AN AREA-BASED MEASURE OF RISK OF SOCIAL EXCLUSION FOR AUSTRALIAN SCHOOL-AGE CHILDREN

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ABSTRACT: This article discusses results of a spatial index of social exclusion for school-aged children at a small area level in Australia. Using data from the 2006 Census, at the height of the mining boom, the index is calculated to examine how the children aged 5-15 years in different states were faring at a time when there were significant differences in the performance of state economies. We analyse the regional distribution of the risk of child social exclusion, examining differences between states, urban and rural areas and by remoteness category. The results show that Tasmania and the Northern Territory are the states with the highest risk of social exclusion for school-aged children. There is a higher proportion of rural small areas which fell into the most at risk category compared to urban areas. Further analysis of results for the education domain and a comparison to child poverty rates are also presented.

KEY WORDS*:* Children, Social exclusion, Spatial, Index, Australia

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1. INTRODUCTION

There has been much discussion in recent years about the two speed economy generated in Australia by the mining boom and its effects on economic outcomes for individuals living in different areas of the country. While some States and specific areas within them have prospered, notably in Queensland and Western Australia, other areas such as Tasmania and New South Wales have experienced much lower rates of growth. The aim of this paper is to present results for an index of risk of social exclusion for school-aged children calculated at the small area level using data from the 2006 Census, at the height of the mining boom. In addition this paper will consider how children in different states were faring at a time when there were significant differences in the performance of state economies. Gross State Product (GSP) in Queensland and Western Australia grew at over twice the rate of GSP in the more populous states of New South Wales and Victoria between 2005 and 2006. In 2006, Western Australia had one of the highest real Gross State incomes per capita while Queensland fell in the middle of the distribution. The question of interest here is whether these differences were reflected in different outcomes for children.

Social exclusion is a broader concept of disadvantage than income poverty and recognises that non-participation can develop in various ways such as discrimination, cultural identification, geographical location or transport accessibility (Burchardt *et al.*, 2002). Thus, while the concept of poverty refers to a level of material resources (i.e. whether the individuals live below or above the poverty line), Saunders *et al*. (2008: 178) have argued that features of social exclusion are not only associated with individual characteristics but also with community, social and spatial characteristics. The phenomenon has featured in the social discourse of many countries, with the realisation from researchers, practitioners and policy makers that disadvantage often spans many dimensions and phases of an individual's life, including childhood. Social exclusion is one of the measures that has been developed to describe multidimensional poverty and disadvantage (for a discussion of related measures see Alkire and Santos, 2013).

Social exclusion has implications for an individual's current standard of living and also impacts on future quality of life. Levitas *et al.* (2007) consider three further aspects of social exclusion. Wide social exclusion arises where a large number of people are disadvantaged on one indicator; deep social exclusion occurs where individuals face multiple

disadvantages on a range of indicators; and concentrated social exclusion occurs where there is a geographical concentration of disadvantage. Some individuals may experience all these aspects of social exclusion.

The concept of social exclusion has been developed in the context of children (see Ben-Arieh, 2008 and for discussions in the British and European contexts, see for example Bradshaw *et al*., 2006; Levitas *et al*., 2007 and Oroyemi *et al*., 2009). While there is limited reference to the term 'social exclusion' in the American literature, many of the same ideas have been used to develop indicators of child wellbeing and disadvantage (see for example Land and Crowell, 2010). Social exclusion for children has also been developed and constructed by several Australian researchers who examined this concept in a spatial setting (see for example Daly *et al*., 2008; McNamara *et al*., 2009 and Tanton *et al*., 2010). The other side of social exclusion is social inclusion which emphasises the positive aspects of children's lives and many of the indicators identified mirror the exclusion indicators and fall within the same domains. It has been argued that positive outcomes for children involve more than just the absence of negative indicators.

The aim of this paper is to bring together the concept of social exclusion in the context of children and Australian regions. Expanding previous work by Daly *et al*. (2008); McNamara *et al*. (2009), Tanton *et al*. (2010) and Abello *et al.* (2012), this paper describes further the refinement and analysis of the spatial index of social exclusion for children in Australia (CSE Index). This work also adds to previous studies which discuss other measures of child wellbeing in Australia for example child poverty (Khan *et al*., 2000) and children's own perspective on their wellbeing (Ramsden, 2013).

We have restricted the analysis here to focus on school-aged children because while there are common issues relevant to all children, there are particular variables relevant to this age group. For example, educational outcomes and the role of connectedness take on particular significance for school-aged children compared to pre-school children. Limiting the study to school-aged children also enables the utilisation of particular data relevant to them. In addition, school-aged children are an important focus of education and health policy and there are a range of policy instruments directed toward this group. Further work has developed an index for pre-school aged children.

In this paper, the small area rather than the individual is used as the unit of analysis. There are several reasons why the location of disadvantage is important. From a practical and policy point of view, there is often a geographical dimension to delivering policies, for example in the areas of

health and education. There may be significant advantages in providing local communities with the information they require to actively engage in promoting the welfare of the population in their areas (Coulton *et al.*, 2009 for the case of children). Miles *et al*. (2008) specify the importance of evidence based information regarding community and regional wellbeing as a superior mechanism to inform and benefit not only the decision makers, but also the communities. Erbstein *et al*. (2013) argue that there is evidence in the literature of neighbourhood effects on the wellbeing of young people with concentrations of high economic wellbeing being associated with positive outcomes in young people (see Brooks-Gunn *et al*., 1993).

The literature has discussed a growing number of small area disadvantage or wellbeing indicators for particular groups of the population which have improved the ability of policy makers and communities to target areas of disadvantage. Noble *et al*. (2010: 294) proposed that having area-based measures will have three main objectives from a policy perspective.

> *"Allocating resources and informing detailed service planning by national, provincial and local governments (thereby increasing transparency and accountability), and reducing the use of anecdotal evidence that is not evidence-based. Policy related and academic research (e.g. a sampling frame for in-depth studies or pilot studies; a tool for contextualising other empirical research). Targeting resources provided by donor agencies, companies, voluntary bodies and charities".*

As the information is typically provided at the level of the domain as well as at an aggregate level in a comprehensive index, it is possible to highlight the domains in which each area is most vulnerable (see for example Barnes *et al*., 2009, Bradshaw *et al.*, 2009, Land and Crowell, 2008 and the Annie E Casey Foundation, 2010).

The paper is organised as follows. The next section discusses the advantages of an area-based social exclusion concept for children. The third section discusses the construction of the Child Social Exclusion Index (CSE) for Australia. The fourth section examines and analyses the results, followed by a concluding section.

2. THE ADVANTAGES OF AREA BASED SOCIAL EXCLUSION CONCEPT ON CHILDREN

There are at least three advantages in adopting the concept of social exclusion for children. Firstly, the multidimensional measure has the advantage of recognising a broader range of indicators of disadvantage beyond income and including the rights of the child, as articulated in the UN Convention on the Rights of the Child. Further, it addresses the concept of multidimensional disadvantage as developed in Sen's capability framework (Sen, 1999). Sen (1999) indicated the importance of a person's actual capability such as the ability to be healthy and the ability to participate in community and society which relies on a combination of factors, including physical and mental characteristics and opportunities and influences to enable them to actively participate (Cassells *et al*., 2011).

A second advantage of a broader measure of disadvantage is that it focuses more on the process or potential risk factors rather than an outcome such as income poverty. The CSE index includes many variables which are indeed process variables associated with poverty. This means the characteristics measured in the index increase the risk of being excluded which may be associated with income poverty and other long-term disadvantages. For example, the CSE index includes variables such as the proportion of children with no parent in paid work (either unemployed or not in the labour force), the proportion of children who live in a single parent family, and the proportion of children who live in a household where no members in the family have completed year 12. These variables are linked to *intergenerational transfer variables*, so children who live in families where their parents or other adults in their family are socially excluded also experience a higher risk of being excluded. This may then impact on the development of the children.

Finally, not only the individual is important, the community/neighbourhood is also critical in determining outcomes. Lupton and Power (2002) argue that social exclusion is affected by the nature of the neighbourhood through three factors. A neighbourhood's characteristics including location, transport availability, housing and economic structure tend to be stable and difficult to change. There is natural residential sorting which pools the population from the most disadvantaged groups in the most disadvantaged neighbourhoods. Finally, once the concentration of disadvantage is established, these disadvantaged areas may acquire more harmful characteristics. For example the areas can be characterised by a high level of crime, poor

health outcomes and other chronic measures of disadvantage. People living in those neighbourhoods may face further difficulties such as access to transport and find themselves stigmatised by their location of residence when attempting to engage with the wider community for employment and social activities. There has been much research on these neighbourhood effects (see Brooks-Gunn *et al.* (1993) and Goldfeld *et al.* (2014) for a recent review of the literature).

3. CONSTRUCTION OF THE CHILD SOCIAL EXCLUSION (CSE) INDEX 5-15 IN AUSTRALIA

Data and Spatial Unit of Analysis

The CSE Index 5-15 years has been developed mainly using data from the Australian 2006 Census of Population and Housing which collects data from the whole population. When this paper was written, the 2011 Census was not available. Future work includes updating the Index using the 2011 Census. Additional data drawn from Year 5 literacy and numeracy scores from the 2009 National Assessment Program – Literacy and Numeracy (NAPLAN) provided by the Australian Curriculum, Assessment and Reporting Authority (ACARA) are also included. We acknowledge that combining data from different years, i.e. the 2006 Census and the 2009 NAPLAN data is not ideal, but this is the first year of NAPLAN data that is available for research purposes. In terms of educational change, we would also not expect to see much in most communities in the three years from 2006 to 2009.

The Australian Census is conducted once every five years. The 2006 Census data is chosen as the primary data source for this study as the geographical unit of analysis applied in this index is at the small area level. The Census is the only source of data available to analyse multiple dimensions of disadvantage of the population at the Statistical Local Area (SLA) level, the geographical unit used in this Index.

The SLA which is part of the ABS (Australian Bureau of Statistics) Australian Standard Geographic Classification (ASGC) is chosen as this is the smallest unit in the ASGC which does not have issues with confidentiality and covers the whole of Australia. There were 1426 SLAs at the time of the 2006 Census. The numeracy and literacy score data are provided at postcode level, thus a population weighted geographical concordance is applied to concord these data to the SLA level.

The advantage of using the SLA rather than postcode for our analysis is that in many urban areas, an SLA is a homogenous suburb, whereas postcodes are derived by Australia Post for postal delivery, not data analysis. Postcodes can also be non-contiguous, so there can be a degree of heterogeneity using postcodes for our analysis, contributing to the Modifiable Areal Unit Problem, which analysis using the SLA geography resolves.

However, relying solely on SLAs as a level of geography means problems can occur in any analysis because SLA boundaries are administrative boundaries defined by the Australian Bureau of Statistics, not social or cultural boundaries. Therefore there are a different number of SLAs in each State, and the number of people in each SLA in each State is very different. Some small states and territories have a relatively large number of SLAs and other larger states have very few. For example, according to the 2006 Census, the Australian Capital Territory contained only 1.63 per cent of Australia's total population (including children), but had 7.64 per cent (109) of the total SLAs. In contrast New South Wales, which contained 33 per cent of Australia's total population, had only 200 SLAs (or 14.03 per cent of all SLAs). Queensland also had 479 SLAs (33.59 per cent of total Australian SLAs), but contained only 19.67 per cent of the total population. Almost half of Queensland SLAs are Brisbane SLAs, with quite low populations. The methodology we use to address the issue of uneven population size is that developed by Baum *et al*. (2005) and used in Daly *et al*. (2008) and McNamara *et al*. (2009). SLAs in Brisbane and Canberra (the areas most affected by relatively small population sizes within SLAs) were aggregated to Local Council Electoral Wards for Brisbane and Statistical Subdivisions (SSD) for Canberra, so that they were more similar in population size to SLAs in other areas of Australia. We also excluded off-shore areas and migratory SLAs from the analysis.

This method was also tested by looking at the Collection District level variability of the SEIFA score in Tanton *et al.* (2010), which found that using the different areas in the ACT and Queensland led to a similar Collection District variability in each State. This suggests that the areas used in this analysis are fairly homogenous, which is important to reduce any aggregation bias or problems with the Modifiable Areal Unit Problem (MAUP).

The whole process left us with a total of 1 154 small areas for analysis (after we had aggregated SLAs and removed areas with low populations and high non-response). The areas are referred as 'small areas' and

include SLAs, Wards and SSD to allow comparison across these areas in Australia.

Domains and Indicators

The first step in the construction of the Child Social Exclusion index is the choice of dimensions and indicators that need to be covered. Conceptually, the choice of dimensions and indicators has been informed by the UN Convention of the Rights of the Child. Bradshaw *et al*. (2006: 7) note that –

> *"the CRC (UN Convention of the Rights of Child) points to the double role of children as being citizens with entitlements in their own right and at the same time as being dependent on their families, schools, communities etc. The discourse on child well-being is thus also one on child well-becoming."*

The importance of the current wellbeing and future potential of children – when they become adults (children well-becoming) has influenced the choice of indicators used to measure social exclusion of children. Ben-Arieh (2005) emphasises the importance of childhood as a phase in its own right and the need to get input directly from children when discussing their wellbeing. The literature also discusses perceived well-being from a child's perspective (see for example, Nic Gabhainn and Sixsmith, 2005; Wright and Barnes, 2011 and Main and Bradshaw, 2012). For example, when Irish children were asked to identify the most important determinants of their wellbeing, they emphasised the roles of family and friends (Nic Gabhainn and Sixsmith, 2005). In a survey of child material deprivation in the UK reported by Main and Bradshaw (2012), it was pocket money, saving money and monthly day trips that were most frequently reported by children as something they lacked but would like to have. A major international survey of children's perceptions of their own well-being is currently being undertaken but Australia is not part of the project (www.childrensworld.org).

In practice, the choice of indicators and domains is also influenced by data availability. There are indicators which are important and affect child wellbeing and well-becoming but cannot be incorporated due to data limitations, i.e. the data are not available in the Census. For example, crime statistics are important in representing neighbourhood safety, but are not available for small areas so cannot be included in this index.

Thus, the selected domains are multidimensional and we combine indicators that focus on the child's own characteristics, the child's family characteristics, the child's housing environment and the child's spatial access to services. All these indicators cover the five domains considered as important for child well-being and child well-becoming in Australia. These domains have been labelled; Socio-economic, Education, Connectedness, Health Services and Housing. The details of the domains and the indicators are presented in Table 1.

Table 1. Child Social Exclusion Index 5-15 years: Domains and Indicators.

Domains	Indicators
Socio-economic	In bottom income quintile
	No parent in paid work
	Single parent family
	No family member completing year 12
Education	Index of Year 5 literacy and numeracy scores
	(compares to the national average)
	No internet at home
Connectedness	No parent volunteering
	No motor vehicle
Health services	Ratio of GPs (general practitioners) per 1000
	population
	Ratio of dentists per 1000 population
Housing	High renting and low income (30/40 rules)
	Overcrowding (need one or more bedrooms)

Source: Australian Population Census (2006); ACARA (2009).

As the unit of analysis is at the SLA level, the indicators are mainly provided as the proportion of dependent children aged 5-15 for each indicator to the total number of dependent children aged 5-15 in that SLA using the ABS usual residence Census data (so each child who is not at

home on Census night is returned to the area where they usually reside). Because we are using household level data, there is no household level information available for households where the children are not enumerated at home. Effectively, this gives us only children who were enumerated at home on Census night, as we have excluded all visitors from the usual residence population.

There are two exceptions to this and these are Year 5 literacy and numeracy scores and health services. The literacy and numeracy score results reflect the average scores of Year 5 students in the schools in an SLA according to the national literacy and numeracy tests and the ratios of GPs and dentists refer to the number of GPs and dentists to 1 000 population in each SLA. For capital cities, the ratio of GPs or dentists is at a higher level of aggregation — the Statistical Subdivision (SSD) rather than SLA is adopted. This adjustment is carried out as the catchment area for health specialists is likely to be larger than the SLA.

Cleaning the data included removing SLAs where any indicator had a 'not stated' value (missing data) for all children of more than 80 per cent, and low cell counts where the total number of children aged 0-15 years old was less than 30. In addition, the final data also excludes SLAs where the literacy and numeracy scores were missing for post codes within these SLAs.

Creating the Index: Methodology

The method used to create the index followed a two-stage approach (for more detailed discussion on the methodology see Abello *et al.*, 2012). The first step was to incorporate the indicators into their domains to create each domain index. The second step combined these domains into one composite measure/index in which a combination of principal components analysis and equal weighting techniques was used to create summary indices. If the indicators were correlated, Principal Components Analysis (PCA) was used. This is a data summary method which transforms a set of correlated data into a smaller set of uncorrelated components that represent all of the information in the original data-set (see further discussion about this methodology in Salmond and Crampton, 2002 and Tanton *et al*., 2010). However, if the indicators are not correlated, but still considered important to the wellbeing of children, PCA cannot be used and equal weighting is preferable.

Our correlation matrix shows that most of the indicators are relatively strongly correlated and PCA is preferred, except for the housing domain

in which low income private renters and overcrowding were combined using an equal weighting method. The domain indices were standardised by ranking and then transformed to an exponential distribution to ensure that the domain weights when they were combined into a single index were not affected by the different distributions in each domain (Barnes *et al.*, 2008). Finally an equal weighting method was applied and a composite measure of the CSE Index at small area level was constructed.

4. RESULTS

Spatial Distribution of CSE Index 5-15

Figure 1 shows the spatial distribution of the CSE Index 5-15 at the small area level. The Spearman rank correlation coefficient between the CSE Index 5-15 and CSE Index for all children aged 0-15 is very close at 0.94, confirming the close relationship between these two indices. The 1 154 small areas are divided into four groups based on the distance from the mean, as follows:

- High risk, if the CSE Index is greater than the mean for all areas plus 1 standard deviation (SD)
- Moderate risk, if the area's CSE Index falls within one SD above the mean
- Low risk, if the area's CSE Index is less than or equal to the mean for the whole sample
- Least risk, if the area's CSE index is less than the mean for the whole sample minus 1 SD.

Nationally with these classifications, we found that four per cent of children aged 5-15 years were classified as having a high risk of child social exclusion and 25 per cent of children in the same age group were classified as having moderate risk of child social exclusion. As shown in Figure 1, there are some concentrations of areas with a high risk of child social exclusion in the capital cities with the exception of the Canberra. Canberra is estimated as having the most areas with the least risk of child social exclusion. Note that because of the nature of area based indicators, this does not mean that there are no children who are at risk of social

exclusion in Canberra (see Goldie *et al*., 2014 and Tanton *et al*., 2015). It means that they are not concentrated in particular small areas in Canberra. This is a recognised limitation of area based measures, which is currently being addressed through other research on individual based indicators of disadvantage (see Tanton *et al*., 2015), but is outside the scope of this paper.

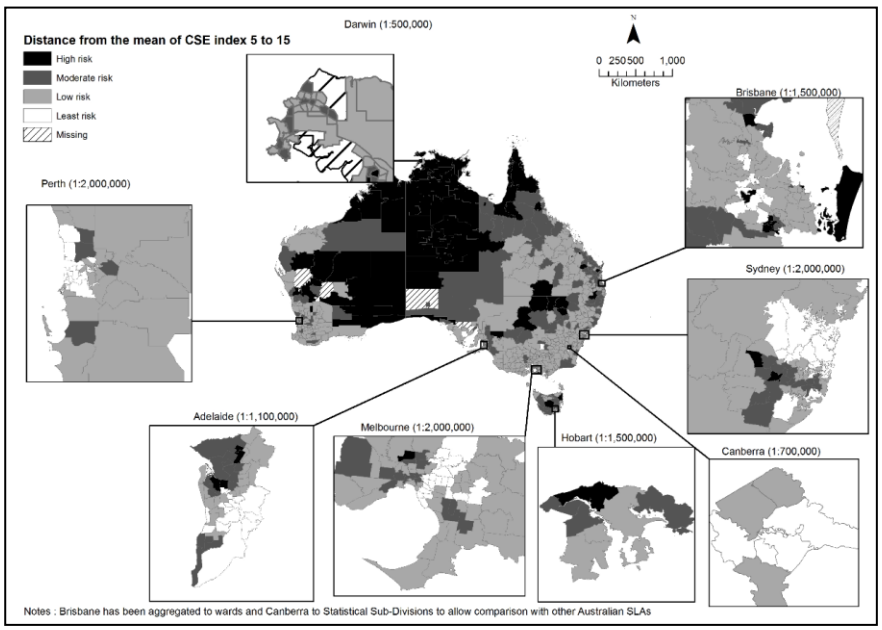

Figure 1. Spatial Distribution of CSE Index 5-15.
Note: The black legend indicates the small areas with a high risk of child social exclusion while the white legend indicates small areas with the least risk child social exclusion (least disadvantaged areas).Areas with missing values due to a high non-response or low population are shown as stippled.
Source: Author's summary

In the middle part of the map (the large black areas), there is a concentration of the highest risk of social exclusion in the regional inland areas of the Northern Territory and Western Australia (Figure 1.). Although these areas are large geographically, there are a relatively small number of children living there.

The disparities in terms of risk of the CSE Index may be clearer from Figure 2 which shows the proportion of children aged 5-15 years in each state that fall in to four groups of risk based on the CSE Index explained

earlier. Children in Tasmania and the Northern Territory are at greater risk of social exclusion relative to other states and territories. Around 53 per cent of the children in Tasmania were classified in areas with high or moderate risk of child social exclusion and 60 per cent in the Northern Territory. In the two states most affected by the mining boom, Western Australia and Queensland, Western Australia had one of the lowest proportion of children experiencing a high or moderate risk of social exclusion, and Queensland had the third highest of all the states and territories. The conclusion that can be made is that living in a state experiencing a high level of growth related to the mining boom did not assure good outcomes for school-aged children according to this index.

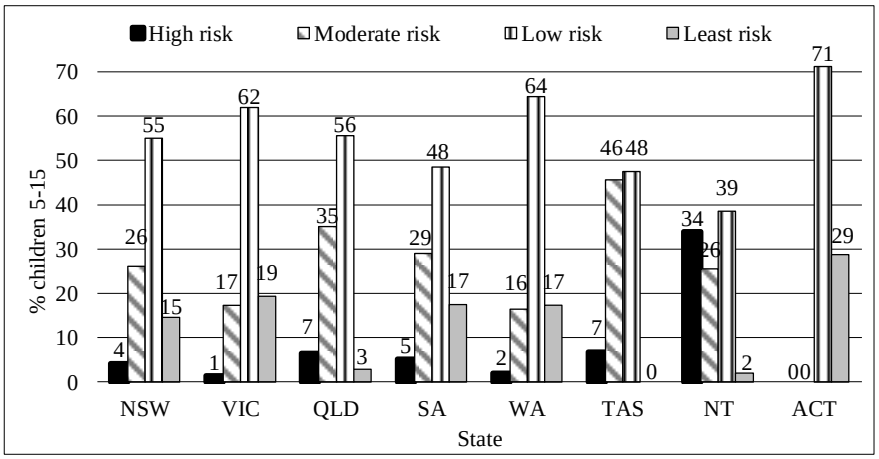

Figure 2. The Proportion of Children 5-15 Years in State by Risk of CSE Index 5-15 (%). Note: The total proportion of children in each state may not be exactly equal to 100, as a result of rounding to nearest whole numbers. Source: Author's summary

Analysis by Remoteness and Urban/Rural Characteristics

Figure 3 shows the proportion of children that fall in to each of the four CSE Index risk categories based on the ABS remoteness structure which classifies locations based on distance to the nearest Urban Centre or access to various centres of public goods and services (see ABS, 2001 for a description of how these are calculated). The remoteness structure covers Major Cities, Inner Regional, Outer Regional, Remote and Very Remote Australia.

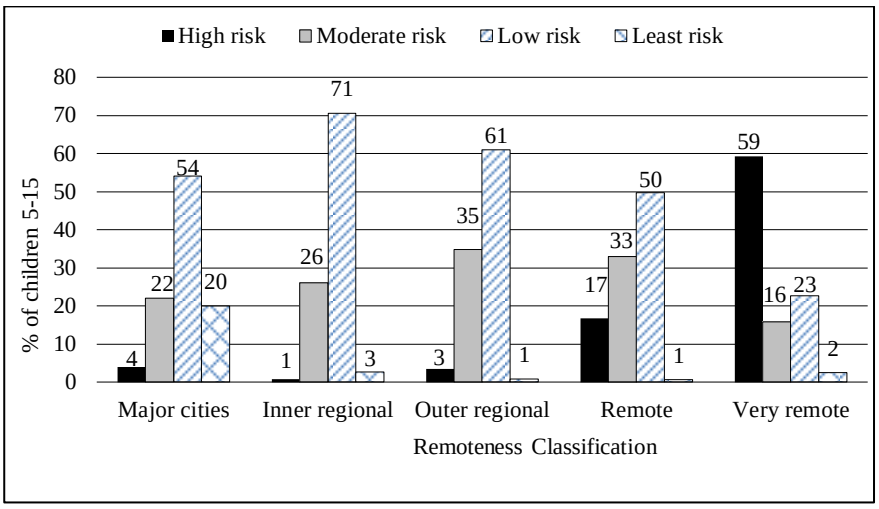

Figure 3. The Proportion of Children 5-15 Years by Risk of CSE Index 5-15 and Remoteness Classification (%). Note: The total proportion of children in each category may not be exactly equal to 100, as a result of rounding to nearest whole numbers. Source: the Authors' summary.

While only 4 per cent of children aged 5-15 in the major cities face the greatest risk of social exclusion, the percentage of children in the very remote areas of Australia who were in this quintile is 15 times higher (59 per cent) and more than four times higher (17 per cent) for those who lived in the remote areas. It is interesting also to find that only one per cent of children aged 5-15 in inner regional and four per cent in the outer regional respectively face a high risk of social exclusion. In contrast, only a few of the children who live in either remote or very remote areas are in the least risk category. It would appear that the mining boom in remote and very remote Australia has not in the short term, created a favourable environment for the children living in those areas.

So, what are the characteristics of children who live in the high risk areas of the CSE Index. Table 2 shows the proportion of children living in high risk areas according to their characteristics divided into urban (capital cities) and rural areas (balance of states). Out of 140 small areas which fell into the high risk areas, 129 of them were rural areas. Knowledge of the extent and nature of the gap in social exclusion between urban and rural areas means policy interventions can be targeted to close this gap. Further, a comparison between individual characteristics

also suggested that some variables may be more important for urban or rural areas. For example, living in a household with no motor vehicle may be less important in urban areas where there may be access to a public transport system that is not available in rural areas.

Table 2. Characteristics of Areas with High Risk of CSE Index 5-15 Years.

Mean	Unit	National average	All 140 areas	Urban 11 areas	Rural 129 areas
Low income	% of children	22.6	46.7	43.9	50.2
No parent in paid work	% of children	15.8	34.5	35.8	32.9
Single parent family	% of children	21.4	32.5	31	34.3
No internet	% of children	18.5	44	35	54.9
No parent volunteering	% of children	64.2	78	82.5	72.6
No motor vehicle	% of children	3.7	17.1	10.2	25.5
High renting costs	% of children	8.4	12.3	14.1	10.1
Overcrowding	% of children	8.8	26.7	20.4	34.3
No Year 12	% of children	22.4	42.4	38.2	47.5
Year 5 Reading	Mean Year 5 Reading	494	440	464	411
Year 5 Numeracy	Mean Year 5 Numeracy	488	448	470	420
GP to 1000 population	Per 1000 persons	1.5	1.0	1.3	0.8
Dentist to 1000 population	Per 1000 persons	0.4	0.2	0.3	0.2

Note: The national mean is calculated based on the mean values of 1 043 small areas. Source: the Authors.

Comparison with the Educational Domain

Although child social exclusion is presented as a single comprehensive measure, further analysis of individual domains that formed the index and the examination of their relationship with the index will increase its value to policy makers. One domain of particular relevance in this study of school-aged children is the education domain. Thus, 1 154 small areas weighted by the number of children aged 5-15 were also divided into four groups based on the distance from the mean for this domain. The distribution of children according to the aggregate CSE index and the educational domain (we refer to it here as educational disadvantage) is shown in Table 3. There are 65.7 per cent of children who fall into either low or least risk of CSE and low or least risk of educational disadvantage or both. At the opposite end of the distribution, there are 13.1 per cent of children who are classified as having a high or moderate risk of educational disadvantage or also a high or moderate risk of child social exclusion or both. While there are no children that fall into the extremes of high risk on one indicator and least risk on the other, a small proportion of children, 1.1 per cent, live in areas that are categorised under high risk of social exclusion but low risk of educational disadvantage. These areas include Fairfield-East (Sydney, NSW), Hume-Broadmeadows (Melbourne, VIC), Biggera Waters-Labrador (rural QLD) and Marngarr (rural NT).

Table 3. Transition matrix Between the CSE Index and Education Domain (% children aged 5-15).

CSE vs Education Domain	**Education Domain**				
Child Social Exclusion Risk	**High risk**	**Moderate risk**	**Low risk**	**Least risk**	**Total**
High risk	1.8	1.2	1.1	0.0	4.1
Moderate risk	1.7	8.3	14.6	0.1	24.7
Low risk	0.1	5.4	48.2	3.6	57.2
Least risk	0.0	0.0	3.5	10.4	14.0
Total	3.7	14.9	67.3	14.1	100.0

Source: the Authors.

An even smaller proportion of children, 0.1 per cent, lived in areas that are categorised under high risk of educational disadvantage but low risk on the CSE index, all in rural areas. These areas were located in rural Queensland (Bungil, Quilpie, Warroo, Bauhinia, Isisford, Townsville), rural Western Australia (Corrigin, Mukinbudin, Carnamah and Port Hedland) and two areas in rural South Australia (Karoonda East Murray and Unincorp Flinders Ranges).

Comparison with Child Poverty Rates

In this section, the following question is posed: does the CSE Index 5-15 provide more information about the spatial distribution of child disadvantage than the more traditional measure of income poverty? To address this question, we used child poverty rates in Australia calculated for children aged 0-14 years (so this will not be a direct comparison with the CSE Index as the age group is slightly different) who live in households whose equivalised gross household income is below the poverty line. The poverty line is set at half-median equivalised household disposable income which was AUD$ 280 per week or equivalent to US$ 290 per week (or US$ 42 a day) in 2006. The child poverty rate is calculated by using a spatial microsimulation model with an extensive validation process to ensure the reliability of the estimates of child poverty rates. A fuller discussion of the technique and the validation process for these estimates is presented in Tanton *et al*. (2011).

Table 4 provides a transition matrix between the CSE index and child poverty rates when the rates are grouped using the distance from the mean following the procedure used for the CSE index. Since there are some areas that do not have valid child poverty rates, we only include 1 043 small areas in the analysis. The diagonal of this matrix shows an overlap between the poverty rates and the CSE index and 68 per cent of children aged 5-15 fall into these categories. It means there are 32 per cent of children located off-diagonal in the matrix. Further, we also calculated the Spearman correlation coefficient which shows that both measures are correlated with R equal to 0.54.

Table 4. Transition matrix of Child Poverty Rates and CSE Index (% Children Aged 5-15).

Child Poverty rate	CSE Index				
	High risk	**Moderate risk**	**Low risk**	**Least risk**	**Total**
High risk	2.2	5.3	1.2	0.0	8.7
Moderate risk	1.3	15.2	10.9	0.1	27.4
Low risk	0.0	4.2	37.8	1.0	43.1
Least risk	0.0	0.1	7.8	12.9	20.8
Total	3.5	24.8	57.6	14.0	100.0

Note: The matrix covers 1 043 small areas. Source: the Authors.

While it is reassuring to observe that no children aged 5-15 fall into areas with high poverty rates and least risk of CSI Index or visa versa, Table 4 still shows that 10.9 per cent of children are classified as living in areas with moderately high poverty rates but low risk according to the CSE Index, and 4.2 per cent of children are living in areas with a moderate risk of social exclusion but low poverty rates.

It is worthwhile examining the characteristics of small areas in the off-diagonal cells. Table 5 shows the characteristics of small areas which are classified as areas with a moderate risk of social exclusion but low poverty rates, and compares these with the national average calculated over the 1 043 small areas. These areas include both urban and rural SLAs, for example Botany Bay and Marrickville (Sydney, NSW), Caboolture– East in (rural QLD), Salisbury Bal (Adelaide, SA), George Town - Pt B (Rural Tasmania) and Alawa (Darwin, NT).

While most of the characteristics are just above or better than the national average, Table 5 shows that the education indicators, particularly the outcomes of Year 5 Reading and Numeracy, were slightly lower than the national average. Access to doctors and dentists was only marginally above the national average in these areas.

Table 5. Characteristics Areas Classified as Low Poverty Rates but Moderate Risk of CSE Index (% Children Aged 5-15).

Variable	Unit	Low poverty rates but moderate risk of CSE Index	National Mean	Ratio to the national mean
		Mean		
Low income	% of children	23.2	22.6	1.02
No parent in paid work	% of children	18.1	15.8	1.15
Single parent family	% of children	26.8	21.4	1.25
No internet	% of children	23.1	18.5	1.25
No parent volunteering	% of children	68.0	64.2	1.06
No motor vehicle	% of children	5.7	3.7	1.54
High renting costs	% of children	11.4	8.4	1.35
Overcrowding	% of children	11.4	8.8	1.30
No Year 12	% of children	27.1	22.4	1.21
Year 5 Reading	Mean Year 5 Reading	471.2	494.2	0.95
Year 5 Numeracy	Mean Year 5 Numeracy	466.8	487.9	0.96
GP to 1 000 population	Per 1 000 persons	1.6	1.5	1.05
Dentist to 1 000 population	Per 1 000 persons	0.4	0.4	1.08

Note: The national mean is calculated based on the mean values of 1 043 small areas. Source: the Authors.

This shows that the CSE index captures different aspects of disadvantage that are not captured by child poverty rates. This is important as children in families with incomes just above the poverty line may still suffer from other types of social exclusion, like educational exclusion (not being able to afford to purchase some books). The CSE index, used in quintiles, provides a more nuanced picture of disadvantage compared to an in poverty/not in poverty indicator based purely on income.

Children that are not identified as the most disadvantaged by reference to child poverty rates can now be identified for particular policy focus using the CSE index. This will be important for regional planning and for the policy makers to provide better targeted initiatives.

5. CONCLUSION

This paper has presented the results of an area-based index of risk of social exclusion for school-aged children. This is an important group and the focus has enabled further investigation of the education domain which is of particular relevance to this age group. The results show that the areas with the highest risk of child social exclusion were in Tasmania and the Northern Territory and that they were generally outside the major cities. While Western Australia performed well on the aggregate index, the other major mining state, Queensland, did not. The link between state income growth and child disadvantage is complex and is an important area for future research. The results also show that school-aged children in remote and very remote areas were at a high risk of social exclusion.

A *further* exploration of the education domain shows that performance in that domain was closely correlated to performance on the aggregate index. However, there were some small areas where there was a low risk of social exclusion at the aggregate level and a high or moderate risk of social exclusion in the educational domain. There were also some small areas that had a high risk of social exclusion at the aggregate level but were performing at least at the national average in the education domain. This highlights the importance of using evidence from each domain for policy formulation in the relevant area.

The paper also compared a ranking of small areas on the basis of the CSE index with a ranking based on an income poverty measure. It showed that while the majority of children fell into the same group as determined by distance from the mean, there were 32 per cent of children

that were classified differently using the CSE index. The CSE index captures a more complex measure of disadvantage than income alone.

The aggregate results presented here for school aged children show a similar ranking of areas to results presented for all children aged 0-15 years reported in Abello *et al.* (2012) with a rank correlation coefficient of 0.94. An advantage of focusing on school-aged children is the ability to investigate more closely some of the factors that are particularly relevant for this age group.

This paper has demonstrated the advantages of taking a wider measure of disadvantage than income poverty for identifying small areas in need of further support for school-aged children. The richer measure enables policy makers to target resources more effectively to those in need. The need to raise the performance of schools has been a particular focus of Australian policy makers in recent years and this CSE index and its domains offer a useful tool for future policy analysis.

REFERENCES

Abello, A., Gong, C., Daly, A. and McNamara, J. (2012). Spatial Dimensions of Child Social Exclusion Risk: Widening the Scope. *Child Indicators Research*, 5(4), pp.685-703.

ABS (2001). Information Paper: ABS Views on Remoteness. ABS Cat # 1244.0, ABS: Canberra

Alkire, S. and Santos, M.E. (2013). A Multidimensional Approach: Poverty Measurement and Beyond. *Social Indicator Research*, 112, pp. 239-257.

Annie E Casey Foundation (2010). *Kids Count*. Online version accessed, at, http://www.aecf.org/work/kids-count/

Barnes, H., Noble, M., Wright, G. and Dawes, A. (2009). A Geographical Profile of Child Deprivation in South Africa. *Child Indicators Research*, 2(2), pp.181-199.

Baum, S., O'Connor, K. and Stimson, R. (2005). *Fault Lines Exposed: Advantage and Disadvantage across Australia's Settlement System*. Monash University ePress, Clayton.

Ben-Arieh, A. (2005). Where are the Children? Children's Role in Measuring and Monitoring Their Well-Being. *Social Indicators*, 74(3), pp. 573-596.

Ben-Arieh, A. (2008).The Child Indicators movement: past, present and future. *Child Indicators Research Journal*, 1(1), pp. 3-16.

Bradshaw, J., Hoelscher, P. and Richardson, D. (2006). Comparing Child Well-Being in OECD Countries: Concepts and Methods. *UNICEF, Innocenti Working Paper IWP-2006-03*. Innocenti Research Centre, Florence.

Bradshaw, J., Noble, M., Bloor, K., Huby, M., McLennan, D., Rhodes, D., Sinclair, I. and Wilkinson, K. (2009). A Child Well-Being Index at Small Area Level in England. *Child Indicators Research*, 2(2), pp. 201-219.

Brooks-Gunn, J., Duncan, G.J., Klebanov, P.K. and Sealand, N. (1993). Do Neighborhoods Influence Child and Adolescent Development? *American Journal of Sociology*, 99(2), pp. 353 – 395.

Burchardt, T., Le Grand, J. and Piachaud, D. (2002). Introduction. In J. Hills, J.J. Le Grand and D. Piachaud (Eds) *Understanding Social Exclusion*, Oxford University Press, New York, pp. 1-12.

Cassells, R., McNamara J. and Wicks, P. (2011).Well-Being Among Australian Children: a Review of Frameworks and Measures.

NATSEM Working Paper 01/11. NATSEM, University of Canberra, Canberra.

Coulton, C., Korbin, J. and McDonell, J. (2009). Editorial: Indicators of Child Well-Being in the Context of Small Areas. *Child Indicators Research*, 2(2), pp. 109-11.

Daly, A., McNamara, J., Tanton, R., Harding, A. and Yap, M. (2008). Indicators of Risk of Social Exclusion for Children in Australian Households: an Analysis by State and Age Group, *The Australasian Journal of Regional Studies*, 14(2), pp. 133-154.

Erbstein, N., Hartzog, C. and Geraghty, E. (2013). Putting Youth on the Map : a Pilot Instrument for Assessing Youth Well-being. *Child Indicators Research*, 6(2), pp. 257-280.

Goldie, X., Kakuk, I. and Wood, G. (2014). Two Tales of a City: Detecting Socio-Economic Disadvantage in an 'Advantaged' Australian Urban Centre. *Australian Geographer*, 45(4), pp. 521–540.

Goldfeld, W., Katz, I., Tanton, R., Brinkman, S., O'Connor, E., Mathews, T. and Giles-Corti, B. (2014). Neighbourhood Effects Influencing Early Childhood Development: Conceptual Model and Trial Measurement Methodologies from the Kids in Communities Study. *Social Indicators Research*, 120(1), PP. 197-212. DOI: 10.1007/s11205-014-0578-x.

Khan, S.A., Brian, D. and Rao, D.S.P. (2000). Child Poverty in Rural Regions of Australia in 1990. *The* A*ustralasian Journal of Regional Studies*, 6(1), pp. 47-65.

Land, K. and Crowell, J. (2010). The Child and Youth Well-Being Index 2010. Online version accessed at, www.soc.duke.edu/~cwi/.

Levitas, R., Pantazis, C., Fahmy, E., Gordon, D., Lloyd, E. and Patsios, D. (2007). *The Multi-Dimensional Analysis of Social Exclusion*. Social Exclusion Task Force: London.

Lupton, R. and Power, A. (2002). Social Exclusion and Neighbourhoods. In J. Hills, J. Le Grand, D.Piachaud (eds). *Understanding Social Exclusion*, Oxford University Press, New York, pp. 118-140.

Main, G. and Bradshaw, J. (2012). A Child Material Deprivation Index. *Child Indicators Research*, 5(3), pp. 503-521.

McNamara, J., Tanton, R., Daly, A. and Harding, A. (2009). Spatial Trends in the Risk of Social Exclusion for Australian Children: Patterns from 2001 to 2006. *Child Indicators Research*, 2(2), pp. 155 - 179.

Miles, R. L., Greer, L., Kraatz, D. and Kinnear, S. (2008). Measuring Community Wellbeing : A Central Queensland Case Study. *The Australasian Journal of Regional Studies*, 14(1), pp. 73-93.

Nic Gabhainn, S. and Sixsmith, J. (2005). Children's Understanding of Well-Being. The National Children's Office: Dublin. Online version accessed at, www.nuigalway.ie/hbsc/.../childrenunderstandingofwellbeing.pdf

Noble, M., Barnes, H., Wright, G. and Roberts, B. (2010). Small Area Indices of Multiple Deprivation in South Africa. *Social Indicator Research*, 95(2), pp. 281-297. DOI 10.1007/s11205-009-9460-7.

Oroyemi, P., Damiolo, G., Barnes, M. and Crosier, T. (2009). Understanding the Risks of Social Exclusion Across the Life Course: Families with Children. A National Centre for Social Research (NatCen) research report for the Social Exclusion Task Force, UK Cabinet Office.

Ramsden, K. (2013). Children's Perspectives on Their Own Wellbeing: 'I Don't Think They Can Hear Us. *Developing Practice: The Child, Youth and Family Work Journal*, 36, pp. 18-30.

Salmond, C. and Crampton, P. (2002). *NZDep2001 Index of Deprivation. Department of Public Health*. Wellington School of Medicine and Health Sciences, Wellington.

Saunders, P., Naidoo, Y. and Griffiths, M. (2008). Towards New Indicators of Disadvantage: Deprivation and Social Exclusion in Australia. *Australian Journal of Social Issues*, 43(2), pp. 175-198.

Sen, A. (1999). Commodities and Capabilities. Oxford University Press, USA.

Tanton, R., Harding, A., Daly, A., McNamara, J. and Yap, M. (2010). Australian Children at Risk of Social Exclusion: A Spatial Index for Gauging Relative Disadvantage. *Population, Space and Place*, 16(2), pp. 135-150.

Tanton, R., Vidyattama, Y. and Mohanty, I. (2015). Disadvantage in the Australian Capital Territory. *Policy Studies*, DOI:10.1080/01442872.2014.981062.

Tanton, R., Vidyattama, Y., Nepal, B., McNamara, J. (2011). Small Area Estimation Using A Reweighting Algorithm. *Journal of the Royal Statistical Society: Series A Statistics in Society*, 174(4), pp. 931 - 951.

Wright, G. and Barnes, H. (2011). Defining child poverty in South Africa using the socially perceived necessities approach. Presentation at NATSEM Workshop on Child Social Exclusion. 5th July 2011.