

# Child protection reports in context



NSW Department of  
Community Services

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## 1. Introduction

A large body of published research literature indicates that determining the underlying causes of child abuse and neglect is a complex and multifactorial issue. One approach is to carry out a cross-sectional analysis to delineate associations between rates of child abuse and neglect and other demographic and social indicators.

Many articles have been written on factors which may be associated with child abuse and neglect (sometimes termed “maltreatment” particularly in US and Canadian literature). While a large number of factors have been discussed, there is general agreement on certain parameters including:

- child personality factors, disability, chronic or serious illness
- family structure – single parent with lack of support, high number of children in household
- social isolation, lack of support
- parental unemployment; homelessness
- dangerous / violent neighbourhood
- community violence.

A literature review focusing on child neglect undertaken by Dr Johanna Watson was published as a DoCS Research Report in May 2005 (1). This paper looked at the prevalence of neglect, the socio-economic model of neglect, risk factors associated with caregiver neglect, developmental outcomes of neglected children, key issues for service providers, interventions and the perspective on Indigenous communities.

Of specific interest for this study is the section in Watson’s paper on risk factors associated with caregiver neglect. These factors are grouped into four categories:

- **Socio-demographic factors:** poverty, low education levels, low status occupations or unemployment, household size, single parent and unmarried status.
- **Parental factors:** absence of father figure, lack of father involvement, maternal age, maternal mental health (e.g. depression, low self-esteem, low self-confidence, lack of impulse control), limited intellectual functioning, own poor parenting patterns, substance abuse, domestic violence and lack of social support.
- **Family interaction factors:** less organised households, less rewarding of positive behaviour, inconsistent/haphazard approach to parenting, alternatively highly organised families where emotional needs of children are not met, depressed or withdrawn parents.
- **Child characteristics:** age, ethnicity (Indigenous / minority groups), disability.

A literature review on child neglect and its link with juvenile crime undertaken by Pia Salmelainen was published as a NSW Bureau of Crime Statistics and Research Bulletin in 1996 (2). This research paper found that a multitude of potential factors can determine the risk of child neglect and subsequent juvenile delinquency.

The issues discussed included:

- there is a strong association between low income and neglect
- a large number of parental factors are associated with neglect including low education level, substance abuse and generally low levels of parenting skill
- housing type does not appear to be linked with child neglect
- there is a strong association between family-child relationships and the risk of juvenile crime.

Goldman and others wrote an overview of literature on risk and protective factors for child abuse and neglect in a bulletin from the US Department of Health and Human Services in 2003 (3). This bulletin is an overview of literature on risk and protective factors for child abuse and neglect with many references to key publications and a summary list of factors.

Goldman presented a list of risk factors for child abuse and neglect as follows:

***Child risk factors:***

- premature birth, birth anomalies, low birth weight, exposure to toxins in utero
- personality factors
- disability, chronic or serious illness
- anti-social peer group
- age
- child aggression, behaviour problems, attention deficits.

***Parental / family risk factors:***

- personality factors including depression / anxiety, insecurity, lack of trust
- insecure attachment to own parents
- high parental conflict, domestic violence
- family structure – single parent with lack of support, high number of children in household
- social isolation, lack of support
- parental psychopathology
- substance abuse
- separation / divorce, especially high conflict divorce
- age
- high general stress level
- poor parent-child interaction, negative attitudes and attributes about child's behaviour
- inaccurate knowledge and expectations about child development.

***Social / Environmental Risk Factors:***

- low socioeconomic status
- stressful life events
- lack of access to medical care, health insurance, adequate child care, and social services
- parental unemployment; homelessness
- social isolation / lack of social support
- exposure to racism / discrimination
- poor schools
- exposure to environmental toxins
- dangerous / violent neighbourhood
- community violence.

The following cross-sectional study aims to highlight associations between the rate of child abuse and neglect and other societal factors using Local Government Areas (LGAs) in NSW as the base geographic unit. The potential explanatory variables have been chosen using the above references as a guide. It should be noted that while we may find some strong associations, these associations do not necessarily imply causality.

This report looks at the relationship of child protection reporting rates with the ABS Index of Disadvantage and associations between child protection reporting rates and other key socio-demographic data series (both including and excluding LGAs with high Indigenous populations). The models formulated are compared and problems and issues requiring further investigation are discussed.

## 2. Relationship of child protection reporting rates with the ABS Index of Disadvantage

### KEY FINDINGS

- There is a strong association between high Index values (indicating lower levels of disadvantage) and low reporting rates.
- The association between low Index values (indicating higher levels of disadvantage) and rates of reporting is less clear. However, low Index values appear to be associated with higher rates of reporting with some exceptions.
- The patterns are similar when looking at those LGAs with relatively low proportions (<5%) of Indigenous people and those LGAs with relatively high proportions (>5% and >10%) of Indigenous people.

### 2.1 Child Protection Reports

During one year a child or young person can be reported to DoCS once or many times. The number of children and young people reported is probably a more accurate portrayal of the dimension of reporting in an area, rather than total number of reports. This analysis therefore looks at the number of children and young people reported during 2004/05 expressed as a rate per 1,000 population aged 0-17 years (using Census 2001 figures).

Child protection reports list postcode as the geographic identifier. While postcode is a useful geographic level (as most postcodes are small geographic areas), the number of data series available at postcode level is limited. For this analysis postcode level data has been converted to a LGA using a postcode-to-LGA concordance based on ABS 2001 Census populations.

### 2.2 ABS Index of Disadvantage

The Index of Disadvantage was assembled for DoCS by the ABS using 2001 Population Census data. The Index is compiled by combining a set of social and economic indicators at small geographic levels with appropriate weightings to arrive at an overall index number. The Index of Disadvantage is constructed in a similar way to the ABS Socio-Economic Index for Areas (SEIFA).

The Index is constructed so that the relatively disadvantaged areas have low index values. Therefore, an area has a low index value if it contains a large proportion of comparatively disadvantaged families with dependent children aged 0-17 years. Higher index numbers indicate lower levels of disadvantage.

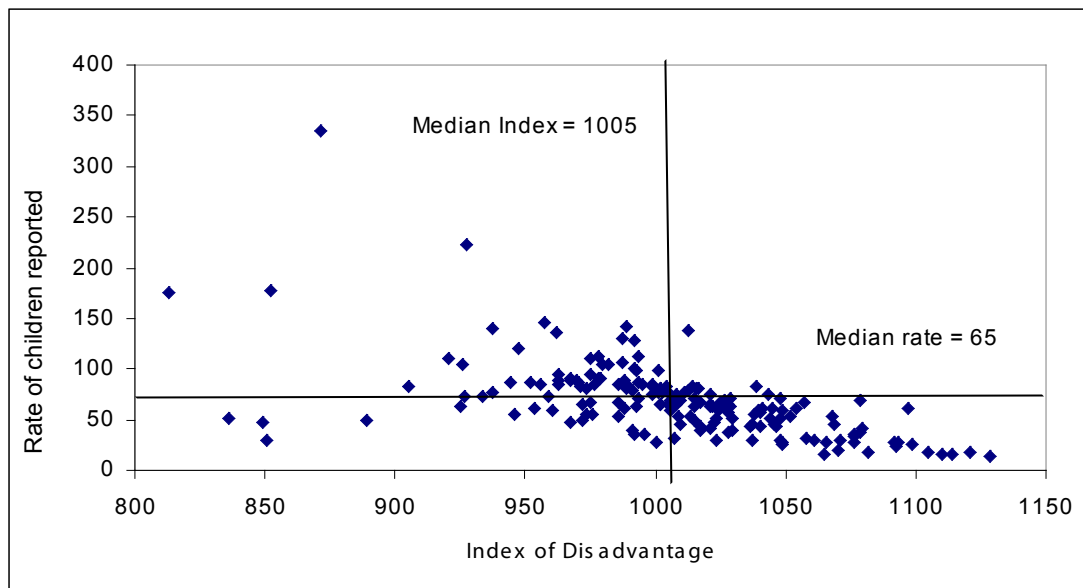
The indicators used in the Index include proportions of low income families, adults with low educational attainment, unemployment, single parent families, families with no motor vehicles and several other series. Indigenous status is not included as a variable in the Index. All indicators apply to households with 0-17 year old dependants.

The Index is produced in two series, "with ethnicity" and "without ethnicity". However, there is little difference between the two and the "with ethnicity" index has been used in this report. The Index is available at a number of geographic levels including postcode and LGA.

### 2.3 Relationship between rate of children reported and the Index at LGA level

Figure 1 shows the association between the Index and the rate of children reported. This is an inverse relationship, and the correlation (Pearson's  $r$ ) is a relatively strong -0.591. The median rate is 65 children reported per 1,000 children aged 0-17 years with a minimum of 14 and a maximum of 335. The median Index value is 1005.

**Figure 1: LGAs - Correlation of rate of children and young people reported with socioeconomic index: correlation  $r = -0.591$**



Dividing the scattergraph into four quadrants using the medians as midpoints gives four sub-populations:

- **High Index (1005+), Low Reporting rate (<65 - bottom right-hand, n=66).** This quadrant represents LGAs with high socio-economic status and low reporting rates. This result is expected. The majority of LGAs in this category are from the Western (22), Metro Central (21) and Southern (12) regions. The remainder are spread across the other DoCS regions of Hunter and Central Coast, Metro South West, Metro West and Northern. The 21 LGAs from Metro Central represent nearly three quarters of all LGAs in that region, while the 12 from Southern represent 60 per cent of all LGAs in that region.
- **Low Index (<1005), Low Reporting rate (<65 - bottom left-hand, n=21).** This quadrant represents LGAs with low socio-economic status and low reporting rates. This is an unexpected result, and is of particular interest as these areas appear to be resistant to a problem which is usually associated with low socio-economic status. Over half (12) of the LGAs in this category are from the Metro Central, Metro South West and Metro West regions. The remainder are spread across the other DoCS regions of Hunter and Central Coast, Northern, Southern and Western.

It is difficult to see any unifying feature within the LGAs in this quadrant, except that several of the urban LGAs have high proportions of overseas-born populations. It could be speculated that these areas have achieved a better result through social cohesion, lower willingness to report or other attributes not captured by the Index.

- **High Index (1005+), High Reporting rate (65+ - top right-hand, n=24).** This quadrant represents LGAs with high socio-economic status and high reporting rates. This is an unexpected result as it indicates that high socioeconomic status has not had a protective effect for these areas. Over half (13) of the LGAs in this category are from the Western region. The remainder are from the Hunter and Central Coast, Metro West, Northern and Southern regions.
- **Low Index (<1005), High Reporting rate (65+ - top left-hand, n=64).** This quadrant represents LGAs with low socio-economic status and high reporting rates. The majority of LGAs in this category are from the Western (25), Northern (25) and Hunter and Central Coast (7) regions. The remainder are spread across the other DoCS regions of Metro Central, Metro South West, Metro West and Southern. The 25 LGAs from the Northern region represent 69 per cent of all LGAs in that region while the 7 LGAs from Hunter and Central Coast region represent half of all LGAs in that region.

Overall there is a strong association between high Index values and low rates of reporting, but the association between low Index values and rates of reporting is less clear.

## 2.4 Relationship between child protection reporting rate and the Index adjusted for Indigenous status

While the Index of Disadvantage does not have an input parameter representing Indigenous status, it is clear from analysis (including work displayed later in this report) that there is a strong association between child reporting rates and the proportion of Indigenous people in an area.

One way to explore this effect is to separate the study areas into two groups – those with a high proportion of Indigenous people, and all other. Figure 2 shows the association between the Index and child reporting rates, for LGAs with comparatively low Indigenous populations (i.e. less than 5% as at the 2001 Census). In general terms, the pattern is similar to that in Figure 1 – high values of the Index are associated with low reporting rates, and low values of the Index are associated with high reporting rates with some exceptions. The correlation at  $-0.498$  is quite strong.

**Figure 2: LGAs with <5% Indigenous population: Correlation of rate of children and young people reported with socioeconomic index: correlation  $r = -0.498$**

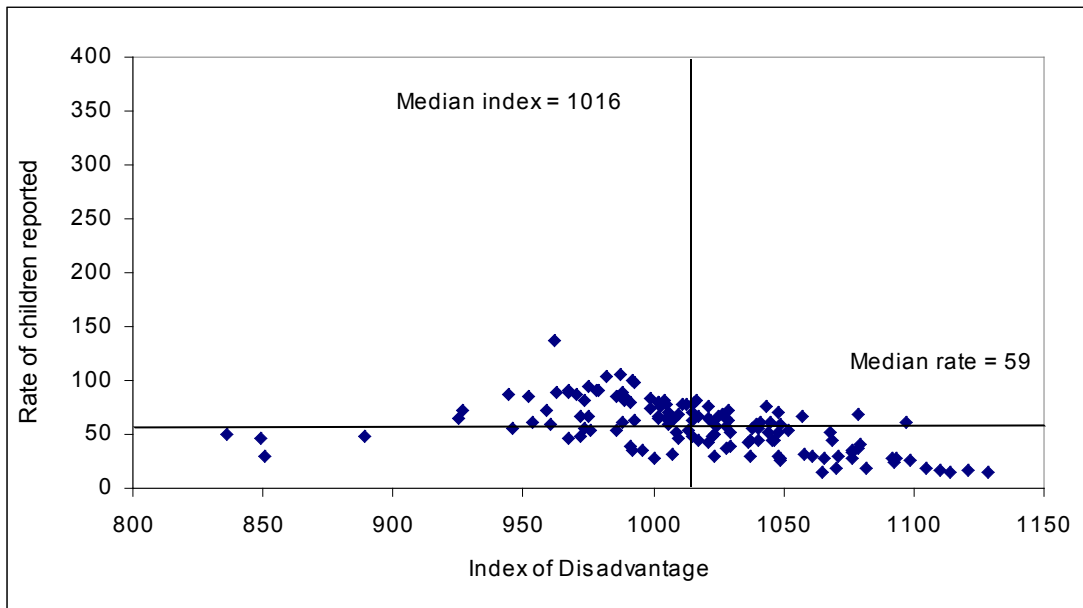


Figure 3 shows the association between the Index and child reporting rates, for LGAs with comparatively high Indigenous populations (i.e. more than 5% as at the 2001 Census). Again, in general terms, the pattern is similar to that in Figure 1 - high values of the Index are associated with low reporting rates, and low values of the Index are associated with high reporting rates with some exceptions. The correlation is a relatively strong  $-0.618$ .

**Figure 3: LGAs with >5% Indigenous population (n=41): Correlation of rate of children and young people reported with socioeconomic index: correlation  $r = -0.618$**

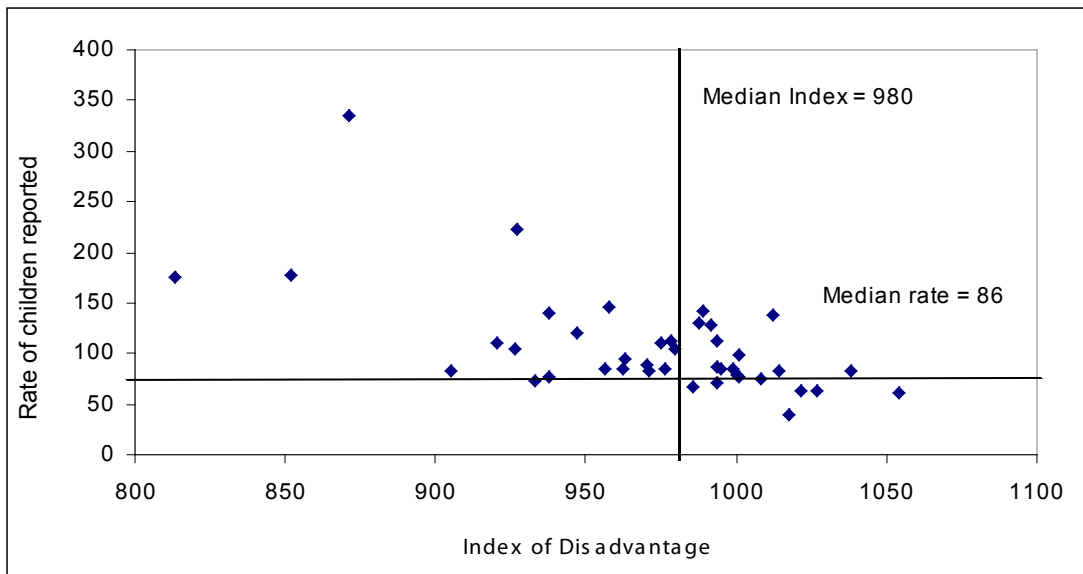
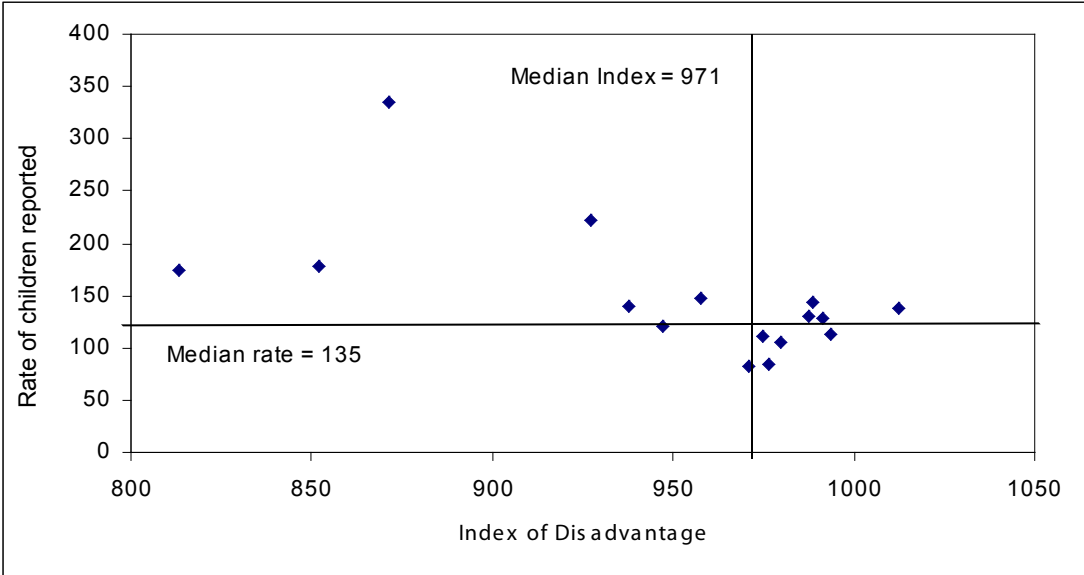


Figure 4 shows the association between the Index and child reporting rates, for LGAs with Indigenous populations higher than 10% as at the 2001 Census. The same pattern is still present and the correlation is still strong at -0.611.

**Figure 4: LGAs with >10% Indigenous population (n=16): Correlation of rate of children and young people reported with socioeconomic index: correlation r = -0.611**





### 3. Relationship of child protection reporting rates with other data series

#### KEY FINDINGS

- Child protection reporting rates in NSW geographic areas are significantly related to the rates of single parent families, unemployment / income support, educational attainment and Indigenous people. In a regression model these factors explain 85% of data variation.
- Excluding the Indigenous variable, child protection reporting rates are now significantly related to rates of single parent families, unemployment and educational attainment. This model explains less of the data variation (45.1%) than the first model stated above.

#### 3.1 Data series that may be associated with disadvantage

There may be a large number of societal influences that are associated with the incidence of children who are reported to DoCS for abuse or neglect. Some of these can be represented by statistical series that are available at postcode or LGA level.

This analysis has concentrated on data series that are readily available from the ABS NSW Regional Profile. These data are compiled at LGA level and include both ABS and non-ABS collections. The series selected as potential explanatory variables are:

- Percentage of persons aged 5 years or more who moved in the last 5 years (2001 Census),
- Percentage of one-parent families with dependent children (Census),
- Percentage of children aged 0-14 years who are in one-parent families (Census),
- Percentage of families with dependent children where no adult is employed (Census),
- Percentage of children aged 0-14 years who are in families where no parent is employed (Census),
- Average household size (Census),
- Average fertility rate (ABS Demography),
- Infant mortality rate (ABS Demography),
- Percentage of persons aged 15 years or more who achieved Year 11 or lower, or did not go to school (Census),
- Percentage of persons aged 15 years or more who achieved Year 9 or lower, or did not go to school (Census),
- Percentage of persons aged 15 years or more who did not go to school (Census),
- Percentage of persons aged 15 years or more with no post-school qualifications (Census),
- Percentage of families with family income up to \$599 per week (Census),
- Percentage of families with family income up to \$399 per week (Census),
- Finalised court appearances of juveniles (aged up to 17 years) per 1,000 population aged 0-17 years (NSW Court Statistics),
- Average vehicles per household (Census),
- Public housing tenant households as a percentage of all households (NSW Housing/Census),
- Public housing stock as a percentage of all households (NSW Housing/Census),
- Number of Centrelink income support customers (excluding age pensioners) as a percentage of all adults (age 18 years or more) (Centrelink/Census),
- Percentage of population that is Indigenous (Census).

#### 3.2 Internal correlations between explanatory variables

Since all of these variables have been selected as possibly being associated with social and economic disadvantage, it would be expected that there would be correlations between them. Table A1 in Appendix A shows correlations between these series that are greater than 0.5 (there were no negative correlations). Highly correlated variables

can affect the process of multivariate analysis in an adverse way. The pairs of variables that are highly correlated (i.e. >0.75) are carefully monitored in the following multivariate analysis to ensure that they do not lead to spurious results.

### 3.3 Strength of association between response (dependent) variable and potential explanatory (independent) variables

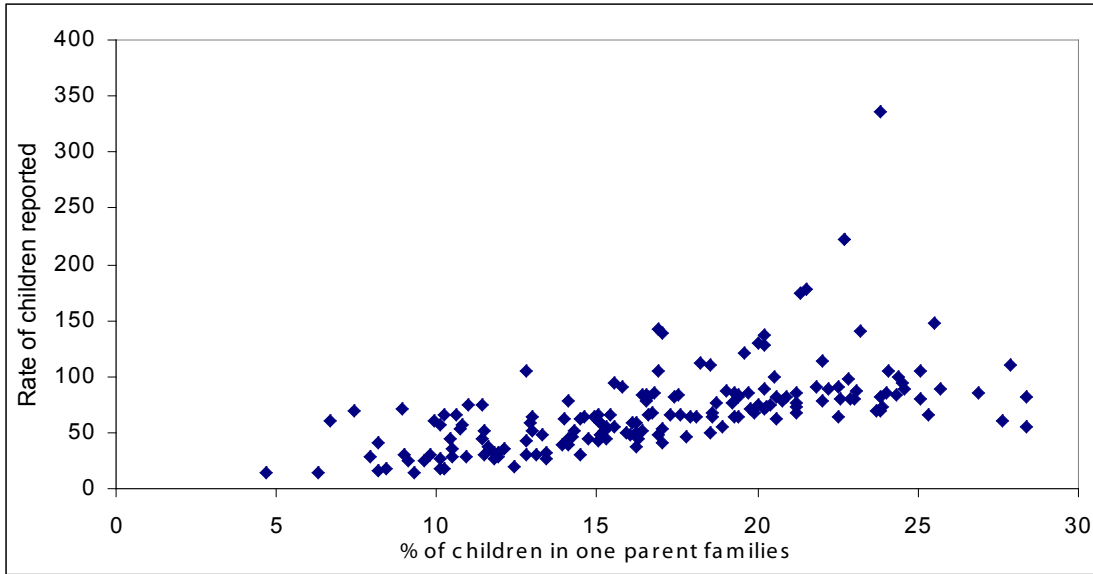
Initially it is useful to measure the strength of the association between each potential explanatory variable and the study variable. Table 1 shows correlation values between all of the selected data series and the rates of children and young people reported. The scattergraphs in Figures 5 to 10 below show the correlations between the rates of children and young people reported and some of the selected data series (scattergraphs for the remaining variables are found in Appendix A).

Variables with non-significant correlations ( $p\text{-value} > 0.05$ ) have been excluded from further analysis. Where two variables essentially measure the same parameter (e.g. percentage of families with family income up to \$599 per week and percentage of families with family income up to \$399 per week) the variable with the lower correlation has been dropped from further analysis.

**Table 1: Correlations between study variable (rate of reporting to DoCS) and potential explanatory variables**

Variable name	Description	Correlation with NOTRATE	Correlation p-value
NOTRATE	Children and young people reported in 2004/05 per 1,000 population aged 0-17	STUDY VARIABLE	-
MIGRATE	% persons aged 5+ who moved in last 5 years	-0.174	0.022
OPFDC	% one-parent families with dependent children	0.523	<0.001
COPF	% of children aged 0-14 who are in one-parent families	0.576	<0.001
OPFNOEMP	% of families with dependent children where no adult is employed	0.586	<0.001
COPFNOEMP	% of children aged 0-14 who are in families where no parent is employed	0.603	<0.001
HLDSIZE	Average household size	-0.001	0.991
FERTRATE	Average fertility rate	0.450	<0.001
INFMORT	Infant mortality rate	0.263	<0.001
Y11DNG	% of persons aged 15+ who achieved Year 11 or lower, or did not go to school	0.477	<0.001
Y09DNG	% of persons aged 15+ who achieved Year 9 or lower, or did not go to school	0.535	<0.001
DNGTS	% of persons aged 15+ who did not go to school	-0.045	0.560
NOQUALS	% aged 15+ with no post-school qualifications	0.507	<0.001
LOWINC1	% of families with family income up to \$599 per week	0.488	<0.001
LOWINC2	% of families with family income up to \$399 per week	0.534	<0.001
FCAJ	Finalised court appearances of juveniles (aged up to 17) per 1,000 aged 0-17	0.651	<0.001
VEHLD	Average vehicles per household	-0.014	0.854
PHTENANTS	Public housing tenant households as a % of all households	0.097	0.203
PHSTOCK	Public housing stock as a % of all households	0.101	0.185
PENSIONS	Number of Centrelink income support customers (excluding those receiving the age pension) as a % of all adults (age 18+)	0.587	<0.001
ATSI	% of population that is Indigenous	0.860	<0.001

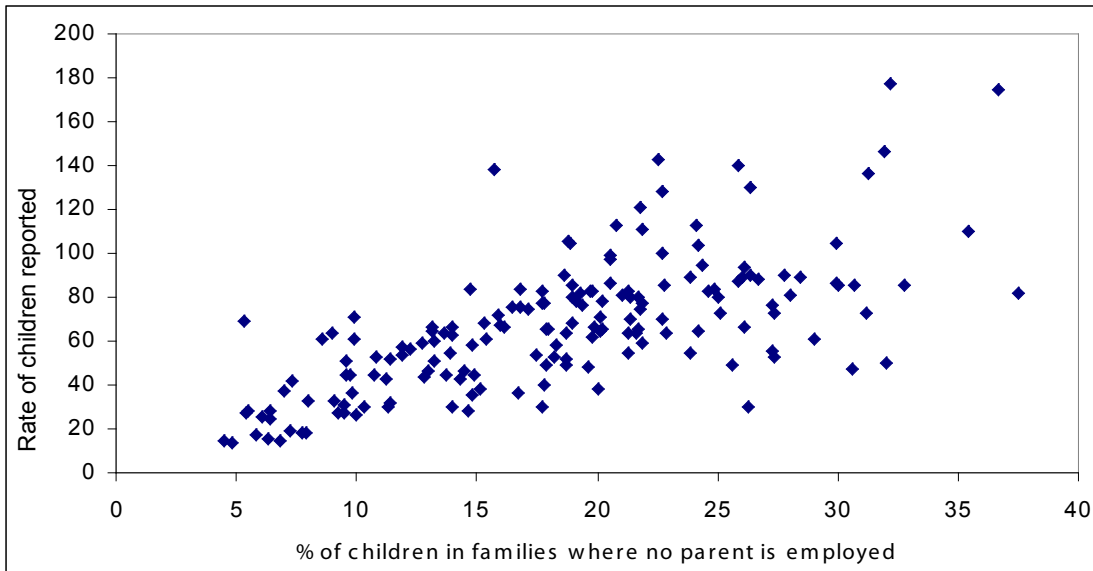
**Figure 5: Correlation of child protection reporting rate with the percentage of children aged 0-14 years in one-parent families ( $r=0.576$ )**



Note: Age interval of 0-17 not available in this and subsequent data series

There is a strong positive association between child protection reporting rates and proportions of children living in one-parent families ( $r=0.576$ ).

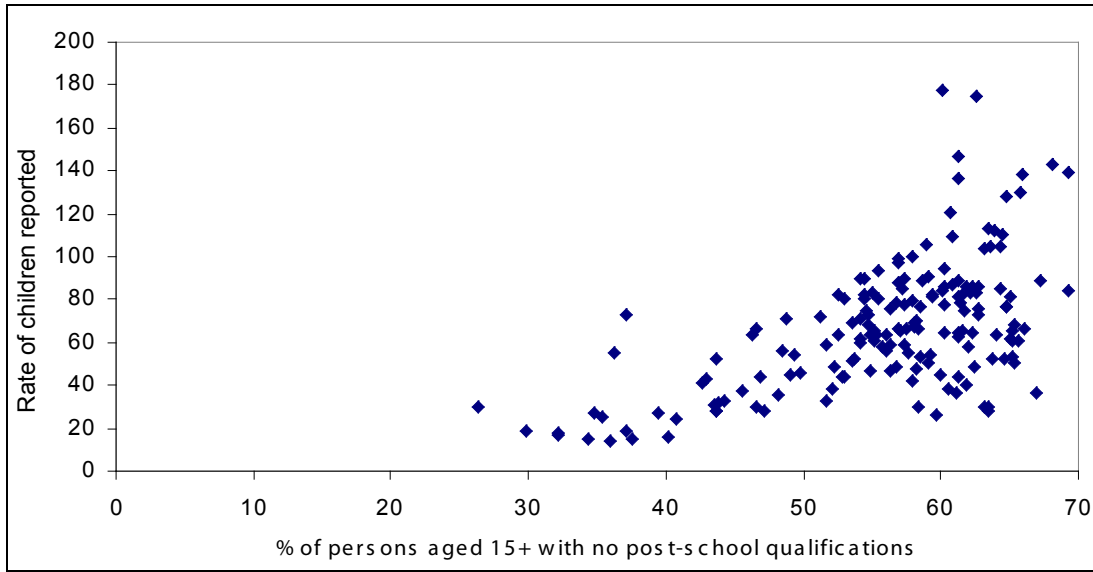
**Figure 6: Correlation of child protection reporting rate with the percentage of children aged 0-14 years in families where no parent is employed ( $r=0.603$ )**



Note: Excludes two high outliers.

There is also a strong positive association between child protection reporting rates and proportions of children living in families where no parent is employed ( $r=0.603$ ).

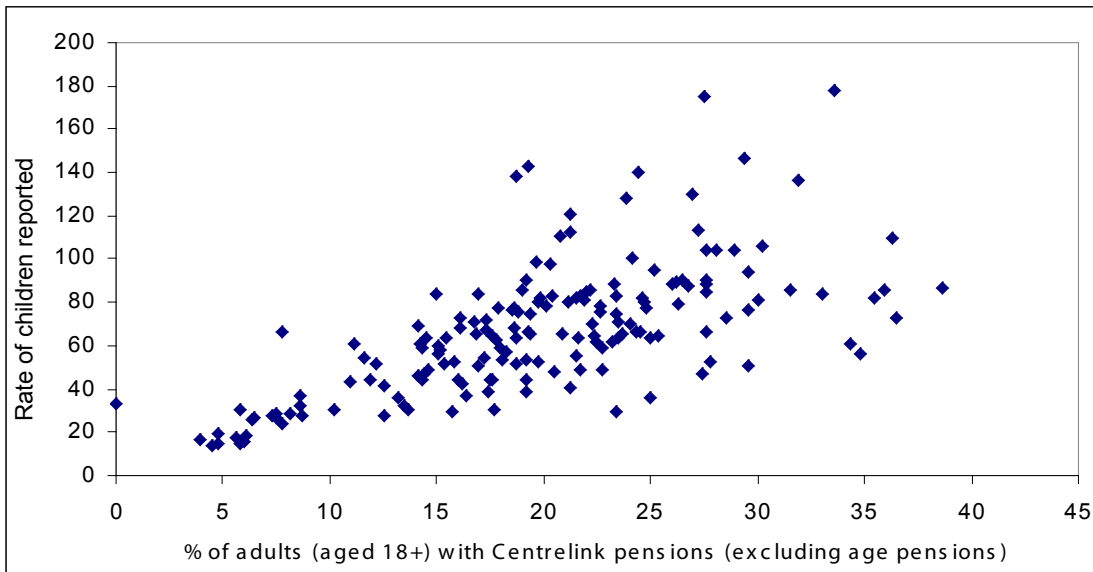
**Figure 7: Correlation of child protection reporting rate with the percentage of persons aged 15+ with no post-school qualifications ( $r=0.507$ )**



Note: Excludes two high outliers.

Similarly, there is a strong positive association between child protection reporting rates and low qualification attainment ( $r=0.507$ ).

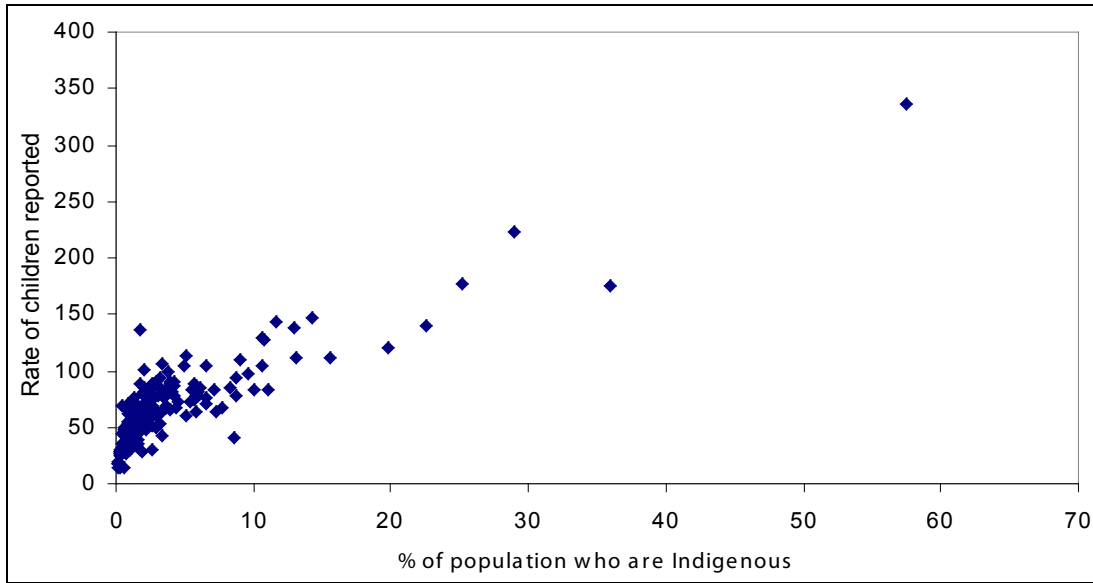
**Figure 8: Correlation of child protection reporting rate with the percentage of adults (18+) receiving Centrelink income support (not including those receiving the age pension) ( $r=0.587$ )**



Note: Excludes two high outliers.

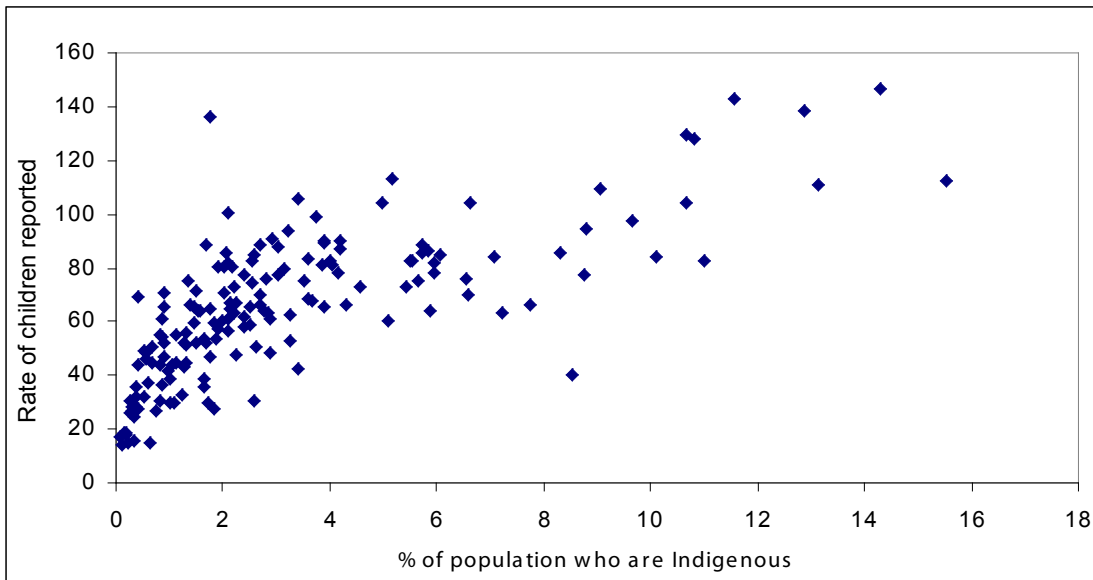
There is a strong positive association between child protection rates and the proportion of adults (aged 18+) with Centrelink pensions (excluding those receiving the age pension) ( $r=0.587$ ).

**Figure 9: Correlation of child protection reporting rate with the percentage of the population who are Indigenous (r=0.86)**



There is a very strong positive association between child protection reporting rates and the proportion of the population who are Indigenous – as can be seen above, a small number of LGAs have very high levels of both of these variables (r=0.86).

**Figure 10: Correlation of child protection reporting rate with the percentage of the population who are Indigenous (highest observations removed)**



Note: Excludes six high outliers.

This pattern displayed in Figure 9 can be seen more clearly if high outliers are removed.

### 3.4 Evaluating data variance

An important step in this investigation is to evaluate the distribution of the variables. Distributions should be normal or near-normal to satisfy the assumptions of regression models. The following evaluations were carried out:

- The normality of the distributions of the dependent and independent variables were evaluated. The independent variable (reporting rate) was slightly non-normal. All but one of the independent variables were very close to normal. The variable for percentage of Indigenous people appeared to be non-normal.
- In most series, a few LGAs departed from the main patterns. Points such as these are sometimes omitted from further analysis as they may become points of undue influence. However, in this case these LGAs were kept in the data as there was no clear reason to remove them.

### 3.5 Univariate linear regressions

Using linear regression, we can see (from Table 2) that each variable was significantly associated with the reporting rate in a univariate situation – as would be expected from the high correlation values. The relationship between child protection reporting rates and finalised court appearances of juveniles is 'contrived' as children appearing in juvenile court would have been mandatorily notified to DoCS. Therefore, this variable has been excluded from further analysis.

**Table 2: Results of univariate linear regressions of rate of reporting versus potential explanatory variables**

Variable name	Description	Coefficient	R - squared	p - value
NOTRATE	Children and young people reported in 2004/05 per 1,000 population aged 0-17	DEPENDENT	-	-
COPF	% of children aged 0-14 who are in one-parent families	4.263	33%	<0.001
COPFNOEMP	% of children aged 0-14 who are in families where no parent is employed	3.107	36%	<0.001
FERTRATE	Average fertility rate	47.855	20%	<0.001
INFMORT	Infant mortality rate	2.024	7%	<0.001
Y09DNG	% of persons aged 15+ who achieved Year 9 or lower, or did not go to school	3.027	29%	<0.001
NOQUALS	% aged 15+ with no post-school qualifications	2.226	26%	<0.001
LOWINC2	% of families with family income up to \$399 per week	3.933	29%	<0.001
FCAJ	Finalised court appearances of juveniles (aged up to 17) per 1,000 aged 0-17	3.280	42%	<0.001
PENSIONS	Number of Centrelink income support customers (excluding those receiving the age pension) as a % of all adults (age 18+)	2.946	34%	<0.001
ATSI	% of population who are Indigenous	5.056	74%	<0.001

### 3.6 Multivariate linear regression

Multivariate linear regression can be used to test the effect of a number of explanatory variables and arrive at a model which incorporates only those that have an independently significant effect on the dependent variable.

A multivariate linear regression was carried out using those variables found to be significant in the univariate analysis. All of the independent variables listed in Table 2 were included, then progressively removed by a process of backward elimination. Table 3 shows the final model.

**Table 3: Final multivariate linear regression model – variables that are independently associated with child reporting rates in NSW LGAs**

VARIABLE	Variable	Coefficient	p-value
-	Constant	-5.769	-
ATSI	% of population who are Indigenous	4.197	<0.001
COPF	% of children aged 0-14 in one-parent families	1.303	<0.001
NOQUALS	% aged 15+ with no post-school qualifications	0.347	0.044
PENSIONS	% aged 18+ with Centrelink income support	0.811	0.003

R-squared = 85.0%

The R-squared value, which measures how much of the variation in the data is explained by the regression, is a very high 85.0%. That is, 85% of the total variation between LGAs in the rate of children reported to DoCS is explained by the four variables – only 15% of the geographical variation in reporting rate remains unexplained. The final model has a comparatively high R-squared value and all independent variables are highly significant. Diagnostic tests indicate that the required assumptions of normality have been met.

While several alternative models were run, including log transformation of reporting rate, log transformation of the Indigenous variable and omission of outlying data points, none were superior to this one. The final regression model can be expressed as an equation, as follows:

Estimated Reporting Rate =  $-5.769 + (\%Indigenous) \times 4.197 + (\%children\ in\ one\ parent\ families) \times 1.303 + (\%with\ no\ qualifications) \times 0.347 + (\%income\ support) \times 0.811$

The coefficients indicate the magnitude of the effect of each variable. For example, each percentage point increase in the proportion of children aged 0-14 in one-parent families predicts an increase of 1.303 in the child reporting rate (children reported per 1,000 population aged 0-17 years).

The final model indicates that child protection reporting rates are independently associated with high proportions of Indigenous people, single parent families, adults with low educational attainment and adults receiving income support. Note that this model measures association but does not imply causality.

Since the Indigenous variable exerts such a powerful effect, it is instructive to consider the same model with this variable removed. Table 4 shows that when the Indigenous variable is omitted, the explanatory power drops to 43.7% and the "Centrelink Pensions" variable loses statistical significance. Single parent families become the most influential variable in explaining the variation in child protection reporting rates between LGAs.

**Table 4: Variables that are independently associated with child reporting rates in NSW LGAs - effect of omitting Indigenous variable on independent variables in final model**

Variable	With Indigenous variable		Without Indigenous variable	
	Coefficient	p-value	Coefficient	p-value
% Indigenous	4.197	<0.001	-	-
% children in 1-parent families	1.303	<0.001	2.690	<0.001
% aged 15+ with no qualifications	0.347	0.003	1.262	<0.001
% Centrelink pensions	0.811	0.044	0.699	0.2
	R-squared = 85.0%		R-squared = 43.7%	

As an alternative, rather than simply removing the Indigenous variable from the final model, the whole model was re-run excluding the Indigenous variable from the outset. Similarly, a method of backward selection was used to select the final set of factors individually associated with the rate of children reported to DOCS by LGA, in the presence of other variables.

Table 5 shows the best alternative model for this data that does not include the Indigenous variable. This model indicates that child protection reporting rates are independently associated with high proportions of single parent families, families where both parents are unemployed and adults with low educational attainment. The explanatory power of this model is 45.1%.

**Table 5: Variables that are independently associated with child reporting rates in NSW LGAs - best alternative multivariate linear regression model without Indigenous variable**

VARNAME	Variable	Coefficient	p-value
-	Constant	-58.200	-
COPF	% of children aged 0-14 in one-parent families	2.037	0.004
COPFNOEMP	% children in families where no parent employed	1.261	0.02
NOQUALS	% aged 15+ with no post-school qualifications	1.249	<0.001

R-squared = 45.1%

Therefore, regardless of the modelling method chosen, the results in this section show that child protection reporting rates are significantly associated with single parent families, adults with low educational attainment, and low income levels (represented by levels of either income support or unemployment).



## 4. Relationship of child protection reporting rates with other data series – excluding LGAs with high Indigenous populations

### KEY FINDINGS

- For areas with relatively low (<5%) proportions of Indigenous people, child protection reporting rates are independently associated with high proportions of single parent families, families where both parents are unemployed, and adults with low educational attainment.
- For areas with relatively high (>5%) proportions of Indigenous people, child protection reporting rates are independently associated with high proportions of families where both parents are unemployed.

### 4.1 Alternative geographic basis

It can be seen from the previous analysis that Indigenous status has a strong effect on the measurements of disadvantage. This section presents analysis focusing on the child protection reports in areas with relatively low concentrations of Indigenous people.

The 41 LGAs that have higher than 5% Indigenous population have been excluded from the analysis (leaving 132 for analysis). The excluded LGAs are shown in Appendix B.

### 4.2 Internal correlations between explanatory variables

As before, since all of the potential explanatory variables have been selected as possibly being associated with social disadvantage, it would be expected that there would be correlations between them.

Table C1 in Appendix C shows higher order correlations between these series (i.e. absolute value >0.5 - greater than +0.5 or less than -0.5).

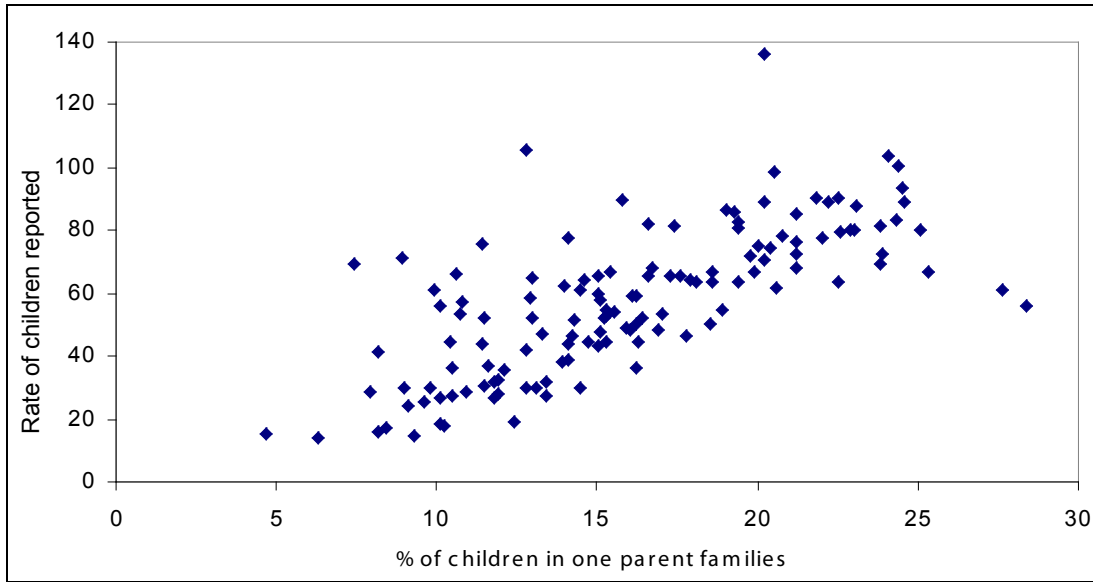
In this case there are actually many more high-order (absolute value >0.5) correlations between these series than in the original dataset (45 compared to 16). This indicates that the inter-relationships between the various indicators of disadvantage “line up” with each other more strongly in the set of LGAs that do not include those with high Indigenous populations. Table C2 in Appendix C shows the most highly correlated variables.

### 4.3 Strength of association between response variable and potential explanatory variables

Table C3 in Appendix C shows the association between each potential explanatory variable and the study variable (rates of children reported). The scattergraphs in Figures 11 to 15 below show the correlations between the rates of children and young people reported and some of the selected data series (scattergraphs for the remaining variables are shown in Appendix C).

As before, the variables with non-significant correlations ( $p$ -value>0.05) have been excluded from further analysis. Where two variables essentially measure the same parameter, the variable with the lower correlation has been dropped from further analysis.

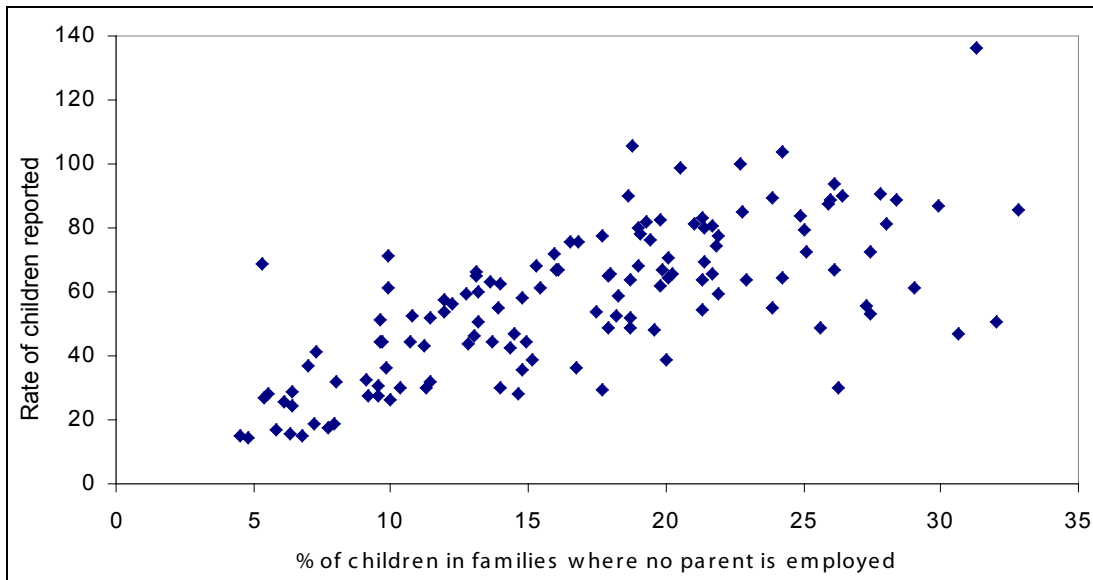
**Figure 11: Correlation of child protection reporting rate with the percentage of children aged 0-14 years in one-parent families ( $r=0.71$ , excluding areas with high Indigenous population)**



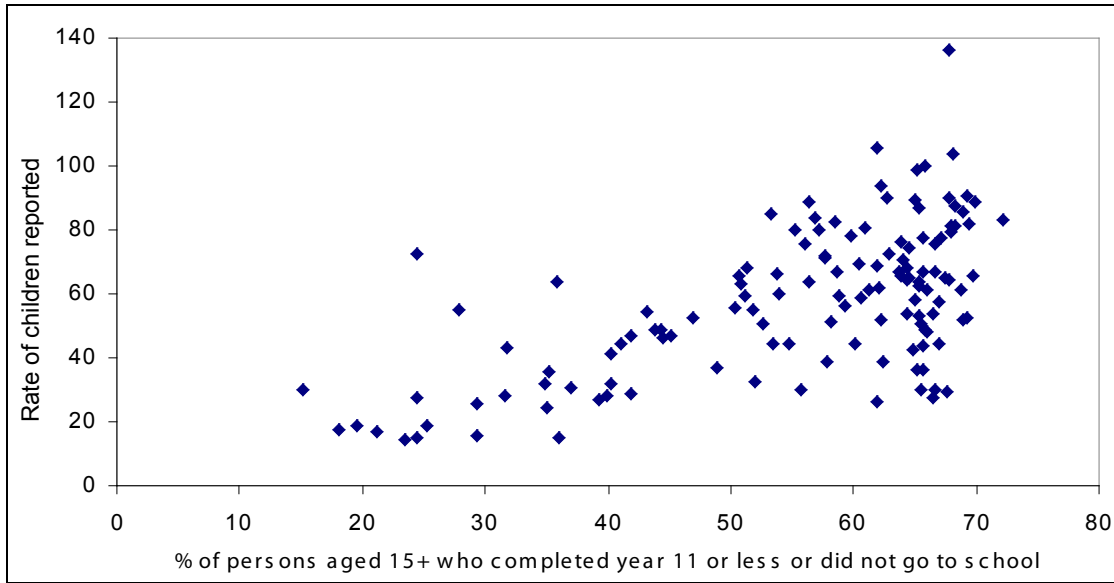
Note: Age interval of 0-17 not available in this data series

There is a strong positive association between child protection reporting rates and proportions of children living in one-parent families ( $r=0.71$ ). There is also a strong positive association between child protection reporting rates and proportions of children living in families where no parent is employed ( $r=0.67$ ).

**Figure 12: Correlation of child protection reporting rate with the percentage of children aged 0-14 years in families where no parent is employed ( $r=0.67$ , excluding areas with high Indigenous population)**

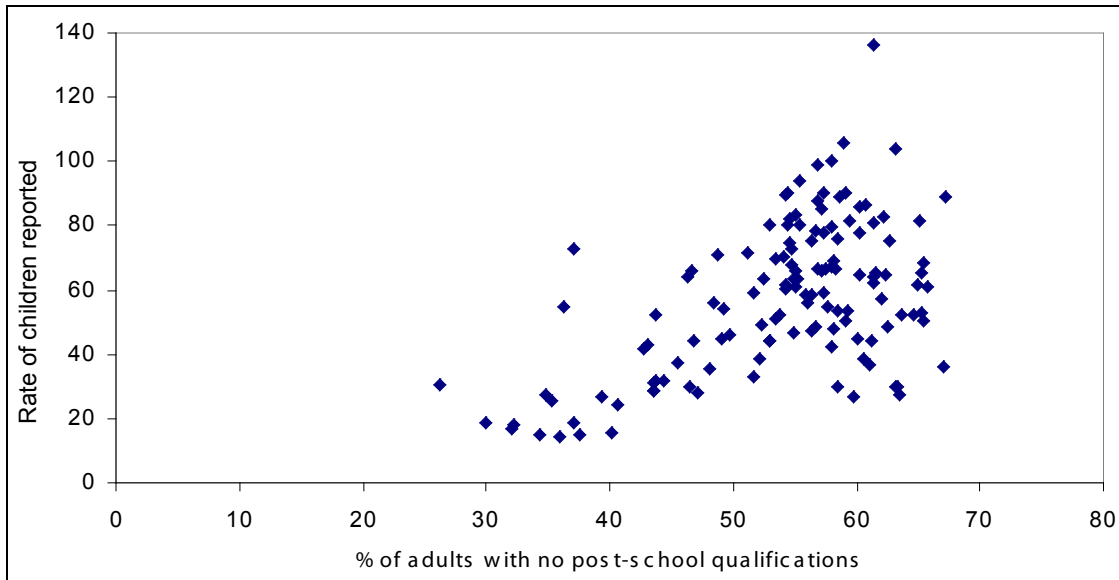


**Figure 13: Correlation of child protection reporting rate with the percentage of adults who completed school to Year 11 or under, or did not go to school ( $r=0.608$ , excluding areas with high Indigenous population)**



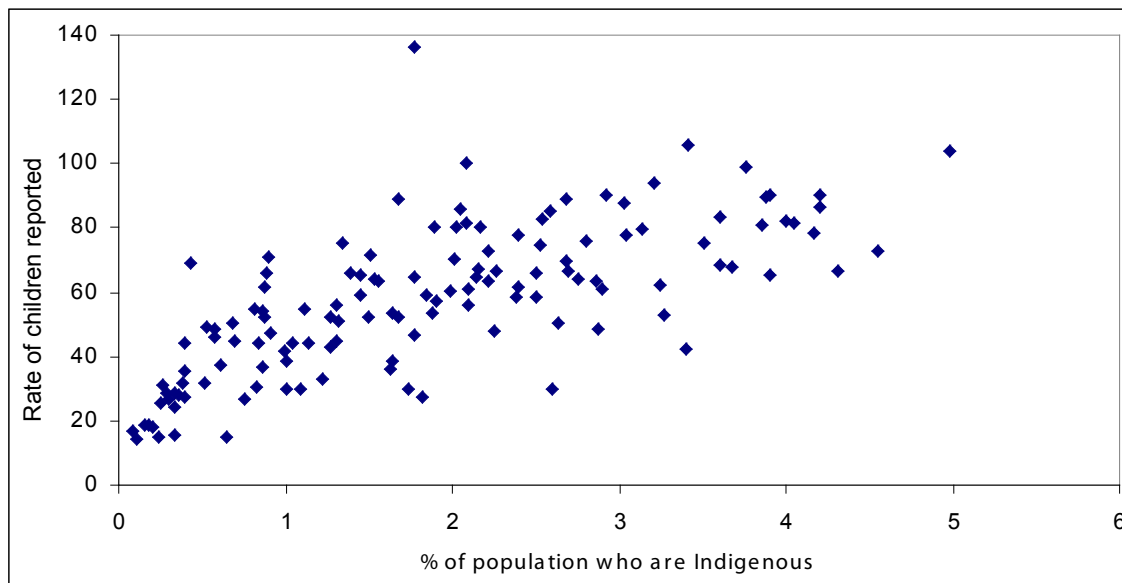
There is a strong positive association between child protection reporting rates and low educational attainment ( $r=0.608$ ).

**Figure 14: Correlation of child protection reporting rate with the percentage of adults with no post-school qualifications ( $r=0.541$ , excluding areas with high Indigenous population)**



There is also a strong positive association between child protection reporting rates and low qualification attainment ( $r=0.541$ ).

**Figure 15: Correlation of child protection reporting rate with the percentage of population who are Indigenous (r=0.712, excluding areas with high Indigenous population)**



Although we have removed the LGAs with high proportions of Indigenous population, there is still a strong positive correlation between child protection reporting rates and percentage of Indigenous population in the remaining LGAs ( $r=0.712$ ).

#### 4.4 Univariate linear regressions

Again, using linear regression we can see (from Table 7) that each variable was significantly associated with the child protection reporting rate in a univariate situation – as would be expected from the high correlation values in Table C3.

**Table 7: Results of univariate linear regressions – rate of reporting versus potential explanatory variables (excluding areas with high Indigenous population)**

Variable name	Description	Coefficient	R - squared	p - value
CNOTRATE	Children and young people reported in 2004/05 per 1,000 population aged 0-17	DEPENDENT	-	-
COPF	% of children in one-parent families	3.261	50%	<0.001
COPFNOEM	% of children aged 0-14 who are in families where no parent is employed	2.304	49%	<0.001
FERTRATE	Average fertility rate	24.63	14%	<0.001
INFMORT	Infant mortality rate	1.038	5%	0.01
Y11DNG	% who achieved Year 11 or lower, or did not go to school	0.994	37%	<0.001
NOQUALS	% aged 15+ with no post-school qualifications	1.415	29%	<0.001
LOWINC2	% with family income up to \$399 per week	2.827	40%	<0.001
PHTENANT	Public housing tenant households %	1.824	7%	0.002
PHSTOCK	Public housing as % of all households	1.733	7%	0.002
PENSIONS	Income support customers (excluding those receiving the age pension)	2.276	55%	<0.001
ATSI	% Indigenous	13.655	51%	<0.001

#### 4.5 Multivariate linear regression – areas of low Indigenous population

As previously, a multivariate linear regression was carried out using the explanatory variables that were found to be significant in the univariate analysis. The final model is shown in Table 8.

**Table 8: Final multivariate regression model (n=132 LGAs with low proportions of Indigenous population)**

VARNAME	Variable	Coefficient	p-value
-	Constant	-15.247	-
COPF	% of children aged 0-14 who are in one-parent families	1.651	<0.001
COPFNOEM	% of children aged 0-14 who are in families where no parent is employed	0.911	0.001
Y11DNG	% of persons aged 15+ who achieved Year 11 or lower, or did not go to school	0.562	<0.001

R-squared = 65.7%

The R-squared value (measuring how much of the variation in the data is explained by the regression) is a high 65.7%. The final model indicates that child protection reporting rates in areas of comparatively low Indigenous populations are independently associated with high proportions of single parent families, families where both parents are unemployed and adults with low educational attainment.

Although we have changed the geographical basis of this analysis, the variable for proportion of Indigenous people is still strongly associated with child protection reporting rates. If the Indigenous variable is added to the above model, it is independently significant ( $p < 0.001$ ) and increases the R-squared value to 69.2%.

#### 4.6 Multivariate linear regression – areas of high Indigenous population

We can also study the 41 areas of high Indigenous population that we omitted in the previous section. Table 9 shows the best model for those areas of high Indigenous populations. Apart from the Indigenous variable, only the single-parent family variable is included in the final model, but the R-squared is a very high 86.2%.

**Table 9: Final multivariate regression model (n=41 LGAs with high proportions of Indigenous population)**

VARNAME	Variable	Coefficient	p-value
-	Constant	23.425	-
ATSI	% Indigenous	4.549	<0.001
COPF	% children in 1-parent families	1.528	0.030

R-squared = 86.2%

Table 10 shows the best model omitting the Indigenous variable – but as can be seen, the fit of this model is poor (R-squared = 17.9%). The second listed explanatory variable (low qualification attainment) has been retained in the model for illustration although it is not statistically significant.

**Table 10: Best multivariate regression model with Indigenous variable omitted (n=41 LGAs with high proportions of Indigenous population)**

VARNAME	Variable	Coefficient	p-value
-	Constant	-164.8	-
COPFNOEMP	% children in families where no parent employed	2.952	0.01
NOQUALS	% aged 15+ with no post-school qualifications	3.248	0.16*

R-squared = 17.9%

\*Trend only i.e. a weak effect which is  $>0.05$  but  $<0.2$

## 5. Comparison of models

Table 11 summarises and compares the four different models presented in this paper:

- The 'core' model which includes all LGAs in NSW and the Indigenous variable,
- A model which includes all LGAs but excludes the Indigenous variable,
- A model including only those LGAs with high Indigenous populations and the Indigenous variable, and
- A model including only those LGAs with low Indigenous populations and excluding the Indigenous variable.

**Table 11: Comparison of models on different geographic and population bases**

Variable	All areas With Indigenous variable		All areas Without Indigenous variable	
	Coefficient	p-value	Coefficient	p-value
Constant	-5.769	-	-60.480	
% Indigenous	4.197	<0.001	-	-
% children in 1-parent families	1.303	<0.001	2.690	<0.001
% aged 15+ with no qualifications	0.347	0.003	1.262	<0.001
% Centrelink pensions	0.811	0.044	0.699	0.2 (NS)
N	173		173	
R-squared	85.0%		43.7%	

Variable	Areas of high Indigenous population		Areas of low Indigenous population	
	With Indigenous variable Coefficient	Without Indigenous variable p-value	Without Indigenous variable Coefficient	Without Indigenous variable p-value
Constant	-63.824	-	-17.511	-
% Indigenous	4.447	<0.001	-	-
% children in 1-parent families	1.307	0.2 (NS)	1.850	<0.001
% aged 15+ with no qualifications	1.291	0.2 (NS)	0.497	0.008
% Centrelink pensions	0.502	0.5 (NS)	1.017	0.001
N	41		132	
R-squared	87.0%		63.7%	

NS = Not significant

As can be seen, the variables representing single-parent families, low qualification levels and high dependence on government pensions have a significant positive effect in most of these scenarios.

## 6. Further development of this analysis

Although the final models display good explanatory power, and all of the independent variables are highly significant, there are a number of data issues that should be noted for further investigation:

- The data series used as explanatory variables are approximations in most cases. The age groups used in most cases are 0-14 years rather than 0-17 years.
- The geographic unit of analysis is not perfect. LGAs are of irregular size – varying from under 2,000 to over 200,000 in population. Since 2001 there have been many LGA boundary changes in NSW, making it difficult to retain comparable data.
- The effect of Indigenous status merits further investigation.
- There may be other data series that are strongly associated with child reporting rates and these should be investigated (e.g. hospitalisation due to alcohol or smoking related causes, rates of domestic violence related assault).

## 7. References

1. Watson J. *Literature Review: Child Neglect*. Centre for Parenting & Research, NSW Department of Community Services, May 2005. Available at [www.community.nsw.gov.au](http://www.community.nsw.gov.au)
2. Salmelainen P. Child Neglect: Its Causes and its Role in Delinquency. Bulletin Number 33, *Contemporary Issues in Crime and Justice, Crime and Justice Bulletin*, NSW Bureau of Crime Statistics and Research, December 1996.
3. Goldman et al. *Risk and Protective Factors for Child Abuse and Neglect*. Bulletin from the US Department of Health and Human Services (2003). Available at [www.childwelfare.gov](http://www.childwelfare.gov).
4. *Index of Disadvantage: Explanatory Notes*. ABS 2004.



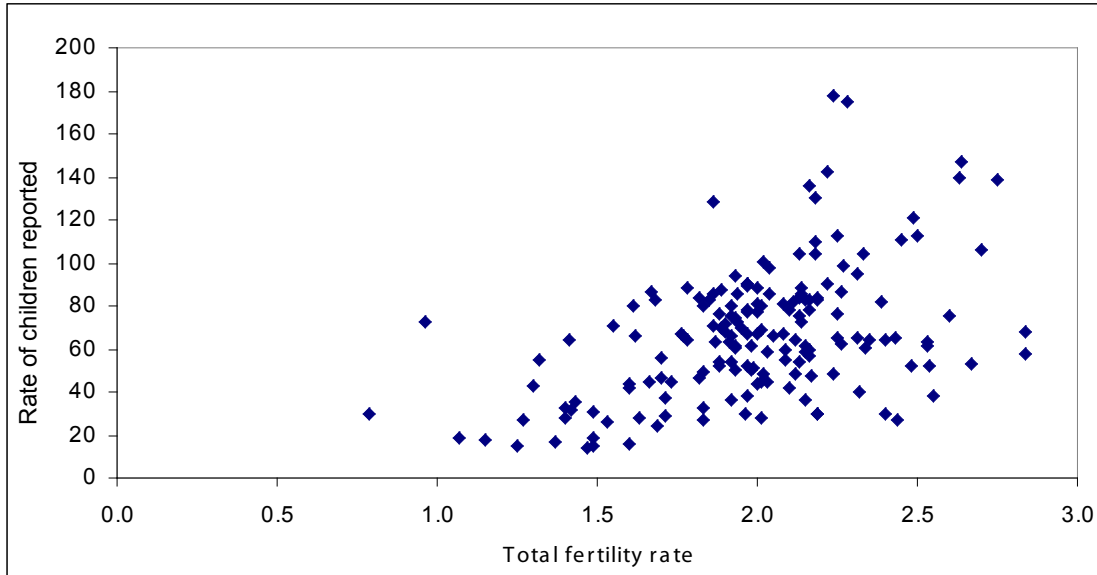
## APPENDIX A

**Table A1: Correlations between potential explanatory variables that are greater than 0.5**

Variable	Correlated with:	Correlation (r)
% of children aged 0-14 in families where no parent employed	% children aged 0-14 in one-parent families	0.795
% of persons aged 15+ Year 9 or lower	% of children aged 0-14 in families where no parent employed	0.579
% of persons aged 15+ Year 9 or lower	Total fertility rate	0.741
% aged 15+ with no post-school qualifications	Total fertility rate	0.798
% aged 15+ with no post-school qualifications	% of persons aged 15+ Year 9 or lower	0.946
% family income up to \$399 per week	% children aged 0-14 in one-parent families	0.608
% family income up to \$399 per week	% of children aged 0-14 in families where no parent employed	0.809
% family income up to \$399 per week	Total fertility rate	0.521
% family income up to \$399 per week	% of persons aged 15+ Year 9 or lower	0.830
% family income up to \$399 per week	% aged 15+ with no post-school qualifications	0.724
Centrelink income support customers	% children aged 0-14 in one-parent families	0.755
Centrelink income support customers	% of children aged 0-14 in families where no parent employed	0.881
Centrelink income support customers	% of persons aged 15+ Year 9 or lower	0.674
Centrelink income support customers	% aged 15+ with no post-school qualifications	0.601
Centrelink income support customers	% family income up to \$399 per week	0.834
% of population who are Indigenous	Finalised court appearances of juveniles	0.661

**Scattergraphs (those not shown in Section 3.3) showing correlation patterns between child protection reporting rate and other socio-demographic variables.**

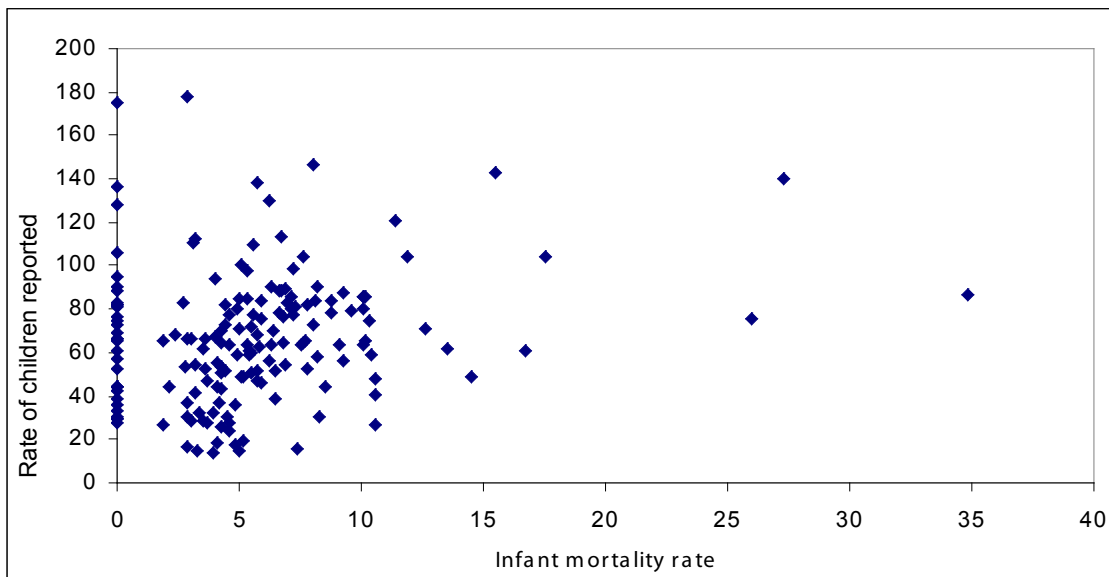
**Figure A1: Correlation of child protection reporting rate with fertility rate ( $r=0.45$ )**



Note: Excludes two high outliers.

There is a strong positive relationship between child protection reporting rates and fertility rates ( $r=0.45$ ). While there are many areas with high fertility rates and low reporting rates, there are no areas with low fertility and high reporting rates. This follows logically as areas with low fertility are likely to have fewer children.

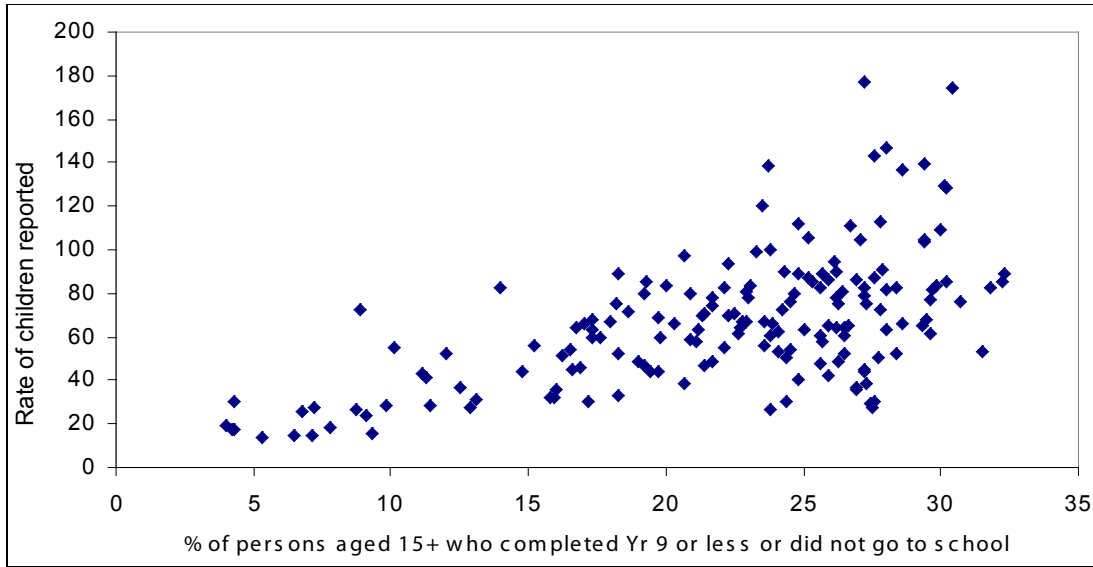
**Figure A2: Correlation of child protection reporting rate with infant mortality rate ( $r=0.263$ )**



Note: Excludes two high outliers.

There is a positive association between child protection reporting rates and the infant mortality rate. However, the pattern is far from clear as can be seen, and may be influenced by a small number of high outliers. Again this result follows logically as both are associated with the level of child population.

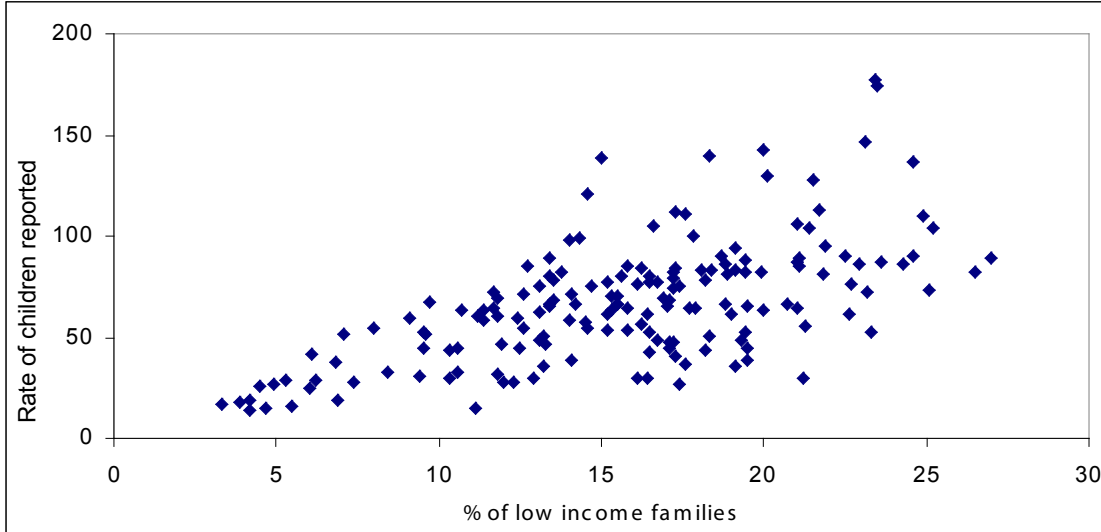
**Figure A3: Correlation of child protection reporting rate with the percentage of persons aged 15+ who completed school to Year 9 or less, or did not go to school ( $r=0.535$ )**



Note: Excludes two high outliers.

There is a strong positive association between child protection reporting rates and low educational attainment ( $r=0.535$ ).

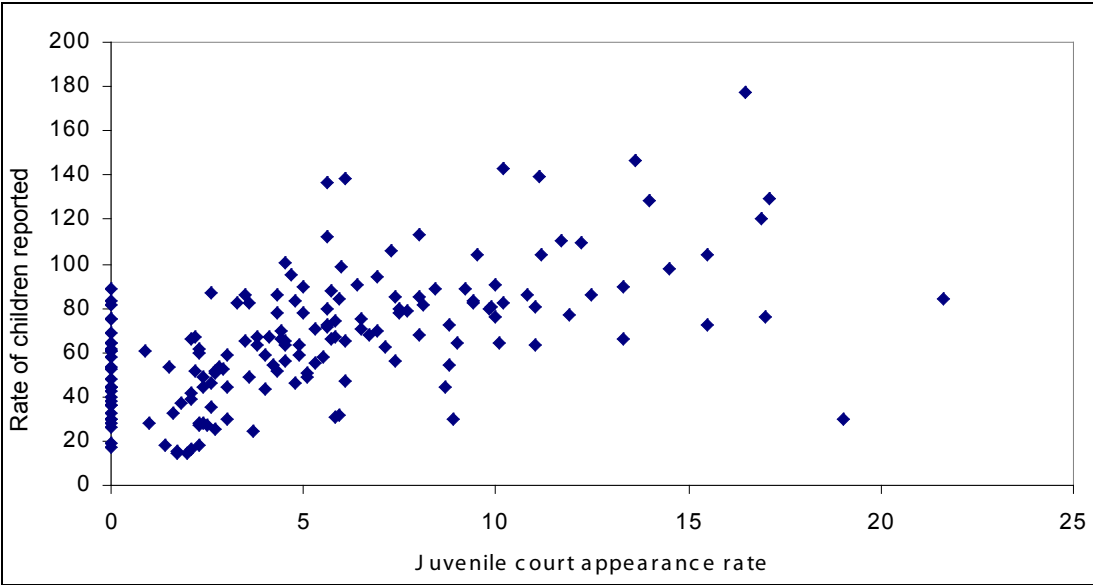
**Figure A4: Correlation of child protection reporting rate with the percentage of families with weekly income less than \$400 ( $r=0.534$ )**



Note: Excludes two high outliers.

There is a strong positive association between child protection reporting rates and low family income ( $r=0.534$ ).

**Figure A5: Correlation of child protection reporting rate with the rate of final court appearances by juveniles (r=0.651)**



Note: Excludes three high outliers.

There is a strong positive association between child protection reporting rates and juvenile court appearances (r=0.651). However, the relationship does not appear to be strictly linear. We could describe this relationship as “contrived” as children appearing in juvenile court would have been mandatorily notified to DoCS.

## APPENDIX B:

### LGAs with higher than 5% Indigenous population that have been excluded from the analysis in Section 4.

Armidale Dumaresq	Lachlan
Balranald	Manilla
Bogan	Moree Plains
Bourke	Murrumbidgee
Brewarrina	Nambucca
Broken Hill	Narrabri
Carrathool	Narrandera
Central Darling	Narromine
Cobar	Parkes
Coonabarabran	Quirindi
Coonamble	Richmond Valley
Cowra	Tamworth
Dubbo	Tenterfield
Forbes	Unincorporated Far West
Gilgandra	Uralla
Grafton	Walcha
Gunnedah	Walgett
Guyra	Warren
Inverell	Wellington
Kempsey	Wentworth.
Kyogle	

## APPENDIX C:

**Table C1 (part 1): Correlations (>0.5) between potential explanatory variables (in dataset excluding LGAs with high Indigenous population)**

Independent variable	Correlated with:	Correlation (r)
% persons aged 5+ moved in last 5 yrs	Average household size	-0.558
% persons aged 5+ moved in last 5 yrs	Infant mortality rate	-0.528
% persons aged 5+ moved in last 5 yrs	% of persons aged 15+ Year 11 or lower	-0.577
% persons aged 5+ moved in last 5 yrs	% of persons aged 15+ who did not go to school	-0.599
% persons aged 5+ moved in last 5 yrs	Finalised court appearances of juveniles	-0.619
% one-parent families with dependent children	% families, dependent children, no adult employed	0.656
% one-parent families with dependent children	% of children aged 0-14 in families where no parent employed	0.655
% one-parent families with dep children	Public housing tenant households	0.511
% one-parent families with dep children	Public housing stock	0.505
% one-parent families with dependent children	Centrelink income support customers	0.609
% children aged 0-14 in one-parent families	% of families with dependent children where no adult employed	0.751
% children aged 0-14 in one-parent families	% of children aged 0-14 in families where no parent employed	0.764
% children aged 0-14 in one-parent families	% family income up to \$599 per week	0.558
% children aged 0-14 in one-parent families	% family income up to \$399 per week	0.562
% children aged 0-14 in one-parent families	Centrelink income support customers	0.723
% families, dependent children, no adult employed	% of persons aged 15+ Year 9 or lower	0.527
% fams, dep children, no adult employed	% family income up to \$599 p.w.	0.74
% fams, dep children, no adult employed	% family income up to \$399 p.w.	0.78
% families, dependent children, no adult employed	Centrelink income support customers	0.863
% families, dependent children, no adult employed	% of persons aged 15+ Year 9 or lower	0.546
% fams, dep chld, no adult employed	% family income up to \$599 p.w.	0.729
% fams, dep chld, no adult employed	% family income up to \$399 p.w.	0.769
% families, dependent children, no adult employed	Centrelink income support customers	0.865
Total fertility rate	% of persons aged 15+ Year 11 or lower	0.777
Total fertility rate	% of persons aged 15+ Year 9 or lower	0.766
Total fertility rate	% aged 15+ with no post-school qualifications	0.823
Total fertility rate	% family income up to \$599 p.w.	0.578
Total fertility rate	% family income up to \$399 p.w.	0.54
% of persons aged 15+ Year 11 or lower	% aged 15+ with no post-school qualifications	0.912
% of persons aged 15+ Year 11 or lower	% family income up to \$599 p.w.	0.782

**Table C1 (part 2): Correlations (>0.5) between potential explanatory variables (in dataset excluding LGAs with high Indigenous population)**

Independent variable	Correlated with:	Correlation (r)
% of persons aged 15+ Year 11 or lower	% family income up to \$399 per week	0.737
% of persons aged 15+ Year 11 or lower	Average vehicles / household	0.512
% of persons aged 15+ Year 11 or lower	Centrelink income support customers	0.64
% of persons aged 15+ Year 9 or lower	% aged 15+ with no post-school qualifications	0.953
% of persons aged 15+ Year 9 or lower	% family income up to \$599 per week	0.852
% of persons aged 15+ Year 9 or lower	% family income up to \$399 per week	0.839
% of persons aged 15+ Year 9 or lower	Centrelink income support customers	0.679
% aged 15+ with no post-school qualifications	% family income up to \$599 per week	0.758
% aged 15+ with no post-school qualifications	% family income up to \$399 per week	0.738
% aged 15+ with no post-school qualifications	Centrelink income support customers	0.632
% family income up to \$599 per week	Centrelink income support customers	0.827
% family income up to \$399 per week	Centrelink income support customers	0.824
Average vehicles / household	Public housing tenant households	-0.515
Average vehicles / household	Public housing stock	-0.515
Public housing tenant households	Public housing stock	0.998

**Table C2: Highly correlated variables (in dataset excluding LGAs with high Indigenous population)**

Independent variable	Correlated with:	Correlation (r)
% families, dependent children, no adult employed	Centrelink income support customers	0.863
% families, dependent children, no adult employed	Centrelink income support customers	0.865
% of persons aged 15+ Year 11 or lower	% aged 15+ with no post-school qualifications	0.912
% of persons aged 15+ Year 9 or lower	% aged 15+ with no post-school qualifications	0.953
% of persons aged 15+ Year 9 or lower	% family income up to \$599 per week	0.852
% of persons aged 15+ Year 9 or lower	% family income up to \$399 per week	0.839
Public housing tenant households	Public housing stock	0.998

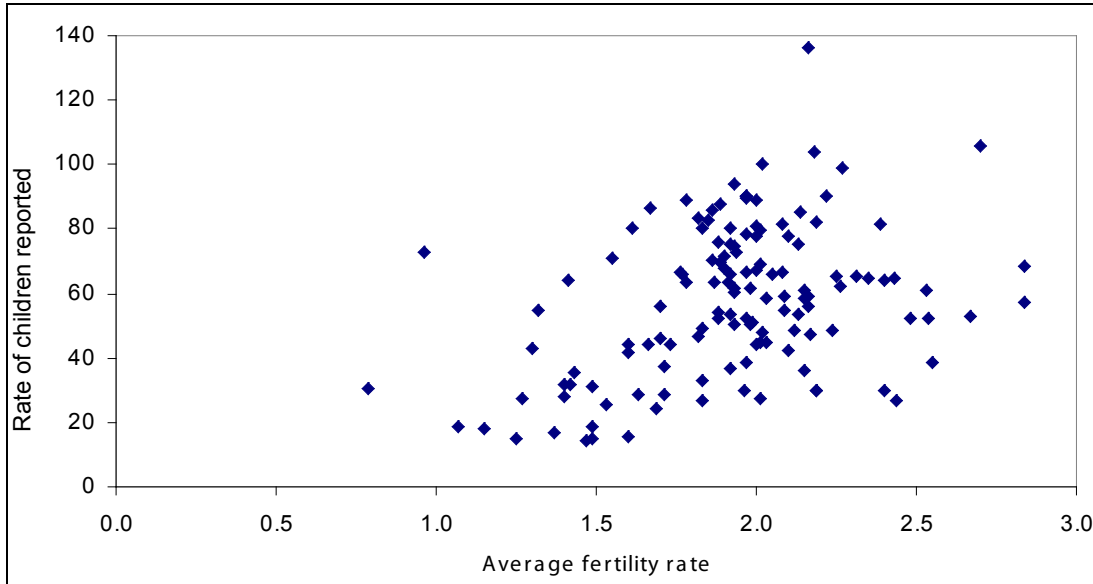
**Table C3: Correlations between study variable and potential explanatory variables (excluding areas with high Indigenous population)**

Variable name	Description	Correlation with CNOTRATE	P-value
CNOTRATE	Children / young people notified in 2004-05 per 1,000 popn aged 0-17	STUDY VARIABLE	-
MIGRATE	% persons aged 5+ who moved in last 5 years	-0.100	0.3
COPF	% of children aged 0-14 who are in one-parent families	0.710	<0.001
OPFNOEMP	% of families with dependent children where no adult is employed	0.670	<0.001
COPFNOEM	% of children aged 0-14 who are in families where no parent is employed	0.700	<0.001
HLDSIZE	Average household size	-0.067	0.4
FERTRATE	Average fertility rate	0.379	<0.001
INFMORT	Infant mortality rate	0.214	0.01
Y11DNG	% of persons aged 15+ who achieved Year 11 or lower, or DNGTS	0.608	<0.001
Y09DNG	% of persons aged 15+ who achieved Year 9 or lower, or DNGTS	0.581	<0.001
DNGTS	% of persons aged 15+ who did not go to school (DNGTS)	-0.077	0.4
NOQUALS	% aged 15+ with no post-school quals	0.541	<0.001
LOWINC1	% of families with family income up to \$599 p.w.	0.624	<0.001
LOWINC2	% of families with family income up to \$399 p.w.	0.634	<0.001
VEHLD	Average vehicles / household	-0.012	0.9
PHTENANT	Public housing tenant households as a % of all households	0.263	0.002
PHSTOCK	Public housing stock as a % of all households	0.256	0.003
PENSIONS	Number of Centrelink income support customers (ex age) as a % of all adults (age 18+)	0.744	<0.001



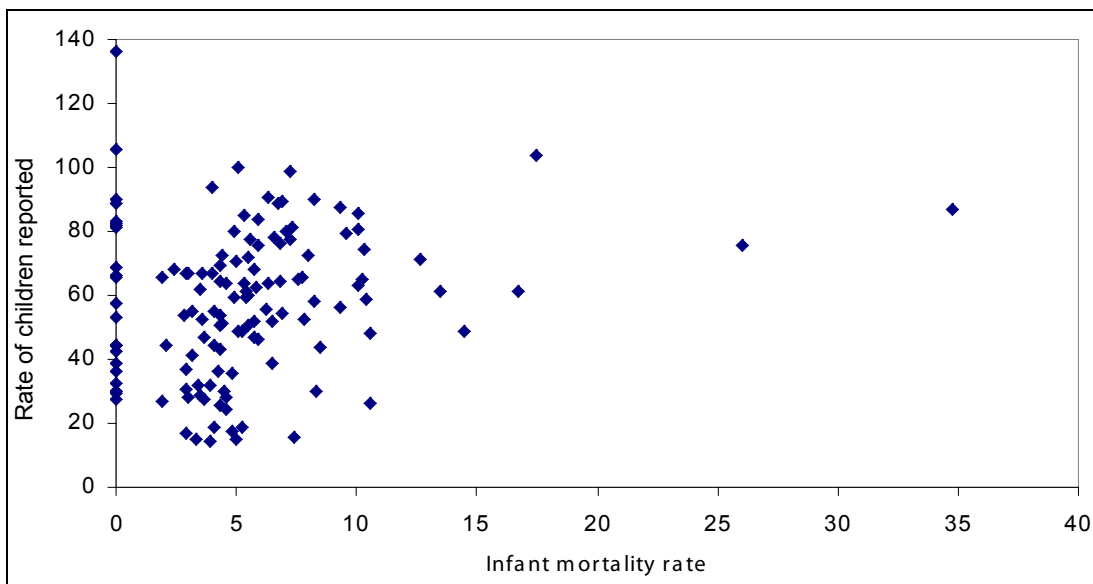
Scattergraphs (not shown in Section 4.3) showing correlation patterns between child protection reporting rate and other socio-demographic variables.

**Figure C1: Correlation of child protection reporting rate with average fertility rate ( $r=0.379$ , excluding areas with high Indigenous population)**



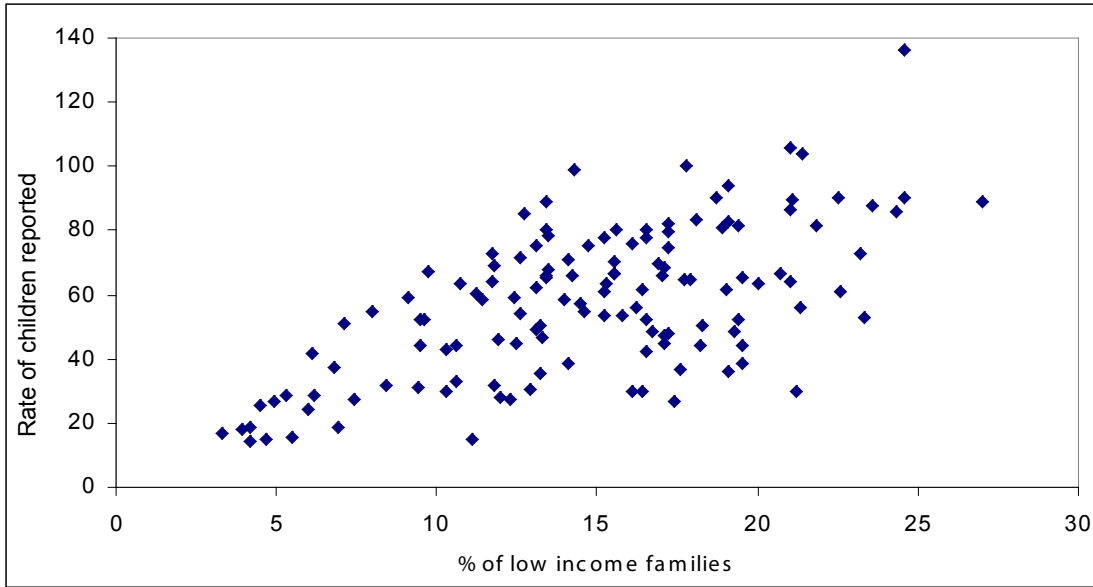
There is a strong positive relationship between child protection reporting rates and fertility rates ( $r=0.379$ ). While there are many areas with high fertility rates and low reporting rates, there are no areas with low fertility and high reporting rates (as would be expected).

**Figure C2: Correlation of child protection reporting rate with infant mortality rate ( $r=0.214$ , excluding areas with high Indigenous population)**



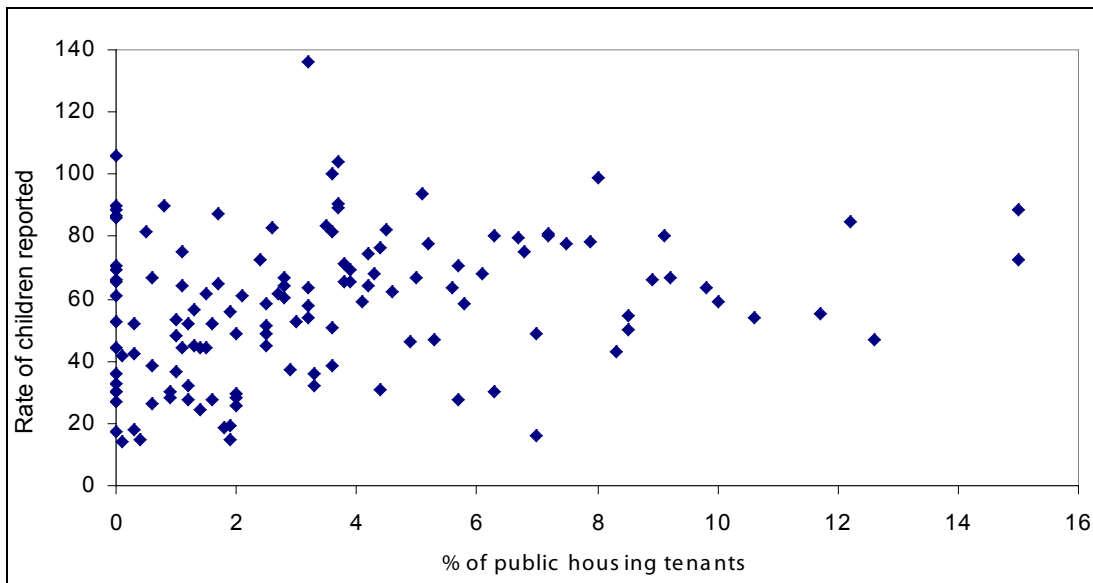
There is a positive association between child protection reporting rates and the infant mortality rate. However the pattern is far from clear as can be seen, and may be influenced by a small number of high outliers.

**Figure C3: Correlation of child protection reporting rate with the percentage of families with family income less than \$400 per week (r=0.634, excluding areas with high Indigenous population)**



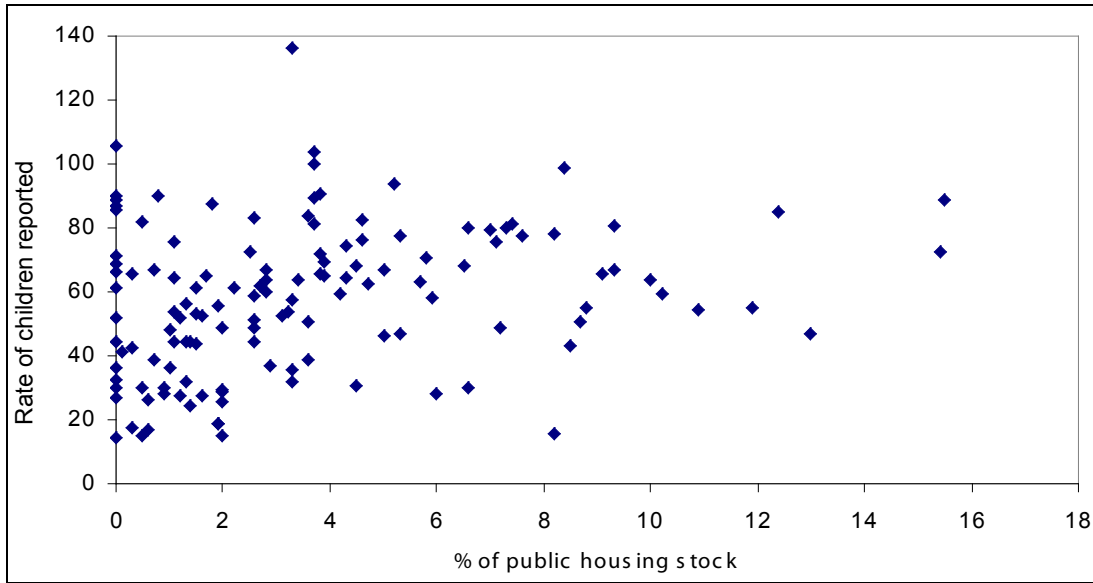
There is a strong positive association between child protection reporting rates and low family income (r=0.634).

**Figure C4: Correlation of child protection reporting rate with the percentage of public housing tenants (r=0.263, excluding areas with high Indigenous population)**



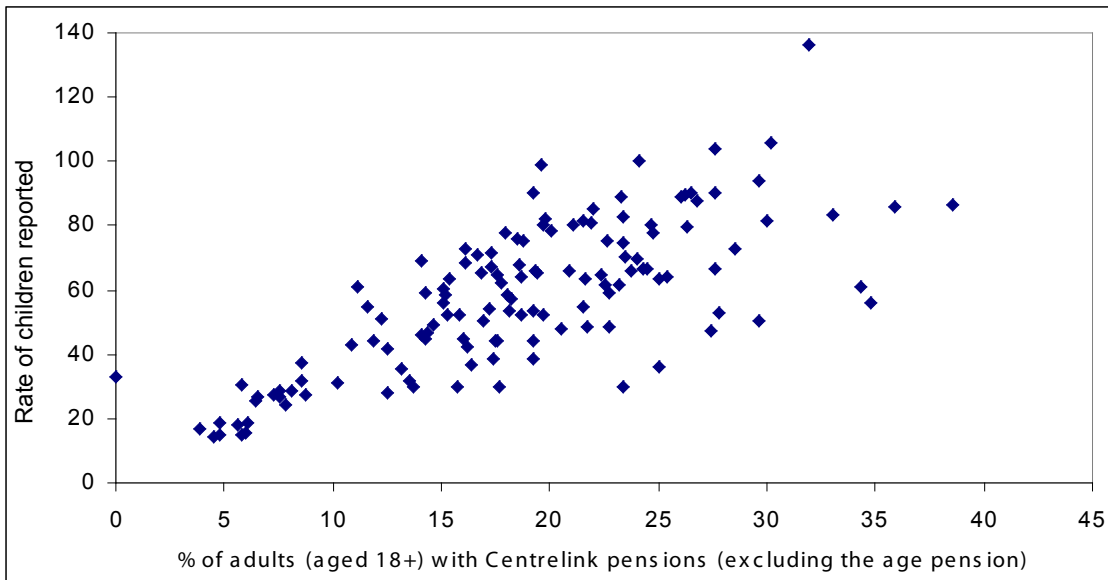
Unlike in the previous dataset, in this case there is a weak positive relationship between child protection reporting rates and the proportion of households that are public housing tenants (estimate: public housing figures from NSW Housing, total households figures from 2001 Census).

**Figure C5: Correlation of child protection reporting rate with the percentage of public housing stock (r=0.256, excluding areas with high Indigenous population)**



There is also a weak positive relationship between child protection reporting rates and the proportion of households that are public housing stock (estimate: public housing figures from NSW Housing, total households figures from 2001 Census).

**Figure C6: Correlation of child protection reporting rate with the percentage of adults (18+) with Centrelink pensions (not age, r=0.744, excluding areas with high Indigenous population)**



There is a strong positive association between child protection reporting rates and the proportion of adults (aged 18+) with Centrelink pensions (excluding age pensions, r=0.744).