VARIATION IN RURAL CRIME

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This paper discusses variation in crime among local government areas of Australia within a social disorganisation framework. The central hypothesis is that regional differences in crime arise from variation in the communities’ ability to provide for formal and informal social control, via the effects that transformations to the local economies have on the residential and socio-economic composition of areas. The findings indicate that in accord with the social disorganisation model, in the rural areas of Australia, the rates of property and violent crime are related to residential stability, family disruption and ethnic heterogeneity. The effect of these structural characteristics is mediated by declines in the agricultural economy, which is the strongest correlate of both property and violent crime rates. Small-to-medium sized areas that are relatively accessible from major regional centres have the lowest crime rates compared to other types of rural towns (i.e. accessible-big towns, remote-small and remote-medium towns). These findings suggest that the relationship between size, location, economic change, and rural crime may be complex, and that more research is required in order to understand processes of structural change and its consequences. In general, the Social Disorganisation Model provides an adequate explanation for the variation of crime rates among the rural localities of Australia.
INTRODUCTION

Very few studies have examined rural crime in Australia and those that have, offer limited explanations. This paper discusses variation in burglary and the violent offences of assault and robbery among rural local government authorities of Australia within a social disorganisation framework.

The traditional social disorganisation model of crime in communities is extended to account for the effects of size, location and economic transformation on structural characteristics associated with residential stability and social composition, and ultimately in the communities' ability to provide for the social control required to reduce crime. Regional variation in crime is hypothesised to arise from local variation in the efficacy with which communities organise and use existing resources to provide (formal and informal) social control.

The paper is organised as follows. The second section provides a brief discussion of the main concepts of the social disorganisation model in rural areas. The third section states the research questions to be addressed in this study. The fourth section describes the data used as part of the study and discusses the method used for answering the research questions. The fifth section discusses the major findings. The final section presents conclusions and discusses opportunities for further research in the area of rural crime.
The Social Disorganisation Model

The social disorganisation model of crime emphasises the effects of a community’s ability to realise the common values of its residents and maintain effective social controls on crime (Sampson & Groves 1989). Sampson (1995) identified the following three major dimensions of social disorganisation:

- The community’s ability to supervise and control (teenage) group-level behaviour.
- The density of relational networks. Communities with strong, dense, and high quality interpersonal networks have greater capability to foster environments that constraint deviant behaviour compared to communities with weak, loose and low-quality networks (Bursik and Grasmick 1993, Glaeser, Sacerdote & Scheinkman 1996, Bellair 1997).
- The rate of participation in voluntary associations and local organisations, as well as the stability and density of social institutions. Low participation in local activities and weak community organisational structures affect communities’ capacity to reduce local crime.

A number of factors mediate the relationship between these dimensions and local crime. Social cohesion among neighbours combined with their willingness to intervene on behalf of the common good, or ‘collective efficacy’, has been linked to reductions in violence (Shaw and McKay 1969, Bursik and Grasmick 1993, Sampson, Raudenbush and Earl, 1997). Crime is high in neighbourhoods with high levels of disorder and low levels of neighbourhood interaction and trust (Snell, 2001) and the distribution of disorder is related to factors such as level of poverty and degree of instability, which in turn disrupts the relational networks within a community (Skogan, 1990).

Change and adaptability are central to the social disorganisation perspective to crime (Bursik and Grasmick 1993, p. 48). Processes of economic change may have major effects on the social,
environmental and physical characteristics of localities. In Australia, wide differences in employment and income between country and city areas have emerged in recent years. In particular, local economies with a high concentration of agriculture and mining activity have experienced marked falls in population, employment and income (Garnaut, Connell, Lindsay and Rodriguez, 2001). Crime in regional Australia has increased at a faster rate compared to metropolitan areas. Economic fluctuations, in particular those affecting agriculture and mining industries have been found to be associated with increasing crime rates. In some cases this occurs directly, while in others it occurs via the effect of economic change in residential stability and the socio-economic composition of local areas (Carcach, 2001).

Both residential stability and socio-economic composition influence the quantity and quality of social interactions that take place among community members. Social interactions generate the conditions by which communities can provide the social control that is required to achieve reductions in local crime. Social interactions, along with their associated processes, affect the local stock of trust, cohesion and resources for collective action in the community, also known as social capital (Coleman, 1989).

Communities have varying ability to use their existing stock of social capital. Communities where residents enjoy high-quality interactions may reach levels of collective efficacy that enable them to use their available social capital in providing the social control for reducing local crime (Sampson, Morenoff and Earls, 1999). As communities make successful use of their social capital to reduce crime, they enhance the quantity and quality of interactions among residents, as well as the local capacity for collective action.

On the other hand, high crime rates generate fear of strangers and withdrawal from community life (Skogan 1986, 1991, Liska and Warner 1991). Besides weakening the local social
organisation, high crime rates increase residential mobility, which in turn leads to disorder and
neighbourhood decline (Bursik and Grasmick 1993, Miethe and Meier 1994, Morenoff and

Rural Crime and Social Disorganisation

Very few studies have examined rural crime in Australia and those that have, offer limited
explanations. O'Connor and Gray (1989) identified elements of the social organisation of rural
areas such as cultural homogeneity, cohesion, and density of relations that effect both residents'
perceptions of crime and the local level of recorded crime. A descriptive study found that in
Western Australia crime varied regionally and that metropolitan areas were not necessarily more
crime prone than non-Metropolitan areas (Crime Research Centre, 1998).

As noted by Veysey and Messner (1999), the lack of adequate data on regional crime has been,
and continues to be, a major limitation of the research on social disorganisation theory. In
Australia, data on census variables from which it is possible to derive aggregate indicators of
residential stability or socio-economic homogeneity are readily available for different types of
geographical units. Regional data regarding other concepts of the social disorganisation model
such as nature and density of relationships, organisational participation, or community cohesion
are more difficult to obtain. The Australian Bureau of Statistics collects some of these data
through large-scale household surveys but does not have a program for the production of small-
area statistics. Police services disseminate regional crime statistics, but these collections are not
intended to support the types of analyses required for the conduct of research on rural crime.

A second limitation lies with the notion of rural. In Australia, the term rural is applied to
population clusters of 1,000 or more people (Australian Bureau of Statistics, 1997a). An
alternative scheme classifies non-metropolitan areas attending to their level of access to services
into the categories of urban, rural and remote areas (DPIE & DHSH, 1994). A major criticism for this classificatory scheme has been its inability to separate the notions of urban-rural and remoteness. A centre can be both urban and remote (Hugo, 1999). More recently, an index known as the Accessibility/Remoteness Index of Australia (ARIA) was developed in an attempt to address this problem. Unlike its predecessor, ARIA is a pure measure of accessibility (DHAC & GISCA, 1999). This allows separate examination of the rural-urban and the remoteness dimensions of places. Rural areas often have a high concentration of employment in primary industries and tend to have small populations, though there may be some exceptions.

Australia is a highly urbanised country. According to the 1996 population census, 85% of Australians live in urban centres (Australian Bureau of Statistics, 1997b). Unlike their urban counterparts, rural localities tend to be geographically isolated and have a low population density. During the last fifty years, rural localities have experienced a decline in population, though this process has affected some areas more strongly than others (Hugo, 2000). Population change in rural Australia has been associated with fluctuations in employment opportunities (Garnaut, 2000) arising from transformations to the local economies. Out migration of skilled labour together with concentration of social and economic disadvantage, are direct consequences of economic change and the processes of structural adjustment that have taken place in rural Australia. The capacity of rural towns to respond to these changes and to take advantage of opportunities for regional development is affected by their location relative to a major economic centre (Ghelfi and Parker 1997). In general, localities that cluster around large cities are better positioned to attract a skilled labour force and to diversify their economies compared to their remote counterparts, but also tend to experience higher levels of crime compared to remote small towns (Carcach, 2001).
Osgood and Chambers (2000) studied the structural correlates of violent juvenile offending in nonmetropolitan counties of the United States. Their findings support the generality of the social disorganisation model. Juvenile violence was associated with residential stability, family disruption, and ethnic heterogeneity. Areas with the lowest populations also have the lowest crime rates, but population size makes little difference on crime rates after reaching 4,000 (juveniles). Crime rates are not affected by the country's proximity to a metropolitan area. Despite not finding support for an explanation that the relationship of population size to crime is spuriously produced by the displacement of juvenile offending from small areas to larger areas offering greater opportunities, Osgood and Chambers do not rule out this possibility.

**RESEARCH QUESTIONS**

Weisheit and Donnermeyer (2000) have argued for the need to conduct rigorous studies of structural theories of crime such as the social disorganisation theory, in rural areas. This study is a first step in testing the applicability of social disorganisation theory in the rural local government authorities of the inland states of Eastern Australia. It examines variation in crime rates for violent and property offences. In accord with previous research, the central hypothesis is that differences in rural crime arise from variation in the communities’ ability to exert social control (Bursik and Grasmick 1993, Sampson 1995). However, the link between social control and crime is mediated by the effects of economic transformation on the degree of residential stability and the social structure of areas, which in turn influence the level and quality of social interactions among residents (Glaeser, Sacerdote and Scheinkman 1996), and their ability to realise common values and work cooperatively in the solution of local problems (Sampson, Morenoff and Earls 1999). Consequently, the following research questions emerge when variation in rural crime rates is analysed within the social disorganisation framework:
1. Declines in the agricultural economy together with local levels of employment are associated with higher crime rates.

2. The capacity of rural towns to take advantage of economic transformation is affected by its size and location relative to a major economic centre (Ghelfi and Parker, 1997). Small rural towns that are easily accessible from major regional centres are residentially unstable and tend to concentrate socio-economic disadvantage compared to other types of rural towns (Osgood and Chambers 2000, Carcach 2001).

3. Crime rates are related to the degree of stability of the local resident populations. Rural towns with unstable populations have higher crime rates compared to towns with stable populations (Osgood and Chambers, 2000). Constant changes in local populations reduce the opportunities for high-quality social interactions among residents (Glaeser, Sacerdote and Scheinkman 1996).

4. Crime rates are positively related to ethnic heterogeneity. In Australia, rural towns may have relatively significant numbers of Indigenous residents who also rank poorly in terms of most socio-economic indicators (Australian Bureau of Statistics and Australian Institute of Health and Welfare, 2001). Geographic concentration of Indigenous people has been identified as a major contributor to regional variation in violent crime (Carcach 1999, Weatherburn 2001).

5. Rural crime rates are positively related to family disruption. High incidence of sole parent families impairs a locality's ability to supervise children and foster proper communication between adults (Sampson and Groves, 1989).

6. Crime rates are positively associated with increases in the ratio of the number of elderly residents compared to youth residents. The higher this ratio the lower is the local crime rate due to an increased community capability to supervise youth behaviour (Sampson, Morenoff and Earls, 1999).
Lack of economic resources is associated with local crime rates (Osgood and Chambers, 2000). Findings from research on urban settings indicate that concentrated affluence, rather than presence of low-income families, contributes to reduce local crime rates by enhancing the communities' ability to generate social capital and increasing the residents' willingness to participate in the solution of local problems (Sampson, Morenoff and Earls, 1999).

**METHODS**

**Units of Analysis**

Local Government Areas (LGAs) of the Eastern Australian states of New South Wales, Victoria, Queensland and South Australia were the units of analysis in this study. LGAs are legally designated areas subject to the authority of incorporated local governments (Australian Bureau of Statistics, 1998). They are equivalent to municipalities and as such correspond to the lowest level of government in Australia. A total of 214 LGAs were classified as rural according to the following 2 criteria:

1. They had a Location Quotient (LQ) of employment in primary industries of 2.5 or greater. LQs measure an industry's share of the total employment within a region relative to its share within a larger area, and as such they are used as indicators of concentration of economic activity (Carcach and Muscat, 2002). A LQ of 2.5 ensures that only localities with a strong concentration of activity in the primary sector are included in the study.

2. They had a population non greater than 50,000 residents during 1996.

A town can be rural without being remote. One-third of all the LGAs classified as either a service centre or very accessible from a service centre were also classified as rural. While 100% of all the LGAs with less than 1,000 residents were classified as rural, rural localities...
represented 13% of all the LGAs with more than 20,000 residents (Table 1). Overall, rural
LGAs represented 59% of all the LGAs in Eastern Australia.

Table 1: Rural Local Government Areas
Population Size and Degree of Accessibility/Remoteness from a Service Centre

<table>
<thead>
<tr>
<th>Population Size (1996)</th>
<th>Less than 1,000</th>
<th>1,000 to Less than 4,000</th>
<th>4,000 to Less than 20,000</th>
<th>20,000 to Less than 50,000</th>
<th>All Rural LGAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Centre or Very Accessible from a Service Centre (ARIA&lt;3.5)</td>
<td>3</td>
<td>46</td>
<td>54</td>
<td>8</td>
<td>111</td>
</tr>
<tr>
<td>Accessible from a Service Centre (ARIA up to 5.8)</td>
<td>5</td>
<td>24</td>
<td>28</td>
<td>2</td>
<td>59</td>
</tr>
<tr>
<td>Remote Relative to a Service Centre (ARIA up to 9.8)</td>
<td>3</td>
<td>19</td>
<td>8</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Very Remote Relative to a Service Centre (ARIA&gt;9.8)</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>All Rural LGAs</td>
<td>16</td>
<td>96</td>
<td>92</td>
<td>10</td>
<td>214</td>
</tr>
<tr>
<td>% of All LGAs (Rural and Non Rural)</td>
<td>100.0</td>
<td>92.3</td>
<td>54.1</td>
<td>13.7</td>
<td>59.0</td>
</tr>
</tbody>
</table>

Data

This study used data on rates of violent and property crime, census data on structural
characteristics of areas and measures of change in local economies (PMP Software, 1998), and
an index of relative location (DHAC & GISCA, 1999).

Measures

Crime

Crime rates for Local Government Areas (LGAs) were either obtained directly from published
crime statistics (New South Wales Bureau of Crime Statistics and Research 1994-1998), or
derived from postcode counts of recorded crime (Victoria Police, Queensland Police and South
Australia Police, 1994-95 to 1997-98). The crime rates used in this study were based on average
counts of crimes over the period from 1994 to 1998, so they roughly correspond to average
crime rates for the year 1996.
The social disorganisation model has been tested using juvenile offending data, in particular data on arrests for violent offences (e.g. Shaw and McKay 1942, Sampson and Groves 1989, Bursik and Grasmick 1993, Vesey and Messner 1999, Osgood and Chambers 2000). In Australia, similar data are not readily available, so this study used crimes recorded by police. The personal offences of robbery and assault, and the property offence of residential burglary were chosen for this study because they are primarily youth crimes. Official statistics indicate that (in the state of Victoria) youth offenders represent 59%, 48%, and 56% of all the alleged offenders of robbery, assault and residential burglary respectively.

Economic Structure and Economic Transformation

The concept of economic structure incorporates the dimensions of economic activity and potential for development. The latter was approximated from the size of the locality measured in terms of 4 population groups and the degree of accessibility or remoteness relative to major service centres. LGAs were classified into 4 size groups according to the total number of residents at 30 June 1996 (PMP Software 1998): Less than 1,000 residents, 1,000 to less than 4,000 residents, 4,000 to less than 20,000 residents, and 20,000 to less than 50,000 residents. The dimension of accessibility (remoteness) from a major service centre was approximated by classifying LGAs into 4 groups defined in terms of their ARIA values: Major service centre or very accessible, accessible, remote, and very remote (Table 1). The ARIA index ranges from 0 to 12, with larger values being associated with remoteness (DHAC & GISCA 1999).

Economic activity was measured from the Location Quotient for primary industries and its change between the 1986 and 1996 population censuses. Male and female unemployment rates as well as their change over the 1986-96 period were used as measures of economic activity. Note that this represents a departure from previous studies of social disorganisation where
unemployment has been used as a measure of socio-economic disadvantage. In Australia, changes in unemployment have been found to have a strong influence on population change in rural areas (Garnaut, 2000).

### Structural Characteristics

Residential stability was measured using the percentage of households with members who had been residents of the area for at least 5 years, and the direction and magnitude of population change.

Following Morenoff, Sampson and Raudenbush (2001) measures of poverty and affluence were derived from the index of concentration at the extremes (ICE). The ICE is given by the following formula: 

\[
\frac{(\text{Number of affluent families} - \text{Number of poor families})}{\text{total number of families}}
\]

where affluent refers to families with income above $A 1,000 a week, and poor refers to families with income below $A 300 a week. The ICE index can take values between –1 (all families are poor) and 1 (all families are affluent), with 0 indicating a 50-50 split between poor and affluent families in the LGA.

Ethnic heterogeneity was measured in terms of the number of Indigenous persons as a percentage of the total number of residents in an area.

The proportion of families with children under 15 years of age that are headed by a sole parent was used as an indicator for the informal sphere of social control. Osgood and Chambers (2000) used a similarly defined variable to measure family disruption.

The decline in youth population is one of the major problems faced by rural localities in Australia. According to Hugo (2000), the nonmetropolitan areas of Australia experienced the
heaviest net losses of young people between 1991 and 1996. This study used percentage decline in the juvenile-to-elderly ratio during 1991-96 as an indicator of change in the localities' ability to provide for social control (Morenoff, Sampson and Raudenbush 2001)

Descriptive statistics are presented in Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (1998)</td>
<td>6223</td>
<td>6728</td>
<td>304</td>
<td>47290</td>
</tr>
<tr>
<td>Number of Property Crimes</td>
<td>120</td>
<td>148</td>
<td>0</td>
<td>1210</td>
</tr>
<tr>
<td>Number of Violent Crimes</td>
<td>6.8</td>
<td>17.3</td>
<td>0</td>
<td>158</td>
</tr>
<tr>
<td>Percentage Decline in Primary Industry Activity (1996-86)</td>
<td>-3.2</td>
<td>5.8</td>
<td>-3.2</td>
<td>0</td>
</tr>
<tr>
<td>Male Unemployment Rate (1996)</td>
<td>9.2</td>
<td>4.4</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Percentage Living in Same Address in 1996 as in 1986</td>
<td>53.4</td>
<td>6.5</td>
<td>31.3</td>
<td>72.2</td>
</tr>
<tr>
<td>Index of Concentration at the Extremes (ICE)</td>
<td>-0.11</td>
<td>0.11</td>
<td>-0.41</td>
<td>0.38</td>
</tr>
<tr>
<td>Proportion of LGAs with ICE Index Below 0 (Concentrated Poverty)</td>
<td>0.86</td>
<td>0.35</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Indigenous Residents as Percentage of Total (1996)</td>
<td>3.9</td>
<td>6.4</td>
<td>0</td>
<td>53.1</td>
</tr>
<tr>
<td>Sole Parent Families with Children Under 15 Years as % of Total Families</td>
<td>7.7</td>
<td>2.2</td>
<td>2.9</td>
<td>15.1</td>
</tr>
<tr>
<td>Percentage Change in Juvenile-to-Elderly Ratio (1996-86)</td>
<td>-25.4</td>
<td>25.3</td>
<td>-73.5</td>
<td>135.3</td>
</tr>
</tbody>
</table>

**Statistical Model**

Let $Y_i$ denote the number of crimes of a given type recorded by police in an LGA ($i = 1, \Lambda , N$).

It is often assumed that the $Y_i$'s are independently distributed as Poisson random variables with mean $\lambda_i$, the crime rate for the $i-th$ LGA. Modelling (the logarithm of) the mean as a function of area level variables is the usual way to account for regional variation in crime rates. For a given local area, the numerator of the rate is the count of crimes recorded by police during a given period. But count data tend to have greater variation than predicted by the Poisson model, a phenomenon known as overdispersion. For the rural areas included in this study, the count of property crimes had a mean of 120.2 and a variance of 22,150.6 whereas for violent crimes the variance was 44 times the mean (Table 2). Adopting the less restrictive assumption of negative-
binomially distributed counts is a commonly used remedy in this type of situation (i.e. Cameron and Trivedi 1998, Osgood 2000).

Theoretically, the negative-binomial distribution can result from either of 2 specifications for the mean-variance function. In one of these, the variance of the Poisson counts is a linear function of the mean, whereas the other assumes a quadratic function. Using a linear or a quadratic specification for the mean-variance function may have profound implications for the regional analysis of crime. Regional counts of crime result from aggregating individual recorded incidents. Recording practices may vary across police forces or regions within police forces, and over stations and officers within police regions (Burrows, Tarling, Mackie, Lewis and Taylor 2000). Local crime rates also depend upon the level and intensity of police activity, the supply and intensity of offending, the opportunity structure of local areas, and the citizens’ proneness to report crimes to the police. Most of these processes are either unobservable, or difficult to observe, which may introduce non-linearity in the mean-variance function. This suggests that a quadratic mean-variance function may be more adequate than a linear specification.

Though relatively successful in accounting for overdispersion, the negative-binomial model assumes independence of crime counts. However, there is still the possibility that unobserved heterogeneity be present in the data after controlling for area-level covariates, which together with spatial variation may contribute to excess of variance. One way around this problem is expanding the regression model by adding a random-area effect and a spatial term. Dealing with random-area effects requires either having access to data for units below the regional level (e.g. individual crime records) or setting the problem within a Bayesian framework (Gilks, Richardson and Spiegelhalter, 1996). An alternative solution followed in this study is trying to control for as many theoretically meaningful area-level variables as possible.
The model used in this study had the numbers of property and violent crimes recorded by police within an area as the response variable. The linear predictor consisted of the measures of social disorganisation discussed in the previous section.

Morenoff, Sampson and Raudenbush (2001) justify the inclusion of spatial variation in social disorganisation models of crime on the grounds that modern neighbourhoods are less distinctly defined with permeable borders compared to the traditional notion of local communities characterised by dense networks of social ties. In modern communities, social processes are more likely to cut across traditional ecological boundaries and less likely to be fully contained in specific geographic units.

Spatial variation due to the reasons argued by Morenoff et al (2001) is difficult to assess when dealing with relatively large geographical units such as the Local Government Areas included in the present study. Inclusion of the ARIA measure of accessibility/remoteness in the model will account for a substantial portion of any spatial variation in crime rates.

Each of the Australian states included in this study has its own criminal justice system and police force. As expected, recorded crime rates vary across the states during a given year mostly due to differences in crime recording practices and procedures. According to official statistics, Victoria has the lowest crime rates in the country. Preliminary analyses indicated that after controlling for the other variables included in the model, the crime rates in the rural areas of Queensland were not different from Victoria. Consequently, the model included two state-dummy variables indicating whether an LGA was in the states of New South Wales or South Australia.
Table 3 shows the results from applying the social disorganisation model to the rural LGAs of Eastern Australia.

**Table 3: Social Disorganisation and Rural Crime**

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Property</th>
<th>Violence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population between 20,000 and 50,000 residents (BIG TOWN)</td>
<td>1.32***</td>
<td>4.03</td>
</tr>
<tr>
<td>Population between 4,000 and 20,000 residents (MEDIUM TOWN)</td>
<td>0.15**</td>
<td>0.26</td>
</tr>
<tr>
<td>Population between 1,000 and 4,000 residents (SMALL TOWN)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Population less than 1,000 residents (VERY SMALL TOWN)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Relative Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGA is &quot;ACCESSIBLE&quot; from a major regional centre (ARIA Index between 3.5 and 5.8)</td>
<td>-0.16**</td>
<td>-0.01</td>
</tr>
<tr>
<td>LGA is a REGIONAL CENTRE or &quot;VERY ACCESSIBLE&quot; from a major regional centre (ARIA Index less than 3.5)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>LGA is &quot;REMOTE&quot; relative to a major regional centre (ARIA Index between 5.8 and 9.8)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>LGA is &quot;REMOTE&quot; relative to a major regional centre (ARIA Index greater than 9.8)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Size-Location Interactions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessible-Big Town</td>
<td>0.93**</td>
<td>3.14</td>
</tr>
<tr>
<td>Accessible-Medium Town</td>
<td>-0.26**</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Local Economy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decline in Agriculture (1996-86)</td>
<td>1.45***</td>
<td>3.14***</td>
</tr>
<tr>
<td>Male Unemployment 1996</td>
<td>0.02**</td>
<td>0.05***</td>
</tr>
<tr>
<td>LGA is in New South Wales</td>
<td>0.46***</td>
<td>0.74***</td>
</tr>
<tr>
<td>LGA is in South Australia</td>
<td>1.83***</td>
<td>2.03***</td>
</tr>
<tr>
<td>LGA is in Queensland</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>LGA is in Victoria</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Structural Features</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Living at same address in 1996 as in 1991 (logit transform)</td>
<td>-0.45***</td>
<td>-0.94***</td>
</tr>
<tr>
<td>Whether ICE index was below 0 (Concentrated Poverty - Logit Transform)</td>
<td>-0.01</td>
<td>-0.15</td>
</tr>
<tr>
<td>% Indigenous residents (Logit Transform)</td>
<td>0.03***</td>
<td>0.04***</td>
</tr>
<tr>
<td>% Sole parent families with children under 15 years of age (Logit Transform)</td>
<td>0.05***</td>
<td>0.08***</td>
</tr>
<tr>
<td>Decline in the youth-to-elderly ratio (1996-86)</td>
<td>-0.58**</td>
<td>-0.77</td>
</tr>
<tr>
<td>Whether ICE index was below 0 (Concentrated Poverty)-Decline in the youth-to-elderly ratio interaction</td>
<td>0.78***</td>
<td>1.16</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-6.33***</td>
<td>-14.41***</td>
</tr>
<tr>
<td><strong>Dispersion</strong></td>
<td>0.12**</td>
<td>0.17**</td>
</tr>
<tr>
<td><strong>Scaled Deviance</strong></td>
<td>1.14</td>
<td>0.97</td>
</tr>
</tbody>
</table>

*** (p<0.01)
** (p<0.05)
Economic Transformation

Declines in the agricultural economy were associated with increases in both property and violent crime rates. The regression coefficients reflect differences in the (natural) logarithms of the crime rate. A log-difference of 0.69 corresponds to a doubling of the crime rate (i.e. $e^{0.69} = 2$). The coefficient of 1.45 for property crime indicates that the crime rate for property crime will double with a 47% decline in agricultural activity ($1.45 \times 0.47 = 0.69$), whereas a doubling in the rate of violent crime would take place after a decline of 22% in agricultural activity ($3.14 \times 0.22 = 0.69$).

Male unemployment was also associated with increases in crime in rural areas. However, the effect of this variable on crime rates was not as dramatic as expected, perhaps due to the inclusion of declines in agricultural activity as part of the model. A doubling of the property crime rate would occur only if the male-unemployment rate increased by a massive 345%. The violent crime rate would double following a 138% increase in male unemployment. Using data in Table 1, on average, an LGA with a male-unemployment rate of 32 ($9.2 \times 3.45$) would be expected to record a property crime rate of 38.5 per 1,000 residents ($120 \times 2/6,223$). A doubling in the violent crime rate (2.1 per 1,000 residents) would occur after a male-unemployment rate of 12.7 ($9.2 \times 1.38$).

Size and Location

The findings support the idea of a spurious relationship between population size, location and rural LGA rates of violent crime (Osgood and Chambers, 2000). Size and location did not affect the rate of violent crime. This was not the case for property offences. Size and location had significant effects on property crime after controlling for the effects of economic activity and
community structure. Property crime rates in big towns (i.e. 20,000-50,000 residents) and medium towns (4,000-20,000) are 708% higher \( e^{(0.32-0.16+0.93)} \) and 24% lower \( e^{(0.15-0.16-0.26)} \) compared to remote or very remote rural areas with less than 4,000 residents respectively (Table 3).

After controlling for the effects of population size, remoteness, economic change, and structural characteristics, the rates of property and violent crime in rural areas of New South Wales were 60% and 109% higher compared to Victoria and Queensland respectively \( e^{0.46} \) and \( e^{0.74} \). In the rural areas of South Australia, property and violent crime rates were 520% and 660% above the rates in Victoria and Queensland respectively \( e^{1.83} \) and \( e^{2.03} \).

Residential Stability

Residential stability exerts a powerful influence on rural crime rates. An increase of 1% in the percentage of residents living in the same area as 5 years ago was associated with a 45% decline in the expected number of recorded residential burglaries and a 94% decline in the expected number of recorded robberies and assaults. This finding is consistent with previous studies of the social disorganisation model in both urban (Sampson and Groves 1989, Petee and Kowalski 1993, Bursik and Grasmick 1993, Veysey and Messner 1999, Osgood and Chambers 2000, Snell 2001, Morenoff et al 2001) and rural settings (Petee and Kowalski 1993, Osgood and Chambers 2000).

Family Disruption

Consistent with previous research, high levels of family disruption, as measured by the percentage of households with children under 15 years that are headed by a sole parent, were associated with higher rates of property and violent crime. Given the current coefficients, an
increase of 1% in sole-parent households would produce increases of 5% and 8% in the rates of property and violent crime respectively.

*Indigenous Population*

Concentration of Indigenous residents had a relatively weak effect on local crime rates, after controlling for other area attributes. A 1% increase in the proportion of residents of Indigenous background was associated with increases of 3% and 4% in the local property and violent crime rates respectively.

*The Decline in the Youth-to-Elderly Ratio and the Effects of Poverty*

A decline in the youth-to-elderly ratio did not have any effects on the local rate of violent crime but was related to a decline in property crime rates. However, the magnitude of such effects was mediated by whether the local government area had concentrated poverty or not, as assessed from the value of the ICE index.

In rural areas classified as having concentrated affluence (i.e. the ICE index was greater than 0), a 1% decline in the youth-to-elderly ratio was associated with a 58% decline in the local rate of property crime, a finding that was consistent with expectations and that gave support to the hypothesis of a positive relationship between a community's capability to provide for social control and its (property) crime rate (Morenoff et al 2001). This result is also consistent with a routine-activities explanation of regional variation in crime rates. A declining youth-to-elderly ratio means that more residents tend to conduct their routine-activities around the home, which in turn increases the degree of property guardianship in the neighbourhood (Cohen and Felson, 1979).
A different picture emerged in rural areas classified as having concentrated poverty (i.e. the ICE index was below 0) where a 1% decline in the youth-to-elderly ratio was associated with a 20% increase in the local rate of property crime. In poor areas, concentrated poverty acts toward weakening the local capability to provide social control, a finding that is consistent with the social disorganisation model (Osgood and Chambers, 2001).

*Unobserved Heterogeneity and Spatial Variation*

The results suggest that the amount of heterogeneity left in the data is relatively modest, as suggested by the relatively small values for the overdispersion parameters (0.12 for property crime and 0.17 for violent crime).

Given the relatively large geographic extension of most of the local government areas included in this study, spatial variation does not seem to be a major feature of the crime rate data. Inclusion of remoteness/accessibility measures may have contributed to remove any spatial variation that might have been present in the data. A test conducted on the residuals of the negative-binomial regression model did not reject the hypothesis of zero spatial covariance.

**CONCLUSION**

The social disorganisation model provides an adequate explanation for the variation in crime between rural areas in Australia. The results indicate that in rural localities, crime rates are associated with such factors as residential stability, family disruption, concentrated poverty (and also concentrated affluence), and Aboriginality in a manner similar to urban areas.

The findings concerning the relationship between economic factors and crime have important implications. Declines in the agricultural economy produce the greatest impact on rural crime
rates, even after controlling for the effects of structural differentiation factors. Although male unemployment rates have a modest direct effect on local crime rates, they act through their association with residential instability, concentrated poverty, and a declining youth population.

Transformations to the local economy influence local crime rates, but this depends upon the size and location of the area. Rates of property crime increase with population size, however this pattern is affected by the locality's degree of accessibility or remoteness. Regional centres (i.e. highly accessible, but not necessarily big towns) have higher rates of property crime compared to remote towns, but among the latter crime rates are higher compared to accessible-small-to-medium towns (i.e. population between 4,000 and 20,000 residents that are close to major service centres). The presence of a buffering effect by which relatively accessible small-medium-sized towns are isolated from crime relative to the largest or smallest towns is a distinct possibility.

The findings indicate that rates of violent crime are not affected by either the size or the remoteness/accessibility of rural localities, but that they are more sensitive to declines in the local economy and residential stability compared to rates of property crime. Violent crime rates are not affected by concentrated poverty or changes to the demographic balance of the local populations. The effects of factors such as family disruption and Aboriginality are similar for violent and property crime rates.

Future research needs to look more carefully at the link between changes to the agricultural economy, farming activity, farmers’ expenditure in rural towns of Australia, and crime rates in rural Australia. Studying the response of rural communities to structural change is crucial to our understanding of the social and economic processes related not only to crime, but also to other local problems.
REFERENCES


