# Indigenous Australian arrest rates: Economic and social factors underlying the incidence and number of arrests

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## Abbreviations and acronyms

| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| AGPS | Australian Government Publishing Service |
| AIC | Australian Institute of Criminology |
| ANU | The Australian National University |
| ATSIC | Aboriginal and Torres Strait Islander Commission |
| CAEPR | Centre for Aboriginal Economic Policy Research |
| CEPR | Centre for Economic Policy Research |
| CDEP | Community Development Employment Projects |
| CURF | Confidentialised Unit Record File |
| IGSS | Indigenous General Social Survey |
| NATSIS | National Aboriginal and Torres Strait Islander Survey (1994) |
| OEA | Office of Evaluation and Audit (ATSIC) |
| OECD | Organisation for Economic Cooperation and Development |
| OLS | Ordinary Least Squares |
| RCADC | Royal Commission into Aboriginal Deaths in Custody |

## Summary

The over-representation of Indigenous Australians in prison continues to be a serious problem, even a decade after the recommendations of the Royal Commission into Aboriginal Deaths in Custody were handed down. The greatest leverage for reducing Indigenous imprisonment rates appears to lie in reducing the rate at which Indigenous persons appear in court rather than in reducing the rate at which convicted offenders are sentenced to imprisonment. This would mean not only diverting Indigenous defendants away from court, but reducing the rate at which Indigenous persons are arrested, through using alternatives to arrest, reducing the rate at which they offend or re-offend and addressing inappropriate differential treatment of Indigenous persons by the criminal justice system.

A unique opportunity to analyse the processes underlying Indigenous arrest is provided by the 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS) data, with its unprecedented range of socioeconomic and cultural data. This report documents the factors associated with Indigenous arrest, rather than directly analysing the nature of offence (re-offence) or differential treatment by the police.

## Data and method

Criminological research points to several factors that are likely to explain the Indigenous arrest rate:

- sex;
- age;
- Torres Strait Islanders, a distinct ethnic group within Indigenous Australia with relatively low arrest rates;
- the adequacy and availability of police services;
- economic predictors of arrest, such as labour force status and education, which attempt to capture the labour market options of individuals and the capacity to communicate with various actors in the criminal justice system;
- alcohol consumption;
- the extent of verbal and physical abuse in Indigenous community;
- health conditions;
- socioeconomic conditions within families—particularly the removal of children from their parents (sometimes known in the Indigenous context as the 'stolen generation');
- housing need (included as an alternative measure of income poverty which tends to be poorly measured for Indigenous Australians); and
- positive and negative peer group influences.

The NATSIS had valid information on these factors for 10,235 respondents aged 13 years and over (e.g., the poor quality of information available for prisoners meant that such data was not used in the main analysis). This data is used to estimate the probability of arrest for various groups of people to assess the relative importance of the factors underlying Indigenous arrest. The results are merely broadly indicative of the factors associated with arrest because of residual concerns about the direction of causality and measurement error.

## Results

The major factors underlying the high rates of Indigenous arrest include sex, labour force status, alcohol consumption, whether a person had been physically attacked or verbally threatened, various age factors, and the cluster of education variables:

- males are 13.1 percentage points more likely to be arrested than females;
- having a job (especially in non-Community Development Employment Projects (CDEP) scheme employment) appears to lower arrest rates by: reducing the time available for illegal activities, reducing immediate financial disadvantage and improving the 'social capital' of workers who are in a better position to engage with the mainstream non-CDEP economy. CDEP scheme participants are less likely to be arrested than Indigenous unemployed (8.1, and 13.1 percentage points);
- alcohol consumption is one of the largest single factors underlying overall Indigenous arrest rates (12.8 percentage points);
- having been physically attacked or verbally threatened increases arrest by a similar amount to the alcohol consumption (10.9 percentage points);
- the probability of arrest peaks among 18 to 24 year-olds and then declines, being lowest among Indigenous people aged 45 years and over; and
- with a few notable exceptions, education variables behave as predicted by criminological theory with the arrest rates declining as the level of schooling increases.

Other factors examined also had a significant impact on Indigenous arrest rates:

- Torres Strait Islanders are much less likely to have been arrested (7.7 percentage points);
- family environment also had a significant effect on arrest. Among these, living with non-Indigenous people and being taken from one's natural family are significantly associated with Indigenous arrest rates (-2.5 and 5.1 percentage points, respectively);
- the housing variables increased Indigenous arrest by between 2.5 and 3.0 percentage points;
- long-term health conditions are also associated with a higher rate of arrest (2.4 percentage points);
- the adequacy and availability of police services also had a significant impact, albeit relatively small compared to that in other studies;
- not only do negative peer influences increase Indigenous arrest but positive role models may also reduce arrests; and
- while dependents exerted no influence on overall arrest, the responsibilities (and the tighter time constraints) associated with parenthood and guardianship affected certain categories of female arrest (i.e., arrests for drinking-related charges and theft).

The overall results were robust, with the basic findings not changing substantially when the analysis was conducted separately for minors (under 18 year-olds), for each sex, or after prisoners were included in the analysis. The apparently small differences between the processes underlying male and female arrests points to cross-cultural or Indigenous-specific factors being more important than gender related issues.

The top six factors underlying the various categories of arrests (drinking-related, assaults, theft and outstanding warrants) are basically the same as those identified above. However, alcohol consumption and being a victim of physical attack or verbal threat are particularly important factors underlying arrests on drinking-related and assault charges. This would seem to confirm the suspicion that there is a cycle of violence and abuse in Indigenous communities which is probably related to alcohol consumption.

## Policy discussion

Ensuring that Indigenous citizens stay out of the criminal justice system should be a priority for governments who are concerned about Indigenous wellbeing. Unfortunately, there are a limited number of policy instruments among the factors identified. For example, sex and age are not factors that will be responsive to policy intervention. However, it is important to take them into account in designing appropriate policy as attitudes and circumstances vary dramatically across demographic groups.

The policy implications are complicated by the fact that 'feedback mechanisms' have been identified where arrest reinforces disadvantage in several of these factors (especially, employment prospects and educational attainment). Any attempt to substantially reduce the high rates of unemployment among Indigenous people also needs to make inroads into Indigenous arrest. Education policy needs not only to improve the marketability of the Indigenous workforce, but to facilitate the citizenship skills required to operate in both the Indigenous and non-Indigenous domains. Notwithstanding such feedback, improving labour market options of Indigenous people should markedly reduce the arrest rate.

The links between alcohol and crime, especially violent crime, are well documented. Substantial progress needs to be made on substance abuse problems before the cycle of violence in Indigenous communities can be broken. Restrictions on liquor supply are consistently nominated as producing the most tangible results in terms of reducing alcohol-related harm among Indigenous Australians.

Family and social factors are less amenable to direct policy intervention. Indeed, the misconceived policy interventions that led to the 'stolen generation' appear to be a major factor underlying Indigenous arrest rates. The negative effects of such policies are likely to be driven by the traumatic disruption to family life and the loss of culturally appropriate parenting skills. Early intervention approaches to dealing with risk factors associated antisocial and criminal behaviour appears to offer a promising avenue for policy action. It is important that Indigenous people have some control over how family services are provided (e.g., the need for Indigenous carers for Indigenous clients is often identified as an issue). The needs of children of Indigenous prisoners, especially those from country areas, should also be taken into account if the risk of delinquent behaviour is to be minimised.

The analysis in this paper should be reassessed when the Indigenous General Social Survey is conducted in 2002. The advantage of this survey is that analogous data will be collected for the non-Indigenous population, thus providing a national benchmark against which to compare the Indigenous analysis.

## Acknowledgments

## Background

The over-representation of Indigenous Australians in prison continues to be a serious problem, even a decade after the recommendations of the Royal Commission into Aboriginal Deaths in Custody (RCADC) were handed down (Baker 2001; Williams 2001).[1] For example, Baker (2001) finds that it stems initially from their higher rate of appearance at court, but is amplified at the point of sentencing, with Indigenous offenders sentenced to imprisonment at almost twice the rate of non-Indigenous persons. The violent nature of the offences for which Indigenous people are convicted and the greater likelihood of Indigenous persons having prior convictions were also found to contribute to their higher rate of imprisonment. Baker (2001) concludes that the greatest leverage for reducing Indigenous imprisonment rates appears to lie in reducing the rate at which Indigenous persons appear in court rather than in reducing the rate at which convicted offenders are sentenced to imprisonment. This would mean not only diverting Indigenous defendants away from court, but reducing the rate at which Indigenous persons are arrested, through both using alternatives to arrest and reducing the rate at which they offend or re-offend.

Several important research questions remain unanswered. Why do Indigenous people appear in court at a rate five times higher than the rest of the population? Why are Indigenous persons more likely to appear for (and be convicted of) certain types of offences? (Baker 2001). Clearly factors such as the over-representation of Indigenous persons at arrest, the nature of Indigenous offending and re-offending, and the differential treatment of Indigenous persons by the criminal justice system will all have a part to play.[2]

The 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS) data, with its unprecedented range of socioeconomic and cultural data, provides a unique opportunity to analyse the processes underlying Indigenous arrest. The NATSIS was undertaken by the Australian Bureau of Statistics (ABS) in response to a recommendation by the RCADC that extra statistical information on the Indigenous population was required in order to better understand the range of factors contributing to deaths in custody (Commonwealth of Australia 1991).

Another reason to conduct this research is that NATSIS provides an opportunity to examine predictors of arrest within the Indigenous population. Policy needs to be informed by an understanding of what distinguishes those who are likely to be arrested from other Indigenous Australians. Statistical models can be used to provide a solid basis for assigning relative importance, or weights, to the various policies which attempt to reduce the incidence of Indigenous arrest.

It is important to recognise that this paper builds on the NATSIS analysis in the 1997 Office of Evaluation and Audit (OEA) report (1997) and Borland and Hunter (2000). The OEA report provided one of the first regression analyses of the NATSIS, albeit on a restricted sample consisting solely of unemployed and Community Development Employment Projects (CDEP) scheme respondents.[3] The OEA's focus on the CDEP scheme is understandable given that they were examining the effect of the scheme relative to its nearest alternative (in terms of labour force status).[4] This paper generalises the OEA results to the Indigenous population as a whole, and uses the full potential of the public NATSIS sample to describe the factors underlying Indigenous arrest rates.

Broadhurst (1997: 417) argues that there is 'clear statistical support for the proposition that 'race' or Aboriginality increases the risk of arrest'. However, he also cautions that

'Aboriginality may be a factor or variable that catches a number of stigmatising characteristics (such as truancy, unemployment, substance abuse) and in this sense operates as a shorthand 'predictive' model for police'. Given that this study is confined to Indigenous respondents, it largely avoids addressing this problem. This is not to say that the effect of this style of 'policing' is eliminated, merely that all people in the survey will be, to a greater or lesser degree, subject to similar sorts of police attitude. Of course, if police pay greater attention to all Indigenous people, then they may notice the behaviour(s) of particular Indigenous persons which they believe may be related to offences, irrespective of the truth of the matter.

This paper confines itself to examining the economic and social factors underlying the various types of arrest experienced by Indigenous people. That is, it examines arrest rather than analysing the nature of offence (re-offence) or differential treatment by the police. While the categories of arrest in the NATSIS are broadly based on various offences, it is important not to conflate the two concepts since people can be arrested without actually having committed an offence. The next section introduces the data and method required to identify the relative importance of various predictors of arrest before sketching out a rudimentary profile of Indigenous arrests and highlighting, wherever possible, the relevant comparisons with the experience of other Australians.[5] After a detailed analysis of the effect of various factors on the incidence and category of arrest, the concluding section discusses the policy options for addressing the high rate of arrest among Indigenous Australians.

## Data and method

### Predictors of arrest

Broadhurst (1997: 413–15) provides an extensive theoretical description of the determinants of criminal activity that underlie the high rates of Indigenous arrest. Based on these theoretical considerations, several variables have been used to predict which Indigenous people are most at risk of arrest, including: gender, age, Aboriginality of family, education, CDEP scheme employment, whether taken away from natural parents, availability of Indigenous police aides, alcohol consumption, region of residence and institutional factors specific to each State's criminal justice system (OEA 1997). Borland and Hunter (2000) also show that other factors are important including whether an Indigenous person: is a Torres Strait Islander, has voted in a recent election, or has had a long-term health condition. This section discusses the relationship of each of these predictors with Indigenous arrest, before introducing several household level factors omitted from existing empirical studies.

The distinct gender and demographic patterns of arrest are well known with male youth being particularly likely to have been arrested. Consequently, variables indicating whether or not a person was male and the broad age group of a respondent are included in the analysis.

Torres Strait Islanders are a distinct ethnic group within Indigenous Australia. Given there is substantial evidence that Torres Strait Islanders have relatively low arrest rates and higher socioeconomic status, it is important to use a separate ethnicity variable for this group (ABS/CAEPR 1997: 25).

One reason why Torres Strait Islanders appear to have low arrest rates may be that many of them live in remote parts of Australia. Not only are there fewer police to arrest people in such areas, but the general lack of infrastructure interacts with other aspects

of the social and economic life of residents which, in turn, may be reflected in arrest rates. Such influences are captured using several geographic variables that indicate whether a person resides in either a capital city, other urban, rural or remote area.

One indicator of whether police services in a community are culturally appropriate is if it has either Indigenous police aides or liaison officers. Given the emphasis on adequacy and availability of police services in determining the incidence of arrest, it is desirable to include a direct measure of access to police. The predictor chosen from the NATSIS data was whether a respondent lived within 50 kilometres of a police station.

The economic predictors of arrest attempt to capture the labour market options of individuals and their capacity or willingness to communicate with various actors in the criminal justice system. For example, being employed may increase access to resources and hence reduce incentive for 'economic' crime. While the prolonged experience of unemployment may increase the time available to commit an offence, it may also increase an individual's dissatisfaction with Australian society (Hunter 2000b). CDEP scheme employment and a not-in-the-labour-force category are included separately as predictors because they reflect the labour market options of respondents (Hunter & Gray 1999).

Education is included in the analysis because it captures both aspects of the economic predictors of arrest. Well educated individuals are more likely to have skills that improve their employability and enhance their ability to communicate within the criminal justice system. Two categories of education variables were included in the analysis: highest level of schooling completed (less than 6 years, years 6 to 9, year 10 or 11, year 12, and still at school), and whether a respondent had any post-school qualification.

Given the preponderance of drinking-related offences among Indigenous Australians, it is also necessary to include a control for alcohol consumption. The variable chosen was whether a respondent had ever drunk alcohol.[6]

A related problem in the Indigenous community is the extent of verbal and physical abuse (National Crime Prevention 2001). While obviously not all violence originates within the community (e.g., there is both anecdotal and statistical evidence of police harassment of Indigenous people), if a cycle of violence is created, then related offences are likely to be perpetrated and prosecuted. The relevant NATSIS variable, which measures whether a person had been physically attacked or verbally threatened, provides an adequate, although imperfect, proxy for such factors (Carcach & Mukherjee 1996). Since such people are, in some sense, a 'victim' of other people's behaviour, they will be referred to by the shorthand of 'victim' for the remainder of this paper.

Long-term health problems may also be related to Indigenous arrest. Health conditions may arise indirectly from behaviours associated with arrest (e.g., alcohol consumption). Alternatively, prolonged health problems could lead to enforced idleness and poverty, thus increasing the opportunity and incentive to engage in criminal activities.

Family influences are likely to be prominent factors associated with arrest (National Crime Prevention 1999). Living in a family with dependents will tend to reduce arrest rates because of the moderating effect of extra family responsibilities. Alternatively, living in a family with non-Indigenous people may reduce the incidence of arrest to the extent that such people tend to have better economic prospects. That is, this 'mixed family' variable is included to pick up socioeconomic factors not captured by other predictors.

Another family-based predictor of arrest is whether an individual was taken from their natural family. Members of the 'stolen generation' who were taken from their natural families have experienced social dislocation and alienation, which anecdotal evidence suggests has significantly increased contact with the criminal justice system (Commonwealth of Australia 1997: 12–16). The disruption to family life entailed in taking children from parents has been identified as a significant risk factor underlying arrest (National Crime Prevention 1999).

While there are valid theoretical reasons for believing that poverty will be associated with arrest, there is no evidence of any significant relationship in any of the existing empirical literature (OEA 1997). One explanation for this may arise from the fact that raw income, which was used in the OEA study, is likely to be a poor proxy for poverty. The real cost of raising large Indigenous families needs be reflected in the 'equivalence scale' used to adjust income for the size and composition of a family. Better measures of poverty can be derived by dividing raw family incomes by standard equivalence scales, such as the 1983 Organisation for Economic Co-operation and Development (OECD) scale.[7] Following Mitchell's (1991) 'median approach', this study defines someone as poor if they earn less than 50 per cent of Australia's median income for the period in question.

While this approach should provide a more robust measure of Indigenous poverty than raw family income, there are several reasons why one might expect poverty to be a less significant factor than it is in general studies of the Australian population. For example, Hunter (1999; 2001) finds that there is little relationship between arrest and poverty. One explanation for this is that measurement error is particularly prominent in Indigenous households where income sharing arrangements may be at variance to the Australian norms (Hunter 2001). In view of these measurement issues, it is worth considering using housing variables as a more direct measure of Indigenous poverty. Variables that measure the housing stock (proxied by houses with an average of two residents per bedroom) and housing quality (captured by whether major household utilities are available and working) are included in the analysis to capture the effect of living without adequate access to resources.

Apart from the household-level variables, other factors have been included in some modified form in previous empirical analysis. The last two household-level variables included in the formal analysis attempt to capture the effect of peer group or social influences within the household. Living with others who have been recently arrested might be used to capture negative peer group influences on arrest prospects. Positive role models might be provided by people who constructively engage with the wider society, proxied here by voting in a recent election. Voting behaviour is a standard measure of the extent of social networks in the social capital literature (Hunter 2000a).

In line with the recommendation in Appendix C, several other variables are included to ensure that all available information on Indigenous arrest is analysed. That is, extra variables are included where a large number of NATSIS respondents would otherwise be excluded from the formal analysis for not providing enough information. For example, one variable used indicates those households where residents are not sure whether there are any Indigenous police aides in the community. Another variable captures those respondents who did not state whether they had completed secondary school. A separate variable was also constructed to indicate households where valid income data was not available for all residents. While such variables are not easy to interpret, it is important that respondents are not excluded unnecessarily, especially if the resulting variable is of relatively minor importance.

## The NATSIS sample

The sample design for the NATSIS was a multi-stage stratified random sample based on Census Collection Districts. The survey covered a total of 4,205 households, which yielded 15,726 Indigenous respondents, 3,076 non-Indigenous persons living in the same household as an Indigenous person and 158 prisoners (ABS 1996).

Not all NATSIS respondents were used in the analysis. First, only people aged 13 years and over were included because they are the only ones for whom data on arrest is collected.[8] Second, non-Indigenous respondents were excluded because only a small portion of the necessary data is collected from them. Finally, 158 persons who were in jail at the time of the survey were considered for the analysis because they are, almost by definition, an important part of the population of Indigenous arrests—representing 1.8 per cent of the total sample.[9] However, given the mandatory constraints on prisoners' freedom and the way such constraints affect the interpretability of the data, the reported multi-variate analysis excludes this group. After imposing these restrictions a sample of 10,235 Indigenous persons remained. A sensitivity analysis which includes Indigenous prisoners was also conducted and is provided in the text where it differs substantially from the reported results.

## Validating NATSIS data on arrest

One issue arising when analysing arrest data from a self-response survey is the possibility of under-reporting of arrest. For example, Freeman (1994: 16) notes that it is common to find under-reporting of crime in the United States by black youth. To examine potential under-reporting of arrest of Indigenous Australians, one is restricted to a comparison between NATSIS data and official police data for Western Australia as this is the only State that reports official police arrest data disaggregated between Indigenous and non-Indigenous persons. Estimates based on the official police data indicate that the proportion of Indigenous persons arrested in Western Australia between 1990 and 1994 was about 24.6 per cent.[10] The NATSIS results indicate that 25.4 per cent of Western Australians aged 13 years and over had been arrested in this period (ABS 1995: 60).[11] The closeness of the estimates of the proportion of the Indigenous population arrested in Western Australia from the NATSIS and official police data gives us some confidence that, at least at an aggregate level, under-reporting of arrest is not a serious problem in NATSIS data.

## Modelling NATSIS arrest

The periodic and relatively rare nature of arrest means that data must be collected over or relate to a reasonable period, usually using respondents' memory to recall interactions with the police. The designers of NATSIS opted for a questionnaire that asked whether a respondent had been arrested in the last five years. This pragmatic decision has important implications for the empirical model used to capture the factors associated with arrest.

$$y_{1it}^* = \alpha_2 \left( \sum_{\tau=t-1}^{\tau=t-5} X_{1i\tau} \right) + \gamma_2 \left( \sum_{\tau=t-1}^{\tau=t-5} y_{2i\tau}^* \right) + u_{1it} \tag{1}$$

Equation 1 specifies that an individual's arrest record over the previous five years, $y_{1it}^*$, depends on variables which may be simultaneously determined with arrest (known in

the econometric literature as endogenous regressors), $(\sum_{\tau=t-1}^{\tau=t-5} y_{2i\tau}^{*})$, a set of other explanatory factors, $(\sum_{\tau=t-1}^{\tau=t-5} X_{1i\tau})$, and a normally distributed error term, $u_{1it}$.

The reason for distinguishing endogenous regressors from other explanatory variables is that they can complicate the statistical model by inducing an 'endogeneity' bias into the magnitude and significance of the measured influence of the factors underlying arrest. Several of the proposed explanatory variables may be endogenous with arrest including labour force status, education, drinking behaviour and income. All other variables used in the regression analysis are unproblematic, at least in terms of the potential for endogeneity bias.

The issues surrounding endogenous variables can also be conceived in terms of reverse causality, which receives a detailed examination in the next section. The problems arising from such factors have been minimised or eliminated by the careful construction of the relevant explanatory variables.

Since the assumptions underlying the standard regression technique, Ordinary Least Squares (OLS), break down when analysing a discrete or dichotomous dependent variable, it is necessary to use another technique to estimate Equation 1. One widely used estimator for dichotomous variables is utilised in this paper, the standard probit estimator (Greene 2000). This technique is appropriate as long as the possibility of 'endogeneity' bias has been eliminated.

## Reverse causality and the differential timing of arrest and explanatory variables

The issue of reverse causality between potentially 'endogenous' or jointly determined variables clearly needs to be discussed. Unfortunately, given that the arrest variables in NATSIS refer to behaviour or outcomes in the previous five years and other variables are largely contemporaneous means that it is almost impossible to identify the extent that causation runs from arrest back to these potentially endogenous variables. In any case, the econometric techniques involved to control for reverse causality require that suitable instruments are available and this is probably not the case.[12] Therefore, the correlations identified in this paper are merely broadly indicative of the factors associated with arrest. Furthermore, given the temporal orderings of the arrest and most other explanatory variables, these factors can only be considered predictors of arrest to the extent that they are relatively permanent for individuals. That is, such factors are unlikely to change over time because of either migration or the intrinsically dynamic nature of such factors.

It is important not to overstate the problem of reverse causality. For example, joint estimation of employment and arrest in Borland and Hunter (2000) indicated that there was no significant endogeneity problem. If this result is replicated between arrest and other labour force states, then the latter can be classified as an 'unproblematic' (non-endogenous) explanatory variable.

Another reason to discount causality issues, is that variables can be constructed to ensure that they are, by definition, capturing relatively permanent factors. For example, alcohol consumption is measured in this paper by whether a person has ever drunk alcohol before. In this way, it makes it unlikely that reverse causality is an issue, except

perhaps for very young respondents for whom the experience of arrest may influence drinking behaviour by putting them into contact with the 'wrong crowd'.

Also, the preference for using housing stock and quality variables to proxy for the effects of poverty, as opposed to income, is likely to reduce or eliminate the potential for bias as the relationship between arrest and housing variables is at best indirect. In any case, since Borland and Hunter (2000) show that arrest is not significantly correlated with Indigenous wage income, endogeneity bias is not likely to be an issue for family income or any transformations of that income (e.g., OECD measures of equivalent income).

The final rationale for ignoring potential joint causality of certain variables is that it is conventional to do so. Notwithstanding sound theoretical reasons for expecting that education and economic status are jointly determined, education is routinely included as a standard explanatory variable in wage equations estimated by economists. If this protocol is followed, then we are effectively assuming that education is not influenced by the experience of arrest. This assumption probably breaks down for younger respondents and it is therefore important to separately analyse Indigenous minors and older NATSIS respondents (Hunter & Schwab 1998). Given the large differences in arrest profiles of males and females, the empirical analysis will also be conducted separately by sex.

Concerns about endogeneity were not ignored altogether. Despite the fact that Carcach and Mukherjee (1996) identified Indigenous perceptions of police of being correlated with arrests, such variables were omitted from the analysis because it was not possible to be confident that an 'endogeneity bias' would distort the measured effect of other factors.

As noted above, information on all explanatory variables in previous time periods are not available—thus it is necessary to include explanatory variables from the current time period to proxy for effects from previous time periods. For some variables which are relatively 'permanent'—such as age, educational attainment, whether taken from natural family, and whether ever drank alcohol—use of 'current' period variables should not cause a significant loss of information. On the other hand, high rates of geographic mobility in the Indigenous population are likely to mean that variables related to current location may be less accurate as proxies for previous location (i.e., they may be mismeasured).[13] Measurement error of non-endogenous variables can itself be a source of bias in the arrest estimates (Greene 1997). However, the use of broad geography to describe Indigenous arrest will minimise this problem, especially if people tend to move within a type of area (e.g., from one remote area to another).

The differential timing of arrest and explanatory variables has implications for the possibility of endogeneity bias and measurement error. Working on the presumption that these issues have been fully addressed in the data construction and specification, the paper will proceed with a standard probit regression analysis of Indigenous arrest.

## Institutional factors

Before moving to the results section, it is necessary to briefly reflect on institutional factors left out of the specification. The omission of information on State or Territory of residence from the publicly available NATSIS data means that it is not possible to directly control for important institutional features of the criminal justice system that vary between jurisdictions. Another reason is that the inclusion of further data on residence will exacerbate the measurement error problems for the geographic variables.

Appendix A shows that analysis of Indigenous arrests based on the NATSIS appears to be insensitive to the inclusion of the State and Territory dummy variables. Using an otherwise identical specification to that used in OEA (1997), the size and significance of the effect of the major factors underlying arrest among Indigenous unemployed and CDEP scheme workers remain largely unchanged. Consequently, the influence of State and Territory is adequately picked up by other variables, especially the 'mixed family' variable (Appendix A).[14]

## Results

### A profile of Indigenous arrest

The NATSIS informs us that about one in five Indigenous Australians were arrested at least once in the five years before the survey. For example, Table 1 shows that 31.6 per cent of males and 9.4 per cent of females over 13 years old had been arrested in the last five years. Of those arrested the average number of arrests is approximately 3.0 for males and 2.3 for females (see Table 2). While youths aged 18 years and over tend to have the highest incidence of arrest, there is an 'inverted U' profile with the very youngest and oldest age groups tending to have very low arrest rates. In general, males are between three and four times more likely to have been arrested than females in each age group. The exception to this is males under 18 years old who are over five times more likely to have been arrested than under-aged females.

**Table 1. Profiles of Indigenous arrest by age and sex (% of age group), 1994**

|  | Broad age group | | | | | |
|---|---|---|---|---|---|---|
|  | 13 to 17 | 18 to 24 | 25 to 34 | 35 to 44 | 45 plus | Total |
| **Males** |  |  |  |  |  |  |
| Arrested in last 5 years | 13.9 | 46.8 | 43.7 | 31.0 | 13.3 | 31.6 |
| **Reason for last arrest** |  |  |  |  |  |  |
| Drinking-related arrest | 1.2 | 22.9 | 24.8 | 17.9 | 7.7 | 16.1 |
| Outstanding warrant | 1.9 | 8.1 | 9.0 | 5.1 | 2.1 | 5.7 |
| Assault | 0.7 | 7.8 | 8.7 | 3.9 | 2.1 | 5.1 |
| Theft | 6.3 | 9.6 | 5.3 | 2.4 | 0.2 | 5.0 |
| **Females** |  |  |  |  |  |  |
| Arrested in last 5 years | 2.7 | 16.7 | 12.7 | 9.4 | 3.3 | 9.4 |
| **Reason for last arrest** |  |  |  |  |  |  |
| Drinking-related arrest | 0.8 | 8.2 | 6.1 | 3.8 | 2.5 | 4.5 |
| Outstanding warrant | 0.2 | 1.5 | 2.3 | 0.9 | 0.2 | 1.1 |
| Assault | 0.2 | 3.3 | 2.8 | 2.0 | 0.3 | 1.8 |
| Theft | 1.1 | 2.1 | 1.9 | 0.4 | 0.0 | 1.2 |

Note: Drinking-related arrests encompass drinking in public and drink driving. These profiles are weighted to reflect the Indigenous population in 1994.

Table 1 also shows that the most common reasons for arrest relate to intoxication—16.1 per cent of males and 4.5 per cent of females had charges for drink driving or drinking in public in their most recent arrest in the previous five years. While about three-quarters of drinking-related male arrests had been charged with 'drinking in

public', almost all such female arrests were associated with this offence (Hunter & Borland 1999: 3).[15]

In general, in their respective age groups, males tend to be between three and four times more likely to be arrested for the various offences than females. Males are even more likely to be arrested for outstanding warrants than females. For example, both teenage and older males (aged 45 and over) are about ten times more likely to be arrested for that offence than females in their respective age groups. In contrast, relatively speaking, males are much less likely to be arrested for assault than females being only (sic) 2.8 times more likely to be arrested for this offence overall (5.1 per cent compared to 1.8 per cent). Notwithstanding some variation, Indigenous male arrest rates are scaled up by a factor of three or four.

As shown in Table 1, the other apparent difference between the sexes is that female arrest rates peak a little earlier (at between 18 and 24 years) for most arrest categories, with the exception of outstanding warrants. Males tend also to have relatively high rates of arrest in the next oldest age group. Indeed, with the exception of theft, all categories of male arrest peak in the 25 to 34 years age group. This exception is not surprising in itself given that arrest for theft is more concentrated among Indigenous youth than any other form of arrest.

**Table 2. Number of arrests (if arrested) in last five years by age and sex, 1994**

|         | Broad age group | | | | | |
|---------|----------|----------|----------|----------|---------|-------|
|         | 13 to 17 | 18 to 24 | 25 to 34 | 35 to 44 | 45 plus | Total |
| Males   | 2.6      | 3.5      | 3.3      | 2.7      | 2.3     | 3.0   |
| Females | 2.6      | 2.5      | 2.3      | 2.1      | 1.5     | 2.3   |

Note:   Average number of arrests is for the subset of persons arrested in the previous five years. Persons with ten or more arrests were assumed to have ten arrests. Drinking-related arrests encompass drinking in public and drink driving. These profiles are weighted to reflect the Indigenous population in 1994.

Table 2 shows that the average number of male arrests (given a person was arrested at least once) also displays an 'inverted U' profile across age groups, although the curve is somewhat flatter than that of Table 1. For example, the number of male arrests in the respective age groups only varies between 2.3 and 3.5. While the average number of arrests among females declines with age, the largest number of arrests in the last five years is for Indigenous females aged between 13 and 17 (arrested 2.6 times). This is consistent with a pattern of arrests which peak in an earlier age group for females.

**Table 3. Arrest rate per thousand population by sex and Aboriginality in Western Australia, 1994**

|                                   | Male  | Female | Male/ female ratio |
|-----------------------------------|-------|--------|--------------------|
| Indigenous                        | 313.8 | 116.6  | 2.7                |
| Non-Indigenous                    | 32.1  | 6.4    | 5.0                |
| Indigenous/Non-Indigenous ratio   | 9.8   | 18.2   |                    |

Notes:  The population estimates used were calculated for those aged 10 or more. This is the age of criminal responsibility in Western Australia (Ferrante & Loh 1996: 40). Arrest rates calculated using police apprehension data from Ferrante and Loh (1996: 49), estimated residential populations for Western Australia from ABS (2000) and Indigenous population projections from ABS (1995: 94). The

differences in these arrest rates from those reported in Ferrante and Loh (1996: 39) arise because of the more accurate estimates of the 1994 Indigenous population available in ABS (1995: 94; 2000).

Western Australian data also shed some light onto the potential role of gender in Indigenous arrest (Table 3). ABS (1995) showed that Indigenous males were about three-and-a-half times more likely to have been arrested in the last five years than Indigenous females. This is roughly consistent with the sex ratio reported in the last column of Table 3 with Indigenous males being 2.7 times more likely to have been arrested than Indigenous females. In contrast, the ratio of male to female arrest rates among non-Indigenous Western Australians was exactly 5.0. That is, Indigenous arrest rates are high for both males and females, but especially high for Indigenous females.

Stated another way, the differential risk of an Indigenous male being arrested compared to other Western Australian males was exactly 9.8 in 1994. Indigenous females were at even greater risk, being 18.2 times more likely to be arrested than other females in Western Australia—almost twice that of males in that State. In contrast to popular belief, Indigenous males are better off in terms of arrest than Indigenous females, at least relative to their non-Indigenous counterparts.

To summarise, over 20 per cent of the Indigenous people aged 13 years and over were arrested at least once during the five years before the survey. More than three times as many males were arrested than females. Almost 47 per cent of males aged between 18 and 24 years were arrested at least once during the five years before NATSIS. About two in three arrests were for disorderly conduct and/or drink driving, and for outstanding warrants and breaches of orders.

## Preliminary analysis

The purpose of this paper is to provide a more sophisticated description of factors associated with Indigenous arrest than is possible using simple cross tabulations. A multi-variate analysis of Indigenous arrest provides the prospect of identifying factors which continue to have a significant association even after the analyst controls for other factors. Preliminary analysis was conducted in order to refine the specification and ensure that only significant factors are reported in the final regression results.

Extensive preliminary analysis on the role of poverty in Indigenous arrest was inconclusive. Indeed, living in a poor household was not significantly associated with Indigenous arrest until basic demographic and geographic factors were controlled for. However, if one includes labour force status then there is no significance influence from poverty. Note that the household factors such as housing conditions and social factors within households do not affect this result. That is, once the higher individual probability of not having a job is taken into account, the direct measure of household poverty is not significant and can be ignored. This result was replicated in all regressions estimated and the OECD measure of poverty was therefore omitted from the final results.

Other variables were also introduced into the preliminary analysis but omitted from the reported results including, a broad indicator for having a post-school qualification and whether a person was still at school. The lack of significant effect of either of these variables means that education is captured solely by the number of years of secondary schooling completed.

As a consequence of this preliminary analysis, three variables were omitted from the final specification, the OECD measure of poverty, post-school qualification and whether

a person was still at school. This final specification was used to estimate all reported results (see Table B1 for full list of variables).

## Defining marginal effects and the 'reference person'

The coefficients of a probit regression are extremely informative but are notoriously difficult to interpret. One statistic that is relatively easy to interpret is the 'marginal effect' of each explanatory variable. This involves estimating the change in the predicted probability of arrest arising from a given change in a variable, holding the value of the other variables constant. Since the effect of changes in the explanatory variables on the probability of arrested varies with the value of all the explanatory variables in the model, it is essential that marginal effects are measured at values which are representative of a significant proportion of the population.

The coefficients from a probit regression, and frequently marginal effects, are interpreted relative to the variables left out of the model so that estimation can proceed. Such variables define the 'base case'. The base case for the analysis in the rest of this paper is:

- an Aboriginal female aged 18–24 years,
- living outside a capital city but more than 50 kilometres from a police station,
- whose community has access to Indigenous police aides/liaison officers,
- is employed but not in the CDEP scheme,
- who completed less than six years of schooling,
- who has never drunk alcohol,
- who has not been physically attacked or verbally threatened in the 12 months before the survey,
- does not have a long-term health condition,
- does not live in a family with dependent children or with non-Indigenous people,
- has never been taken away from their natural family,
- lives in a household with less than two persons per bedroom and where the basic utilities are in a working condition, and
- other household members have neither been arrested in the previous five years nor have they voted in a recent government or ATSIC election.

Since this base case is in no way representative of the overall Indigenous population, it is fortunate that marginal effects can be calculated using alternative values for the respective explanatory variables. Instead, the marginal effects are estimated using the average characteristics of the sample provided in Appendix B and the standard procedure described in Greene (1997). Therefore, the reference person for the calculated marginal effects is the average Indigenous person (in the NATSIS), rather than the base case. In each case the marginal effect is calculated as the difference in probability of arrest for a person with and without the specified characteristic, with all other characteristics fixed at average values. While no single person embodies the 'average', this change means that the estimated marginal effects are more robust and are relevant to a greater number of people.

## All Indigenous arrest

Table 4 reports the marginal effect of the various factors underlying Indigenous arrest. The first line describes the average probability of arrest for all Indigenous people over 12 years of age (excluding prisoners). All other rows show the marginal effect on the average probability of arrest due to the presence of a particular factor. Unless otherwise stated, the benchmark for statistical significance in this paper is whether a statistic is significant at the 5 per cent level.

### Table 4. Marginal effects of factors underlying Indigenous arrest

|  | All arrests | Drinking-related | Assault | Theft | Outstanding warrant |
|---|---|---|---|---|---|
| Average probability of being arrested in the previous 5 years | 17.0 | 9.6 | 3.0 | 2.4 | 2.6 |
| **Marginal effect of having a particular characteristic (%)** | | | | | |
| Male | 13.1* | 4.7* | 1.4* | 1.3* | 1.4* |
| Torres Strait Islander | -7.7* | -2.8* | -0.8* | -0.5* | -0.6* |
| Aged between 13 and 17 | -4.5* | -3.8* | -0.8* | 1.0* | -0.4* |
| Aged between 25 and 34 | -0.5 | 0.6 | 0.1 | -0.3* | 0.1 |
| Aged between 35 and 44 | -4.8* | -0.6 | -0.8* | -0.8* | -0.3* |
| Aged between 45 years and over | -9.5* | -2.6* | -1.3* | -1.1* | -0.8* |
| Live in a capital city | 4.0* | 0.6 | 0.0 | 0.3 | 1.0* |
| Rural area | -3.5* | -1.0* | -0.9* | -0.4* | 0.0 |
| Remote area | -4.2* | -0.9 | -0.5 | -0.5* | -0.2 |
| Indigenous police aides in community | -1.5* | -0.8* | -0.5* | -0.3* | -0.1 |
| Within 50 kilometres of police station | -5.1* | -2.8* | -0.4 | -0.3 | -0.2 |
| Work in CDEP scheme | 8.1* | 3.2* | 0.8* | 0.0 | 0.8* |
| Unemployed | 13.1* | 4.0* | 1.2* | 0.9* | 1.2* |
| Not in the labour force | 4.8* | 1.3* | 0.3 | 0.5* | 0.9* |
| Completed 6 to 9 years of schooling | 9.2* | 2.0* | 1.6* | 1.7* | 1.2* |
| Completed year 10 or 11 | 5.7* | 0.9 | 0.6 | 0.9* | 1.0* |
| Completed year 12 | 0.7 | -0.6 | 0.1 | 0.6 | 0.5 |
| Has drunk alcohol at least once | 12.8* | 7.2* | 1.7* | 0.7* | 1.1* |
| Physically attacked or verbally threatened | 10.9* | 4.0* | 1.5* | 0.6* | 0.4* |
| Long-term health condition | 2.4* | 0.6 | 0.7* | 0.1 | 0.3* |
| Lives with non-Indigenous persons | -2.5* | -1.0* | 0.0 | -0.4* | -0.4* |
| Living in family with at least 1 dependent | -0.8 | -0.6 | 0.0 | -0.1 | 0.0 |
| Taken away from natural family | 5.1* | 0.9 | 0.4 | 0.4 | 0.5* |
| Crowded house | 2.5* | 1.4* | 0.5* | 0.2 | 0.2 |
| Household utilities available and working | -3.0* | -0.4 | -0.1 | -0.4* | -0.2 |
| Other householders arrested | 3.6* | 1.6* | 0.5* | 0.3* | 0.3* |
| Other householders voted | -1.2 | -0.4 | 0.4 | 0.0 | 0.0 |

Notes:  Marginal effect is the effect of having a particular characteristic relative to the reference characteristics listed in Table B2 (i.e., the average characteristics of the NATSIS sample). An asterisk denotes a marginal effect is significantly different from zero at the 5 per cent level.

Source: Based on regression coefficients in Appendix B.

Overall, the marginal effects shown in Table 4 confirm the analysis in Borland and Hunter (2000) where the probability of arrest was found to be significantly higher for males, decreasing with age and years of high school, and to be lower for persons who were living in a mixed family, did not have a long-term health condition, had never drunk alcohol, lived in a remote region or in an urban area outside a capital city, or were Torres Strait Islanders. While their findings suggest that life cycle and human capital factors are important for explaining arrest, the probability of arrest is also strongly related to a person's family and socioeconomic environment. This section provides a detailed description of Table 4 paying particular attention to variables omitted in Borland and Hunters' analysis.

Males are more likely to be arrested than females, being 13.1 percentage points more likely to be arrested. The differences between male and female coefficients mean that this differential will vary depending upon the relative endowments of males and females with this estimate probably providing a conservative estimate of the influence of gender. However, as noted above, the factors effecting arrests among Indigenous males and females are remarkably similar.

Torres Strait Islanders are much less likely to have been arrested (7.7 percentage points less likely) than other Indigenous Australians. In contrast to Borland and Hunter (2000), the inclusion of under 15 year-olds in Table 4 induces an inverted U relationship with age whereby the probability of arrest first increases with age, then declines. The probability of arrest peaks among 18 to 24 year-olds and then declines, being lowest among Indigenous people aged 45 years and over. The oldest age group is 9.5 percentage points less likely to be arrested than other NATSIS respondents.

Arrests rates are significantly higher in capital cities compared to other urban areas, although the marginal effect is relatively small (4.0 percentage points). Indigenous arrest rates in rural and remote areas are significantly lower, but the size of the effect is again small (3.5 and 4.2 percentage points, respectively).

The policing variables are relatively less significant than they were shown to be by Borland and Hunter (2000). For example, the presence of Indigenous police aides only reduces arrest, albeit a statistically significant reduction, by 1.5 percentage points. Living within 50 kilometres of a police station also has a significant marginal effect (reducing arrest by 5.1 percentage points), but it is not as important, in relative terms, as it was shown in the previous analysis. One explanation for this change in relative magnitude is that this study controls for labour force status, including CDEP scheme employment, which is concentrated in such areas. Notwithstanding the potential role of unobserved geographic factors, the fact that proximity to police actually significantly reduces the incidence of arrests means that one should not overemphasise the role of differential policing as a factor underlying Indigenous arrests.

Households where there was no clear indication of whether or not Indigenous police aides were available also had a significantly lower probability of arrest (see Appendix B, Table B4). One explanation is that there would be less opportunity to find out whether specialist police services were provided to Indigenous people if relatively few community members had been arrested recently. Alternatively, if a person did not anticipate being arrested because the assessment of the probability of arrest is based on the (low) number of people around them who have been arrested, then they may have less incentive to seek out information about Indigenous police aides.

Relative to those in non-CDEP employment, other Indigenous people were more likely to have been arrested in the previous five years. This is consistent with the theory that having any job should lower arrest rates by reducing the time available for illegal activities, reducing immediate financial disadvantage and improving the 'social capital' of workers, who are in a better position to engage with the mainstream (non-CDEP) economy. Consistent with the OEA (1997) report, the marginal effect of CDEP scheme jobs is significantly less than for the Indigenous unemployed although it is about the same for as the not in the labour force group (8.1, 13.1 and 4.8 percentage points respectively).

Other important factors underlying arrest are the educational outcomes, which are not straightforward to interpret. Compared to people with less than six years of schooling, those completing between six and nine years of education have very high rates of arrest (9.2 percentage points higher). However, the marginal effects of more education are significantly less, being only 0.7 percentage points for those who complete secondary school.

Why do people who have not had any secondary schooling have relatively low rates of arrest? One possibility is that such people are concentrated in remote and rural areas that are lightly policed. That is, the omitted education variable is picking up unmeasured geographic factors or the relatively short history of colonisation for people with limited exposure to the mainstream educational system (i.e., probably in remote parts of Australia). The other education variables behave as predicted by various criminological theories, with the arrest rates declining as the level of schooling increases.

Drinking of alcohol is one of the largest single factors underlying not only drinking-related offences, but overall Indigenous arrest rates (12.8 percentage points). Clearly, alcohol consumption needs to be addressed if significant inroads are to be made into the over-representation of Indigenous people in the criminal justice system.

While alcohol has a large impact, other factors have a similar, or greater, influence on arrest outcomes. In addition to the education variables or being unemployed, having been physically attacked or verbally threatened increases arrest by a similar amount to the alcohol consumption proxy (10.9 percentage points). One explanation is that being a 'victim' is likely to be associated with situations which lead to police being called on to intervene. Another is that there is a cycle of violence being perpetrated within the Indigenous community with persons who have been subjected to such violence and threats lashing out at others, possibly more vulnerable than themselves, in the local vicinity.

Long-term health conditions are also associated with a significantly higher rate of arrest, although the marginal effect is much smaller than for many other factors (2.4 percentage points).

Several 'family' variables also have a significant effect on arrest. Among these, living with non-Indigenous people and being taken from one's natural family are significantly associated with Indigenous arrest rates (-2.5 and 5.1 percentage points, respectively). The former may be a result of the higher socioeconomic status of non-Indigenous family members, while the latter is probably a result of a sense of dislocation from a society which permitted these dubious practices to occur (Commonwealth of Australia 1997).

Having been taken away from one's natural family as a child is the major 'family' influence. While a similar effect is likely to be found among the non-Indigenous population, the extent of the 'stolen generation' means that such effects will be more

widespread among Indigenous people being found among all strata of society and in all socioeconomic status groups (Hunter 2001).

The other family variable is whether a respondent lives in a family with at least one dependent child. Given that dependents exerted no influence on overall male and female arrests, it is not surprising that the marginal effects are negligible (see Table 4). However, as indicated above, responsibilities (and the tighter time constraints) associated with parenthood and guardianship still affect certain categories of female arrest (i.e., arrests for drinking-related charges and theft).

The housing stock variables are significant and have the expected sign (direction of influence). For example, living in a crowded house with more than two residents per bedroom increases arrest rates by 2.5 percentage points. The quality of the housing stock also matters, with residents of households where all the basic household utilities work have a significantly lower arrest rate (3.0 percentage points).

The 'peer group' or social influences within the household also significantly affect Indigenous arrest. Living in house where others have been arrested in the last five years increases Indigenous arrest by 3.6 percentage points. Not only do negative peer influences increase arrest but positive role models may also reduce arrests. For example, living with people who exercised their citizenship rights and voted in a recent election reduced arrest by 1.2 percentage points. However, this positive peer effect was only statistically significant at the 10 per cent level.

Concerns about the NATSIS data quality for prisoners, arising from the constrained nature of their choices and consequent distortions in responses to various questions (e.g., labour force status) led to the exclusion of such data from the calculations underlying Table 4. In any case, the other data for prisoners were either of questionable quality (e.g., no prisoners indicated they had dependents) or driven by the assumptions required to derive them (e.g., prisons were assumed to have adequate housing). However, results were not substantively changed by including data on the 158 prisoners in the NATSIS; the vast majority of whom had been arrested in the previous five years. The only noteworthy changes arose from the variables for dependents and positive peer group influences, which significantly affected all the estimated probabilities of arrest once prisoners were included, although the marginal effects were still rather small relative to those for other factors. Unfortunately, one cannot discount the possibility that these changes are a result of poor data quality or the assumptions used in data construction among prisoners. Given this qualification, more weight should be attached to the analysis that excludes prisoners.

## Analysis by sex and broad age group

The profile of Indigenous arrests appears to point to substantial differences between various age groups. Given that the criminal justice system treats minors differently from adults, there are sound theoretical reasons to expect the factors underlying arrest to vary between 13 to 17 year-olds and persons aged 18 years and over. Notwithstanding, the empirical analysis by broad age group indicates that age-based differences were smaller than anticipated and can be explained in terms of the relatively small numbers of under-aged respondents in the NATSIS (see Appendix B).

Only two coefficients estimated for adults were outside the confidence interval of the estimates for minors. The coefficients for the variables indicating the presence of Indigenous and non-Indigenous family members (i.e., so-called 'mixed families') and the quality of the housing stock were both significantly less for minors than among adults.

Since the incidence of mixed families varies significantly across Australian States and Territories, it may be capturing differences in the institutional treatment of juvenile offenders. In any case, the marginal effects of either of these variables are not significantly different between broad age groups.

Similarly, there are relatively few differences between coefficients for males and females if one ignores the obvious differences in levels of arrest (see Appendix B). Consequently, marginal effects tend to be scaled up by the average differential in arrest data (i.e., males are about 3.4 times more likely to be arrested than females in the NATSIS).

The main differences arise from the not completing secondary school, and several family, household and peer variables. For example, only completing six to nine years of school (relative to somebody who attended for less than 6 years) increases the probability of arrest by 14.7 percentage points for males—significantly more than the analogous marginal effect for females of 4.5 percentage points. Therefore, notwithstanding the significant differences in education coefficients for respective sexes, the marginal effect is roughly in proportion with the average differential.

The differences between the sexes are less proportionate for some of the other variables. Being taken from one's natural family has a significantly larger effect on males than on females; males being over five times more likely to have been arrested (10.1 and 2.0 per cent, respectively). Given that the effect of the stolen generation among females is only significant at the 10 per cent level, the effect of this factor is concentrated among Indigenous males.

Two household level variables appear to have a significant effect on males but not on females. Living in a house where all the basic utilities work significantly reduces the probability of male arrest by 7.1 percentage points. The fact that such factors are measured at household level means that it is impossible to target policy specifically at male members of the household.

The other, somewhat subtle, difference between the sexes arose from the pattern of significance of the presence of dependents in a family. While the presence of dependents did not effect the probability of arrest for males for any category of arrest, it significantly affected the probability of female arrest in the drinking-related and theft-related arrests (marginal effects of –0.6 and 0.2 percentage points). That is, having children reduces female arrests arising from alcohol consumption, presumably because of the moderating effect of extra family responsibilities. Ironically, the small, but significant, increase in female arrests for theft may also result from extra responsibilities in that the economic incentive to steal may derive from a need to provide resources for children within poorer households. In contrast, males are not responsive to such pressures. However, even where the effect of dependents on the various types of arrest is significant for Indigenous females, the marginal effects are small in both relative and absolute terms.

The result that dependents do not effect overall arrest rates among females would be a surprising result if it were found in an analysis of non-Indigenous females. The overall minor nature of the differences between this NATSIS analysis of male and female arrests points to cross-cultural or Indigenous-specific factors being more important than gender related issues. This is consistent with the ratios expressed in Table 3 which indicated that, in terms of arrest rates, Indigenous females were worse off relative to their non-Indigenous counterparts than Indigenous males were relative to theirs.

Having described the factors associated with overall Indigenous arrest, attention is now turned towards whether these factors vary for the various categories of arrest. Table 4

illustrates that the direction of influence of the factors is virtually identical for the various types of arrest with most difference arising from the size and significance of the marginal effects. Given the large and significant association of alcohol consumption and Indigenous arrest, it is appropriate that the focus is placed first on drinking-related arrest.

## Drinking-related offences

Drinking-related offences dominate the overall arrest profiles of Indigenous Australians, comprising well over 50 per cent of all arrests (9.6 per cent out of the 17.0 per cent of the NATSIS respondents were arrested at least once in the last 5 years). Consequently, it is not surprising that drinking-related arrests are affected by similar factors to those identified above. The top five influences still include sex, labour force status, alcohol consumption, the 'victim' proxy, various age factors, and the cluster of education variables. However, there is some re-ranking within the most important factors, with alcohol consumption being the most important influence for such arrest (7.2 percentage points), displacing sex into second place (4.7 percentage points). The observation that alcohol consumption is strongly related to such arrest is no surprise since these factors are correlated by definition.

The next most important factors are whether a person has been a 'victim' or is unemployed (both with marginal effects of 4.0 percentage points). The importance of the 'victim' variable in drinking-related arrests means that the phenomena may be closely linked.

The pattern of significance is also noteworthy. Several factors were not significant for drinking-related arrests but are significant for regression of all Indigenous arrests. Among the insignificant variables, those for capital cities and remote areas stand out. The correct interpretation of this is that drinking-related arrests are just as likely to occur in capital cities, other urban areas and remote areas, but they are slightly less likely to occur in rural areas (a marginal effect of 1.0 percentage points).

Long-term health conditions and living in poor quality housing where basic household utilities do not work are also not significant. The influence of housing stock is through living in a crowded house. The result for health conditions is particularly interesting because it seems to suggest that health problems are not related to drinking-related arrest and, by inference, the consumption of alcohol, which is the largest single correlate with such arrests. This provides indirect evidence that health conditions are not strongly correlated with drinking behaviour and hence suggests that the influence of health problems may be through enforced idleness and poverty, which in turn increases the opportunity and incentive to engage in criminal activities.

## Assault

The top six factors underlying Indigenous assaults are very similar to those identified above. In order of magnitude of effect, these include: alcohol consumption, education, a victim of physical attack or verbal threat, sex, age, and labour force status. While the link between consumption of alcohol and violence is well established, the prominence of this factor may be related to the public nature of much Indigenous drinking (Drugs and Crime Prevention Committee 2000).

The probability of being arrested for assault declines with years of secondary school, being heavily concentrated among those with only a few years of secondary schooling

(marginal effect of 1.6 percentage points). However, Indigenous people with little education (having primary schooling or no formal schooling) have the least chance of this type of arrest. This may indicate that this variable is capturing variations in the State-based education systems. Alternatively, it may be picking up the detrimental effect of imposing a largely alien education system onto Indigenous peoples with the consequent impact on their cultures and social cohesion (Dawes 2000).

After the effect of alcohol consumption (1.7 percentage points) and education, being physically attacked or verbally threatened and sex are the next most important factors underlying Indigenous arrests for assault (both having marginal effects of about 1.5 percentage points). While being male is still an important factor underlying assault, it is relatively less important than it is for other forms of arrest. Unless the relatively small marginal effect of being male on assault is replicated in the non-Indigenous population, this confirms there are fewer gender differences in the Indigenous population than in the rest of the community. In terms of homicide, there is overwhelming evidence that extremely violent assaults are heavily concentrated among men in the larger community (Easteal 1993), and hence the difference between Indigenous women and other Australian women is likely to be larger than the analogous difference between Indigenous and non-Indigenous men. Notwithstanding the lack of an academic consensus on a causal relationship between alcohol and violent crime (Murdoch, Pihl and Ross 1990), there is a widespread belief that the relationship between alcohol use, aggression, and alcohol-related aggression over time are conditioned by gender (Nunes Dinis & Weisner 1997; White & Hansell 1996). This presumption does not appear to be valid for Indigenous Australians.

As with the drinking-related arrest, being a victim of a physical attack or verbal assault is relatively more important than it is for other types of Indigenous arrest. This would seem to confirm the suspicion that there is a cycle of violence and abuse in Indigenous communities which is probably related to drinking-related behaviour.

In addition to listing the significant factors underlying Indigenous assault, it is worth considering the insignificant factors, especially where there are some differences between the various types of arrest. There are no significant differences in the rate of arrest associated with assault charges in capital cities and other urban areas, although such arrests are less likely to occur in rural or remote areas. The other insignificant variables include living with non-Indigenous people, the quality of the housing stock and for peer group effects. The lack of significance of such factors probably indicates the low power of the statistical analysis when examining relatively infrequent occurrences (only 3.0 per cent of NATSIS respondents were arrested for assault) than it does about the influence of these factors. Indeed, with the exception of the proxy for positive role models, all these factors affected assault in the same direction as for other categories of arrests.

## Theft

Given the relatively lower probability of arrest for theft (2.4 per cent), the marginal effects for such arrests will also be proportionately smaller, and probably less significant, than for most other types of arrests. The largest marginal effect was for completing between six and nine years of schooling, at 1.7 percentage points.

The relative importance of education vis-à-vis other arrest categories is not surprising. Given that education is the largest single determinant of Indigenous wages (Daly 1995; Hunter & Gray 2001), and theft is often directly associated with an anticipated

economic gain (if not caught and prosecuted), education and theft should be expected to have a relatively strong correlation. This is consistent with the fact that being unemployed and living in poor quality housing are both associated with a significantly higher probability of a theft-related arrest.

The other variables with the six largest influences on Indigenous theft, in order of size of marginal effect, are: sex, age, labour force status, alcohol consumption, and the 'victim' proxy. In contrast to the other forms of Indigenous arrest, drinking alcohol is relatively less important among people arrested for theft. That is, while alcohol consumption still has a significant effect on being arrested for theft, it is not as important as factors that can be directly related to an economic motivation for theft.

The age profile of Indigenous theft-related arrests is another distinguishing feature of such arrests with minors being 2.1 percentage points more likely to be arrested for this offence than people aged over 45 years of age. Arrests for theft peaked in the youngest age group before gradually declining in the older groups. This is again consistent with an economic motive for theft given the lack of opportunities for economic independence among Indigenous youth. An alternative institutional based explanation is that Indigenous youth have less legal access to alcohol and therefore their composition of arrest will be biased away from those categories which are strongly associated with drinking behaviour.

The lack of significant influence of certain factors such as long-term health conditions, distance to the nearest police station, and one of the proxies for peer group influences is again attributable to the power of the data to discriminate between alternative hypotheses when analysing infrequent occurrences. Even if the marginal effects were not significant in their own right, they were all in the direction predicted by the theory described above.

## Outstanding warrants

An outstanding warrant could be characterised as a 'second order' arrest which relates to the failure to respond to a legal order, such as those arising from other categories of arrest. Notwithstanding, it is analysed in this section in order to provide insights into why many Indigenous Australians do not comply with legal orders (usually to attend court proceedings over another charge). While fewer Indigenous people are arrested for outstanding warrants than drinking-related charges or assault (2.6%, 9.6% and 3.0%, respectively), it is still a major factor underlying Indigenous interactions with the criminal justice system.

The factors underlying arrest for an outstanding warrant are again similar to those identified for all Indigenous arrests. Like the other types of arrest, having completed year 12 does not lessen the impact on this form of arrest relative to those without any education. Stated another way, there is no significant decline in the probability of being arrested for an outstanding warrant in those completing secondary school. Given a common expectation that education informs students of the consequences of their actions and should provide them with the capability to deal with societal institutions, this is a surprising result. It calls into question the nature of the curriculum and the effectiveness of secondary school in imparting this 'citizenship education'. Another more plausible explanation is that people with some education are more willing to argue their case with authorities. For example, a person with a secondary education may have been made aware of the injustice of a particular legal order, but probably will not have the

legal background to effectively challenge such orders. In this case, the problem may not be with the school system, but rather with the criminal justice system.

## Number of arrests

Appendix C uses an identical set of variables to analyse the number of arrests among NATSIS respondents using several statistical models. With virtually no exception, the analysis of multiple arrests confirms the pattern of significance (and relative magnitude) of the factors underlying Indigenous arrests generally. Not only are economic, alcohol-related, demographic, geographic, and human capital factors important, but the number of arrests is also strongly related to a person's family, housing stock and socioeconomic environment.

## Discussion

Indigenous Australians are over-represented at almost every stage of the criminal justice system. Studies by the Australian Institute of Criminology (AIC) and others have consistently produced evidence of the over-representation of Indigenous Australians at the different stages of the criminal justice system (Carcach & Mukherjee 1996).[16]

Much of the public debate focuses solely on how to divert Indigenous people away from the court system and from jail (Cunneen & McDonald 1997). Unfortunately, unless the tide of Indigenous people being arrested is directly addressed, the success of these diversionary policies will be severely circumscribed with a disproportionate number of people getting through the cracks in the system, eventually ending up in court, and, ultimately, in jail. Couched in these terms, the crucial policy question is how to reduce the rate at which Indigenous Australians are arrested.

The analysis in this paper provides a strong empirical and theoretical justification for the policy recommendations of the RCADC (Commonwealth of Australia 1991). In particular, ensuring that Indigenous citizens stay out of the criminal justice system should be a priority policy issue for governments who are concerned about Indigenous wellbeing. For example, the major factors underlying the high rates of Indigenous arrest include sex, labour force status, alcohol consumption, whether a person had been physically attacked or verbally threatened, various age factors, and the cluster of education variables. The policy implications of the analysis are complicated by the fact that feedback mechanisms have been identified where arrest reinforces disadvantage in several of these factors over the longer term. For example, Borland & Hunter (2000) and Hunter & Schwab (1998) examine the role of arrest in depressing Indigenous employment and educational attainment.

Unfortunately, there are a limited number of independent policy instruments among these correlates of Indigenous arrests. For example, sex and age are not factors that will be responsive to policy intervention. However, it is important to take them into account in designing appropriate policy as attitudes and circumstances vary dramatically across demographic groups. Labour market programs, educational courses, and information dissemination need to take into account the requirements of the target audience (Taylor & Hunter 1996).

The policy implications of the role of geographic location may not be immediately apparent. Other than encouraging mobility from areas of high arrest (which would be politically unpalatable and undesirable), policy could attempt to address structural difficulties in the regions affected by funding adequate infrastructure. Ironically, if the

above analysis can be taken at face value, building police stations closer to Indigenous communities may actually help reduce arrest rates. Certainly, provision of Indigenous aides in existing police stations will help achieve this result.

As indicated above, both employment and education are implicated in a vicious cycle, which reinforces Indigenous over-representation among Australian arrests. Any future attempt to substantially reduce the high rates of unemployment and idleness among Indigenous people also needs to make inroads into Indigenous arrest. Education policy needs not only to improve the marketability of the Indigenous workforce, but to facilitate the citizenship skills required to operate in both the Indigenous and non-Indigenous domains (see Groome & Hamilton 1995 for an overview). It is important not to underestimate the magnitude of the task given that Indigenous youth sub-cultures may value resistance to mainstream education above any citizenship skills provided (Dawes 2000). This resistance is also outlined in the conflict theories about Indigenous involvement in crime (Cunneen 2001).[17]

The role of the CDEP scheme in lowering Indigenous arrests relative to the unemployed confirms the OEA (1997) analysis, but in a more general setting. The continued expansion of the CDEP scheme is likely to play a role in mitigating Indigenous over-representation in arrest statistics (Hunter & Taylor 2001; Taylor & Hunter 2001).

The prominence of the correlation between alcohol consumption and Indigenous arrest is consistent with findings from the National Police Custody Survey (see AIC 1994). The links between alcohol and crime (violence, disorder and acquisitive crime) are well documented (see Ramsay 1996 for a review on this topic). The cycle of violence perpetuating violence, which ultimately leads to high rates of Indigenous arrest, is demonstrated by the significance of the variable capturing whether a respondent had been physically attacked or verbally threatened. Substantial progress needs to be made on substance abuse problems in Indigenous communities before this cycle of violence can be broken.

Pearson (2000: 16–20) speculates about the impact of alcohol on Cape York Aboriginal societies and links this to the 'poison of welfare dependency'. Martin (2001) criticises his focus on reforming the delivery of welfare because it leads him to underestimate how deeply alcohol is implicated in the production and reproduction of the problems identified. However, there are potential avenues for addressing a crucial structural issue in the facilitation of social change, including the supply of alcohol through the canteens controlled by the Cape York community councils (Martin 1998).

This is not the place to review all of the literature on effective alcohol policies for Indigenous people (see Brady 2000 for an overview). However, it would be remiss not to point out that restricting supply is consistently nominated as producing the most tangible results in terms of reducing alcohol-related harm among Indigenous Australians (Gray et al. 2000).

The significance of household factors, such as the quantity and quality of the housing stock, points to an obvious avenue for active policy intervention. The intrinsic difficulty in measuring and defining income in a cross-cultural setting means that obvious indicators of deprivation (such as a decaying housing stock) provide a better signal than household income measured against a national benchmark (see Hunter 2001 for a description of cross-cultural issues in income measurement). In light of the general insignificance of poverty itself as a predictor of arrest, it may be better that housing policy focus directly on improving the housing stock in Indigenous communities rather than relying solely on welfare transfers so that people could afford adequate housing.

Family and social factors are less amenable to direct policy intervention. Indeed, misconceived policy interventions that led to the 'stolen generation' appear to be a major factor underlying Indigenous arrest rates. The negative effects of the policies that gave rise to the 'stolen generation' is likely to be driven by the traumatic disruption to family life and the loss of culturally appropriate parenting skills. A recent government report identified several developmental and early intervention approaches to dealing with risk factors (as well as outlining protective factors) and associated antisocial and criminal behaviour (National Crime Prevention 1999). The factors investigated include: child factors, family factors, school context life, life events, and community and cultural factors. Unfortunately, while there are over ten thousand early intervention programs operating in Australia, it is rare to find any explicit reference to crime prevention and consequently conscious strategies to address such problems are absent.

The National Crime Prevention (1999: 183–5) report also paid considerable attention to issues of particular relevance for Indigenous people. In addition to highlighting the role of the 'stolen generation', it emphasised the importance of Indigenous control over how family services are provided, access to education and the need for Indigenous carers for Indigenous clients. The report also identified that the special needs of children of Indigenous prisoners, especially those from country areas, should be taken into account if the risk of delinquent behaviour is to be minimised.

The inter-relationship of many of the pathologies in Indigenous communities are highlighted by the effect of long-term health conditions on arrest. The extensive and growing literature on policy debate on Indigenous health needs to be informed by an awareness that health outcomes reinforce disadvantage in a range of social indicators (Gray et al. 2001; Hunter 2000b; Hunter & Gray 1999).

Peer groups can also assist in reducing Indigenous arrest rates at the margin. Ensuring that people stay away from negative role models appears to be more important than providing positive models to look up to. This result highlights the self-reinforcing nature of Indigenous arrest and underscores the importance of continued efforts to reduce the rate of imprisonment and other sources of negative role models.

This paper has been careful to distinguish between whether an offence was committed and the fact of being arrested. Unfortunately, existing data sources do not permit the analyst to separate the offence from the arbitrary actions of certain police or indeed the systemic cultural inflexibility of the criminal justice system. The antecedents of arrest and how Indigenous people interpret these events are crucial in understanding the role that cultural factors might play in the contacts between Indigenous Australians and the police (Carcach & Mukherjee 1996). Unfortunately, it is probably unrealistic to expect an omnibus survey like the NATSIS to collect data on the perspectives of the various actors in this process. In any case, the cross-cultural tensions in reconciling such data would probably render any regression-based empirical analysis intractable, insignificant or hopelessly biased. In these circumstances, a case study or ethnographic approach is more likely to illuminate the issues that need to be addressed by policy makers.

Carcach and Mukherjee (1996) claim that the NATSIS approach to gathering law and justice information was too conservative. For example, there were no explicit links between the issues of culture, victimisation and deviant behaviour. They conclude that future data collections need to focus on issues of crime, violence and family violence. The first opportunity to revisit these issues will be when the Indigenous General Social Survey (IGSS) is conducted by the ABS in 2002 as it will cover many of the same issues addressed in the NATSIS. The advantage of the IGSS is that analogous data may be

collected for the non-Indigenous population providing a national benchmark against which to compare the Indigenous analysis. Furthermore, the IGSS will be collected every six years and the issues flagged above can be re-visited at that time.[18] However, it is important that our expectations of the IGSS data are not too high as measurement error in arrest and various explanatory variables, combined with the intrinsically culturally sensitive nature of analysis, means that the empirical analysis of Indigenous arrest will continue to be only broadly indicative. Given that causality issues are still contestable in academic literature (Murdoch, Pihl & Ross 1990), there is little hope they can be easily resolved in a cross-cultural context simply by collecting better and more comprehensive data. In the meantime, policy makers will need to content themselves with addressing the significant factors identified using the NATSIS data or appropriate case studies.

# Appendix A. Sensitivity analysis of the factors underlying Indigenous arrest using the publicly available NATSIS data

This appendix focuses on a sensitivity analysis of the 1997 OEA report on the factors underlying arrest among unemployed and employed respondents to the NATSIS (OEA 1997). The main aim of the sensitivity analysis is to identify whether it is possible to use the NATSIS Confidentialised Unit Record File (CURF) to consistently estimate the statistical model of arrest without resorting to the master data file, which can only be accessed by the ABS staff. Given that the ABS's master file is the sole means of accessing data on the State or Territory in which a respondent resides, this is tantamount to a test of the importance of including State-specific institutional factors.[19] That is, if the results do not change significantly after State and Territory factors are taken into account, then this provides evidence that the interactions between such factors and other predictors can be ignored. In this case, State- or Territory-specific factors may still be important, but they do not bias the significance or size of the effect of other factors. Indeed, this report provides evidence of the imputed size of such effects, where significant, using the OEA results.

## Data and method

This section discusses the model used in the OEA report, introduces the available data, and provides details of the most intuitive means of summarising the effect of various factors and whether such effects are sensitive to the inclusion of dummy variables for States and Territories.

### The statistical model

The OEA report uses a logistic analysis of arrest in order to assess whether CDEP scheme employment significantly reduces employment relative to the Indigenous unemployed. Logistic regressions are often used where the dependent variable has two possible values, zero or one—for example, those who were arrested in the previous five years versus others who were not. To overcome the fact that this is a limited dependent variable, a logit transformation is used to ensure that the predicted probabilities lie between zero and one. The basic formulation of the binomial logistic regression model is

$$Logit\ P_i = \log\left(\frac{P}{(1-P)}\right)_i = bX_i + e_i \qquad (1)$$

where b is a coefficient vector, the explanatory variables $X_i$ and $e_i$ are the error terms which approximate a normal distribution. See Agresti (1984) and Hosmer and Lemeshow (1989) for fuller discussions. Logit P, which is also known as the log odds ratio, is the dependent variable in the logistic regression. The logistic regression models are estimated using maximum likelihood estimation techniques.

The coefficients from the binomial logistic regression can be converted into probability values using the formula:

$$P = \frac{e^{\log it\, P_i}}{\left(1 + e^{\log it\, P_i}\right)} \qquad\qquad (2)$$

Often the coefficients of the binomial logistic model are interpreted using the log odds ratio (e.g., OEA 1997). Hosmer and Lemeshow (1989) show that the log odds, or rather the natural log of the odds ratio, equals the individual coefficient of the respective variables.[20] The coefficients in a logistic model must be interpreted as relative to a reference person defined by the omitted categories of the respective groups of explanatory variables. The reference person, or base case, in OEA (1997) is an unemployed female aged between 15 and 24 years in an Indigenous-only two parent family with an income of more than $30,000 per annum, who attends a cultural activity, has less than 6 years of formal education, has never consumed alcohol before, and lives in a Western Australian rural or remote area. Therefore, if we are interested in the affect of being educated to year 12 on the probability of arrest, then a positive coefficient implies that arrest is more likely (i.e., there is a higher log odds ratio) among Indigenous people who completed secondary school.

The 'marginal effect' of each variable is presented in the text because they are easier to interpret than the log odds ratios. The marginal effects give the change in the predicted probability of arrest for a given change in the value of a variable, holding the value of the other variables constant. For example, how is the probability of being arrested affected by being employed in a CDEP scheme? However, the effect of changes in the explanatory variables on the probability of being arrested varies with the value of all the explanatory variables in the model. Given that the reference person in the OEA report is in no way representative of Indigenous unemployed or CDEP scheme participants, the marginal effects are estimated using the average characteristics of the sample provided in Table A1. Thus calculated, the marginal effect is the change in probability from the average rate of arrest in the NATSIS sample (i.e. 33.5 per cent) resulting from a one unit change in the variable being examined.[21]

## Data

Unlike the OEA (1997), the distributions of all variables used in the following sensitivity analysis are reported in Table A1. Such information provides useful benchmarks for the reader to interpret the analysis but is also crucial to the calculation and interpretation of the marginal effects. These descriptive statistics are roughly consistent with the characteristics of NATSIS respondents who were either unemployed or employed in the CDEP scheme (ABS/CAEPR 1996; Hunter 1999; Hunter 2000a).

**Table A1. Summary statistics for replication of the results of the OEA report (1997), Indigenous unemployed and CDEP scheme workers, 1994**

| Variable | Proportion in sample | Standard deviation |
|---|---|---|
| Arrested in previous five years | 0.335 | 0.472 |
| Male | 0.606 | 0.489 |
| Age 25–34 | 0.344 | 0.475 |
| Age 35–44 | 0.178 | 0.383 |
| Age 45–64 | 0.108 | 0.310 |
| Family with both Indigenous and non-Indigenous members | 0.106 | 0.308 |
| One parent family | 0.088 | 0.283 |
| Couple only family | 0.141 | 0.349 |
| Single, other | 0.384 | 0.486 |
| Family Income less than $12,000 p.a. | 0.125 | 0.331 |
| Family Income less than $12,001 to 20,000 p.a. | 0.234 | 0.424 |
| Family Income less than $20,001 to 30,000 p.a. | 0.272 | 0.445 |
| CDEP scheme employment | 0.388 | 0.487 |
| Taken away from natural family | 0.086 | 0.281 |
| Identifies with tribal groups | 0.734 | 0.442 |
| Role of elders is important | 0.897 | 0.304 |
| Attends cultural activity but does not have a place | 0.364 | 0.481 |
| Does not attend cultural activity | 0.194 | 0.395 |
| Police station more than 100 km away | 0.147 | 0.354 |
| Availability of Indigenous police aides | 0.675 | 0.469 |
| Seven to nine years of schooling | 0.447 | 0.497 |
| 10 to 11 years of schooling | 0.411 | 0.492 |
| 12 years of schooling | 0.067 | 0.250 |
| Last drank alcohol less than a week ago | 0.513 | 0.500 |
| Drank more than a week ago | 0.327 | 0.469 |
| Capital city | 0.068 | 0.252 |
| Other urban centres | 0.475 | 0.499 |
| | | |
| N | 2,128 | |

## Replicating the OEA report

The task of replicating the OEA results is made more difficult by the idiosyncracies of their analysis. The main issue is that their analysis retains both significant and insignificant coefficients in their final results. This may not be important if there is only one significant coefficient in a group of dummy variables (i.e., variables which sum to 1 for all individuals by definition), but can significantly distort the estimates for individual coefficients. Given that the inclusion of irrelevant variables may lead to biased results, we should exclude variables (or groups of variables) for which there were no significant coefficients (Greene 2000). For example, since all family income variables are insignificant these variables should all be omitted from the relatively parsimonious specification reported in Table A2.

The exception to this rule is the variable which captures whether a family contains both Indigenous and non-Indigenous members, the so-called 'mixed family' variable. The rationale for its continued inclusion is that it is likely to pick up the influence of the omitted State and Territory variables. The large variation in the number of mixed families in the respective States and Territories appears to depend upon the history of colonisation with the Northern Territory, Western Australia, South Australia and Queensland having relatively few 'mixed' families (Ross 1999).

Table A2 confirms the suspicion that the mixed family variable is a substitute for the omitted State and Territory variables. In contrast to OEA (1997), this variable has a significant coefficient. Given that the mixed family variable is probably a proxy for the omitted State and Territory variables, it should not be interpreted as having an independent effect on Indigenous arrest. This caveat should be borne in mind in any specification that omits data on the State and Territory of residence.

Notwithstanding the difficulty with interpreting this coefficient, the OEA estimate of the mixed family parameter is within the 95 per cent confidence interval of the estimate in our parsimonious regression model. That is, we can be 95 per cent sure that the OEA coefficient is within the feasible range estimated on the NATSIS CURF. Therefore the point estimate of the mixed family coefficient has not been significantly distorted by the focus on a parsimonious model.

Indeed, none of the coefficients reported in Table A2 are affected by leaving out the State and Territory dummy variables or those variables with insignificant coefficients in the OEA report. That is, the OEA analysis is not significantly affected by focusing on the parsimonious specification. This provides strong evidence that it is possible to proceed with a CURF based analysis without resorting to the NATSIS master file.

Another idiosyncracy of the OEA analysis is that they did not use all available information in the NATSIS. For example, the difference in the number of observations for the respective specifications in Table A2 is driven by omitting variables (or groups of variables) which were not significant in the OEA report.

The inclusion of the variable measuring the 'availability of Indigenous police aides' leads to 266 variables being deleted in both specifications because the relevant NATSIS responses are either 'don't know' or 'not stated'. Given the substantial loss of information from such omissions it is worth considering constructing another variable for the not stated categories of such questions. This will be done in the final report to ensure that all useable information has been included.

The importance of parameters can be measured by both the significance and size of the coefficient estimates. Having dealt with the former in Table A2, attention is now turned to the latter. As argued above, the size of the logistic coefficient is difficult to interpret by itself. A more intuitive approach is to estimate the change in the probability of arrest associated with having a particular characteristic relative to some reference person (see Table A3).

The OEA analysis is dominated by the effect of alcohol consumption, which increases the probability of arrest by almost one-third. This provides an indication of the prominence of drinking-related offences in the Indigenous population (Borland & Hunter 1997; Borland & Hunter 2000; Hunter & Borland 1999).

The other significant positive marginal effects on Indigenous arrest are being male, living in a capital city and whether a person was taken away from their natural family as a child: all of these variables increasing the prospect of arrest by over 10 percentage points.

## Table A2. Replication of OEA's (1997) LOGIT estimates of arrest among Indigenous unemployed and CDEP workers, 1994

| | OEA (1997) | Parsimonious specification on NATSIS CURF | | |
| | | | 95% confidence interval | |
| | Coefficients | Coefficients | Lower bound | Upper bound |
|---|---|---|---|---|
| Constant | -3.14 | -3.17 | -3.86 | -2.49 |
| Male | 1.30 | 1.29 | 1.06 | 1.51 |
| Aged between 25 and 34 years | 0.12 | 0.13 | -0.10 | 0.37 |
| Age between 35 and 44 years | -0.26 | -0.35 | -0.65 | -0.06 |
| Age between 45 and 64 years | -1.20 | -1.27 | -1.69 | -0.84 |
| Both Indigenous and non-Indigenous family members* | -0.22 | -0.42 | -0.76 | -0.09 |
| One parent family | 0.25 | | | |
| Couple only family | 0.11 | | | |
| Single, other | 0.12 | | | |
| Family income less than $12,000 p.a. | 0.01 | | | |
| Family income between $12,001 and $20,000 p.a. | 0.14 | | | |
| Family income between $20,001 and $30,000 p.a. | 0.10 | | | |
| CDEP employment | -0.31 | -0.28 | -0.51 | -0.04 |
| Taken away from natural family | 0.72 | 0.81 | 0.46 | 1.16 |
| Identifies with tribal groups | 0.10 | | | |
| Role of elders is important | -0.14 | | | |
| Attends cultural activities but does not have a place | -0.04 | | | |
| Does not attend cultural activities | -0.02 | | | |
| Police station more than 100 km away | 0.27 | | | |
| Availability of Indigenous police aides | -0.39 | -0.32 | -0.54 | -0.09 |
| Seven to nine years of schooling | 0.14 | -0.05 | -0.49 | 0.38 |
| 10 to 11 years of schooling | -0.28 | -0.44 | -0.89 | 0.02 |
| 12 years of schooling | -0.79 | -0.95 | -1.56 | -0.34 |
| Last drank alcohol less than a week ago | 2.55 | 2.47 | 1.94 | 3.01 |
| Drank alcohol more than a week ago | 2.03 | 2.02 | 1.48 | 2.56 |
| NSW | -0.36 | NA | | |
| Victoria | -0.27 | NA | | |
| QLD | -0.68 | NA | | |
| SA | 0.23 | NA | | |
| NT | -0.41 | NA | | |
| Capital city | 0.71 | 0.62 | 0.20 | 1.04 |
| Other urban centres | 0.25 | 0.34 | 0.09 | 0.58 |
| Number of observations | 2,063 | 2,128 | | |

Notes. The reference person (based on omitted categories is: an unemployed female aged between 15 and 24 years in an Indigenous only two parent family with an income of more than $30,000 p.a., who attends a cultural activity, has less than 6 years of formal education, has never consumed alcohol before, and lives in a Western Australian rural or remote area. As indicated in the text the dummies for the respective States are not available (NA) on the NATSIS CURF. With the exception of the variable denoted with an asterisk), the parsimonious specification only includes those variables that were significant in OEA (1997)

**Table A3. Significant changes in probability of arrest (%) implied by OEA (1997) LOGIT estimates**

|                                                                              | Probability of arrest | Marginal effect |
|------------------------------------------------------------------------------|:---------------------:|:---------------:|
| Average probability of being arrested in the previous five years, if in the NATSIS sub-sample | 33.5 | |
| **Significant marginal effects ranked by magnitude**                         |                       |                 |
| Age 45 to 64 years                                                           | 14.7                  | -18.8           |
| 12 years of schooling                                                        | 19.4                  | -14.1           |
| QLD                                                                          | 20.4                  | -13.2           |
| NSW                                                                          | 26.0                  | -7.5            |
| CDEP employment                                                              | 29.4                  | -4.1            |
| Availability of Indigenous police aides                                      | 30.8                  | -2.8            |
| Male                                                                         | 45.7                  | 12.2            |
| Taken away from natural family                                               | 49.3                  | 15.8            |
| Capital city                                                                 | 49.4                  | 15.9            |
| Last drank alcohol less than a week ago                                      | 63.6                  | 30.1            |
| Drank alcohol more than a week ago                                           | 66.4                  | 32.9            |

Notes.   Marginal effect is the effect of having a particular characteristic relative to the reference characteristics listed in the notes of the previous table. For example, being aged between 45 and 64 years is associated with a 18.8 percentage point lower probability of arrest relative to youth aged between 15 and 24 years. All other variables are measured at the mean when calculating a marginal effect. It is not possible to estimate the standard error of the marginal effects using the delta method because insufficient information was provided in the OEA report (Greene 1997: 297). A marginal effect is included in this table only if the coefficient from which it is derived is significantly different from zero at the 5% level.

While being employed in a CDEP scheme tends to reduce arrest, it does so by only a small amount (see the OEA report for a detailed analysis of the effect of CDEP). Similarly the availability of Indigenous police aides has only a small effect on the arrest rate.

The coefficients for State and Territory variables are particularly interesting given that it will not be possible to analyse their influence using the NATSIS CURF. Both New South Wales and Queensland have significantly lower rates of arrest with the residents being 7.5 and 13.2 percentage points less likely, respectively, to have been arrested than the average person in the sample. The marginal effects for the other States are based on insignificant coefficients. If these results translate into the estimates for the overall NATSIS sample, that is not just based on the unemployed and CDEP scheme employed in NATSIS, then we should expect the probability of arrest in the main report to be similarly depressed. These results can be interpreted as indicating State-specific factors, possibly related to the way the respective laws are policed, which are reducing the probability of Indigenous arrest. Unfortunately, it is not possible to eliminate the possibility that some non-institutional factors or unmeasured variation in relevant factors across these States is leading to lower arrest rates. In terms of the proposed analysis of the NATSIS CURF this last issue can be dealt with by an improved specification which includes more relevant, significant and appropriate (from a criminological point of view) variables in the estimated model.

Of the factors that significantly reduce arrest, only the education variable presents a viable policy instrument. While older Indigenous respondents have the least chance of

arrest, age is not something which can be altered by administrative fiat. However, increasing the retention rate so that more Indigenous students complete secondary school (i.e., having 12 years of schooling compared to those who spend less than 6 years in education), policy-makers will substantially reduce the number of Indigenous people being arrested.

## Concluding remarks

To be fair, the OEA (1997) report was not designed to accurately summarise all the factors underlying Indigenous arrest as its sole focus was on the CDEP scheme. Notwithstanding, the results based on the NATSIS CURF appear to be insensitive to the inclusion of the State and Territory dummy variables. That is, using an otherwise identical specification to that used in the OEA (1997) report, the size and significance of the effect of the major factors underlying arrest among Indigenous unemployed and CDEP scheme workers remain largely unchanged.

Therefore, the analysis can proceed using the publicly available NATSIS data. Given that the geographic dimension (at least of State or Territory of residence) is adequately controlled for by other publicly-available variables and that interaction effects are unlikely to be important, the analysis of the number of arrests in the previous five years and the reason for the last arrest can also proceed using the NATSIS CURF.

## Appendix B. Modelling arrest among all NATSIS respondents

### Table B1. Variable definitions in alphabetical order.

| Variable name | Description |
|---|---|
| **Dependent variables** | |
| ARRESTED | Whether arrested in previous five years |
| ASSAULT | Last arrest for assault |
| DRINKARR | Last arrest for drink driving or public drunkenness |
| THEFT | Last arrest for theft |
| **Explanatory variables** | |
| AGE1317 | Aged between 13 and 17 |
| AGE2534 | Aged between 25 and 34 |
| AGE3544 | Aged between 35 and 44 |
| AGE45P | Aged between 45 years and over |
| ARRESTOH | Other household members arrested in last 5 years |
| CAPCITY | Live in a capital city |
| CDEP | Work in a Community Development Employment Projects scheme |
| CROWDEDH | An average of more than 2 persons per bedroom in the house |
| DEPENDTS | Living in family with at least one dependent |
| DRINK | A person has drunk alcohol at least once in lifetime |
| HEALTH | Has had a health problem for more than 6 months |
| HOUSEOK | Household utilities (including electricity, gas, water, sewerage, running water, toilets and bathroom) are both available and working |
| INDIGPOL | Indigenous police aides/liaison officers in community |
| INDPOLNS | Question about Indigenous police aides not completed |
| MIXEDF | Lives in family with non-Indigenous persons |
| NEARPOL | Lives within 50 kilometres of police station |
| NILF | Not in the labour force |
| REMOTE | Lives in rural non-remote area (less than 100 kilometres from a TAFE institution) |
| RURAL | Lives in a rural remote area (more than 100 kilometres from a TAFE institution) |
| SCHNSNA | Question about highest level of schooling completed either not stated or not applicable |
| SEX | Male |
| TAKEN | Taken away from natural family |
| TSI | Torres Strait Islander |
| UNEMP | Unemployed |
| VICTIM | Victim of crime (physically attacked or verbally threatened) |
| VOTEDOH | Other household members voted in either recent Federal, State or ATSIC election |
| YEAR1011 | Highest level of schooling completed—year 10 or 11 |
| YEAR12 | Completed year 12 schooling |
| YEAR6TO9 | Highest level of schooling completed—years 6 to 9 |
| **Variables used but were not significantly different from zero at 5% level in any regression** | |
| HINCMISS | Income data not available for all household members |
| POORHH | Household income less than 50% of estimated median of OECD equivalent household income from the 1994–95, Survey of Income and Housing Costs |
| QNONE | No post-school qualification |
| STILLSCH | Still at school |

**Table B2. Summary statistics of variables used in regression, NATSIS respondents aged 13 year and over in 1994**

|  | Females | Males | Aged 13 to 17 | Aged 18 & over | All respondents |
|---|---|---|---|---|---|
| **Dependent variables** | | | | | |
| ARRESTED | 0.092 | 0.258 | 0.076 | 0.191 | 0.170 |
| DRINKARR | 0.048 | 0.150 | 0.012 | 0.114 | 0.096 |
| ASSAULT | 0.016 | 0.045 | 0.009 | 0.034 | 0.030 |
| THEFT | 0.009 | 0.041 | 0.039 | 0.020 | 0.024 |
| OUTSWARR | 0.011 | 0.043 | 0.008 | 0.030 | 0.026 |
| **Explanatory variables** | | | | | |
| SEX | 0.000 | 1.000 | 0.529 | 0.460 | 0.472 |
| TSI | 0.070 | 0.073 | 0.066 | 0.073 | 0.072 |
| AGE1317 | 0.160 | 0.200 | 1.000 | 0.000 | 0.179 |
| AGE2534 | 0.262 | 0.248 | 0.000 | 0.311 | 0.256 |
| AGE3544 | 0.172 | 0.163 | 0.000 | 0.204 | 0.168 |
| AGE45P | 0.205 | 0.203 | 0.000 | 0.249 | 0.204 |
| CAPCITY | 0.128 | 0.116 | 0.146 | 0.117 | 0.122 |
| RURAL | 0.166 | 0.188 | 0.202 | 0.171 | 0.176 |
| REMOTE | 0.226 | 0.244 | 0.187 | 0.245 | 0.235 |
| INDIGPOL | 0.507 | 0.481 | 0.408 | 0.514 | 0.495 |
| INDPOLNS | 0.208 | 0.230 | 0.300 | 0.200 | 0.218 |
| NEARPOL | 0.852 | 0.838 | 0.879 | 0.838 | 0.845 |
| CDEP | 0.077 | 0.149 | 0.042 | 0.126 | 0.111 |
| UNEMP | 0.144 | 0.214 | 0.090 | 0.196 | 0.177 |
| NILF | 0.613 | 0.408 | 0.830 | 0.448 | 0.516 |
| YEAR6TO9 | 0.335 | 0.343 | 0.102 | 0.390 | 0.339 |
| YEAR1011 | 0.320 | 0.274 | 0.113 | 0.338 | 0.298 |
| YEAR12 | 0.066 | 0.048 | 0.010 | 0.067 | 0.057 |
| SCHNSNA | 0.016 | 0.011 | 0.001 | 0.016 | 0.014 |
| DRINK | 0.628 | 0.780 | 0.269 | 0.794 | 0.700 |
| VICTIM | 0.114 | 0.111 | 0.099 | 0.115 | 0.112 |
| HEALTH | 0.381 | 0.303 | 0.230 | 0.368 | 0.344 |
| MIXEDF | 0.177 | 0.182 | 0.241 | 0.166 | 0.180 |
| DEPENDTS | 0.540 | 0.425 | 0.414 | 0.501 | 0.485 |
| TAKEN | 0.073 | 0.070 | 0.026 | 0.082 | 0.072 |
| CROWDEDH | 0.334 | 0.347 | 0.385 | 0.330 | 0.340 |
| HOUSEOK | 0.772 | 0.764 | 0.790 | 0.763 | 0.768 |
| ARRESTOH | 0.277 | 0.299 | 0.454 | 0.251 | 0.287 |
| VOTEDOH | 0.430 | 0.469 | 0.277 | 0.486 | 0.449 |
| Number of observations | 5,402 | 4,833 | 1,832 | 8,403 | 10,235 |

Note:   The descriptive statistics are unweighted and consequently only reflect the characteristics of the NATSIS sample used in the regression analysis.

**Table B3. Probit estimates of arrest by broad age groups**

| Variables | Aged 13 to 17 years | | Aged 18 years and over | |
|---|---|---|---|---|
| | Coef. | Std. Err | Coef. | Std. Err |
| SEX | 0.780* | 0.118 | 0.731* | 0.041 |
| TSI | -0.632* | 0.315 | -0.667* | 0.098 |
| AGE2534 | NA | NA | -0.026 | 0.047 |
| AGE3544 | NA | NA | -0.319* | 0.056 |
| AGE45P | NA | NA | -0.724* | 0.066 |
| CAPCITY | 0.426* | 0.145 | 0.176* | 0.060 |
| RURAL | -0.192 | 0.156 | -0.226* | 0.056 |
| REMOTE | -0.373 | 0.207 | -0.253* | 0.064 |
| INDIGPOL | -0.056 | 0.126 | -0.094* | 0.044 |
| INDPOLNS | -0.414* | 0.149 | -0.560* | 0.064 |
| NEARPOL | 0.099 | 0.220 | -0.290* | 0.069 |
| CDEP | 0.008 | 0.277 | 0.416* | 0.067 |
| UNEMP | 0.264 | 0.233 | 0.628* | 0.054 |
| NILF | 0.199 | 0.224 | 0.279* | 0.056 |
| YEAR6TO9 | 0.798* | 0.153 | 0.467* | 0.068 |
| YEAR1011 | 0.299 | 0.184 | 0.309* | 0.073 |
| YEAR12 | 0.298 | 0.413 | 0.034 | 0.103 |
| SCHNSNA | NA | NA | 0.544* | 0.158 |
| DRINK | 0.923* | 0.121 | 0.980* | 0.075 |
| VICTIM | 0.308* | 0.148 | 0.524* | 0.050 |
| HEALTH | 0.127 | 0.122 | 0.145* | 0.041 |
| MIXEDF | -0.591* | 0.132 | -0.086 | 0.054 |
| DEPENDTS | -0.006 | 0.117 | -0.057 | 0.043 |
| TAKEN | 0.514* | 0.244 | 0.239* | 0.061 |
| CROWDEDH | 0.190 | 0.124 | 0.138* | 0.043 |
| HOUSEOK | -0.413* | 0.127 | -0.138* | 0.045 |
| ARRESTOH | -0.030 | 0.107 | 0.238* | 0.042 |
| VOTEDOH | -0.144 | 0.126 | -0.085* | 0.042 |
| CONSTANT | -2.336* | 0.359 | -2.158* | 0.147 |
| Pseudo R$^2$ | 0.290 | | 0.237 | |
| Log Likelihood | -351 | | -3,124 | |
| Number of observations | 1,830 | | 8,403 | |

Note:   Heteroscedasticity robust standard errors used. An asterisk denotes that a statistic is significantly different from zero at the 5 per cent level. The variable SCHNSNA and two observations were dropped from the regression for minors because both were both arrested and hence this predicts the model perfectly if included.

**Table B4. Probit estimates of arrest among Indigenous males**

|  | ARRESTED | | DRINKARR | | ASSAULT | | THEFT | |
|---|---|---|---|---|---|---|---|---|
| TSI | -0.656* | 0.113 | -0.699* | 0.137 | -0.320 | 0.199 | -0.734* | 0.272 |
| AGE1317 | -0.329* | 0.094 | -0.949* | 0.147 | -0.281 | 0.156 | 0.443* | 0.136 |
| AGE2534 | -0.032 | 0.063 | 0.122 | 0.069 | 0.096 | 0.091 | -0.280* | 0.101 |
| AGE3544 | -0.402* | 0.074 | -0.076 | 0.081 | -0.344* | 0.117 | -0.999* | 0.163 |
| AGE45P | -0.824* | 0.082 | -0.450* | 0.090 | -0.432* | 0.129 | -1.304* | 0.218 |
| CAPCITY | 0.160* | 0.074 | -0.010 | 0.091 | -0.063 | 0.120 | 0.046 | 0.117 |
| RURAL | -0.241* | 0.068 | -0.177* | 0.077 | -0.420* | 0.120 | -0.426* | 0.123 |
| REMOTE | -0.331* | 0.076 | -0.196* | 0.084 | -0.228* | 0.116 | -0.517* | 0.132 |
| INDIGPOL | -0.115* | 0.054 | -0.101 | 0.060 | -0.156* | 0.081 | -0.076 | 0.090 |
| INDPOLNS | -0.609* | 0.073 | -0.539* | 0.090 | -0.462* | 0.128 | -0.445* | 0.131 |
| NEARPOL | -0.255* | 0.079 | -0.365* | 0.087 | -0.140 | 0.119 | -0.199 | 0.144 |
| CDEP | 0.401* | 0.077 | 0.315* | 0.085 | 0.269* | 0.118 | -0.079 | 0.148 |
| UNEMP | 0.595* | 0.064 | 0.384* | 0.072 | 0.299* | 0.096 | 0.349* | 0.113 |
| NILF | 0.291* | 0.074 | 0.146 | 0.084 | 0.049 | 0.122 | 0.309* | 0.136 |
| YEAR6TO9 | 0.507* | 0.077 | 0.245* | 0.088 | 0.489* | 0.138 | 0.760* | 0.145 |
| YEAR1011 | 0.364* | 0.082 | 0.192* | 0.096 | 0.323* | 0.148 | 0.390* | 0.156 |
| YEAR12 | -0.039 | 0.127 | -0.085 | 0.148 | 0.075 | 0.229 | 0.315 | 0.221 |
| SCHNSNA | 0.425 | 0.217 | 0.230 | 0.228 | -0.187 | 0.446 | 0.395 | 0.484 |
| DRINK | 0.927* | 0.083 | 1.346* | 0.181 | 0.549* | 0.155 | 0.614* | 0.132 |
| VICTIM | 0.562* | 0.065 | 0.469* | 0.069 | 0.311* | 0.087 | 0.268* | 0.100 |
| HEALTH | 0.161* | 0.052 | 0.090 | 0.058 | 0.185* | 0.079 | -0.009 | 0.088 |
| MIXEDF | -0.150* | 0.064 | -0.115 | 0.077 | -0.075 | 0.103 | -0.226* | 0.113 |
| DEPENDTS | 0.002 | 0.051 | -0.037 | 0.058 | 0.049 | 0.083 | -0.163 | 0.087 |
| TAKEN | 0.330* | 0.080 | 0.207* | 0.085 | 0.197 | 0.117 | 0.182 | 0.149 |
| CROWDEDH | 0.106* | 0.052 | 0.181* | 0.057 | 0.092 | 0.081 | 0.082 | 0.088 |
| HOUSEOK | -0.248* | 0.056 | -0.064 | 0.062 | -0.083 | 0.083 | -0.363* | 0.087 |
| ARRESTOH | 0.230* | 0.051 | 0.189* | 0.059 | 0.178* | 0.077 | 0.174* | 0.080 |
| VOTEDOH | -0.082 | 0.050 | -0.101 | 0.057 | 0.119 | 0.078 | -0.008 | 0.082 |
| CONSTANT | -1.289* | 0.166 | -2.041* | 0.237 | -2.356* | 0.276 | -2.017* | 0.282 |
| Pseudo R$^2$ | 0.226 | | 0.203 | | 0.147 | | 0.206 | |
| Log Likelihood | -2,137 | | -1,628 | | -756 | | -651 | |

Note:   Heteroscedasticity robust standard errors used. An asterisk denotes that a statistic is significantly different from zero at the 5 per cent level.

**Table B5. Probit estimates of arrest among Indigenous females**

|  | ARRESTED | | DRINKARR | | ASSAULT | | THEFT | |
|---|---|---|---|---|---|---|---|---|
| TSI | -0.620* | 0.161 | -0.403* | 0.194 | -0.337 | 0.256 | -0.161 | 0.342 |
| AGE1317 | -0.298* | 0.124 | -0.522* | 0.186 | -0.304 | 0.237 | 0.504* | 0.236 |
| AGE2534 | -0.025 | 0.071 | 0.001 | 0.089 | -0.042 | 0.116 | -0.162 | 0.148 |
| AGE3544 | -0.228* | 0.085 | -0.098 | 0.103 | -0.288 | 0.147 | -0.843* | 0.259 |
| AGE45P | -0.600* | 0.105 | -0.455* | 0.127 | -0.813* | 0.215 | -0.860* | 0.372 |
| CAPCITY | 0.265* | 0.082 | 0.218* | 0.109 | 0.045 | 0.137 | 0.388* | 0.165 |
| RURAL | -0.207* | 0.088 | -0.117 | 0.106 | -0.210 | 0.150 | -0.088 | 0.189 |
| REMOTE | -0.159 | 0.100 | 0.026 | 0.117 | -0.080 | 0.183 | -0.276 | 0.234 |
| INDIGPOL | -0.044 | 0.065 | -0.105 | 0.078 | -0.170 | 0.100 | -0.413* | 0.140 |
| INDPOLNS | -0.426* | 0.094 | -0.672* | 0.132 | -0.410* | 0.156 | -0.341 | 0.202 |
| NEARPOL | -0.273* | 0.112 | -0.200 | 0.129 | -0.085 | 0.209 | -0.055 | 0.263 |
| CDEP | 0.404* | 0.125 | 0.523* | 0.148 | -0.038 | 0.229 | 0.333 | 0.358 |
| UNEMP | 0.658* | 0.097 | 0.618* | 0.124 | 0.366* | 0.161 | 0.593* | 0.273 |
| NILF | 0.329* | 0.090 | 0.363* | 0.116 | 0.156 | 0.152 | 0.364 | 0.255 |
| YEAR6TO9 | 0.402* | 0.097 | 0.273* | 0.125 | 0.340 | 0.182 | 0.619* | 0.253 |
| YEAR1011 | 0.179 | 0.103 | 0.014 | 0.134 | -0.031 | 0.198 | 0.513* | 0.247 |
| YEAR12 | 0.090 | 0.144 | -0.065 | 0.183 | -0.011 | 0.268 | 0.044 | 0.428 |
| SCHNSNA | 0.599* | 0.204 | 0.526* | 0.255 |  |  | 0.959* | 0.480 |
| DRINK | 0.965* | 0.087 | 1.413* | 0.147 | 0.785* | 0.190 | 0.569* | 0.207 |
| VICTIM | 0.440* | 0.071 | 0.343* | 0.087 | 0.381* | 0.110 | 0.294* | 0.145 |
| HEALTH | 0.109 | 0.057 | 0.044 | 0.074 | 0.255* | 0.096 | 0.092 | 0.124 |
| MIXEDF | -0.187* | 0.082 | -0.238* | 0.108 | 0.100 | 0.128 | -0.502* | 0.211 |
| DEPENDTS | -0.095 | 0.065 | -0.155* | 0.079 | -0.120 | 0.118 | 0.372* | 0.149 |
| TAKEN | 0.176 | 0.091 | -0.060 | 0.119 | -0.056 | 0.161 | 0.285 | 0.193 |
| CROWDEDH | 0.197* | 0.066 | 0.194* | 0.079 | 0.214* | 0.118 | 0.239 | 0.134 |
| HOUSEOK | -0.045 | 0.069 | -0.053 | 0.083 | 0.025 | 0.122 | 0.246 | 0.177 |
| ARRESTOH | 0.152* | 0.061 | 0.231* | 0.073 | 0.115 | 0.101 | 0.194 | 0.145 |
| VOTEDOH | -0.064 | 0.063 | 0.004 | 0.079 | 0.080 | 0.104 | 0.027 | 0.141 |
| CONSTANT | -2.229* | 0.212 | -2.978* | 0.286 | -2.899* | 0.392 | -3.887* | 0.492 |
|  |  |  |  |  |  |  |  |  |
| Pseudo R$^2$ | 0.190 | | 0.204 | | 0.161 | | 0.195 | |
| Log Likelihood | -1,342 | | -822 | | -381 | | -213 | |

Note: Heteroscedasticity robust standard errors used. An asterisk denotes that a statistic is significantly different from zero at the 5 per cent level. The variable SCHNSNA and 86 observations were dropped from the assault regression because they would predict the model perfectly if included.

**Table B6. Probit estimates of Indigenous arrest, 1994**

|  | ARRESTED | | DRINKARR | | ASSAULT | | THEFT | |
|---|---|---|---|---|---|---|---|---|
| sex | 0.738* | 0.038 | 0.606* | 0.045 | 0.402* | 0.063 | 0.706* | 0.076 |
| tsi | -0.660* | 0.094 | -0.616* | 0.115 | -0.318 | 0.162 | -0.576* | 0.230 |
| age1317 | -0.294* | 0.074 | -0.808* | 0.120 | -0.284* | 0.131 | 0.428* | 0.117 |
| age2534 | -0.030 | 0.047 | 0.074 | 0.054 | 0.045 | 0.071 | -0.242* | 0.083 |
| age3544 | -0.323* | 0.056 | -0.082 | 0.063 | -0.321* | 0.093 | -0.969* | 0.138 |
| age45p | -0.736* | 0.065 | -0.451* | 0.073 | -0.553* | 0.110 | -1.220* | 0.189 |
| capcity | 0.209* | 0.055 | 0.076 | 0.070 | -0.011 | 0.091 | 0.164 | 0.096 |
| rural | -0.222* | 0.053 | -0.151* | 0.062 | -0.340* | 0.095 | -0.326* | 0.104 |
| remote | -0.268* | 0.061 | -0.126 | 0.069 | -0.180 | 0.099 | -0.449* | 0.112 |
| indigpol | -0.089* | 0.041 | -0.104* | 0.047 | -0.153* | 0.063 | -0.164* | 0.076 |
| indpolns | -0.539* | 0.058 | -0.580* | 0.074 | -0.453* | 0.101 | -0.401* | 0.113 |
| nearpol | -0.266* | 0.065 | -0.318* | 0.073 | -0.118 | 0.104 | -0.180 | 0.123 |
| cdep | 0.393* | 0.065 | 0.344* | 0.072 | 0.215* | 0.103 | 0.026 | 0.135 |
| unemp | 0.603* | 0.053 | 0.430* | 0.061 | 0.308* | 0.083 | 0.391* | 0.102 |
| nilf | 0.281* | 0.054 | 0.176* | 0.063 | 0.081 | 0.091 | 0.336* | 0.110 |
| year6to9 | 0.484* | 0.060 | 0.257* | 0.072 | 0.415* | 0.112 | 0.725* | 0.124 |
| year1011 | 0.305* | 0.064 | 0.124 | 0.077 | 0.175 | 0.121 | 0.439* | 0.130 |
| year12 | 0.042 | 0.096 | -0.086 | 0.115 | 0.036 | 0.176 | 0.263 | 0.194 |
| schnsna | 0.545* | 0.154 | 0.376* | 0.176 | -0.375 | 0.405 | 0.672* | 0.358 |
| drink | 0.935* | 0.060 | 1.362* | 0.116 | 0.681* | 0.117 | 0.591* | 0.114 |
| victim | 0.501* | 0.047 | 0.410* | 0.054 | 0.337* | 0.068 | 0.269* | 0.081 |
| health | 0.138* | 0.038 | 0.076 | 0.046 | 0.212* | 0.061 | 0.040 | 0.073 |
| mixedf | -0.156* | 0.050 | -0.149* | 0.062 | -0.013 | 0.082 | -0.304* | 0.098 |
| dependts | -0.044 | 0.040 | -0.079 | 0.047 | -0.010 | 0.068 | -0.033 | 0.071 |
| taken | 0.257* | 0.059 | 0.114 | 0.068 | 0.112 | 0.093 | 0.213 | 0.119 |
| crowdedh | 0.142* | 0.041 | 0.187* | 0.047 | 0.139* | 0.067 | 0.108 | 0.075 |
| houseok | -0.165* | 0.043 | -0.057 | 0.050 | -0.044 | 0.069 | -0.211* | 0.076 |
| arrestoh | 0.199* | 0.039 | 0.202* | 0.046 | 0.147* | 0.062 | 0.183* | 0.070 |
| votedoh | -0.070 | 0.039 | -0.057 | 0.046 | 0.110 | 0.063 | 0.000 | 0.070 |
| CONSTANT | -2.108 | 0.133 | -2.715* | 0.177 | -2.830* | 0.228 | -2.953* | 0.245 |
| | | | | | | | | |
| Pseudo $R^2$ | 0.252 | | 0.236 | | 0.167 | | 0.229 | |
| Log Likelihood | -3,496 | | -2,471 | | -1,146 | | -884 | |

Notes: Heteroscedasticity robust standard errors used. An asterisk denotes that a statistic is significantly
different from zero at the 5 per cent level. The coefficients for the analysis of outstanding warrants are
omitted because of lack of space, but are available on request.

## Appendix C. Factors underlying multiple arrests

As well as experiencing high rates of arrest, Indigenous people are also likely to be arrested repeatedly. The profile of arrest in the NATSIS shows that once an Indigenous person has been arrested, on average they can expect to be arrested at least once more—with the average number of arrests ranging between 2.3 and 3.0 (for females and males, respectively). This Appendix describes multiple arrests among NATSIS respondents and then estimates several statistical models in order to identify the factors associated with being arrested more than once.

Table C1 describes the distribution of multiple arrests by basic demographic characteristics (i.e., age and sex). It re-presents the data in Table 2 in a different format so as to introduce the relevant issues involved in an empirical analysis of number of arrests. Consequently, the basic story that there is an inverted U relationship between age and number of arrests with the old and young tending to have relatively low rates of multiple arrests. Females tend to have fewer repeated experiences of arrest compared to males with 4.2 per cent as opposed to 17.1 per cent having been arrested two or more times. The ratio of male to female with multiple arrests is slightly higher than the analogous ratio of the simple arrest rates in the NATSIS where males tend to be about three to four times more likely to have been arrested than females.

These differences are exaggerated at the extremes of the distribution where males are over than six times more likely than females to have been arrested ten or more times in the last five years (3.1 per cent compared to 0.5 per cent). Similarly, minors and people aged 45 years and over were between six and seven times more likely to be in the top category for number of arrests.

### Table C1. Distribution of number of arrests by age and sex (%)

|                   | Number of arrests in last five years | | | | | |
|                   | 0    | 1    | 2–4  | 5–9  | 10 or more | Total |
|-------------------|------|------|------|------|------------|-------|
| Age               |      |      |      |      |            |       |
| 13–17 years       | 92.6 | 3.2  | 2.7  | 0.9  | 0.6        | 100.0 |
| 18–24 years       | 73.4 | 9.4  | 11.0 | 2.4  | 3.8        | 100.0 |
| 25–34 years       | 73.6 | 11.0 | 10.5 | 2.8  | 2.0        | 100.0 |
| 35–44 years       | 81.8 | 8.7  | 6.6  | 1.3  | 1.5        | 100.0 |
| Aged 45 and over  | 92.3 | 3.9  | 2.5  | 0.7  | 0.5        | 100.0 |
| Sex               |      |      |      |      |            |       |
| Males             | 72.6 | 10.3 | 11.0 | 2.9  | 3.1        | 100.0 |
| Females           | 90.8 | 5.0  | 3.2  | 0.6  | 0.5        | 100.0 |
| Persons           | 82.1 | 7.5  | 6.9  | 1.7  | 1.7        | 100.0 |

The relatively large number of Indigenous people in various sub-populations who have been arrested ten or more times has important implications for the modelling the number of arrests. It is not appropriate to conduct a simple OLS regression because we do not know the exact number of arrests that people in this category have had in the last five years. In technical terms, the dependent variable is left censored. Consequently, OLS techniques will be sensitive to whether we assume that such people had been arrested ten times or 20 times in the last five years. One alternative is to conduct a Tobit model, a variant of an OLS model, where truncated observations are

allowed to take a range of feasible values. Johnston and DiNardo (1997: 436–41) provide an introductory description of Tobit and related models. Given that the number of arrests takes on integer values only, it may be necessary to consider some generalisations of the Tobit model (Amemiya 1984). However, there was no substantive difference in the overall conclusions drawn from adopting a Tobit modelor some generalisation of it, especially at a broad level of comparison.

## Table C2. Tobit regression analysis of number of Indigenous arrests, 1994

|  | Coefficient estimate | Standard error | T-ratio |
|---|---|---|---|
| Male | 3.238 | 0.170 | 19.0 |
| Torres Strait Islander | -2.680 | 0.401 | -6.7 |
| Aged between 13 and 17 | -1.228 | 0.316 | -3.9 |
| Aged between 25 and 34 | -0.375 | 0.198 | -1.9 |
| Aged between 35 and 44 | -1.477 | 0.236 | -6.3 |
| Aged between 45 years and over | -3.308 | 0.280 | -11.8 |
| Live in a capital city | 0.900 | 0.229 | 3.9 |
| Rural area | -0.969 | 0.229 | -4.2 |
| Remote area | -1.161 | 0.272 | -4.3 |
| Indigenous police aides in community | -0.579 | 0.172 | -3.4 |
| Within 50 kilometres of police station | -1.067 | 0.288 | -3.7 |
| Work in CDEP scheme | 1.746 | 0.277 | 6.3 |
| Unemployed | 2.465 | 0.226 | 10.9 |
| Not in the labour force | 1.285 | 0.232 | 5.5 |
| Completed 6 to 9 years of schooling | 2.129 | 0.252 | 8.4 |
| Completed year 10 or 11 | 1.291 | 0.270 | 4.8 |
| Completed year 12 | 0.119 | 0.410 | 0.3 |
| Has drunk alcohol at least once | 4.180 | 0.274 | 15.2 |
| Physically attacked or verbally threatened | 2.263 | 0.196 | 11.5 |
| Long-term health condition | 0.648 | 0.162 | 4.0 |
| Lives with non-Indigenous persons | -0.869 | 0.216 | -4.0 |
| Living in family with at least 1 dependent | -0.228 | 0.167 | -1.4 |
| Taken away from natural family | 1.248 | 0.251 | 5.0 |
| Crowded house | 0.679 | 0.172 | 3.9 |
| Household utilities available and working | -0.470 | 0.180 | -2.6 |
| Other householders arrested | 0.872 | 0.166 | 5.2 |
| Other householders voted | -0.239 | 0.166 | -1.4 |
| Constant | -9.700 | 0.594 | -16.3 |
| Pseudo-$R^2$ | 0.146 |  |  |
| Number of observations | 10,199 |  |  |

Note:  The Tobit model used also assumes that people with no arrests are left-censored—in effect, assuming that some people may expect to have a negative number of arrests. This is a latent variable model which assumes that people have a propensity to be arrested a certain number of times. That is, it allows the statistical model to distinguish people who are very unlikely to be arrested from those who just happened not to be. In total, 8,492 respondents were left-censored (had not been arrested) and 123 respondents were right-censored (had been arrested ten or more times). The remaining respondents were not censored by the way the question was asked in NATSIS. All 158 prisoners were excluded.

To be consistent with the above analysis, the same set of explanatory variables is used to analyse the factors underlying the number of Indigenous arrests. To retain comparability with Table 4 prisoners are excluded from the analysis of Table C2. The Tobit coefficients can be interpreted as the additional number of arrests a person can expect if they have a particular characteristic, holding all other explanatory variables constant. For example, Indigenous males can expect to be arrested on 3.2 more occasions than Indigenous females. The t-ratios are provided as an indicator of significance of the various parameters—the rule of thumb being that any statistic greater than two indicates a significant coefficient (i.e., at the 5 per cent level).

In order of magnitude, the largest impacts on the number of arrests are from the alcohol variable, followed by age, sex, whether a Torres Strait Islander, labour force status, whether physically attacked or verbally threatened and schooling. With the exception of the Torres Strait Islander variable all of these were among the six most significant factors identified in Table 4. This provides an indication that Torres Strait Islanders are much less likely to have multiple experiences of arrest, at least in the NATSIS sample.

The main thing that arises from Table C2 is that all the factors underlying arrest are more significant than those in Table 4 (i.e., they have a higher t-statistic). This should not be seen as surprising since the information on whether a person was arrested is a subset of the number of arrests. The Tobit analysis is giving more weight to people who have been arrested many times and hence any factors associated with such people will be highlighted.

Indeed, only two variables had a negligible or insignificant effect on the number of arrests including: the proxies for positive peer group effects in the household, and whether a respondent lived in a family with at least one dependent. Again this is very similar to the analysis of Table 4, which found these variables only became significant at the five per cent level when prisoners were included in the analysis.

In order to ensure that the empirical results are robust, another alternative statistical model which takes into account the fact that the number of arrests is provided as count data with a preponderance of zeros and small integer values (i.e., arrest is still a relatively rare occurrence for many Indigenous people). In such cases, Greene (1997: 931) suggests that using the Poisson regression model will improve on standard linear techniques such as Tobit. Given that the Poisson distribution assumes that the mean and variance of the distribution being examined are equal, the negative binomial model is frequently used when there is more variation than would be expected for a Poisson process (i.e., the problem of overdispersion). This was indeed the case for the NATSIS data on the number of arrest and a negative binomial model was estimated to test the sensitivity of the tobit results. Again, the results did not change substantially. The only difference of note was that the housing quality coefficient was no longer significant at the five per cent level, but was still significant at the 10 per cent level.

In summary, the analysis of the number of arrests confirms the pattern of significance (and relative magnitudes) of the factors underlying Indigenous arrests. Not only are economic, alcohol-related, demographic, geographic, and human capital factors important, but the probability of arrest is also strongly related to a person's family, housing stock and socioeconomic environment.

# Notes

1. The recommendations emphasised the need to reduce the disproportionate levels of Aboriginal persons in custody, rather than the need to directly prevent their deaths. This emphasis arose out of the Royal Commission's conclusion that the 99 Aboriginal deaths in custody which occurred during the 1980s were not a result of Aboriginal persons being any more likely than others to die in custody, but were a result of their gross over-representation in prison.

2. See Broadhurst et al. (1994) and Cunneen and McDonald (1997).

3. The CDEP scheme is a Federal government program in which unemployed Indigenous people forgo their entitlements to Newstart Allowance payments but receive the equivalent from a local community organisation in return for work. It is distinguished from the work-for-the-dole scheme in having a much longer history (beginning in 1977), in being specific to Indigenous communities, and having a broader community-development component.

4. Appendix A provides a detailed analysis of the OEA report, including a test of whether the results are sensitive to the inclusion of State-specific institutional factors, and hence whether it is possible to use publicly available NATSIS data.

5. Prisoners were included in the descriptive statistics in this section because the data on demographics and arrest appears to be of reasonable quality.

6. Preliminary analysis revealed there was no significant loss of information by collapsing two variables that broadly measured the frequency of alcohol consumption into one variable. That is, there is no significant gain in distinguishing frequent drinkers (defined as those who drank in last week) from less frequent drinkers in any of the regressions examined.

7. The OECD scale is described in full in Mitchell (1991). It gives a weight of one to the first adult, 0.7 to the second and subsequent adults and 0.5 to all dependents.

8. Depending on the age of criminal responsibility in the various States people under this age can be, and are, arrested.

9. For more details on the characteristics of the population in jail at the survey date, see Carcach and Mukherjee (1996).

10. Official police data show that in each year from 1990 to 1994 total arrests were 15.9 per cent, 16.9 per cent, 15.9 per cent, 15.6 per cent, and 15.9 per cent of the Indigenous population in Western Australia (Ferrante & Loh 1996: 39). To make the official police data comparable with the NATSIS data it is necessary to convert the annual percentages to an estimate of the proportion of the Indigenous population arrested over the previous five years. This calculation is made by summing total arrests as a percentage of the Indigenous population across the five-year period from 1990 to 1994, and then adjusting to take account of persons who were arrested multiple times throughout the period. The adjustment uses a measure of the average number of arrests per arrested person over the previous five years in Western Australia derived from the NATSIS data (3.3 arrests). This method of calculation provides an estimate from the official police data of the proportion of Indigenous persons arrested in Western Australia between 1990 and 1994 of 24.6 per cent.

11. Note that no account is taken of the possibility that some persons living in Western Australia at the time of the NATSIS had been arrested in other States, or that some persons recorded in official police data as having been arrested in Western Australia during 1990 to 1993 were no longer living in Western Australia in 1994. However, inter-State mobility is generally fairly

low—for example, Taylor and Bell (1996: 397) report that only 5.1 per cent of the Indigenous population moved between States from 1986 to 1991.

12. That is, instruments must be, in econometric language, both 'valid' and 'identified'.

13. For example, Taylor and Bell (1996) using 54 Census Statistical Divisions found that about 47 per cent of the Indigenous population changed residence between 1986 and 1991.

14. The large variation in the number of mixed families in the respective States and Territories appears to depend upon the history of colonisation, with the Northern Territory, Western Australia, South Australia and Queensland having relatively few 'mixed' families (Ross 1999).

15. Note that more than one reason for the last arrest may be given by NATSIS respondents.

16. For example, the National Police Custody Surveys conducted by the AIC in 1988, 1992 and 1995 showed that Indigenous Australians were between 26 and 27 times more likely to be taken into police custody than other Australians (AIC 1994). On the other hand, data from the National Prison Census (AIC 1982–1993) showed Indigenous people as being 13 or 14 times more likely to be in prison than the rest of the population.

17. The essential theme of conflict theory is that the legitimacy of the law is rejected by the 'outside group' because it fails to recognise or represent their values. Recent revisions of Australian history, which emphasise the struggle between races over land use, have acted as a stimulus to conflict theories of Indigenous arrest (Reynolds 1982). Anthropological studies show that ongoing cultural conflict can lead to profound differences in legal sensibilities as to the content of the law and the basis of collecting evidence (Poole 1986). While the occasional riot in country towns gives the impression of rebellion or protest, cultural conflict is likely to be a subtle problem, which may not be overtly evident.

18. A General Social Survey, which includes non-Indigenous people, will be conducted every three years from 2002.

19. Apart from the broad 'Part-of-State' variable, all detailed geographic information was suppressed by the ABS to protect the confidentiality of respondents. Virtually no other information was suppressed.

20. See Hosmer and Lemeshow (1989) for details of the interpretation of these ratios.

21. All the variables used in the OEA report are dummy variables, which vary between zero and one.

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