Original Article

Assessing gender and ethnic differences in developmental trajectories of offending

Abstract

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, generalizable research which compare and contrast offending patterns across and within gender and ethnic groups. The current study applies a semi-parametric group-based modelling approach to a large, longitudinal dataset of offenders to determine if, and how, offending trajectories vary across gender and ethnic sub-groups. Findings suggest that some trajectory attributes (e.g. number and shape) are shared across gender/ethnic groups, while other trajectory attributes (height, peak age) are not. An exploratory investigation of the risk factors associated with trajectory group membership finds that few of the available factors discriminate between trajectories either *within* or *across* gender/ethnic offender groups. The findings fill a knowledge gap, particularly in relation to offending patterns in Australia. Invariance in trajectory risk factors present a challenge to taxonomic theories of offending.

Keywords

Offending trajectories, offending frequency, gender, ethnicity, Indigenous status

Introduction

Despite the fact that gender and ethnic status (race) emerge as strong correlates of crime, explanatory models and theories which account for gender and ethnic differences vary widely. In terms of gender disparities, some scholars maintain that the processes leading to male and female offending are equivalent and that gender differences are predominantly due to differing levels of exposure to the same underlying factors. However, an alternate line of reasoning maintains 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). On-going debate between perspectives underscores the need for more investigation of gender differences in offending (Fitzgerald et al., 2012). Further trends in offending such as rising rates of violent crime amongst women, add to the impetus to explore differences *between* and *within* gender groups (Odgers et al., 2007; Fitzgerald et al., 2012).

Similarly, there is need to explore racial/ethnic-based differences in offending. US 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 overwhelming evidence of Aboriginal over-representation in official offending (Ferrante and Loh, 2001; Blagg et al., 2005; Luke and Cunneen, 1995; Skrzypiec and Wundersitz, 2005; Harding et al., 1995). Despite this evidence, there are differing international and Australian perspectives regarding the causes of these ethnic differences. Some scholars favour explanations based on traditional

theories of crime; others favour hypotheses which attribute cause to culturally-specific or other unique factors (e.g. systemic bias; see Ferrante (2013) for a more complete discussion). Yet others account for ethnic disparities through other mechanisms. Piquero, Moffitt and Lawton (2005b), for example, argue that it is the ecological context that different ethnic groups live in that gives rise to more pronounced anti-social behaviour in one group than in another. They argue that ethnic difference in 'ecological context' refers also to differences in family structure, and community and neighbourhood context. A by-product of different family structures across ethnic groups is reduced supervision and, ultimately, failed socialization.

This ecological explanation of ethnic difference is consistent with that presented in a number of developmental, group-based theories of offending (e.g. Moffitt, Patterson). Moffitt (1993) argues that institutionalized racism and poverty selectively affect minority groups, particularly African Americans. Such factors have a negative effect on early life socialization 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'. In other words, for ethnic minorities, adverse structural conditions operate to restrict life chances over the life-course (e.g. less access to prenatal care, more exposure to environmental toxins, attenuated familial bonds due to socioeconomic stress, more exposure to disadvantaged schools, fewer employment opportunities) making it more likely that individuals from these groups engage in life-course persistent (LCP) offending.

The range of alternative explanatory models for racial differences in offending emphasises the need for further quantitative analyses of these issues. As Piquero and

Brame (2008) maintain, "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).

Trajectory models

Researchers in the life-course/developmental domain have shown considerable interest in exploring offending patterns 'in different populations at different [life] time points'. This interest has been spurred by statistical developments (i.e. the advent of trajectory modelling techniques) and by the emergence of several taxonomic theories of offending proposing different age-related patterns of development for different groups (e.g. Moffitt, Patterson). An abundance of studies exploring offending over the life course have followed, many using a semi-parametric group-based trajectory method (SPGM; Nagin and Land, 1993). Piquero (2008) recently reviewed more than 80 offending trajectory studies of undertaken between 1993 and 2005. Most of the studies were located in the US (Eggleston et al., 2004; Laub and Sampson, 2003; Piquero et al., 2001; Piquero et al., 2002); however, some were based elsewhere e.g. England, the Netherlands (Blokland, 2005; Francis et al., 2004). The studies employed a varied array of sampling frames (offender-based/general population), data sources (self-report/official records) and covered various periods of the life-course (childhood/adolescence/ adulthood). Although there were variations in the way that the trajectory models had been applied, Piquero (2008) concluded that "the use of group-based methods to estimate trajectories of criminal activity over the life-course suggests that there is a fair degree of consistency among and across a wide range of samples with respect to group number and shape but the length of follow-up and age

range may affect substantive conclusions regarding the shape of the trajectory (though this no fault of the methodology *per se*)" (Piquero, 2008: p.48).[1]

Despite the surge in trajectory research, few studies have examined gender differences in offending trajectories, and only a handful of studies have examined differences based on race or ethnicity. .

Gendered trajectories

There are few studies of female offending trajectories and results are mixed (D'Unger et al., 2002). An early study by Silverthorn and Frick (1999) 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. Fergusson and Horwood (2002) fitted five different trajectory groups to a general population sample and 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.

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[1] As a reviewer pointed out, differences in sampling schemes (general population versus offender cohorts) raise important questions about the extent to which findings can be compared. Other researchers have noted similar – that sampling variations and other methodological differences e.g. differing definitions of the response variable (offence frequency/severity scale), different data sources (self-report versus official records) and variations in follow-up period, also affect research findings and their applicability or generalizability to other settings (Piquero, 2008; Block et al., 2010; Weaver, 2010). In terms of sampling schemes, the current study uses a large offender cohort, not the general population. As such, the results apply to offenders only and distinctions between groups refer to differences *in sub-groups within the offender population*.

Consistent with Fergusson and Horwood, but in contrast to Silverthorn and Frick(1999), Eggleston and Laub (2002) found that the *same* trajectory groups existed for boys and girls; however, 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). Using data from the Second Philadelphia Cohort study (3,000 females; 1,000 males), the researchers 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, an additional 'chronic offender' group was found for boys only. The study also found that: i) females 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. The study concluded that typologies applied to male offender could not be generalised to females and that observed differences could be reflecting differing attachments to various social institutions through the life course.

Piquero and colleagues (2005a) also found variation in male 'conviction experiences' when compared to females, identifying three trajectories for males, but only two for females. 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. Cohen et al (2010) identified four male trajectories (non-offenders, low-rate offenders, adolescent-peaked offenders, and low steady chronic but declining offenders), but only three female groups. In addition, offending rates were noticeably higher for the male groups than for the female groups. Weaver (2010), too, investigated gendered trajectories using a large US 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). Six trajectory groups could be fitted to male offenders, but only three 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 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. Weaver 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. Offending trajectories were similar across males and females, though males exhibited a higher frequency of offending 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 gender trajectories, research findings from the various studies have been summarised (Table 1). Results 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 1 about here** >>>

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 the proportion of offenders that "belong" to each group. However, there is inconsistency in the number of trajectory groups for each gender. Regarding the risk factors associated with group membership, some studies suggest that, in addition to a general set of risk factors, there are some specific risk that distinguish between offending trajectories; however, no consistent pattern has emerged (Caudy, 2011). In summary, the extant literature on gendered trajectories suggests that there are many similarities but also some differences in male and female trajectories. There is no clear consensus regarding gender differences in the correlates associated with these trajectories.

Ethnic-specific trajectories

Piquero and colleagues (2005b) were the first to examine ethnic-based differences in life-course-persistent pathways. Although they found differences between Black and White levels of chronic offending, they concluded that the developmental processes predicting chronic offending were the *same* across racial groups. The researchers also pointed to 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/racial groups as well as for males and females' (p. 68). Only four subsequent

US 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 ethnic group. Reitzel (2006) tracked a sample of 524 high-risk offenders following release from the California Youth Authority (CYA) and found both similarities and differences across ethnic-specific trajectory groups. Reitzel (2006) also examined how various childhood factors distinguished between offending trajectories across ethnic group. He found that IQ, age at first arrest, parental criminality and sibling criminality significantly distinguished between offending trajectories for Whites, while family structure and family welfare distinguished between offending trajectories for Blacks, and juvenile drug use distinguished between offending trajectories among Hispanics.

In contrast, Maldonado-Molina and colleagues (2009) compared offending trajectories across two samples of Hispanic youth and found that the risk and protective factors that distinguished between trajectories were more similar than different across the two samples. A later study by Cohen and colleagues (2010) also estimated the trajectory models for White, African-American and Hispanic groups, identifying both 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 racial/ethnic groups.[2] Cohen and colleagues (2010) looked at gender differences, too, and found that four trajectories best fitted males, while only three trajectory groups fitted females. The researchers concluded that the low

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[2] 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. Second, African-Americans demonstrated a higher rate of offending over time than Whites.

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 ethnic group.

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. He identified four trajectories for Whites and Blacks, and three trajectories for Hispanics. Consistent with Moffitt's (1993) developmental taxonomy, he found that an adolescent-peaked and a chronic offending trajectory emerged across all models. The study concluded that patterns of offending were more or less invariant across ethnic group. In terms of risk factors, the study found little variation in the correlates associated with each trajectory and concluded that the trajectory groups differed 'in degree' rather than 'by type'.

Applications of the group-based approach in Australia

In Australia, only a handful of published studies have investigated offending trajectories using either SPGM or latent class analysis (LCA) (Marshall, 2006; Fitzgerald et al., 2012; Livingston et al., 2008). Marshall (2006) applied the SPGM to a single birth cohort of offenders in South Australia (those born in 1984) and identified six distinct juvenile offending groups. Similarly, Livingston and colleagues applied the SPGM techniques to an offender 1983/84 birth cohort located in Queensland. In both studies, gender and ethnic group (Indigenous 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.

Fitzgerald and colleagues (2012) assessed gender differences *only* in a cross-sectional sample of 1,503 serious juveniles offenders in Queensland. Consistent with a range of other studies (see Table 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. The study went on to explore the relationship of a single risk factor (child maltreatment) to trajectory/class membership and, interestingly, found that the experience of abuse was experienced *differentially* across gender. It was concluded that some subsets of offenders may, indeed, follow potentially different and 'gendered' pathways.

Purpose of study

As is evident, research effort on gender- and ethnic-specific offending trajectories has been limited and results are mixed. 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 inform the design and targeting of criminal justice 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 ethnic group (Indigenous status)? What

are the factors associated with such trajectories? And, do such factors vary across gender and Indigenous status?

Data and Method

Data was sourced from the official contact records of the Western Australian (WA) criminal justice system. The records describe official offending of *all* offenders born between 1977 and 1995 – a total of 122,517 offenders. For each individual, the offending records comprised *all* records of formal police apprehension (arrest and charge, or summons) and *all* records of juvenile diversion (including formal police cautions and referrals to Juvenile Justice Teams) from the earliest contact with the WA criminal justice system (commencing 1 January 1984) to the end of the study period (31 December 2005). The data were brought together and linked using the INOIS system (Ferrante, 1993).

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.[3]

Note that the study excluded non-offenders from all analyses of offending frequency. This approach is consistent with the criminal career perspective where 'dimensions' of offending may be partitioned and studied separately (Blumstein et al., 1986). The criminal career paradigm maintains that patterns of offending participation and offending frequency are distinct, and that the factors that predict participation in offending may be quite different to those that predict the

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[3] Note that no adjustment was made to the dependent variable for time spent in custody or for mortality, as there is evidence to suggest that, at population level, this level fine-tuning on re-offending rates may not be warranted (Ferrante et al., 2009).

frequency of offending (Nagin and Smith, 1990; Smith et al., 1991). In the current study, offending frequency is viewed as being discrete from offending participation and, therefore, only offenders are included.

For modelling purposes, the study combined all offenders into a single offender group and analysed offending at each age level, irrespective of birth year.[4] This approach may lead to biases in analyses, as trajectory estimates at later ages will tend to be influenced by the offending patterns of older offenders (since lambda for younger offenders were 'missing' for ages not yet reached). However, prior to using a combined offender dataset, the study separately modelled trajectories for individual offender birth cohorts. Despite variations in follow-up times, the number of trajectories to emerge for each birth cohort did not vary substantially.

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.[5]

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[4] Recall that the data comprised *all* offenders born between 1977 and 1995 and followed from 1984 to 2005. Thus, the data essentially comprised multiple birth cohorts with varying follow-up times. Offenders in the earliest birth cohort were followed for the longest time (up to age 28), while offenders in later birth cohorts had shorter follow-up times (followed to age 10 only).

[5] Details of the model specification and fitting are not reported here but can be obtained on request from the author. Further modelling was 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 race group.

Determining factors associated with trajectory group membership.

An exploratory study was undertaken to gain insight into whether certain risk factors might distinguish between trajectories *within* sub-groups of the offender population.[6] 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 offender groups. The set of risk factors included in the 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, Indigenous status, birth year), the environment (geography, disadvantage), and some criminal justice variables.

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. *Indigenous status* was included when gender-specific trajectories were modelled. One in seven offenders (14%) 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.

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* 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. These variables

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[6] It is important to note that the examination of risk factors pertains to offending trajectories only. Recall that this is a study of offending frequency (not offending participation) and thus only offenders have been included in the study. The risk factors here relate to differences between one group of offenders and another, and not to the differences between offenders and non-offenders.

were used as indicators of more serious offending. These variables and *Early_onset* were included in the models as it is well-established that 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. As the aim of diversionary processes is to reduce the effects of labelling and stigmatisation associated with juvenile offending, it was hypothesized that this variable would have a protective effect.

Environmental/ecological variables

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* was derived from the statistical local area of first offence. The Kimberley and Pilbara regions of Western Australia were classified as 'north'. 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 Western Australia (Harding et al., 1997).

A number of socio-economic variables or indices were included in the models to explore the relationship between disadvantage and offending. *Onset_disadv, onset_edocc* and *onset_resource* were used as three alternative measures of disadvantage, each derived from the ABS SEIFA data from 1986 to 2006 and applied at the postcode level.[7]

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[7] *Onset_disadv* 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* is a variant of the socio-economic index which places greater emphasis on educational

Results

Characteristics of the study offender population are presented in Table 2. Some differences across gender and ethnic groupings are immediately apparent - 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.

<<< **Table 2 about here** >>>

Final fitted trajectory solutions

The final fitted trajectory solutions for male, female, Aboriginal and non-Aboriginal offenders are illustrated in Figures 1 – 4 respectively. The best fitting model for male offenders comprised three trajectories:

- G1 (lower trajectory) – a low-rate offending group, comprising 83% of male offenders, n=70,743

- G2 (middle) – a mid-range group, 13.8% of male offenders, n=9,783

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

It is notable that offending levels declined during adulthood across all male trajectories.

The best fitting model for female offenders comprised two trajectories:

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

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and occupational disadvantage. *Onset_resource* places even greater emphasis on the educational and occupational characteristics of the local community.

- G2 (upper) – a mid-rate offending group, 8.5% of 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. The adolescent offending trajectory peaked at age 15 for females and at age 17 for males.

<<< Figure 1. about here >>>

<<< Figure 2. about here >>>

The best fitting model for the Aboriginal cohort comprised three trajectories, while the best fitting model for the non-Aboriginal cohort comprised just two trajectories. For both Aboriginal and non-Aboriginal offenders, offending levels declined during adulthood across all trajectory groups. Indeed, for Aboriginal offenders, the offending levels of the   mid-rate and high-rate trajectory groups almost converged by age 28.

<<< Figure 3. about here >>>

<<< Figure 4. about here >>>

<<< Table 3 about here (landscape) >>>

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Risk factors associated with trajectory group membership

Results from the regression modelling are presented in Tables 3 and 4. Unless otherwise stated, the low-rate offending group was used as the reference group to which all others were compared.[8]

Risk factors associated with male trajectories

For males, two risk factors - Indigenous status and early onset offending – emerged as the strongest factors which distinguished between low-rate offending and all other trajectories (see Table 3). Being Aboriginal increased the likelihood of membership of both the mid-rate G2 trajectory (by a factor of 3.97) and 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 trajectories.

Some factors were found to act in a negative direction. Living in the north of WA and 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. *Onset_diversion* appeared to operate contrary

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[8] For males and for the Indigenous cohort, 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 trajectories. These results are also shown.

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, of the included risk factors *uniquely* distinguished between male trajectories. With the exception of some environmental or ecological variables, none of the factors *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

The same risk factors that distinguished between the low and higher rate trajectories for males also distinguished between the trajectories for females (Table 3). Note, though, that Indigenous 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).

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. Neither of these factors was significant for males. Further, while

educational/occupational disadvantage increased the risk for males, this was not significant for females.

Risk factors associated with Aboriginal and non-Aboriginal trajectory membership

As expected, one of the most significant factors distinguishing between Aboriginal offending trajectories was gender (Table 4). 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 offending trajectories were the same as those that distinguished between male offending trajectories and between female offending 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. Similarly, 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 between the trajectories of male offenders, and female offenders (Table 4).

Discussion

The current study uses a large, longitudinal offender population base and the SPGM approach to model age-related offending trajectories for male and female offenders, and for Aboriginal and 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 offending pathways. Consistent with the majority view from international research on trajectories (Piquero, 2008), the study finds that either two and three trajectories adequately describe the frequency of offending over the life-course for specific gender and ethnic offender cohorts. For each gender/ethnic cohort, the trajectories comprise a low-rate offending 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 the trajectories for all offender groups.

Gender differences in trajectory models

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 pathways followed by both male and female offenders. 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; 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 and has been attributed to the low prevalence and frequency of female offending which downwardly bias female offending patterns (D'Unger et al (2002), Weaver (2010), Silverthorn & Frick (1999), Piquero et al (2005), Jennings et al (2010) and Cohen et al (2010)). 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) and Block et al (2010)) and has been attributed to the earlier onset of puberty and social maturation of women.

Ethnicity-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 ethnic variations in life-course patterns of offending (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. Differences were observed in the number of trajectory groups, peak age and proportion of offenders in each group. Compared with non-Aborigines, Aboriginal offenders 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, particularly from the US, owing to differences in the ethnic make-up of the respective countries. In Australia, neither Livingston et al (2008) nor Marshall (2006) modelled

the trajectories of Aboriginal offenders separately from non-Aboriginal offenders, so direct comparison of findings is not possible. However, there are commonalities with those studies. As with each of 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.

Risk factors

In addition to fitting trajectory models, the study also explored whether there were any gender- and ethnic-specific differences in the risk factors associated with trajectory group membership. Note that the risk factors related to differences between one group of offenders and another, and not to the differences between offenders and non-offenders. 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 (or may not) discriminate between offending trajectory groups based on gender or ethnic difference.

Looking *across* Aboriginal and non-Aboriginal trajectories, the study found more similarities than differences in the risk factors associated with trajectory membership. *Few factors operated for the Aboriginal offender cohort and not the non-Aboriginal cohort.* Similarly, looking *across* 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 male and female offenders, membership of higher-rate trajectory groups was found to be largely predicted by early-onset offending, Indigenous 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 perspectives of offending which predict that early onset of offending and serious offending (in addition to being male and/or being part of an ethnic minority) are indicative of higher rates of offending.

Different risk factors. The study found that few risk factors operated differently across either gender or ethnic status and, 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 amongst offender groups. 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 clearly. 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 northern parts of Australia. 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. 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, 1999; Wundersitz, 1996; Holmes, 2010; Pritchard, 2010; Sutton, 2000; Baker and Goh, 2004; Ferrante, 2009). 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 all gender/ethnic groups). However, the factor was found to operate in the opposite direction – that is, being diverted early in the criminal career acted to *increase* the likelihood of higher-rate offending. It also operated differentially across gender. It is not clear why this would or should be the case. Such findings raise 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 lead to net-widening and net-tightening outcomes.

In sum, the study found that, 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' and that *these do not vary across gender and ethnic offender groups.* Irrespective of gender or ethnicity, the highest levels of risk (of the same factors) were consistently observed for the trajectories with highest rates of offending, while lowest levels of risk (of the same factors) were consistently observed for the lower rate trajectories.

Although the evidence suggests that a common sub-set of factors predict all offending trajectories, it would be premature to conclude that they are reflective of common underlying developmental processes. The reason for this is simple – the study's ability to determine which factors distinguish between one trajectory and another was limited by the range of available data items. The study's risk factor analysis included only a narrow set of factors.[9] Many other variables that were not part of the current study *do* distinguish between offending trajectories. Reitzel (2006), for example, identified a number of childhood variables (IQ, parent and sibling criminality) that distinguish

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[9] The study has other limitations, too. In exploring the diversity of the offender population and delving into Indigenous 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 race and gender from each other (race-gender interactions) and from other factors such as social disadvantage and geography.

trajectories for Whites and some family variables (family structure, welfare) that distinguish 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 offenders live in may give rise to more pronounced involvement with the justice system or offending behaviour by one group.

Theoretical implications

Although it was not the purpose of the study to testthe robustness of taxonomic theories of crime, it is nevertheless evident that some of the findings present a challenge to such theories. On the 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. On the other hand, the study could not identify risk factors that *uniquely* distinguished between one offending trajectory and any other. Such a finding contradicts taxonomic theories which propose different aetiologies (and so, different risk factors) for each taxonomic group.[10] Recall, however, the factors included in the study were limited. There is no

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[10] It is interesting to note that trajectory studies to date 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. It may be argued that these models have yet to include sufficient contextual or 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.

doubt that a more detailed study, *with a full complement of risk and protective factors*, would likely shed more light on this issue.

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. That there may be gender- and/or ethnic-specific variations to these classifications further adds to the appeal as this suggests that gendered approaches or culturally-specific interventions should be considered. It is somewhat disappointing, 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. Rather, the lack of difference suggests that more general approaches to crime prevention and reduction may be more appropriate.

While the predictive utility of taxonomies may be limited; the trajectory groupings may be useful in other ways. Weaver (2010) suggests that SPGM trajectories 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) demonstrate 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 of interventions (each matched to a specific trajectory within a model) could become an effective way of comparing and prioritizing them.

Conclusion

The current 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 criminal justice interventions on these important issues.

Acknowledgement

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Table 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.

Table 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

Figure 1: Trajectories of Offending – Male
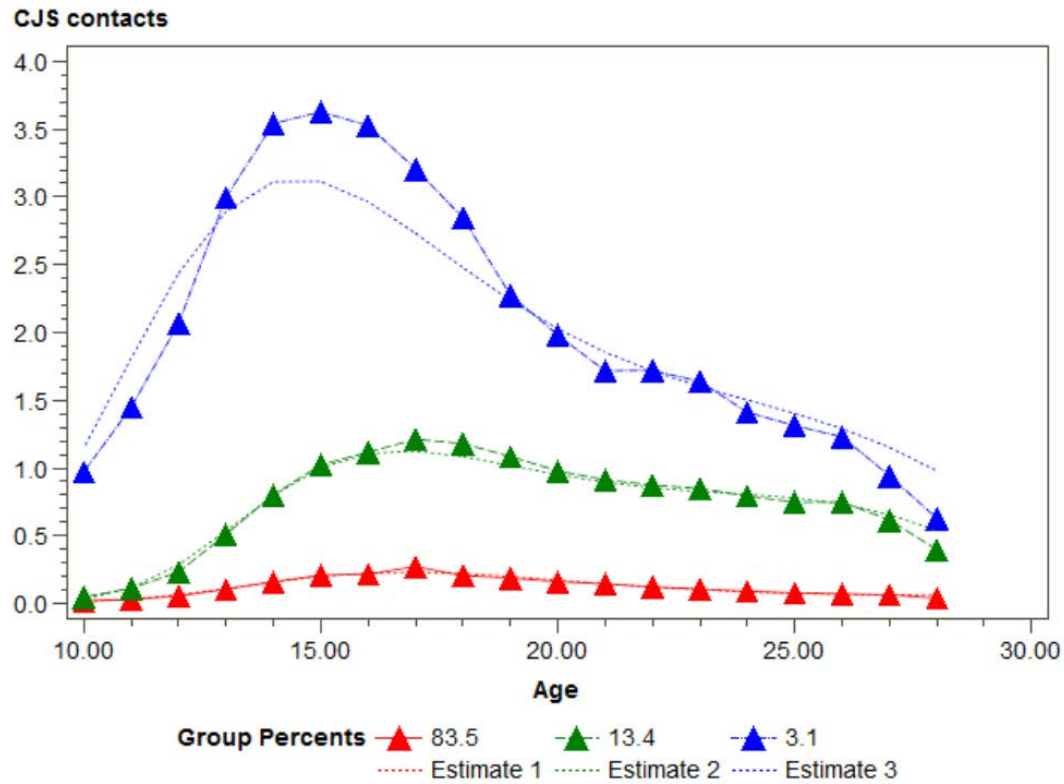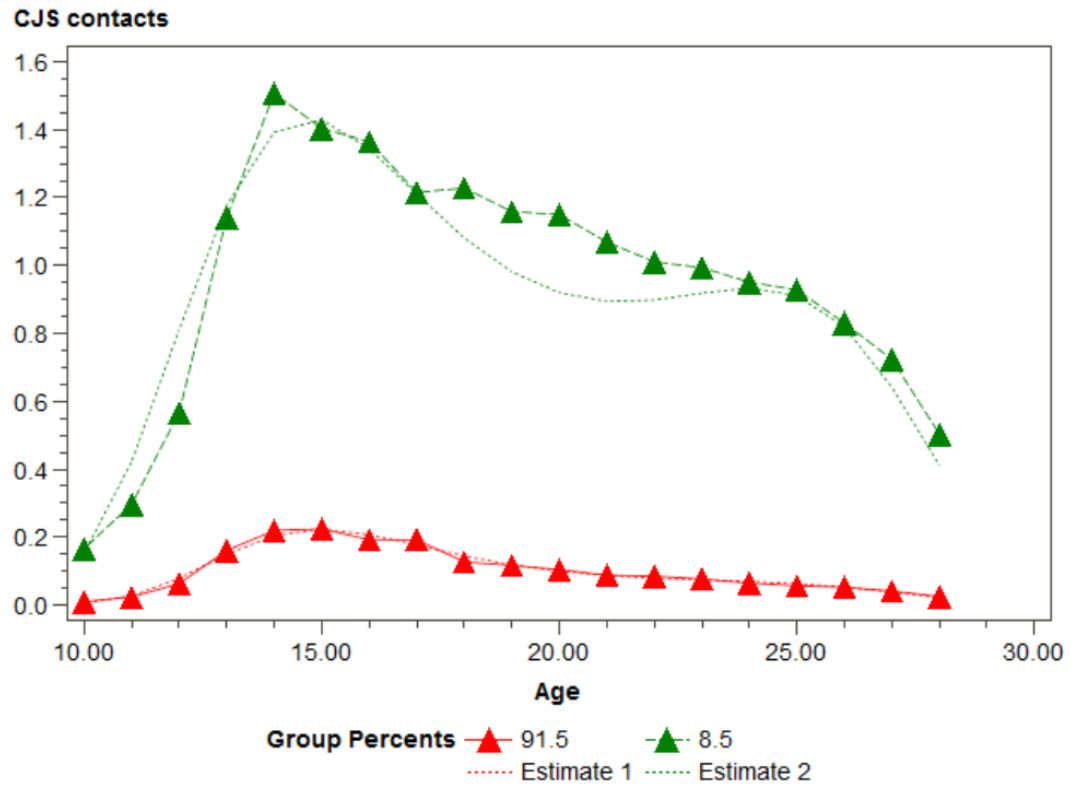
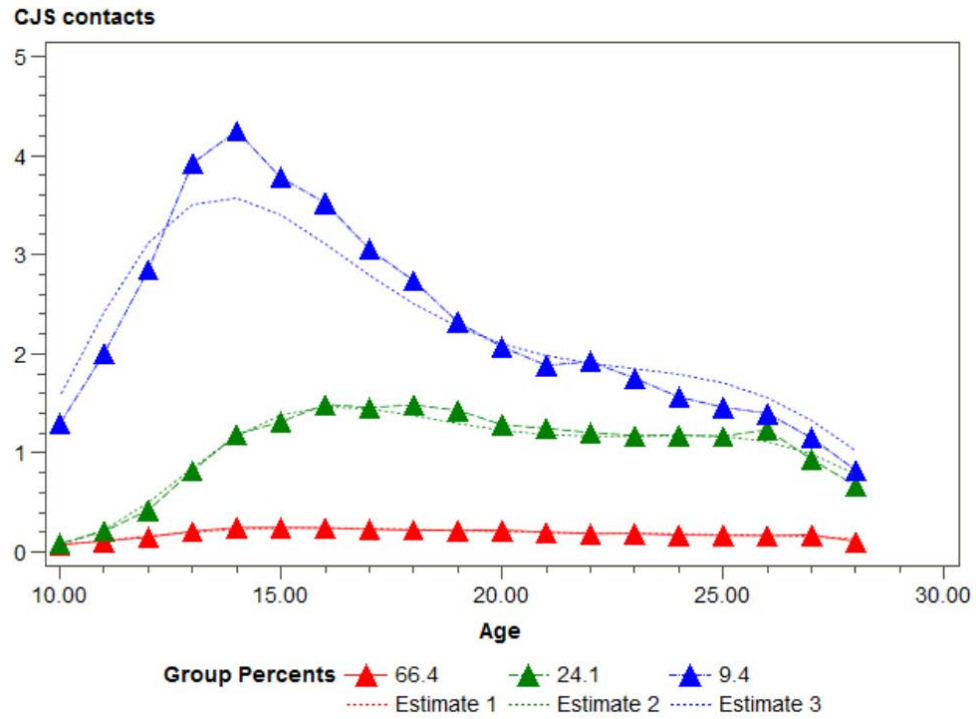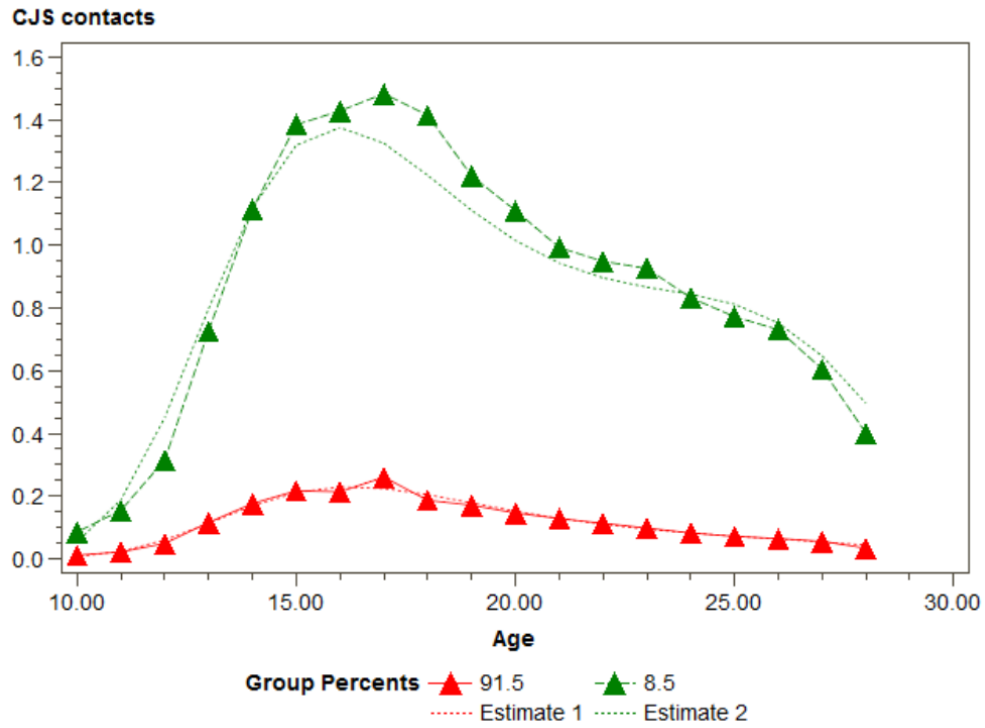**Figure 2: Trajectories of Offending – Female**

Figure 3: Trajectories of Offending – Aboriginal

Figure 4: Trajectories of Offending – Non-Aboriginal

Table 3: Risk factors for trajectory group membership – male and female models

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 4: Risk factors for trajectory group membership – Aboriginal and non-Aboriginal models

ABORIGINAL MODEL	G2* Mid-rate N = 3,633		G3* High-rate N = 1,570		G3 compared to G2		NON-ABORIGINAL MODEL	G2* Mid-rate N = 7,400	
Dependent var	R_sq = 0.0695		R_sq = 0.3640		R_sq = 0.3230		Dependent var	R_sq = 0.1042	
traj grp membership							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	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