 (0.57) and spell_7 (0.59).
num_lvl_7	WALNA numeracy level score at Yr 7
writing_lvl_7	WALNA writing level score at Yr 7
spell_lvl_7	WALNA spelling level score at Yr 7
read_lvl_9	WALNA reading level score at Yr 9; **Low_ed_achieve_9** is derived from this variable. Low_ed_achieve_9=1, if read_9 in lowest 25th percentile; otherwise low_ed_achieve=9. High correlation between read_9 and each of num_9 (0.58) and writing_9 (0.59).
num_lvl_9	WALNA numeracy level score at Yr 9
writing_lvl_9	WALNA writing level score at Yr 9
sch_absence_3 (**wagger_3**)	A proxy measure for school absence in Yr 3 - derived from WALNA 'did not sit' variables. If a student was absent from two or more WALNA tests in Yr 3, then sch_absence_3 or wagger_3=1; otherwise sch_absence=2.
sch_absence_5 (**wagger_5**)	A proxy measure for school absence in Yr 5 - derived from WALNA 'did not sit' variables. If a student was absent from two or more tests in Yr 5, then sch_absence_5 or wagger_5=1; otherwise sch_absence=5.

sch_absence_7 (**wagger_7**)	A proxy measure for school absence in Yr 7 - derived from WALNA 'did not sit' variables. If a student was absent from two or more tests in Yr 7, then sch_absence_7 or wagger_7=1; otherwise sch_absence=2.				
sch_absence_9 (**wagger_9**)	A proxy measure for school absence in Yr 9 - derived from WALNA 'did not sit' variables. If a student was absent from two or more tests in Yr 9, then sch_absence_9 or wagger_9=1; otherwise sch_absence=2.				
Community factors					
seifa_birth	The Index of Relative Social Disadvantage, as defined by the ABS, was used to determine the level of socioeconomic disadvantage in the census collection district (CD) relating to the mother's residence at time of child's birth. A categoric variable, **birth_disadv**, was derived from this index. For CDs having the most disadvantage (in 10th percentile), birth_disadv_serious=1; for CDs with least disadvantage (90th percentile), birth_disadv_serious=5. .An additional categoric variable with fewer levels, **birth_disadv_serious**, was also derived. For CDs having the most disadvantage (in 25th percentile), birth_disadv_serious=1; else birth_disadv_serious=2.				

Table G2 presents results from preliminary comparison of means for offenders and non-offenders.

Table G2: Results from preliminary comparison of means for cases (offenders) and controls (non-offenders).

Explanatory variables	Controls (non-offender) N=94,540		Cases (Offender) N=18,098		
	Mean	95% CI	Mean	95% CI	
Individual-based factors					
At birth:					
Indigenous status	1.97	(1.97,1.97)	1.72	(1.71,1.73)	
sex	1.51	(1.50,1.51)	1.24	(1.23,1.24)	
moth_age	26.90	(26.87,26.93)	24.53	(24.45,24.60)	
infant_weight	3355.3	(3,351.7,3,358.9)	3328.6	(3,320.6,3,336.5)	
obcomp_1	0.93	(0.92,0.94)	1.01	(1.00,1.03)	
tot_oc_adm	0.25	(0.24,0.25)	0.44	(0.42,0.46)	
tot_oc_days	10.15	(9.89,10.41)	10.41	(9.99,10.84)	na
prf_impulse_20	2.15	(2.14,2.16)	2.30	(2.28,2.33)	
Health-derived:					
total_adm	2.74	(2.69,2.79)	5.46	(5.37,5.56)	
total_days	10.66	(10.46,10.86)	23.74	(23.04,24.44)	
tot_mh_adm	0.10	(0.09,0.11)	0.39	(0.36,0.42)	
tot_mh_days	21.76	(19.52,24.00)	22.76	(20.44,25.07)	na
tot_mh_ops	1.40	(1.31,1.49)	5.10	(4.77,5.43)	
tot_as_adm	0.01	(0.01,0.01)	0.11	(0.10,0.12)	
tot_as_days	2.57	(1.85,3.28)	3.28	(2.94,3.62)	
tot_sh_adm	0.01	(0.01,0.01)	0.06	(0.05,0.06)	
tot_sh_days	7.11	(5.47,8.74)	4.48	(3.47,5.49)	
tot_da_adm	0.01	(0.01,0.02)	0.20	(0.18,0.21)	
tot_da_days	12.17	(9.74,14.61)	17.27	(15.08,19.46)	

teen_parent	1.99	(1.99,1.99)	1.93	(1.93,1.94)	
Maltreatment/abuse:					
dcp_physical_flag	0.02	(0.02,0.02)	0.14	(0.13,0.14)	
dcp_sexual_flag	0.02	(0.02,0.02)	0.09	(0.08,0.09)	
dcp_maltreat_cnt	0.06	(0.06,0.06)	0.38	(0.37,0.40)	
dcp_orders_cnt	0.00	(0.00,0.00)	0.02	(0.02,0.02)	
dcp_order_apps_cnt	0.00	(0.00,0.00)	0.03	(0.02,0.03)	
dcp_period_care_cnt	0.01	(0.01,0.01)	0.13	(0.12,0.14)	
dcp_placement_cnt	2.77	(2.45,3.08)	5.22	(4.74,5.70)	
first_maltreat_age	8.13	(7.99,8.26)	7.94	(7.80,8.08)	na
Family-based factors					
Family structure:					
sib_cnt	1.85	(1.84,1.86)	2.78	(2.75,2.81)	
older_sib_cnt	0.77	(0.76,0.78)	0.61	(0.59,0.62)	
Family movement:					
mum_mobility	2.93	(2.92,2.94)	3.50	(3.46,3.53)	
dad_mobility	2.64	(2.62,2.65)	2.43	(2.40,2.46)	
Parents:					
parent_death	1.96	(1.96,1.96)	1.91	(1.91,1.92)	
total_mum_adm	8.95	(8.84,9.07)	15.80	(15.31,16.29)	
total_dad_adm	3.94	(3.84,4.04)	5.50	(5.11,5.89)	
tot_parent_mh_adm	0.46	(0.44,0.49)	1.11	(1.03,1.20)	
tot_parent_mh_ops	5.01	(4.70,5.32)	10.79	(9.72,11.86)	
tot_parent_as_adm	0.02	(0.02,0.02)	0.17	(0.16,0.18)	
tot_parent_as_days	4.87	(4.36,5.38)	5.18	(4.77,5.60)	na
tot_parent_sh_adm	0.02	(0.02,0.02)	0.06	(0.06,0.07)	
tot_parent_sh_days	8.33	(7.22,9.45)	5.93	(4.96,6.90)	
tot_parent_da_adm	0.09	(0.09,0.10)	0.43	(0.41,0.46)	
tot_parent_da_days	17.63	(16.43,18.83)	13.85	(12.69,15.02)	
Siblings:					
sib_death_cnt	0.04	(0.04,0.04)	0.09	(0.09,0.10)	
sib_crim_cnt	0.09	(0.09,0.10)	0.62	(0.60,0.63)	
total_sib_adm	5.44	(5.36,5.51)	14.25	(13.90,14.61)	
total_sib_days	21.23	(20.88,21.59)	64.38	(62.61,66.16)	
tot_sib_mh_adm	0.18	(0.17,0.19)	0.55	(0.51,0.59)	
tot_sib_mh_days	23.27	(21.59,24.95)	26.97	(24.28,29.65)	
tot_sib_mh_ops	3.76	(3.55,3.98)	9.89	(9.04,10.74)	
tot_sib_as_adm	0.02	(0.02,0.03)	0.18	(0.17,0.19)	
tot_sib_as_days	3.16	(2.79,3.52)	4.31	(3.93,4.68)	
tot_sib_sh_adm	0.02	(0.02,0.02)	0.07	(0.06,0.08)	
tot_sib_sh_days	6.46	(5.41,7.50)	5.82	(4.36,7.27)	na
sibs_dcp_physical_flag	0.04	(0.04,0.05)	0.31	(0.29,0.33)	
sibs_dcp_sexual_flag	0.05	(0.04,0.05)	0.24	(0.23,0.26)	
sibs_dcp_maltreat_cnt	0.14	(0.14,0.15)	1.02	(0.97,1.06)	
sibs_dcp_orders_cnt	0.01	(0.01,0.01)	0.08	(0.07,0.09)	
sibs_dcp_order_apps_cnt	0.01	(0.01,0.01)	0.10	(0.09,0.10)	
sibs_dcp_period_care_cnt	0.03	(0.02,0.03)	0.29	(0.27,0.31)	
sibs_dcp_placement_cnt	5.50	(4.89,6.11)	8.52	(7.72,9.32)	
School factors					
read_lvl_3	272.92	(269.89,275.96)	181.55	(172.70,190.41)	
num_lvl_3	330.11	(327.27,332.95)	257.44	(249.76,265.11)	
writing_lvl_3	263.49	(259.52,267.45)	135.41	(122.08,148.73)	
spell_lvl_3	282.41	(278.45,286.36)	170.85	(161.22,180.47)	
read_lvl_5	362.09	(360.35,363.84)	280.63	(276.04,285.22)	
num_lvl_5	397.28	(395.75,398.81)	333.88	(330.07,337.68)	
writing_lvl_5	365.27	(362.73,367.80)	251.17	(243.58,258.77)	
spell_lvl_5	408.71	(406.35,411.08)	306.55	(300.39,312.71)	
read_lvl_7	445.65	(443.97,447.33)	363.00	(358.32,367.68)	

num_lvl_7	476.63	(474.84,478.41)	398.47	(394.12,402.82)
writing_lvl_7	457.22	(454.21,460.23)	314.27	(304.94,323.59)
spell_lvl_7	497.50	(495.31,499.68)	391.72	(385.17,398.26)
read_lvl_9	449.67	(445.49,453.85)	327.82	(315.17,340.48)
num_lvl_9	515.81	(512.65,518.96)	430.46	(421.87,439.04)
writing_lvl_9	524.15	(517.07,531.23)	350.58	(328.46,372.69)
sch_absence_3	0.14	(0.14,0.15)	0.15	(0.15,0.16)
sch_absence_5	0.12	(0.12,0.12)	0.15	(0.15,0.16)
sch_absence_7	0.12	(0.12,0.12)	0.16	(0.15,0.16)
sch_absence_9	0.14	(0.14,0.14)	0.15	(0.15,0.16)
Community factors				
seifa_birth	992.44	(991.78,993.11)	942.86	(941.16,944.55)

Note: T-tests were significant at p=0.001 for all variables *except those indicated by na.*
Significance at p=0.001 was selected because of large N.