

Integrating criminal careers and ecological research: The importance of geographic location for targeting interventions towards chronic and costly offenders

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Abstract

This study explored whether chronic and costly offenders were more likely to be from disadvantaged communities and whether the most disadvantaged communities accounted for higher proportions of chronic and costly offenders. The Semi-Parametric Group-based Method was used and costs applied to the five offending trajectories. Moderate and chronic offenders represented 15.8% of the cohort but 70% of total costs. The Index of Relative Disadvantage was assigned based on the first recorded residential postcode and an ANOVA indicated that moderate and chronic offenders resided in communities that had more disadvantage. The 5% most disadvantaged communities were compared with other communities and were found to have higher concentrations of chronic and costly offenders. Implications for the efficient targeting of crime prevention programs and interventions are discussed.

Introduction

The criminal careers approach aims to improve understanding about how offending develops over the life-course and its correlates so that factors can be identified and manipulated to hinder initiation, hasten desistence and reduce career length (Blumstein et al., 1986; Piquero et al., 1999, 2001). Many of the studies that have been conducted within this paradigm have been aided by statistical techniques such as the Semi-Parametric Group-based Method (SPGM), which identifies different latent groups of offenders based on individual variation over time (Kreuter & Muthén, 2008; Nagin & Land, 1993). Typically, studies that employ this method have identified between three and five trajectory groups, including an early onset group that has high levels of offending and does not desist from crime with age (Piquero, 2008; Piquero et al., 2007).

This chronic offending group is of considerable interest because interventions could potentially target members to efficiently reduce crime. While only a small proportion of offenders are chronic offenders, they are convicted of a large number of offences and account for a large proportion of the costs of crime. Cohen et al. (2010a) found that 3.1% of the sample or 13% of offenders in the Second Philadelphia Birth Cohort accounted for over 40% of costs. When a bottom-up costing approach was used that assessed the estimated tangible costs resulting from various types of crime, each chronic offender was found to cost \$515,382 by the time they turned 27. When a top-down costing approach was used which also included intangible costs relating to fear of crime (i.e., crime prevention expenditure, avoidance behaviour and insurance costs) as well as loss of social cohesion, each chronic offender was found to cost \$1.1 million by the time they turned 27.

Other studies have produced lower estimates about the cost of chronic offenders because they have used more conservative estimates about the costs of various types of crime or have only included direct or tangible costs (i.e., value of goods stolen, cost of medical treatment for injuries). Piquero et al. (2013) found that 2% of males in the Cambridge Study

in Delinquency Development (CSDD) or 5.7% of offenders in the cohort were high-rate chronic offenders, with each averaging 21.1 convictions. The average cost of a chronic offender was estimated as being \$95,241 when they were aged 10 to 50 years old. Allard et al. (2014) found that 3% of offenders in the 1983 and 1984 Queensland Longitudinal Dataset (Australia) were early onset chronic offenders and that this group accounted for over 25% of the costs. On average, each early onset chronic offender committed 46.4 offences when aged 10 to 20 years old. The direct criminal justice system cost of each early onset offender was estimated as being \$163,997 and their overall cost was \$262,799 when additional tangible costs were included.

Given these offending profiles and cost-estimates, it is not surprising that some studies have attempted to predict who will become an early onset chronic offender. This has not been a particularly fruitful avenue of inquiry (Piquero et al., 2010). Sampson and Laub's (2003) analyses of nearly 500 high-risk boys from the Gluecks' classic study found that risk factors during childhood and adolescence had little predictive power for identifying a distinct group of chronic offenders. Bersani and colleagues (2009) analyses of the 4,615 individuals in the Dutch Criminal Career and Life-Course Study (CCLS) indicated that demographic characteristics and offending related risk factors during adolescence were dispersed across the trajectory groups and that no pattern differentiated the chronic offending group from other offending groups. In their five year follow-up of 287 boys that were first arrested before 12 years of age, van Domburgh and colleagues (2009) concluded that it was difficult to predict trajectory group membership based on individual and environmental characteristics known to police at the time of the first arrest.

Other criminal careers research has focused on whether factors such as neighbourhood conditions can be used to differentiate offending trajectories. Cross-sectional research indicates that neighbourhood-level factors such as poverty and disadvantage are only weakly related to offending at the aggregate level. Correlations are typically around .1, rarely

exceeding .25, and neighbourhood factors account for about 4% of the variance in offending (see Ingoldsby & Shaw, 2002). Theorists typically propose that neighbourhood conditions are moderated by individual-level risk and protective factors such as family (Leventhal & Brooks-Gunn, 2000; Wikstrom & Loeber, 2000) or by community social processes such as socialisation and informal social control (Sampson, 1991; Sampson et al., 1997; Wikstrom, 1991). Despite these findings at the aggregate level, criminal careers research highlights the potential importance of neighbourhood conditions, which may help to differentiate high and escalating offending trajectories from low offending trajectories (Chung et al., 2002), or may only have an impact on adolescent onset offenders who have a high or moderate level of protective factors (Wikstrom & Loeber, 2000). Others suggest that early onset chronic offenders are more likely to have experienced the greatest exposure to social disadvantage and adverse neighbourhoods (Fergusson & Horwood, 2002; Fergusson et al., 2000; Patterson et al., 1998). Therefore, it appears that neighbourhood conditions are useful for differentiating between offending trajectories but additional research is needed to determine the exact nature of the relationship.

In assessing the impact that neighbourhood conditions have on offending trajectories, much could be gained from linking the criminal careers and ecological approaches and exploring whether neighbourhoods with particular characteristics account for higher proportions of chronic and costly offenders. This approach raises numerous technical difficulties resulting from the longitudinal nature of the offending data and the need to link individuals and costs to one location at one point in time. Nevertheless, ecological research consistently finds that offenders and offending are not randomly distributed geographically (Brantingham & Brantingham, 1999; Crow & Bull, 1975; Roncek, 2000; Sherman et al., 1989; Weisburd & Green, 1994; Weisburd et al., 1992). High crime rates are usually found to be concentrated in small geographical areas characterised by structural disadvantage, including low socio-economic status, unemployment, poverty, segregation, a high proportion of single parent families, residential instability and a large proportion of racial/ethnic minority groups (Bursik,

1986; Oberwittler, 2004; Pratt & Cullen, 2005; Sabol et al., 2004; Shaw & McKay, 1969; Silver & Miller, 2004; Swartz, 2000; Triplett et al., 2003). Whether such communities account for greater proportions of chronic and costly offenders than less disadvantaged communities remains unanswered.

Given the relationship between neighbourhood conditions and offending, the current study linked the criminal careers and ecological paradigms and addressed four research questions: (1) How many distinct offending trajectories can be identified in an Australian longitudinal cohort? (2) What are the monetary costs of officially recorded offending for individuals on different offending trajectories? (3) Do individuals on different offending trajectories experience varying levels of community disadvantage? and (4) Do the most disadvantaged communities account for higher proportions of chronic and costly offenders than less disadvantaged communities? Addressing these questions will add to the limited research that has assessed the cost of offending trajectories (Allard et al., 2014; Cohen et al., 2010a, 2010b; Piquero et al., 2013) and mixed findings about how neighbourhood conditions are related to offending trajectory group membership. Moreover, addressing the fourth question extends on existing trajectory research by changing the unit of analysis from the individual to the community level, which could help policymakers target scarce crime prevention resources towards communities who need it most.

Methods

This study used the Queensland Longitudinal Database (QLD) which includes all people who were born in 1990 and guilty of an offence in Queensland (Australia) between 2000 and 2010, when aged 10 to 20 years old. In Queensland, a person is not criminally responsible for offences committed before the age of 10 and they are considered a youth if aged 10 to 16 years old at the time of the offence (Youth Justice Act (Qld) 1992). The QLD was created by linking between administrative databases that exist for each of the practices used to respond to offending in Queensland. These practices include formal police cautioning, police

referred youth justice conferencing, youth court and adult court. The database includes dates when individuals in the cohort had contact with each criminal justice system practice, their residential postcode when they had contact, all offences for which individuals had contact, as well as court outcomes such as length of community-based orders or detention/incarceration. The database has been used extensively for research, with the process used for data linkage and cleaning described elsewhere (Allard et al., 2010; Little et al., 2011).

The offender cohort included 14,171 individuals. Most of the cohort were male (9,949, 70.2%), non-Indigenous (1,895, 13.4%) and the average age when they had contact with the criminal justice system was 16.21 years of age ($SD=2.38$). Individuals in the cohort were responsible for 71,413 offences, primarily theft ($n = 20,651$, 28.9%), break and enter ($n=10,585$, 14.8%), public order ($n=10,479$, 14.7%) or property damage (8,069, 11.3%). Cohort members had 33,455 separate criminal justice system events, which involved either a formal police caution or police referred youth justice conference taking place or a finalised youth/adult court appearance.

Analytic Strategy

The analytical strategy involved four steps. First, a dataset was created for the purpose of undertaking the trajectory analysis. The dataset had the annual number of offences that the 14,171 individuals in the cohort had committed when they were aged 10 to 20 years old. The measure of offending was a conviction for any criminal offence. Traffic offences were excluded to ensure consistency, as most are dealt with via on-the-spot infringement notices but some progress to the courts as contested traffic offences. Breach of court order offences were also excluded because they typically involve failure to comply with conditions such as reporting requirements rather than new offending, and as any new offending would already be captured in the database.

The Semi-Parametric Group-based Method (SPGM) was used to model the frequency of offences on an annual basis using the SAS procedure "PROC TRAJ" (Nagin & Land, 1993; Jones et al., 2001). The offending count data was distributed according to the Zero-Inflated Poisson distribution to account for the excess of data cells with zero counts for offending (Fergusson et al., 2000; Nagin, 1999). To enable trajectory analysis to converge, individuals who had offence counts exceeding 20 in a given year had these scaled back (n=279, 2%). The number of trajectory groups being modelled and their form was specified prior to analysis, with the process repeated to determine the parameters that produced the best fit for the data. The model with the optimum number of trajectories was selected on the basis that it had a high Bayesian Information Criterion (indicating improved model fit) and an average probability of group assignment that was as close to one as possible.

Second, costs were assigned to each individual and the overall costs of each offending trajectory were estimated. Two types of costs were assessed. Criminal justice system costs were assessed taking into account the number of each type of criminal justice system event and the types and lengths of any periods of supervision. The six event types were: (1) formal police cautioning, (2) youth justice conferencing, (3) Children's Court finalised appearance, (4) Magistrates Court finalised appearance, (5) District Court finalised appearance, and (6) Supreme Court finalised appearance. Based on advice from relevant agencies, youth were estimated to serve 60% of their detention sentences and adults were estimated to serve 80% of their incarceration sentences before being released under community-based supervision. Criminal justice system costs were applied using previously published estimates that represent the average opportunity cost for police, courts and supervising agencies (Figure 1, Allard, 2014). For example, the cost of a caution only involved police resources whereas the cost of a Magistrates court finalisation involved both police (\$2,696) and court (\$394) resources. All costs are expressed in 2012 Australian dollars (near parity to United States at the time of writing).

INSERT FIGURE 1 ABOUT HERE

Wider economic and social costs were established and applied based on Rollings (2008) estimates for 12 offence types. These estimates included medical costs, costs relating to property loss or damage, costs of lost output and intangible costs. The study noted that there was likely to be considerable variability in the cost of offences within each category so explored offence characteristics to more adequately assess costs. For example, the proportion of assaults that resulted in medical treatment was explored and this cost was incorporated into the overall cost of assault. Rollings (2008) costs were firstly reviewed and one offence type (fraud) was re-estimated using the median cost. This was necessary because the original estimate assessed the average cost and a few high-cost frauds unduly influence the average cost of fraud offences (Allard, 2014; Rollings, 2008). The estimates were then mapped across to the Australia and New Zealand Standard Offence Classification (ANZSOC, Table 1). Where more than one offence category in the original assessment was included in one ANZSOC offence code, average costs for the offence code were calculated. Average costs were based on ratios developed to account for the frequency of each offence category in Queensland during 2010/11 (QPS, 2011). Costs were then adjusted for inflation between 2005 and 2012 (RateInflation, 2012). Consistent with past research, nominal values were estimated for offence types that were not originally costed based on their perceived nature and impact (Allard et al., 2014; Cohen & Piquero, 2009). The costs were then applied to individuals based on the number and types of offences for which they had been convicted. Finally, total costs were calculated for each individual by summing the criminal justice system costs and the wider social and economic costs.

INSERT TABLE 1 ABOUT HERE

Third, a one-way between-groups analysis of variance (ANOVA) was conducted to determine whether individuals on different offending trajectories experienced varying levels

of community disadvantage. The Index of Relative Socio-economic Disadvantage (IRSD) was assigned to individuals based on their residential postcode when they committed their first offence. The IRSD is a broad-based measure produced by the Australian Bureau of Statistics (ABS, 2006a) that assesses the relative level of disadvantage in each postcode during 2006. Lower scores indicate that many households in a location have low incomes and that many individuals have no qualifications and are either unemployed or have low skilled occupations. In Queensland, IRSD scores ranged from 564 to 1136 ($M=984.18$, $SD=70.21$) (ABS, 2006b). The first recorded postcode was selected because of the importance placed on the early years of life from a criminal careers perspective and because of the cumulative nature of risk and protective factors (Farrington, 2002; Howell, 2003; Stouthamer-Loeber et al., 2002). Unfortunately, individuals who resided in postcode 4000 had to be excluded ($n=277$) because this postcode appeared to be used as a default postcode when information was not available. Those who had a missing postcode or lived out of state ($n=463$) also had to be excluded. Most (90.9%) of the individual who were excluded were from the low offending trajectories identified by the SPGM. After excluding these individuals, there were 13,431 offenders in the analysis from 380 postcodes.

Fourth, a dataset was created for the purpose of exploring whether the most disadvantaged communities accounted for higher proportions of chronic and costly offenders than less disadvantaged communities. This dataset was created by aggregating data based on postcode and included variables such as postcode, number of 16 year olds in the population during 2006 (which corresponds with when individuals in the cohort would have been aged 16), level of disadvantage (IRSD score), number of moderate and chronic offenders who resided in the postcode when they first offended (based on the SPGM model), and their cost. Postcodes that had a population of 10 or less 16 year olds in 2006 were excluded because of difficulties associated with small cell size and the random allocation process used by the ABS to prevent individual identification. After excluding these postcodes and postcode 4000, there were 327 locations that had a population between 11 and 1,675 ($M=169.97$,

$SD=199.21$) 16 year olds. Locations had between zero and 70 moderate and chronic offenders ($M=6.54$, $SD=9.65$, $Sum= 2,140$). The 5% most disadvantaged communities that had the lowest IRSD scores ($n=16$) were then compared with less disadvantaged communities based on the number and proportion of chronic offenders and costs. The 5% most disadvantaged locations had an IRSD score between 564 and 885.8 ($M=793.61$, $SD=98.78$) while other locations had an IRSD score between 887.03 and 1,136 ($M=1001.49$, $SD=53.32$).

Results

Trajectory Analysis

The first research question sought to determine how many distinct offending trajectories could be identified in an Australian offender cohort. Models with two to seven trajectories were created and the BIC and average group membership probabilities for each were examined (Table 2). The optimum model included five or six groups, with the sixth group having a slightly higher BIC while the five group model had a relatively high value for BIC and a slightly higher probability of group membership (0.79). The form of the trajectories were examined and indicated that the six group model split the chronic offending trajectory into two groups, but did not add to interpretation. Consequently, the five group model was selected for ease of interpretation (Fergusson et al., 2000). The estimates of each component were examined to ascertain the form of the five trajectories and all were found to have a significant cubic term and be described best by cubic functions.

INSERT TABLE 2 ABOUT HERE

The five offending trajectories identified by the model are presented in Figure 2. Individuals in the first two groups offended less frequently, with individuals in group one committing 8,923 offences ($M=2.1$, $SD=1.4$) and individuals in group two committing 14,626 offences ($M=1.9$, $SD=1.5$). Group one peaked during adolescence when individuals were aged 14 to

16 years old while group two had late adolescence or early adulthood onset when individuals were typically aged 17 years or older. These groups accounted for most of the offender cohort, with 4,159 (29.3%) individuals in group one and 7,778 (54.9%) in group two. Group one was labelled “adolescent peaking (low)” and group two was labelled “adult onset (low)”. The third group had early onset and high levels of offending, with the 428 individuals in this group representing 3% of the cohort and committing 20,069 offences ($M=49.9$, $SD=46.2$). This group was labelled “early onset (chronic)”. The fourth group had adolescent onset when individuals were aged 11 to 14 years old. The 1,488 individuals in this group comprised 10.5% of the cohort and had moderate levels of offending ($n=16,680$, $M=11.2$, $SD=6.2$). This group was labelled “Adolescent onset (moderate)”. Group five had adolescent onset of offending when individuals were aged 12 or 13 years old, with high levels of offending that peaked when individuals were aged 20 or 21. The 318 individuals in this group comprised 2.2% of the cohort and committed 11,115 offences ($M=35.0$, $SD=29.7$). This group was labelled “adolescent onset (chronic)”.

INSERT FIGURE 2 ABOUT HERE

Cost of Offender Trajectories

The second research question sought to determine the monetary cost of officially recorded offending by individuals on the different offending trajectories. Table 3 presents these costs. Over four-fifths (84.2%) of the cohort were in the two low offending groups, but these groups accounted for less than one-third (30.3%) of total costs. About one-tenth (10.5%) were in the adolescent onset (moderate) group, who accounted for 23.9% of the costs. Each individual in the moderate group cost an average of \$53,410, with criminal justice system costs contributing two-thirds (64.1%) of this cost. While 5.2% of the cohort were in the two chronic groups, they accounted for 45.8% of the total costs. On average, each individual in the adolescence onset (chronic) group generated a total cost of \$231,547 and each individual in

the early onset (chronic) group cost an average of \$167,835. For all of the trajectory groups, justice system costs contributed to over one-half of total costs.

INSERT TABLE 3 ABOUT HERE

Offending Trajectories and Disadvantage

Given the possible role of disadvantage, the third research question sought to determine whether individuals on different offending trajectories experienced varying levels of disadvantage. Individuals in the five trajectory groups were found to experience different levels of disadvantage ($F(4,13,426)=40.46, p<.001$). The effect size, calculated using eta squared, was .01 which is considered small (Cohen, 1988). Post-hoc tests using Fisher's Least Significant Difference (LSD) test indicated that the adult onset (low) group was significantly different from all other groups and experienced the lowest level of disadvantage ($M=996.61, SD=61.51$). The adolescent-peaking (low) group was also different from all groups and experienced the second lowest level of disadvantage ($M=987.97, SD=65.58$). The early onset (chronic) group experienced the most disadvantage ($M=970.38, SD=77.10$) and was statistically different from all groups except the adolescent onset (chronic) group ($M=975.29, SD=87.09$). The adolescent onset (moderate) group experienced less disadvantage ($M=980.02, SD=74.44$) than the early onset (chronic) group but similar levels as the adolescent onset (chronic) group.

Proportion of chronic and costly offenders from the most disadvantaged communities

The fourth research question changed the level of analysis from the individual to the community level and sought to determine whether the most disadvantaged communities accounted for higher proportions of chronic and costly offenders. The 5% most disadvantaged communities were found to account for 8.7% of offenders in the moderate and two chronic trajectory groups. Chronic and costly offenders who resided in the most disadvantaged communities when they committed their first offence accounted for 10.9% of

offences and 11.6% of the offending costs (11.9% of criminal justice system costs and 11.3% of social costs). On average, each chronic offender who resided in the most disadvantaged communities cost \$140,945 while each chronic offender who resided in less disadvantaged communities cost \$102,127.

Discussion

This study explored whether disadvantaged communities could potentially be targeted to reduce offending by chronic and costly offenders. Prior findings indicated that chronic offenders commit a large proportion of offences and account for a large proportion of costs (Allard et al., 2014; Cohen et al., 2010a, 2010b; Piquero et al., 2013). However, findings also indicate that it is difficult to predict who will become a chronic offender (Bersani et al., 2009; Piquero et al., 2010; Sampson & Laub, 2003; van Domburgh et al., 2009). Therefore, the current study explored whether individuals on different offending trajectories experienced varying levels of disadvantage. Based on the findings of previous research, it was anticipated that chronic and costly offenders would be more likely to have resided in disadvantaged neighbourhoods than more normative offenders (Chung et al., 2002; Fergusson & Horwood, 2002; Fergusson et al., 2000; Patterson et al., 1998). Given the need to target chronic and costly offenders, the study also explored whether the most disadvantaged communities accounted for higher proportions of chronic and costly offenders than less disadvantaged communities. Understanding how the costs of chronic offenders are geographically distributed in this way provides policymakers with additional evidence required to target interventions towards communities that experience disadvantage. The four research questions addressed by the study were: (1) How many distinct offending trajectories can be identified in an Australian longitudinal cohort? (2) What are the monetary costs of officially recorded offending for individuals on different offending trajectories? (3) Do individuals on different offending trajectories experience varying levels of community disadvantage? and (4) Do the most disadvantaged communities account for higher proportions of chronic and costly offenders than less disadvantaged communities?

While few studies have assessed the cost of offending trajectories, the findings from the current study are generally consistent and support two main conclusions (Allard et al., 2014; Cohen et al., 2010a; Piquero, 2008; Piquero et al., 2013). First, chronic offenders consume a high proportion of total costs. In the current study, chronic offenders represented 5.2% of the population but accounted for 45.8% of total costs. Cohen et al. (2010a) found that the 3.1% of the sample or 13% of offenders accounted for 41-43% of costs, while Piquero et al. (2013) found that 12.7% of the sample accounted for 52.6% of the costs. Allard et al. (2014) found that 4.8% of the sample accounted for 41.1% of costs. Second, each individual on a chronic offending trajectory costs considerably more than each individual on a low offending trajectory. Consistent with Allard et al. (2014) who used the 1983/84 cohort, each chronic offender in the 1990 cohort cost 20 times more than each offender in the low groups. Previous research suggests that chronic offenders cost over 10 times more than individuals in low offending groups (Cohen et al., 2010a; Piquero et al., 2013).

Despite these similarities with previous studies, the current study produced different cost estimates for the offending trajectories. The estimates for each of the groups were lower than reported by Cohen et al. (2010), higher than reported by Piquero et al. (2013) and similar to those reported by Allard et al. (2014). In the current study, the average cost of an adolescent onset (chronic) offender was \$231,547 and the average cost of an early onset (chronic) offender was \$167,835. Previous studies have reported that each chronic offender costs between \$95,241 and \$1.1 million (Allard et al., 2014; Cohen et al., 2010a, 2010b; Piquero et al., 2013). Each individual on a moderate offending trajectory was estimated to cost \$53,410 in the current study, while others have assessed the cost of these offenders as being \$40,933 or \$885,000 (Cohen et al., 2010a, 2010b; Piquero et al., 2013). In the current study, each offender on the low offending trajectories was assessed as costing \$7,858 or \$8,786, while others have assessed the cost of each individual in the low offending group as \$10,210 or \$144,996 (Cohen et al., 2010a, 2010b; Piquero et al., 2013).

Variation in the estimated cost of offending trajectories arises because of three main differences between the studies. First, there are differences in the way that offending is measured. Like Allard et al. (2014), the current study included all offences for which there had been a finding of guilt with the exception of traffic and breach offences. Other studies have measured offending using police contacts or convictions and have either focused on specific offence types, or have applied multipliers to account for offences that individuals committed but for which they are not held responsible (Cohen et al., 2010a; Piquero et al., 2013). Focusing on fewer offence types is likely to reduce costs, while applying multipliers is likely to increase costs. Second, the overall cost of trajectories is largely dependent on the cost estimates produced for specific types of crime. There is currently considerable variability in these estimates. For example, each assault has been estimated as costing between \$16,586 and \$85,000 (Cohen et al., 2010a; Piquero et al., 2013). In the current study, each assault was estimated as costing \$2,062 plus criminal justice system event and supervision costs, which are not attributable based on crime type. Third, studies have different follow-up timeframes. The timeframe for the current study was when individuals were aged 10 to 20 years old, slightly less than Cohen et al. (2010a) who focused on 10 to 26 year olds and Allard et al. (2014) who focused on 10 to 25 year olds. However, Piquero et al. (2013) included a longer criminal career timeframe and followed individuals aged 10 to 50 years old. Examining criminal careers for longer periods of time should increase costs.

Regardless of differences in cost estimates, chronic offenders are expensive which has motivated research to determine whether various factors can be used to predict or differentiate between the offending trajectories. Given the potential role of neighbourhood factors, the current study explored how disadvantage was related to trajectory group membership. Consistent with previous findings, disadvantage was only found to have a small effect on trajectory group membership, but individuals in the chronic and moderate offending trajectories were more likely to have resided in more disadvantaged communities

when they committed their first offence than individuals in the low offending trajectories (Chung et al., 2002; Fergusson & Horwood, 2002; Fergusson et al., 2000; Patterson et al., 1998). This finding may be indicative of the possible indirect role that neighbourhood factors such as disadvantage have on offending, which may be mediated by individual-level factors such as family or by community social processes such as socialisation and informal social control (Leventhal & Brooks-Gunn, 2000; Sampson, 1991; Sampson et al., 1997; Wikstrom, 1991; Wikstrom & Loeber, 2000)

Given that a significant association was found between disadvantage and trajectory group at the individual level, the current study explored whether the most disadvantaged communities accounted for greater proportions of chronic and costly offenders than less disadvantaged communities. Linking the criminal careers and ecological approaches in this way may provide evidence that supports the targeting of interventions to communities, rather than individuals, to reduce chronic and costly offending. Findings indicated that the 5% most disadvantaged communities accounted for 8.7% of chronic and costly offenders and 11.6% of offending costs.

There are a wide range of community, situational and developmental interventions that could potentially be implemented in disadvantaged locations. Evidence suggests that interventions targeting community-level risk factors through Vocational and Educational Training (VET) or community economic development may reduce offending (Burghardt et al., 2001; McCord et al., 2001; Sherman et al., 1997). The micro-environments within these communities could also be explored to identify highly specific locations that have highly specific problems and interventions could be implemented to reduce opportunities or provocations for offending (Clarke, 1997; Clarke & Felson, 1993; Cornish & Clarke, 2003). Many of these situational or environmental interventions have proven effective for reducing offending in other locations (Clarke, 1997; Eck, 2006). Additionally, interventions based on the developmental or early intervention framework may be appropriate. These could be offered to all individuals in some

postcodes, or risk screening tools could be used to improve efficiency and identify likely potential offenders. Evidence indicates that effective programs include early/developmental programs (i.e., parental training, home visiting, day-care/pre-school programs and home/community programs), multi-modular programs that target several domains of a person's ecological environment simultaneously (i.e., Multi-Systemic Therapy) and family-based interventions (Burghardt et al., 2001; Drake, et al., 2009; Farrington & Welsh 2003; McCord et al., 2001; Sherman et al. 1997).

Despite the importance of the findings from this study, they should be interpreted in light of six main limitations. First, the SPGM classifies individuals into latent groups based on their probability of group membership and therefore some classification error is necessarily introduced. The average probability of group membership was 0.79 for the five group model and the groups should only be interpreted as approximating reality. While this necessarily limits the ability of the findings to support the targeting of specific individuals and communities, it nevertheless adds to the evidence-base about how this could be done based on neighbourhood conditions such as disadvantage. Second, offender mobility and temporal changes that may occur in communities further reduces the potential for interventions to be targeted towards chronic and costly offenders based on where they resided. The location where offenders resided was assessed based on their residential postcode when they committed their first offence. This postcode was recorded when offenders were aged 10 years or older, but it is not known how long they had lived in each location. However, two-thirds of chronic and costly offenders changed residential locations at least once during the 10 year timeframe, with one-third changing location at least three times. Additionally, the study was not able to determine whether the same disadvantaged locations were consistently more likely to have chronic offenders who offended more frequently and were more costly over time. If geographic location is to be used to efficiently target interventions, it is essential that there is temporal consistency and the same disadvantaged locations are identified using different cohorts.

Third, average criminal justice system costs were used and wider social and economic costs were estimated by updating Rollings (2008) assessment. The use of average criminal justice system costs did not allow for costs to vary based on factors that are likely to have an impact such as whether the offender plead guilty, the offence type and the location of the offence. The wider social and economic costs were assessed using a bottom-up costing approach and could be considered underestimates given international comparisons (Cohen et al., 2010a, 2010b). Unfortunately, there is an absence of top-down cost estimates in Australia based on methods such as willingness-to-pay. Fourth, the study was based only on officially recorded offending. Therefore, the level of offending and costs reported are underestimates. While it would have been preferable to apply multipliers and account for offending that was not officially recorded, unfortunately no Australian estimates exist to account for differences between self-reported and officially recorded offending. Fifth, the study was not able to account for attrition from the sample or migration into the sample. It is likely that some individuals either moved into or out of Queensland or died. Taking attrition into account may change the final trajectory model that is identified (Eggleston et al., 2004). Sixth, the study did not take into account the effects of exposure time or time-at-risk. It has been argued that it is necessary to take this into account to calculate unbiased estimates of individual rates of offending (Piquero et al., 2001). However, offenders are rarely incarcerated in Queensland and they are incarcerated for short periods of time. The median length of incarceration for individuals in the 1990 cohort was relatively short (6 months) and earlier investigation found negligible effects of incapacitation on the rate of offending (Stewart et al., 2004).

In light of these limitations, future research is needed that continues to integrate the criminal careers and ecological approaches. This research could explore how offender mobility impacts on offending trajectories and the extent that it limits the ability to target chronic offenders based on location. Future research should also consider whether the same disadvantaged locations are consistently identified as being more likely to have chronic

offenders who offend more frequently and are more costly over time. This would require replication within the same jurisdiction so that an evidence-base develops. Additionally, future research should continue to try and differentiate chronic offenders from other types of offenders with the ultimate aim of predicting who will become a chronic offender based on risk and protective factors that emerge early in life. While the findings of research focused on this issue to date have not been promising, being able to prospectively identify likely chronic offenders and efficiently target interventions is likely to result in considerable financial benefits.

In sum, the findings from this study confirm that chronic offenders consume a high proportion of total costs and that individuals on chronic and moderate offending trajectories cost considerably more than offenders on low offending trajectories. Chronic and moderate offenders were more likely to be from communities that had higher levels of disadvantage than offenders on low offending trajectories. While additional research is needed exploring the impact of offender mobility and whether the same locations are identified over time, the findings suggest that interventions could potentially be targeted towards the most disadvantaged communities to efficiently reduce offending by chronic and costly offenders. The 5% most disadvantaged communities accounted for 8.7% of moderate/chronic offenders, 10.9% of offences and 11.6% of offending costs. This represents a considerable cost that could be better directed towards implementing a range of evidence-based community, situational and developmental interventions.

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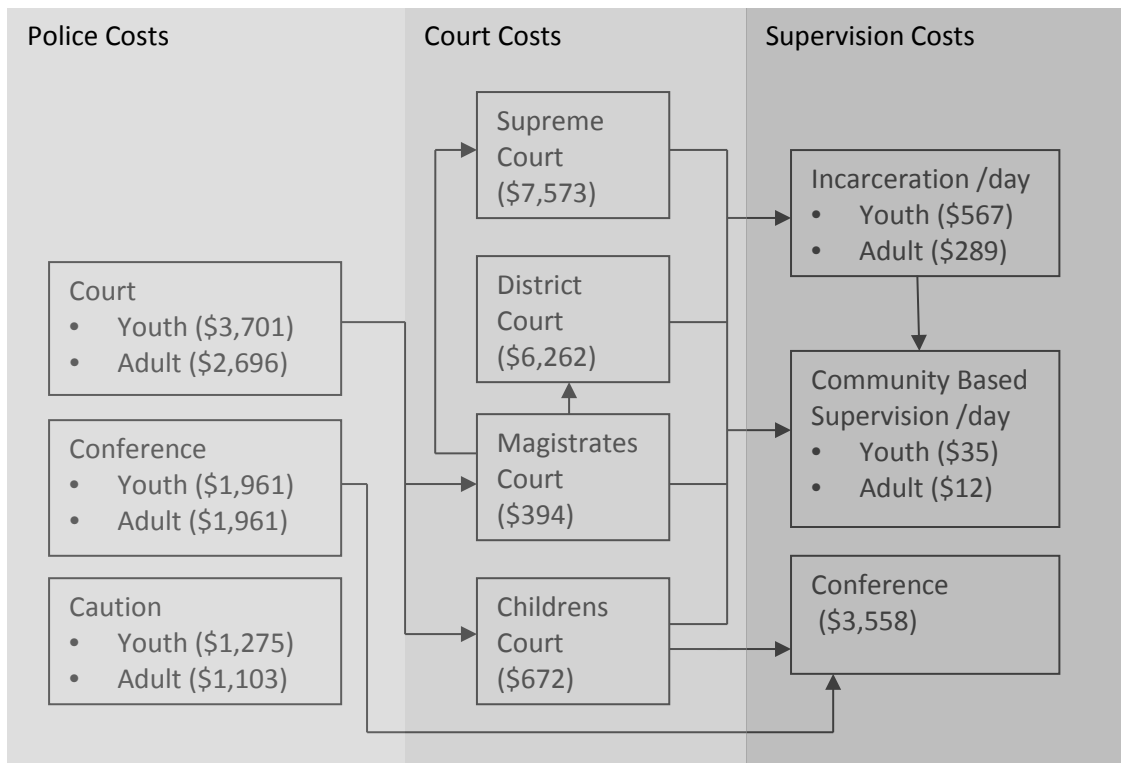


Figure 1. Cost of criminal justice system events and supervision

Table 1. Mapping Australian economic and social costs to Australian and New Zealand Standard Offence Classification (ANZSOC) codes and cost estimates

2005 Australian Assessment		ANZSOC		
Offence type	Cost (\$)	Australian offence code	Cost (\$2005)	Cost (\$2012)
Homicide	1,915,323	Homicide and related offences	1,915,323	2,329,919
Sexual assault	7,500	Sexual assault and related offences	7,500	9,123
Assault	1,695	Acts intended to cause injury	1,695	2,062
Burglary	2,869	Unlawful entry with intent	2,869	3,490
Robbery	2,300	Robbery, extortion and related offences	2,300	2,798
Theft of vehicles	7,024	Theft and related offences	1,241 ^a	1,510
Thefts from vehicles	1,004			
Shop theft	123			
Other theft	400			
Fraud ^b	21,370	Fraud, deception and related offences	425	517
Criminal damage	1,251	Property damage and environmental	3,357 ^a	4,084
Arson	81,200	pollution		
		Abduction/harassment/other offences ^c against the person		1,000
		Prohibited/regulated weapons and explosives offences ^c		500
		Illicit drug offences ^c		500
		Dangerous and negligent acts endangering persons ^c		250
		Public order offences ^c		250
		Offences against justice ^c		250
		Miscellaneous offences ^c		250

Sources: Rollings (2008); QPS, 2011

^a Highlighted indicates that cost was assessed by mapping original assessment to Australian standardised offence code which incorporates that offence, taking into account the number of each type of offence in Queensland during 2010/11

^b Original assessment was \$21,370 which included high cost outliers. Reduced estimate calculated by averaging the median cost of fraud reported by three jurisdictions in Australia (Rollings, 2008).

^c Nominal values attached based on perceived nature and impact (Cohen and Piquero, 2009).

Table 2: BIC and average group membership probability of trajectory models

Number of groups	BIC (1)	BIC (2)	AIC	Avg. Group Membership Prob.
2	-105950.3	-105935.9	-105890.5	0.96
3	-103267.5	-103247.1	-103182.8	0.91
4	-102299.8	-102273.4	-102190.3	0.92
5	-101663.7	-101631.3	-101529.2	0.79
6	-101049.7	-101010.1	-100885.4	0.78
7	-100810.5	-100764.9	-100621.3	0.73

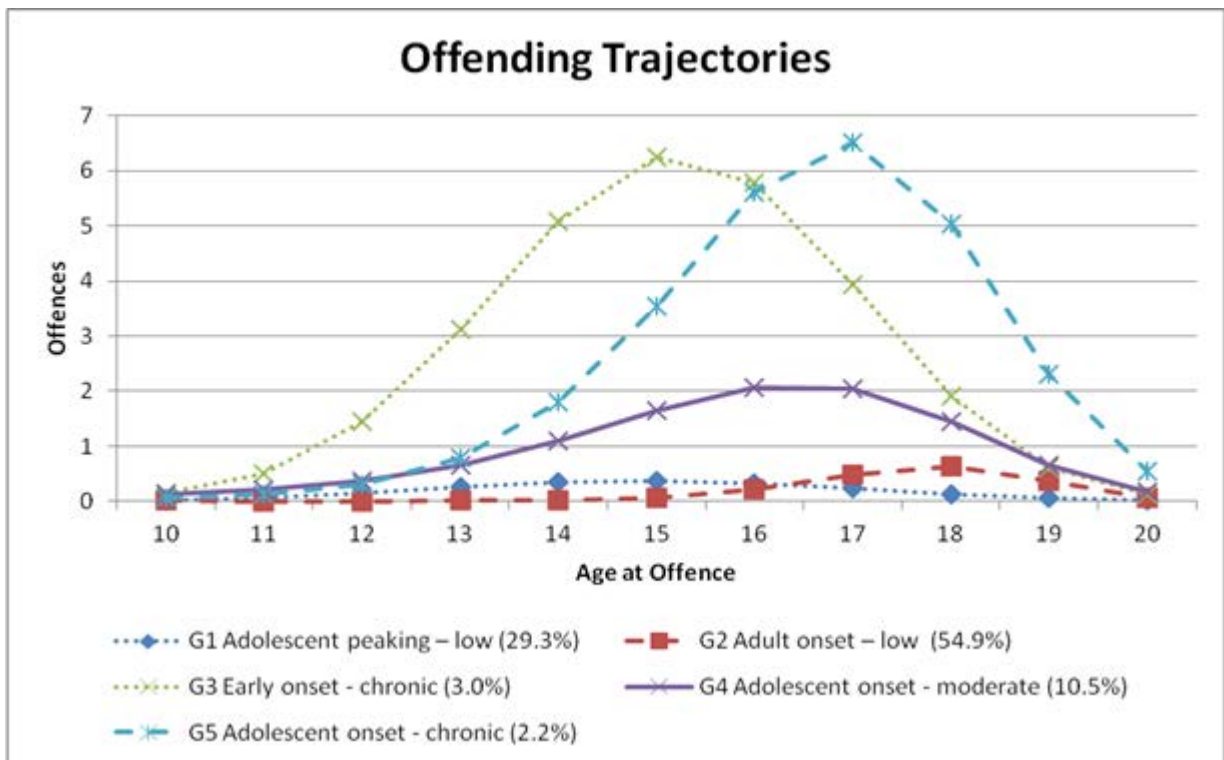


Figure 2. Number and form of offending trajectories in the 1990 cohort

Table 3. Justice system and wider economic/social costs of offending trajectories

Group	Cohort Members		Justice System Costs			Wider Economic and Social Costs			Total Costs		
	N	%	Mean (\$)	Group Costs (\$ mill)	% Cost	Mean (\$)	Group Costs (\$ mill)	% Cost	Mean (\$)	Group Costs (\$ mill)	% Cost
G1 Adolescent peaking (low)	4,159	29.3	4,095	17.03	8.7	3,763	15.65	11.5	7,858	32.68	9.8
G2 Adult onset (low)	7,778	54.9	5,683	44.20	22.5	3,103	24.14	17.7	8,786	68.34	20.5
G3 Early onset (chronic)	428	3.0	123,603	52.90	26.9	107,944	46.20	33.9	231,547	99.10	29.8
G4 Adolescent onset (moderate)	1,488	10.5	34,277	51.00	25.9	19,133	28.47	20.9	53,410	79.47	23.9
G5 Adolescent onset (chronic)	318	2.2	99,727	31.71	16.1	68,108	21.66	15.9	167,835	53.37	16.0
Total	14,171	100	13,891	196.86	100	9,605	136.12	100	23,497	332.97	100