CENTRE FOR ABORIGINAL ECONOMIC POLICY RESEARCH

THE AUSTRALIAN NATIONAL UNIVERSITY

Ranking Regions: Revisiting an Index of Relative Indigenous Socioeconomic Outcomes

N. Biddle

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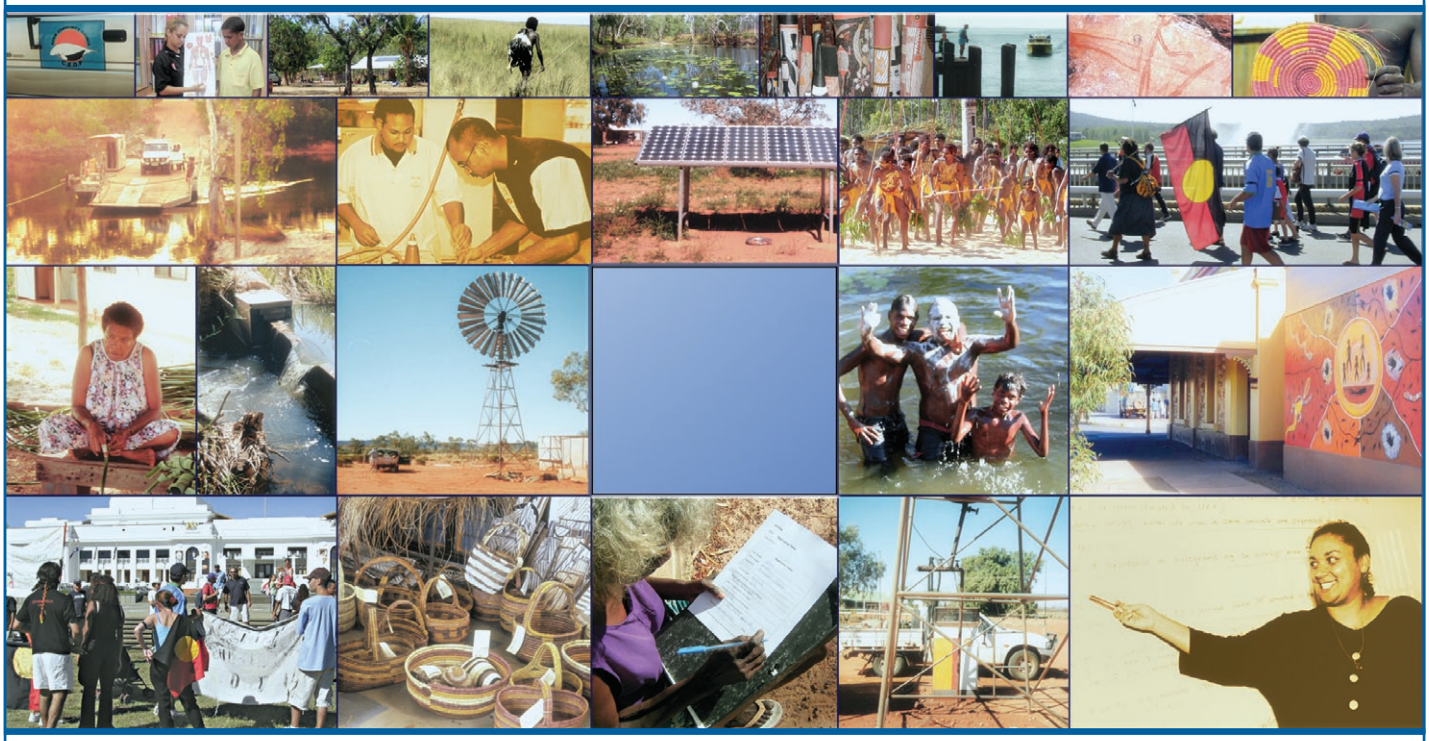

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and Torres Strait Islander Affairs

Ranking regions: Revisiting an index of relative Indigenous socioeconomic outcomes

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ABSTRACT

For any chance of success in achieving targets for improvement in Indigenous socio-economic outcomes, policy makers need to understand where relative and absolute need is greatest. To summarise the distribution of relative need, a single index can be used to rank regions or areas within regions. In this paper nine outcomes across employment, education, income and housing from the 2001 and 2006 Censuses are used to create a single index for 37 Indigenous Regions. Across the nine input variables the large capital city regions were the least disadvantaged. At the other end of the distribution, remote regions ranked relatively poorly, especially in the Northern Territory. All 531 Indigenous Areas were also ranked, showing significant diversity within Indigenous Regions. In particular, the Indigenous Region of Sydney had the greatest diversity, with six of the seven most advantaged Indigenous Area across all of Australia, but ten areas in the lowest two quartiles. While the overall distribution was similar to that found in previous censuses, at the area level especially there was some significant change between 2001 and 2006. Much of this change was related to high rates of inward migration.

Keywords: Indigenous socioeconomic outcomes, regional change, 2006 Census.

CAEPR INDIGENOUS POPULATION PROJECT

This project has its genesis in a CAEPR report commissioned by the Ministerial Council for Aboriginal and Torres Strait Islander Affairs (MCATSIA) in 2005. The aim of the paper (published as CAEPR Discussion Paper No. 283) was to synthesise findings from a wide variety of regional and community-based demographic studies. What emerged was the identification of demographic 'hot spots'—particular Indigenous population dynamics in particular regions that give rise to issues of public policy concern. These trends spatially align with specific categories of place that transcend State and Territory boundaries. The 'hot spots' coalesce around several structural settings including city suburbs, regional towns, town camps, remote Indigenous towns, and outstations, as opposed to the more formal regionalised or jurisdictional spatial configurations that have tended to guide and inform Indigenous policy development.

Recognising that the structural circumstances facing Indigenous populations are locationally dispersed in this way, MCATSIA has established an enhanced research capacity at CAEPR to further explore the dynamics and regional geography of Indigenous population and socioeconomic change.

This research activity commenced in late 2007 and is constructed around four discrete yet overlapping projects:

- a detailed regional analysis of relative and absolute change in Indigenous social indicators
- an assessment of social and spatial mobility among Indigenous metropolitan populations
- case-study analyses of multiple disadvantage in select city neighbourhoods and regional centres
- the development of conceptual and methodological approaches to the measurement of temporary short-term mobility.

Working Papers related to these projects are co-badged with MCATSIA and released as part of the CAEPR Working Paper Series. It should be noted that the views expressed in these publications are those of the researcher/s and do not necessarily represent the views of MCATSIA as a whole, or the views of individual jurisdictions.

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EXECUTIVE SUMMARY

1. For any chance of success in achieving targets for improvement in Indigenous socioeconomic outcomes, policy makers need to understand where it is that Indigenous Australians live, where relative and absolute need is greatest, and what the particular challenges are for different regions across Australia.

2. One way to summarise the distribution of relative need is through a single index that can be used to rank regions or areas within regions. In this paper, nine measures of socioeconomic outcomes across employment, education, income and housing from the 2001 and 2006 Censuses are used to create a single index for 37 Indigenous Regions and 531 Indigenous Areas.

3. Across the nine input variables the large capital city regions were the least disadvantaged. Of these, Adelaide and Perth rank slightly lower than the eastern capitals. At the other end of the distribution, remote regions ranked relatively poorly, especially in the Northern Territory. Other regions outside of the Northern Territory in the bottom quarter of the distribution were Cape York, Port Augusta, Kununurra and Derby. Comparing maps of the distribution of socioeconomic outcomes in 2006 with 1991 reveals a remarkable degree of stability in regions of disadvantage, which is focused on the Northern Territory, most of the Kimberley and Cape York Peninsula.

4. Despite this broad long-term stability, there were some changes at the individual region level over the most recent intercensal period. A further map summarises the change in the distribution of Indigenous outcomes between 2001 and 2006. Of the regions that changed ranking substantially between 2001 and 2006, Townsville and Alice Springs make an interesting comparison as they both had high rates of net inward migration over the period. It would appear that internal Indigenous migrants to Townsville had better outcomes, on average, than internal Indigenous migrants to Alice Springs.

5. There were only three Indigenous Regions for which all Indigenous Areas were in the same quartile. All 15 areas in Apatula and all 11 in Nhulunbuy were in the lowest quartile whereas all three areas within the Australian Capital Territory (ACT) were in the top quartile. The Indigenous Region of Sydney had the greatest diversity with six of the seven most advantaged Indigenous Areas across all of Australia, but ten areas in the lowest two quartiles.

ACT: Australian Capital Territory

6. Apart from the ACT and to a lesser extent the Northern Territory, delineating by jurisdiction does not result in a set of homogenous Indigenous Areas.

7. Indigenous Australians in city areas are doing quite well on average relative to their remote counterparts. Of the four remote location types, remote towns have the most favourable mean ranking, with the other three location types all averaging in the mid 400s or worse. The three areas designated as town camps have a mean ranking of 522 out of a maximum of 531. Clearly it is in these areas where measured outcomes are worse.

8. There was a high degree of continuity between 2001 and 2006 in terms of the Indigenous socioeconomic rank of the area. With a correlation of 0.942 across the two years, those that ranked relatively highly in 2001 also tended to rank relatively highly in 2006.

9. Areas with relatively low or relatively high rankings are more likely to be adjacent to other areas with similar rankings. This spatial auto-correlation can be used to identify outliers or areas which stand out from those that are adjacent to it.

10. There was a high positive correlation between socioeconomic disadvantage and the percentage of the population who speak an Indigenous language at home. While there is no testing of causation in the paper, this relationship would suggest that although likely to prove difficult, development planning should incorporate both Indigenous-specific aspirations and the variables included in the index for this paper.

INTRODUCTION AND OVERVIEW

In many ways 2008 was a year of target setting in Indigenous affairs policy in Australia. In his apology to the stolen generations on February 13th, the Prime Minister outlined a 'new partnership on closing the gap'. More specifically, he established a number of 'concrete targets' that he hoped to achieve over varying time frames. These were:

> '...within a decade to halve the widening gap in literacy, numeracy and employment outcomes and opportunities for indigenous Australians, within a decade to halve the appalling gap in infant mortality rates between indigenous and non-indigenous children and, within a generation, to close the equally appalling 17-year life gap between indigenous and non-indigenous in overall life expectancy.' Rudd (2008)

Through the Council of Australian Governments (COAG) processes, these targets have been made more explicit, while other areas such as housing have been included amongst the goals. More recently, on August the 3rd the Prime Minister teamed up with Andrew Forrest, Chief Executive of Fortescue Metals Group, to announce an ambitious plan to create 50,000 new jobs for Indigenous Australians within two years. Altman, Biddle and Hunter (2008) used historical data to consider the prospects for this 'closing the gaps' agenda and concluded that although progress is being made in a number of the indicators that are being focused on (or proxies for them), statistical equality is unlikely to occur in the relatively short time frames being considered without substantial policy realignment.

COAG: Council of Australian Governments

Biddle, Taylor and Yap (2008) have provided an estimate for the number of new jobs that would need to be created between 2006 and 2016 in order to meet the target of halving the employment gap. Importantly, the authors produced separate estimates for 37 Indigenous Regions across Australia. In addition, Biddle (2008) provided an estimate by Indigenous Region of the number of houses that contain Indigenous Australians that were deemed to be overcrowded. The key finding from both of these studies was that the level of need was highest in relative terms in remote parts of Australia, but it was in cities and some regional areas where the greatest total number of jobs and additional houses were required.

Underlying both of the above regional analyses was the assertion that for any chance of success in meeting the aforementioned targets, policy makers need to understand where it is that Indigenous Australians live, where relative and absolute need is greatest, and what the particular challenges are for different regions across Australia. This is especially the case considering the importance of State Government policy in a number of areas outlined by the Prime Minister and was recognised in his speech when he advocated 'flexible, tailored, local approaches to achieve commonly-agreed national objectives' (Rudd 2008). Across most indicators, Indigenous Australians lag behind non-Indigenous Australians, meaning that national approaches to improving Indigenous outcomes cannot be ignored. In terms of service delivery, however, those areas with greater levels of measured socioeconomic disadvantage either relative to the rest of the Australian Indigenous population or relative to the non-Indigenous population in the region will be those that require the greatest per capita investment in training, infrastructure and job creation or support.

INDICES OF INDIGENOUS SOCIOECONOMIC STATUS

One way to summarise the distribution of relative need is through a single index that can be used to rank regions or areas within regions. A number of authors have created summary measures of socioeconomic outcomes for the Indigenous population using census data. As far back as 1991, Tesfaghiorghis (1991) used three variables representing education, employment and income to construct an index of socioeconomic advantage at the Aboriginal and Torres Strait Islander Commission (ATSIC) Region level for the Indigenous

ATSIC: Aboriginal and Torres Strait Islander Commission

population using the 1986 Census. Altman and Liu (1994) used a similar list of variables to examine socioeconomic status for a reduced number of regions[1] for the 1991 Census, making some comparisons with results for the 1986 Census.

In 2000 two sets of analyses constructed indices of socioeconomic outcomes at the area level for the Indigenous population, both using ATSIC Regions as their unit of analysis. Gray and Auld (2000) constructed an index of relative disadvantage using four variables representing family income, housing, educational attainment, and employment. Importantly, Gray and Auld (2000) augmented their census-based analysis with administrative data to attempt to control for the Community Development and Employment Projects (CDEP) scheme. The authors found a reasonable level of stability between 1991 and 1996 in terms of how regions ranked, with Alice Springs and Cairns being notable exceptions.

CDEP: Community Development Employment Projects

ABS: Australian Bureau of Statistics

NATSIS: National Aboriginal and Torres Strait Islander Survey

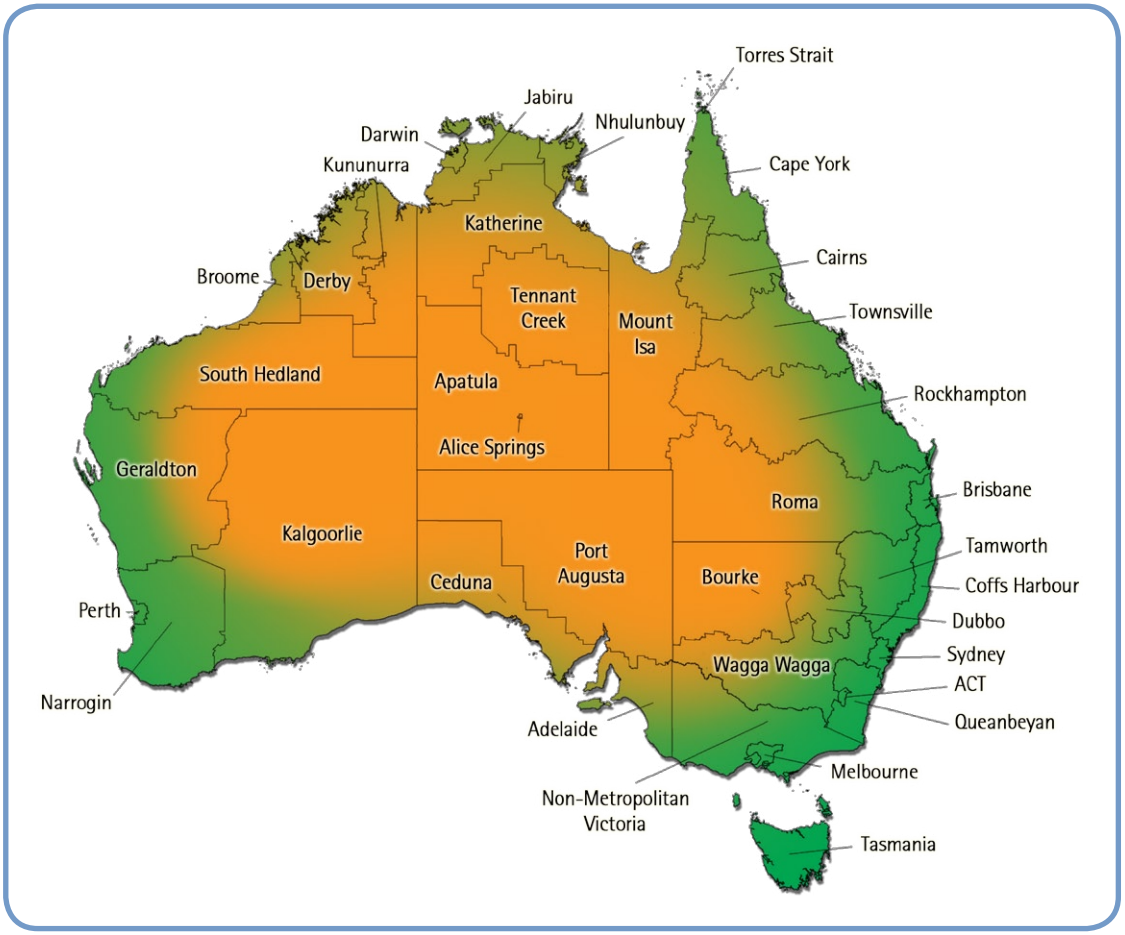
SEIFA: Socio-Economic Indexes for Areas

In the same year, the Commonwealth Grants Commission funded the Australian Bureau of Statistics (ABS) to undertake a major study to construct indices of Indigenous socioeconomic disadvantage (ABS 2000). One major difference between ABS (2000) and the previous studies was the combining of data from the 1996 Census and both the 1992 National Aboriginal and Torres Strait Islander Survey (NATSIS) and perinatal statistics. Another difference was that nine separate indices were created representing different aspects of socioeconomic advantage or disadvantage. The authors found that if the regions were grouped into quartiles, there was a fair degree of consistency across the indices. The major exception to this was the index that used health administrative data (ABS 2000: 97). However it is worth noting that Zubrick et. al (2004) found a health gradient across regions that did not necessarily correlate with remoteness, and hence the finding that indices that include health measures differ slightly from other socioeconomic indices may have some support.

All of the above analyses of Indigenous outcomes sit alongside the ongoing production of the Socio-Economic Indexes for Areas (SEIFA) indices created for the total Australian population. For the Australian population as a whole, the SEIFA indices are widely used measures of relative disadvantage at the area level and have been found to correlate with other characteristics of the individuals who live in the areas. For example, Adhikari (2006) found a strong correlation between the 2001 SEIFA scores and the proportion of people in an area who report poor health, obesity and other health risk factors. Despite this, the indices are not always useful when it comes to the Indigenous population for four main reasons:

- Given the relative size of the Indigenous population, only a small proportion of the population in the areas used as the basis for the indices are likely to be Indigenous. Therefore, the standard SEIFA indices will be dominated by the characteristics of the non-Indigenous population and will not adequately show the distribution of Indigenous disadvantage. Kennedy and Firman (2004) illustrate this issue of the 'ecological fallacy' by showing that the Indigenous population consistently has a lower socioeconomic status than other residents given the standard SEIFA indices.
- One of the variables that is used to calculate the Index of Socio-economic Disadvantage (one of the most commonly used SEIFA indices) is the proportion of people in the area who identify as being Indigenous. While this may be useful when analysing the total population, as Indigenous status correlates highly with other aspects of disadvantage not included in the Census,[2] clearly it will tend to introduce a strong upward bias on any measures of the average levels of disadvantage of the areas in which the Indigenous population live. That is, any correlations of this particular index against the proportion of Indigenous persons will always be significant, because the proportion of Indigenous persons is an input variable.
- There are variables in the standard SEIFA indices that may not be as relevant or have a different meaning for the Indigenous population compared to the non-Indigenous

Fig. 1. Indigenous Region structure, 2006



population. For example, the presence of CDEP programs in a number of areas makes the interpretation of the unemployment rate quite difficult. Alternatively, the cut-offs for some of the variables like income or rent may not reflect the distribution of Indigenous outcomes.

- The SEIFA indices constructed by the ABS are not comparable between census years as both the variables included and the geographic boundaries differ through time. Hence it would not be possible to compare the change in the distribution of socioeconomic outcomes through time, Indigenous or otherwise.

Given the above problems with using SEIFA indices to analyse the geographic distribution of Indigenous socioeconomic outcomes and the fact that the most recent published set of indices specific to the Indigenous population used 1996 Census data, an updated set of indices would be a timely addition to the literature This is especially so given the increased focus on needs stimulated by the COAG Indigenous reform process.

The two sources of data for this paper are the 2001 and 2006 Censuses of population and housing. The main benefits of using the censuses are that the questions are consistent through time (importantly including the question on Indigenous status), universal in that the main questions do not vary across the population, and comprehensive in that all Australians are in scope. This last point means that, in theory

at least, there should be a census record for every individual in Australia, making robust estimates of variation in socioeconomic outcomes across small geographic areas and population subgroups possible. In practice, however, Taylor & Biddle (2008) have shown that there is a substantial degree of undercounting in many parts of remote Australia in particular. For this reason, in this paper the focus is on rates rather than levels of disadvantage.

AIGC: Australian Indigenous Geographical Classification

To look at the distribution of outcomes, Indigenous Regions are used as the base unit of geography.[3] These are the least disaggregated level of the Australian Indigenous Geographical Classification (AIGC) and in 2006 there were 37 Indigenous Regions. The boundaries and nomenclature are given in Fig. 1.

Given the size of some areas (Kalgoorlie, for example, is over 900,000 km^2), there is likely to be substantial variation within a number of the regions. Hence an index value is also estimated for a lower level of geography, Indigenous Areas. These will be explained in more detail in the relevant section.

ESTIMATION METHODOLOGY AND OUTCOME VARIABLES

ABS (2000: 12) outlined a methodological approach to constructing an index of disadvantage for the Indigenous population.[4] While recognising that the process is somewhat iterative, this approach is modified and used in the present paper as follows:

- Identify the concept of advantage/disadvantage that is being summarised;
- Choose the variables from the census that best capture that concept;
- Identify the technique or set of techniques to construct the index;
- Construct the index.

Following this approach, the first two steps are outlined below, with the final two steps covered in Appendix 1.

CONCEPT OF ADVANTAGE/DISADVANTAGE

The concept used to summarise advantage/disadvantage in this paper is an individual's potential and actual access to economic resources. The index is constructed in such a way due to the restricted set of data available from the census. As such, there are a number of limitations that should be kept in mind when interpreting and using the index. Some examples are listed below:

- The concept is highly skewed towards mainstream or non-Indigenous notions of relative advantage, and as such represents only a partial analysis (Taylor 2008). For example, it was not possible to include the resources a number of Indigenous Australians gain from hunting and fishing that are used to supplement goods purchased in the market sector (Altman, Buchanan and Biddle 2006).
- Being an individual level analysis, it does not capture community level indicators. Examples that might be important and vary across geographic areas are access to medical services and other infrastructure, crime rates, environmental quality and social capital.
- It is not possible to take into account the variation in supply and costs of goods and services which any given income may purchase. For example, in remote and even regional areas fresh fruits and vegetables are likely to be more expensive, whereas in other areas rental and house prices are quite high.

These caveats aside, the concept does incorporates a number of the areas included in the government's set of short- and long-term targets.

VARIABLES USED TO CAPTURE ADVANTAGE/DISADVANTAGE

In order to capture advantage/disadvantage using the concept just outlined, it was necessary for the variables being used to be comparable and available in both 2001 and 2006. Furthermore, to avoid spurious results it was also important for each of the variables to measure slightly different aspects of socioeconomic advantage/disadvantage and not be linearly related to other input variables. Given these two criteria, the following table contains the nine variables that were selected, as well as the average values for the Indigenous population across the Indigenous Regions in 2001 and 2006. All nine variables are calculated as percentages and calculated at the individual level.[5] They have been set up to measure positive aspects of access to economic resources.

Table 1. Average values for variables used to capture Indigenous and non-Indigenous access to economic resources, 2001 and 2006

	Indigenous		Non-Indigenous	
Variable	2001 (%)	2006 (%)	2001 (%)	2006 (%)
Employed[a]	42.23	45.55	66.49	69.51
Employed as a manager or professional[a]	6.18	7.35	18.08	19.53
Employed full-time in the private sector[a]	13.74	15.01	36.35	38.20
Completed Year 12[a]	16.84	20.74	38.13	44.21
Completed a qualification[a]	14.15	20.67	40.78	46.52
15 to 24 year olds attending an educational institution	29.23	29.73	39.86	40.19
Individual income above half the Australian median[a]	57.52	53.34	77.24	76.16
Lives in a house that is owned or being purchased	20.16	22.31	56.07	56.58
Lives in a house with at least one bedroom per usual resident[b]	32.93	36.75	62.90	66.84

Notes: a. Calculated for those aged 15 years and over. As the values in the above table are averaged without population weights across the 37 Indigenous Regions rather than calculated for Australia as a whole, the figures will differ slightly from Australian averages.

b. While this is a relatively unsophisticated measure of overcrowding that does not take into account household composition, it correlates very highly at the area level with other measures that do (Biddle 2008).

As can be seen in Table 1, the Indigenous Australian population lags behind the non-Indigenous population for all nine variables used to construct the index. However, apart from the income variable there was improvement in all indicators between 2001 and 2006.

RESULTS: RANKING INDIGENOUS REGIONS BY INDEX OF SOCIOECONOMIC OUTCOMES

To summarise the distribution of regions by the nine socioeconomic outcomes above, the regions are all ranked based on the component scores outlined in Table A2 and the values for the nine input variables for that region. These rankings are given in Table 2 for 2001 and 2006 as well as the difference between the two years.

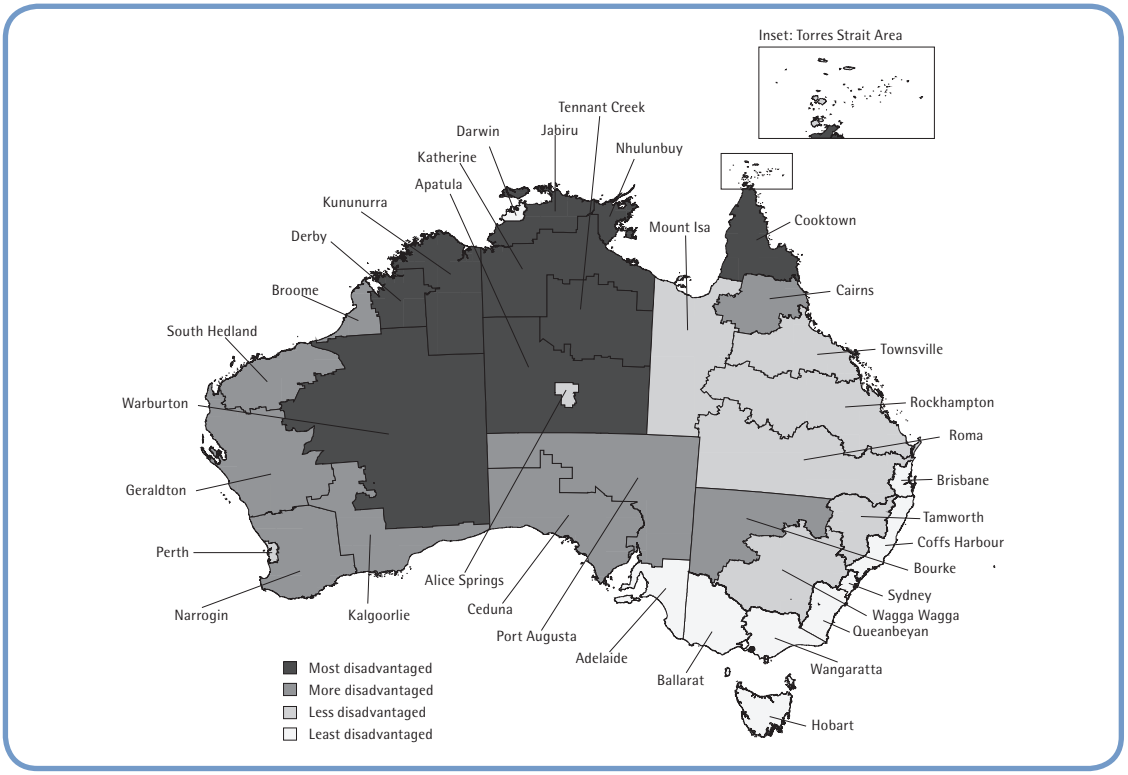
Keeping in mind that a ranking of one (the ACT) refers to the region with the most favourable outcomes whereas a ranking of 37 (Apatula) refers to the least favourable outcomes, it is clear that across the nine input variables the large capital city regions were the least disadvantaged. Of these, Adelaide and Perth

Table 2. Rank of Indigenous Regions by Indigenous index of socioeconomic outcomes: 2001, 2006 and change

Indigenous Region	2001 rank	2006 rank	Intercensal change in rank[a]
Queanbeyan	11	12	1
Bourke	25	25	0
Coffs Harbour	9	9	0
Sydney	3	5	2
Tamworth	21	20	-1
Wagga Wagga	12	16	4
Dubbo	18	17	-1
Melbourne	2	2	0
Non-Met. Victoria	6	8	2
Brisbane	5	3	-2
Cairns	17	18	1
Mt Isa	26	26	0
Cape York	31	31	0
Rockhampton	13	10	-3
Roma	14	14	0
Torres Strait	15	15	0
Townsville	16	13	-3
Adelaide	7	6	-1
Ceduna	27	24	-3
Port Augusta	28	29	1
Perth	8	7	-1
Broome	23	21	-2
Kununurra	32	32	0
Narrogin	19	19	0
South Hedland	24	27	3
Derby	30	30	0
Kalgoorlie	29	28	-1
Geraldton	22	22	0
Tasmania	4	4	0
Alice Springs	20	23	3
Jabiru	35	35	0
Katherine	34	33	-1
Apatula	37	37	0
Nhulunbuy	36	36	0
Tennant Creek	33	34	1
Darwin	10	11	1
ACT	1	1	0

Note: a. A negative value indicates an improvement in outcomes.

Fig. 2. Relative socioeconomic disadvantage ranked by quartile, 1991



Source: Gray & Auld (2000).

Fig. 3. Quartiles of Indigenous socioeconomic outcomes by Indigenous Region, 2006

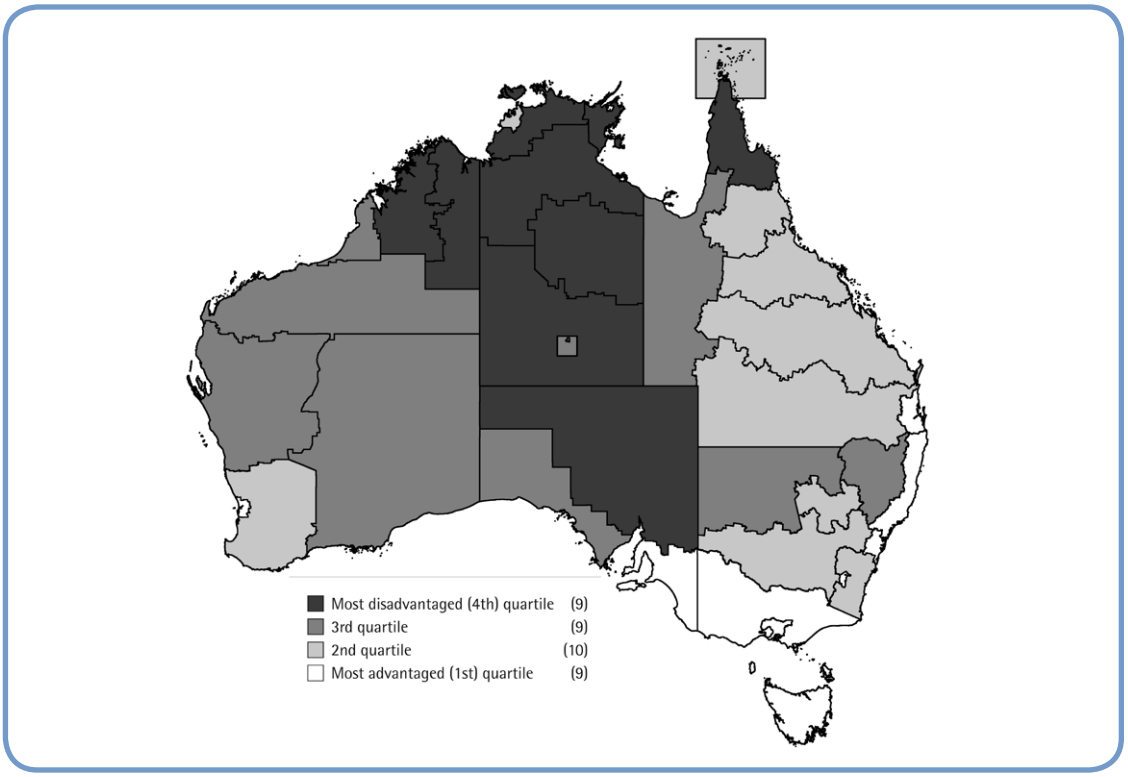
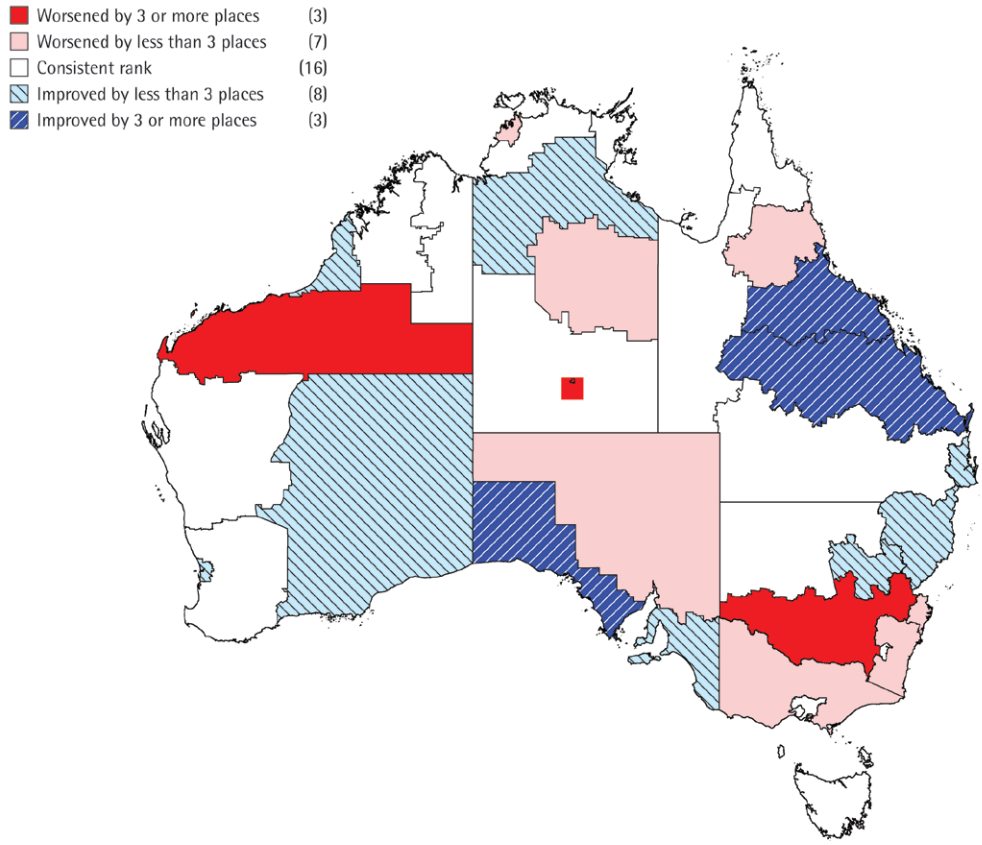


Fig. 4. Change in Indigenous socioeconomic rank by Indigenous Region, 2001–06



rank slightly lower than the eastern capitals. At the other end of the distribution, remote regions ranked relatively poorly, especially in the Northern Territory. Other regions outside of the Northern Territory in the bottom quarter of the distribution were Cape York, Port Augusta, Kununurra and Derby.

The Torres Strait Indigenous Region stands out to a certain extent as being one that is generally classified as part of very remote Australia yet, according to the input variables used in this paper, ranks in the top half of the distribution. However, those Indigenous Australians who identify as being Torres Strait Islanders as opposed to Aboriginal have been identified as having relatively favourable outcomes in the census (Arthur 2003).

The example of the Torres Strait Indigenous Region aside, this concentration of disadvantage in remote Australia and the Northern Territory in particular is not new and has been a feature of all the previous calculations of indices for the Indigenous population mentioned in the introduction to this paper. In order to demonstrate this, Figs 2 and 3 compare regions ranked by quartile of socioeconomic status in 1991 (Gray & Auld 2000) and the most recent picture from 2006.

What these two maps clearly show is a persistent pattern of disadvantage in the Northern Territory, most of the Kimberley, and Cape York Peninsula. Despite this broad long-term stability, there were some changes at the individual region level over the most recent intercensal period. What is interesting, therefore, is the change in ranking between 2001 and 2006 given in the final column of Table 2 and mapped in Fig. 4. Remembering that the same variables were used for each year but a separate Principal Components

Analysis (PCA) was undertaken (that is, the component scores for each variable may be different), there were three regions that improved their ranking by three places between 2001 and 2006. These were Rockhampton, Townsville and Ceduna. Compared to this, Wagga Wagga's ranking worsened by four places while South Hedland and Alice Springs both fell by three.

The changes in rankings between 2001 and 2006 do not necessarily represent an improvement/worsening in the socioeconomic status of those who lived in the region in 2001. Firstly, by using rankings the focus is explicitly on relative changes in outcomes. So, a region may have the same values for employment, education, income and housing in 2006 as it did in 2001, but if all other regions improved then that region's ranking is likely to worsen. Secondly, there is substantial population turnover across censuses, meaning that the outcomes of those in the region in both years may have stayed the same, with the inward migrants having quite different outcomes to those who left.

Of the regions that changed ranking substantially between 2001 and 2006, Townsville and Alice Springs therefore make an interesting comparison as they both had high rates of net inward migration over the period. Townsville, with a net inward migration rate of 5.0 per cent appears to have been more successful in absorbing the internal Indigenous migrants than Alice Springs, although the latter did have a somewhat higher net inflow (9.4%). In addition to the higher rate of inward migration, there are three possible demographic explanations for why Townsville's ranking improved whereas Alice Springs worsened. Firstly, the net migration rate for Alice Springs represented a much higher level of population turnover. In other words, the level of both inward and outward migration were higher, meaning that in absolute terms more people had to find employment, accommodation and schools. Secondly, Alice Springs is a much smaller region in terms of the total population, meaning that the Indigenous incoming migrants place a greater strain on infrastructure and labour markets.

The third potential explanation for why Alice Springs and Townsville moved in opposite directions is the source regions from which the migrants came. For Alice Springs, 64.7 per cent of migrants came from Apatula, which ranked lowest out of all regions in 2001. People coming from that region into Alice Springs are likely to have relatively low levels of financial and human capital and hence find it more difficult to integrate into the mainstream economy. Migrants into Townsville, on the other hand, came from a more diverse range of regions all across Queensland, many of which ranked reasonably highly in 2001. This last explanation would need to be tested with individual data once they become available, however what this regional comparison ultimately shows is that large net inflows of people can have very different impacts depending on the characteristics of the region and the characteristics of the migrants.

RESULTS: VARIATION OF INDIGENOUS AREAS WITHIN INDIGENOUS REGIONS

Although useful as a way to summarise the distribution of outcomes across Australia, there is likely to be substantial diversity within Indigenous Regions. For some regions, this is because of sheer geographic size. For example, if the Indigenous Region of Kalgoorlie was a country it would rank 31st in the world in terms of geographic size, just below Egypt but above such countries as Pakistan, France and Spain. Another reason for diversity is population size, with the Coffs Harbour, Sydney and Brisbane Indigenous Regions all having over 40,000 Indigenous Australians counted in the 2006 Census.

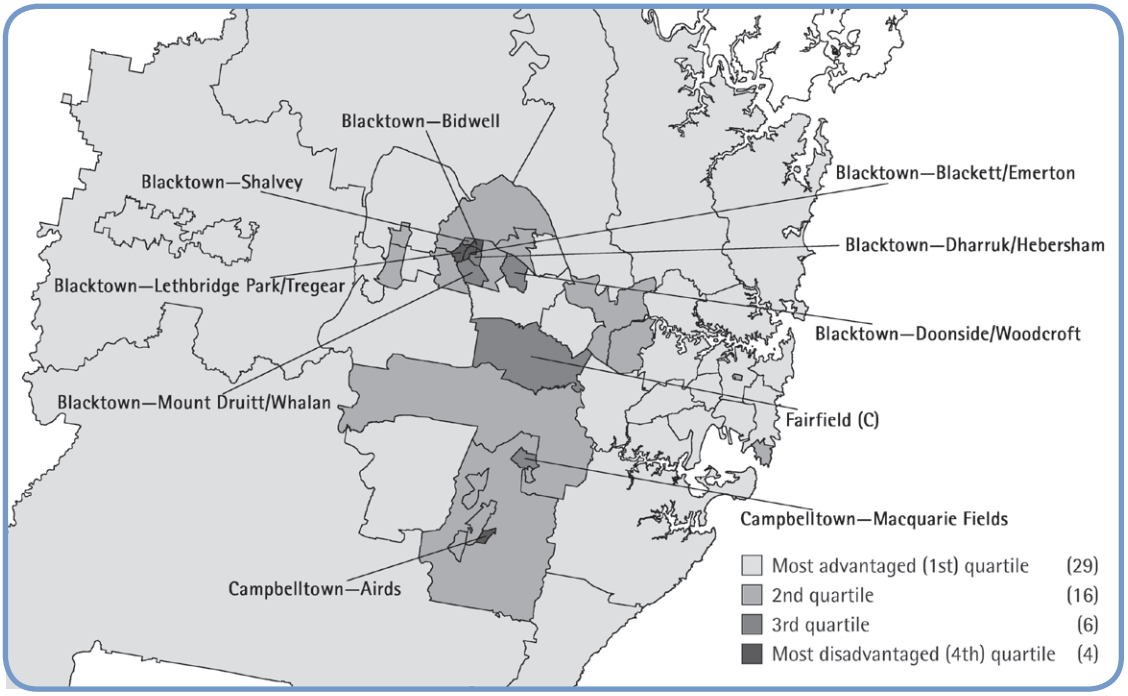
Given this diversity, the PCA was replicated for Indigenous Areas using 2001 and 2006 Census data. In total, there were 531 Indigenous Areas in 2006, with the 2001 data linked using a quasi-population-based concordance (Taylor and Biddle 2008). The results from the Indigenous Area PCA are given in Appendix Tables A3 and A4, with the ranking for each area given in a separate comma separated (.csv) file. The results

Table 3. Number of Indigenous Areas per Indigenous socioeconomic quartile rank by Indigenous Regions, 2006

		Number of areas per quartile in area level analysis[a]			
Indigenous Region	Region level quartile	1st quartile	2nd quartile	3rd quartile	4th quartile
Queanbeyan	2	3	3	3	0
Bourke	3	0	0	6	4
Coffs Harbour	1	6	10	8	1
Sydney	1	29	16	6	4
Tamworth	3	0	3	7	4
Wagga Wagga	2	1	9	12	1
Dubbo	2	0	2	6	0
Melbourne	1	21	1	1	0
Non-Met. Victoria	1	7	10	5	0
Brisbane	1	18	7	3	0
Cairns	2	5	4	7	2
Mt Isa	3	0	0	4	2
Cape York	4	1	0	2	10
Rockhampton	2	5	8	4	1
Roma	2	2	8	5	1
Torres Strait	2	1	4	9	1
Townsville	2	1	7	4	1
Adelaide	1	7	10	4	2
Ceduna	3	0	0	2	1
Port Augusta	4	0	1	3	3
Perth	1	7	12	3	0
Broome	3	0	1	0	5
Kununurra	4	0	0	1	12
Narrogin	2	1	3	8	5
South Hedland	3	0	1	2	3
Derby	4	0	0	1	9
Kalgoorlie	3	0	0	4	5
Geraldton	3	0	0	6	2
Tasmania	1	9	6	1	0
Alice Springs	3	0	1	0	1
Jabiru	4	0	0	1	10
Katherine	4	0	0	1	9
Apatula	4	0	0	0	15
Nhulunbuy	4	0	0	0	11
Tennant Creek	4	0	0	1	5
Darwin	2	6	6	3	2
ACT	1	3	0	0	0

Note: a. 1st quartile = most advantaged; 4th quartile = most disadvantaged.

Fig. 5. Quartile of Indigenous socioeconomic rank by Indigenous Areas, Sydney



for the Indigenous Area-based analysis are summarised in Table 3, showing the number of areas within each Indigenous Region that fall into each of the four quartiles (with the 1st quartile representing the most advantaged and the 4th quartile the most disadvantaged). The quartile ranking for the Indigenous Region as a whole is also given for comparison (calculated from Table 2).

Of the 37 Indigenous Regions, there were only three for which all Indigenous Areas were in the same quartile. All 15 areas in Apatula and all 11 in Nhulunbuy were in the lowest quartile, whereas all three areas within the ACT were in the top quartile. Of the other Indigenous Regions, Alice Springs, Cape York and Sydney stand out as having interesting patterns of diversity. There are only two Indigenous Areas in Alice Springs—Alice Springs itself and Alice Springs Town Camps. However, these areas have quite different ranks, with Alice Springs itself ranking 203rd whereas the Alice Springs Town Camps rank 526th out of only 531 areas. In Cape York, the Indigenous Area of Weipa ranks 37th, high enough to be in the top quartile. Of the remaining 12 areas, the next highest rank is Cook at 317. Clearly, the 483 Indigenous Australians counted in Weipa have substantially better outcomes than those in surrounding areas. They are also doing substantially better than the Indigenous population of Weipa in 2001, with that area having the greatest improvement across Australia over the last intercensal period.

There is substantial diversity in socioeconomic outcomes within Sydney, not surprisingly, given its large population size. However, both Coffs Harbour and Brisbane had a similar Indigenous population count in the 2006 Census, and these regions had a greater amount of clustering around the average region ranking. To highlight the diversity within Sydney it is interesting to note that six of the seven highest ranking areas across Australia are in Sydney, primarily in the north of the city. Compared to this, there were four Indigenous Areas in Sydney that ranked in the lowest quartile, three around Blacktown and the other in Campbelltown—Airds. It would appear, therefore, that there is also a spatial component to the socioeconomic diversity within Sydney, as shown in Fig. 5. In this map, the 55 Indigenous Areas within the Sydney Indigenous Region are colour coded, based on their quartile ranking. The darkest areas are those which rank in the bottom quartile, the lightest areas are those in the top quartile.

Table 4. Indigenous Area rankings by jurisdiction and location type, 2006

Jurisdiction/Location type	Number of Indigenous Areas	Rank		Areas in lowest ranked:	
		Mean	Standard deviation	Quartile	Decile
State					
New South Wales	144	229	128	14	0
Victoria	45	129	103	0	0
Queensland	127	242	134	18	4
South Australia	33	244	135	6	1
Western Australia	91	343	129	41	8
Tasmania	16	129	84	0	0
Northern Territory	72	421	138	53	40
Australian Capital Territory	3	18	6	0	0
Location type					
City areas	141	132	109	4	0
Large regional towns	94	226	97	2	0
Small regional towns and localities	112	258	115	12	0
Regional rural areas	22	205	132	4	0
Remote towns	36	318	85	5	0
Indigenous towns	79	447	87	65	31
Town camps	3	522	4	3	3
Remote dispersed settlements	44	448	57	37	10
Total Australia	**531**	**266**	**153**	**132**	**44**

Looking at Fig. 5, those Indigenous Areas in the bottom two quartiles are concentrated around Blacktown in the west of Sydney and Campbelltown in the south-west. An interesting finding from the analysis was that Redfern ranked 236th out of all Indigenous Areas in Australia in the 2006 Census, high enough to be in the 2nd quartile and hence not highlighted in the map. This was an improvement of 87 places from 2001 and represents substantial improvements in three variables: high school completion; qualifications; and overcrowding.

RESULTS: AREA CHARACTERISTICS ASSOCIATED WITH THE INDEX OF SOCIOECONOMIC OUTCOMES

Previous results presented in this paper have demonstrated a number of patterns in terms of socioeconomic ranking. In general, those regions or areas in remote parts of Australia ranked relatively poorly, whereas those in capital cities did relatively well (apart from some parts of Sydney). In this final section of results the variation in socioeconomic rank of Indigenous Areas is examined. Firstly, Table 4 looks at variation across the eight Australian States or Territories and, in addition, a classification of Indigenous Areas first presented in Taylor and Biddle (2008). Here, Indigenous Areas are allocated into eight location types based on the remoteness and population size of the predominant urban centre or localities. For each jurisdiction

Table 5. Change in Indigenous Area rankings by state and location type, 2001–06

State/Location type	Number of Indigenous Areas	Rank		Areas with large change in rank:	
		Mean	Standard deviation	Improved	Worsened
State					
New South Wales	144	6	46	9	18
Victoria	45	25	44	1	11
Queensland	127	-20	58	32	10
South Australia	33	15	57	4	9
Western Australia	91	-7	56	13	9
Tasmania	16	10	27	0	2
Northern Territory	72	9	43	1	6
Australian Capital Territory	3	-5	8	0	0
Location type					
City areas	141	3	38	11	9
Large regional towns	94	7	52	10	19
Small regional towns and localities	112	0	57	17	19
Regional rural areas	22	-11	98	5	5
Remote towns	36	-23	80	8	2
Indigenous towns	79	1	37	5	7
Town camps	3	4	1	0	0
Remote dispersed settlements	44	-1	41	4	4
Total Australia	531	0	52	60	65

or location type the number of areas is presented, as well as the mean and standard deviation of the ranking for all the areas, and the number of areas that were in the bottom quartile (25%) and decile (10%) of areas.

Indigenous residents in the three areas in the ACT had the most favourable socioeconomic ranking of all the States and Territories. Tasmania and Victoria had the next most favourable mean ranking, with Western Australia and the Northern Territory doing worst on average. In the latter jurisdiction, 40 out of 72 Indigenous Areas ranked in the bottom decile. Looking at it another way, a little over three-quarters of Indigenous Areas that ranked in the bottom decile were in the Northern Territory, despite making up only 13.6 per cent of all Indigenous Areas.

All jurisdictions apart from the Northern Territory had at least one Indigenous Area ranked 21st or better. Even in the Northern Territory, the outer parts of Palmerston ranked reasonably highly at 56th. Of all the jurisdictions, the standard deviation was greatest in the Northern Territory; however it was also high in the four states with large geographic areas. Clearly, apart from the ACT and to a lesser extent the Northern Territory, delineating by jurisdiction does not result in a set of homogenous Indigenous Areas.

An alternative way to separate Indigenous Areas (which has the same number of categories) is by location type. Using this classification, the second set of results presented in Table 4 confirm that Indigenous Australians in city areas are doing on average quite well relative to their remote counterparts (once again, based on the nine input variables chosen). Large regional towns, small regional towns and regional rural areas all have a mean rank in the low to mid 200s, however regional rural areas have the largest standard deviation of the eight location types. Of the four remote location types, remote towns have the most favourable mean ranking, with the other three location types all averaging in the mid 400s or worse. The three areas designated as town camps have a mean ranking of 522 out of a maximum of 531. Clearly it is in these areas where measured outcomes are worse.

A similar analysis to that presented in Table 4 is repeated in Table 5 using the change in Indigenous Area socioeconomic ranking across the most recent intercensal period (2001–06). Once again the mean and standard deviation are given, however the last two columns now give the number of areas that had a substantial (50 places or more) increase or decrease over the last intercensal period. It should be kept in mind that although the same set of variables was used in both periods, the PCAs produced slightly different component scores. This may be driving some of the changes in Indigenous Area rankings across the two periods rather than changes in the underlying variables.

Keeping in mind that a negative value in Table 5 refers to an improvement in socioeconomic outcomes (that is, the most advantaged area is ranked 1st, the most disadvantaged ranked 531st) there were three jurisdictions that witnessed an improvement in average rank over the last intercensal period. The largest mover was Queensland, which had an average improvement of 20 places. Compared to this, Victoria had the worst average deterioration, followed by South Australia and Tasmania.

Moving on to the second section of Table 5, there are two location types that stand out in terms of having significant gains in average socioeconomic rank. Remote towns had an average gain of 23 places and regional rural areas had an average gain of 11 places. There was however a high level of stability across the other six location types, at least in terms of averages.

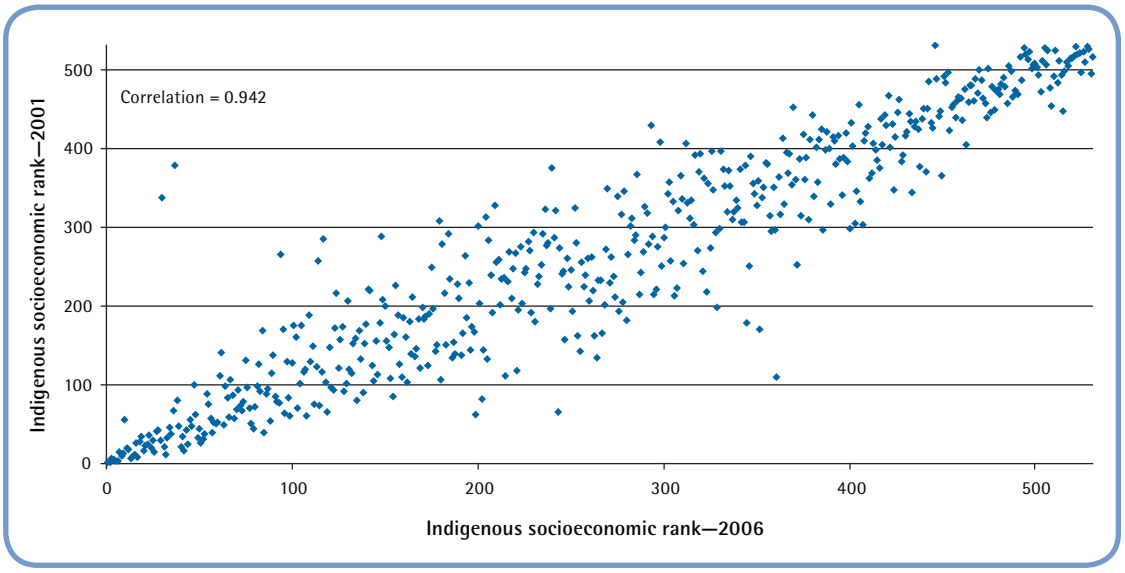
In addition to the geographic distribution of socioeconomic outcomes presented in Table 4, measured socioeconomic outcomes also vary by the demographic and other characteristics of the area's usual residents. Using graphs and correlations, the relationship between the Indigenous Area rank in 2006 and the following is examined:

- The Indigenous Area rank in 2001
- The Indigenous Area rank for the non-Indigenous population in 2006
- The average rank of adjacent or contiguous Indigenous Areas in 2006
- The percentage of the population who speak an Indigenous language at home in 2006
- The percentage of 3–5 year olds attending preschool in 2006 (excluding those who have started school).

RELATIONSHIP BETWEEN INDIGENOUS AREA SOCIOECONOMIC RANK IN 2001 AND 2006

Between 2001 and 2006, 67.8 per cent of the applicable Indigenous population stayed in the same Indigenous Area of usual residence. This national average in terms of propensity to move hides a lot of variation at the area level, with some areas having much greater turnover than others. In these areas, especially if those who moved into an area have different characteristics to those who left, there is a strong chance that the socioeconomic rank will have changed over the last intercensal period. Furthermore, there may have been specific regional policies or local interaction with specific policies that led to either improvement or worsening in the socioeconomic outcomes of those that did not move. It is interesting, therefore, to look

Fig. 6. Indigenous socioeconomic rank in 2006 by Indigenous socioeconomic rank in 2001



at the correlation between an area's rank in 2001 and 2006 and important to identify those areas that ranked substantially higher in one year compared to another. This is demonstrated in Fig. 6, which plots the Indigenous socioeconomic rank of the area in 2006 along the x-axis and the Indigenous socioeconomic rank in 2001 along the y-axis.

Fig. 6 shows a high degree of continuity between 2001 and 2006 in terms of the Indigenous socioeconomic rank of the area. With a correlation of 0.942 across the two years, those that ranked relatively highly in 2001 also tended to rank relatively highly in 2006. Those areas that did change rank substantially between the two Censuses (either upwards or downwards) tended to be those that were towards the middle of the distribution in 2001. This is perhaps not surprising as there is really only one direction to go when an area has a very high or a very low rank. However it does show that there are areas in Australia with entrenched levels of disadvantage, as well as those which rank consistently well on the standard socioeconomic indices. Those areas that ranked relatively poorly in both years were exclusively in remote Australia with some having quite large populations. Alice Springs Town Camps, Tanami, Thamarrur and Maningrida Indigenous Areas all ranked quite low in both years, yet had an Indigenous count of over 1,000 people in 2006.

While it is important to identify those areas with entrenched levels of disadvantage, it is also worth identifying those areas that changed ranks substantially over the time period. As mentioned previously, Weipa Indigenous Area had the greatest improvement in rank between 2001 and 2006, going from 378th to 37th. This change was brought about mainly by a large inflow of Indigenous Australians into the area, with a net migration rate equivalent to 30.6 per cent of the 2001 population.

The Indigenous Area whose ranking fell by the most between 2001 and 2006 was Tennant Creek (excluding town camps). This area fell from 110th in 2001 to 361st in 2006. While Tennant Creek is clearly in remote Australia, there were also a number of non-remote areas that also went backwards over the period. This includes: Campbelltown—South-West and Blacktown—Doonside/Woodcroft in Sydney; Wodonga and Warrnambool in country Victoria; Gray, an Indigenous Area in Darwin; and Busselton in regional Western Australia. It is very hard to argue that in these areas the indicators chosen do not capture a

large component of socioeconomic status (though the absence of crime and health data in the census is a notable weakness, as discussed in the conclusion). These areas therefore represent important sites of social policy concern.

There were only a few areas with substantial changes in ranking between 2001 and 2006 that had relatively low levels of population turnover. These include Tumut in NSW and Yorke in the Torres Strait Indigenous Region, which both improved; and Jervis Bay Territory in NSW, which worsened. However, these areas tended to have relatively small populations. It would appear that the main way in which the average circumstances of an area changes is through population turnover.

RELATIONSHIP BETWEEN INDIGENOUS AND NON-INDIGENOUS AREA-BASED SOCIOECONOMIC RANK IN 2006

While calculating the ranking for Indigenous Regions in a previous section of this paper, it was pointed out that for the non-Indigenous population at that level of geography the variables chosen do not capture variation in socioeconomic status well. In particular, two of the variables had a negative correlation with the first principal component. By undertaking the analysis at the Indigenous Area and more significantly weighting the correlation matrix by population size, it was possible to obtain a more robust index of socioeconomic outcomes. The results for this PCA are given in Appendix 1, Table A3.

To look at the relationship between Indigenous and non-Indigenous socioeconomic rank it was possible to use the weighted PCA whilst still being confident that all other points raised about the characteristics of low and high ranking areas for the Indigenous population hold. This is because there was very little difference between the weighted and unweighted Indigenous rank.[6]

Fig. 7 shows a complex relationship between Indigenous and non-Indigenous socioeconomic rank in the area. Firstly, there is a negative correlation between the two rankings, although the magnitude of this is quite small. There are, however, some discernible patterns in Fig. 7, although these become apparent only when it is split into three sections along the x-axis. Going from left to right, there appears to be a weak positive relationship between socioeconomic rank for the Indigenous population in the area and the corresponding non-Indigenous population up until around the 70th to 80th Indigenous Area. These areas are generally in the wealthier parts of Australia's large cities with all residents doing reasonably well on the measures chosen (though the Indigenous population still lags behind the non-Indigenous population in these areas).

The second section of the figure runs from around the 80th ranked Indigenous Area according to the Indigenous usual residents to around the 430th. In this section there is no clear relationship between the Indigenous and non-Indigenous rankings. However, this section makes up the bulk of Indigenous Areas and reinforces the point made in an earlier part of the paper that the standard SEIFA (which for most areas is heavily skewed towards the non-Indigenous population) may not always be a good indicator of the distribution of Indigenous socioeconomic outcomes.

The final section of the figure includes the lowest 100 or so ranked Indigenous Areas. In many ways this is the most interesting part of the scatter plot in that it is clearly grouped around a cluster of low ranking areas according to Indigenous outcomes, but high ranking areas according to their non-Indigenous outcomes. This group is predominantly made up of Indigenous Areas classified as Indigenous towns, town camps or remote dispersed settlements in the location type classification presented in Table 4. Indeed, when the correlations are calculated separately for the first four and the last four categories in the location type classification, one finds a positive correlation between Indigenous and non-Indigenous outcomes in non-remote Australia (equal to 0.548) and a negative correlation in remote Australia (-0.323).

Fig. 7. Indigenous by non-Indigenous socioeconomic rank in 2006 using weighted Principal Components Analysis (PCA)

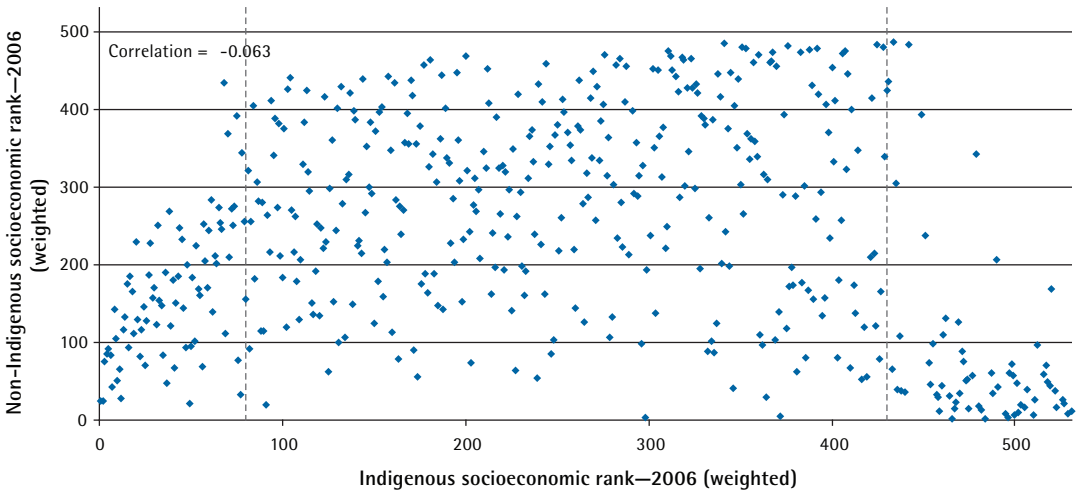
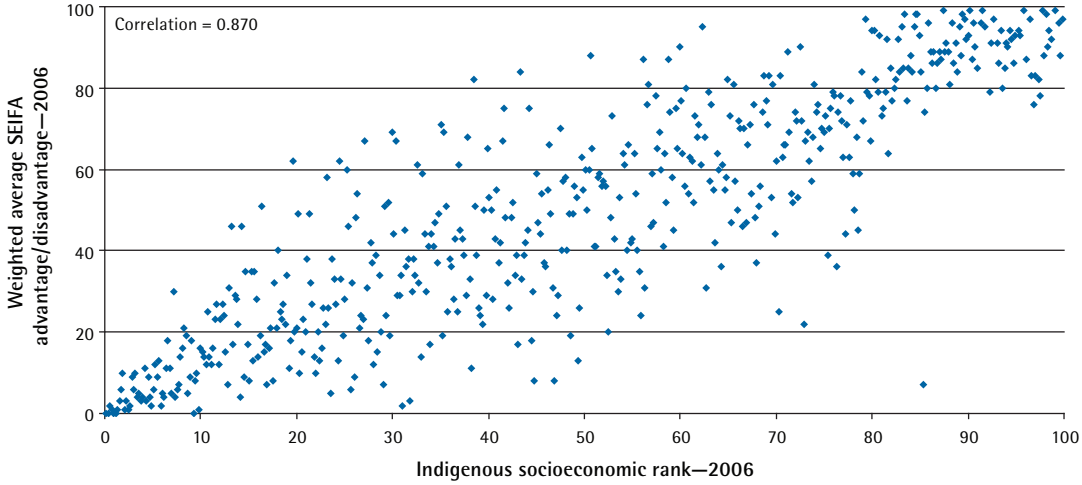


Fig. 8. Indigenous socioeconomic rank by weighted average SEIFA advantage/ disadvantage rank across the Indigenous Area, 2006



CD:
Collector District

Interestingly, the correlation between the SEIFA advantage/disadvantage and the Indigenous socioeconomic rank of the Indigenous Area calculated in this paper is positive and quite high. Specifically, the score for each Census Collector District (CD) was averaged across the Indigenous Area in which they fall (keeping in mind that the AIGC also has CDs as its base) weighted by the number of Indigenous Australians in that CD. The Indigenous Areas were then ranked between one and 100, with one being the most advantaged and 100 the most disadvantaged. Fig. 8 plots this weighted average SEIFA value (on the y-axis) against the Indigenous socioeconomic rank normalised to the same scale.

While there was a large positive correlation between the socioeconomic rank of the Indigenous Area and the average SEIFA value, there was still substantial variation around a one-to-one relationship. For example the Indigenous Area of Groote Eylandt/Milyakburra and Outstations was ranked in the 7th percentile based on its SEIFA values, but was ranked in the 86th percentile (453rd) in this paper. Although not as extreme, there were a number of other outliers presented in Fig. 8. While related to a certain extent to the different geographic scales used to create the indices (a version of the ecological fallacy) it does nonetheless show that an index calculated on the total population is not always going to reflect the distribution of outcomes of the Indigenous population.

RELATIONSHIP BETWEEN INDIGENOUS AREA SOCIOECONOMIC RANK AND AVERAGE RANK OF CONTIGUOUS AREAS IN 2006

The results presented in Table 4 showed a certain level of geographic clustering in Indigenous socioeconomic outcomes through the lower standard deviation within location type than for Australia as a whole. However, Indigenous Areas can also cluster spatially. That is, rather than grouping Indigenous Areas based on a common characteristic, it is possible to test whether the rank of an Indigenous Area is related to the rank of adjacent Indigenous Areas. This is done in Fig. 9 through plotting the socioeconomic rank of Indigenous Areas in 2006 based on the characteristics of the resident Indigenous Australians on the x-axis and the average rank of all Indigenous Areas that are contiguous (adjacent to it) on the y-axis. Once again, the correlation between the two values is given in the upper left-hand part of the figure.[7] Those areas without contiguous Indigenous Areas (that is island Indigenous Areas) are not included in this part of the analysis.

Fig. 9 shows a positive correlation between the socioeconomic rank of the Indigenous Area in 2006 by the average socioeconomic rank of contiguous areas. In other words, areas with relatively low or relatively high rankings are more likely to be adjacent to other areas with similar rankings. This spatial auto-correlation can be used to identify outliers or areas which stand out from those that are adjacent to it.

By identifying outliers in Fig. 9 it is possible to identify areas with favourable or unfavourable rankings relative to adjacent areas. This can be used as a way to identify local as opposed to national or regional policies or circumstances that are associated with beneficial or poor Indigenous outcomes respectively. There were ten areas that ranked 200 or more places above the average rank for adjacent areas and a further 54 that ranked between 100 and 200 places higher. The three areas that ranked most favourably compared to adjacent areas were the remote towns of Alice Springs (excluding town camps), Weipa and Karratha. Clearly these areas have more favourable outcomes than the adjacent dispersed settlements or town camps. In addition to remote towns where there are a total of ten Indigenous Areas that are 100 or more places above adjacent areas, there are also a number of city areas (14 in total), large regional towns (14) and small regional towns (16). There was, however, only one remote dispersed settlement which falls into that category.

Fig. 9. Indigenous socioeconomic rank by average socioeconomic rank of contiguous areas, 2006

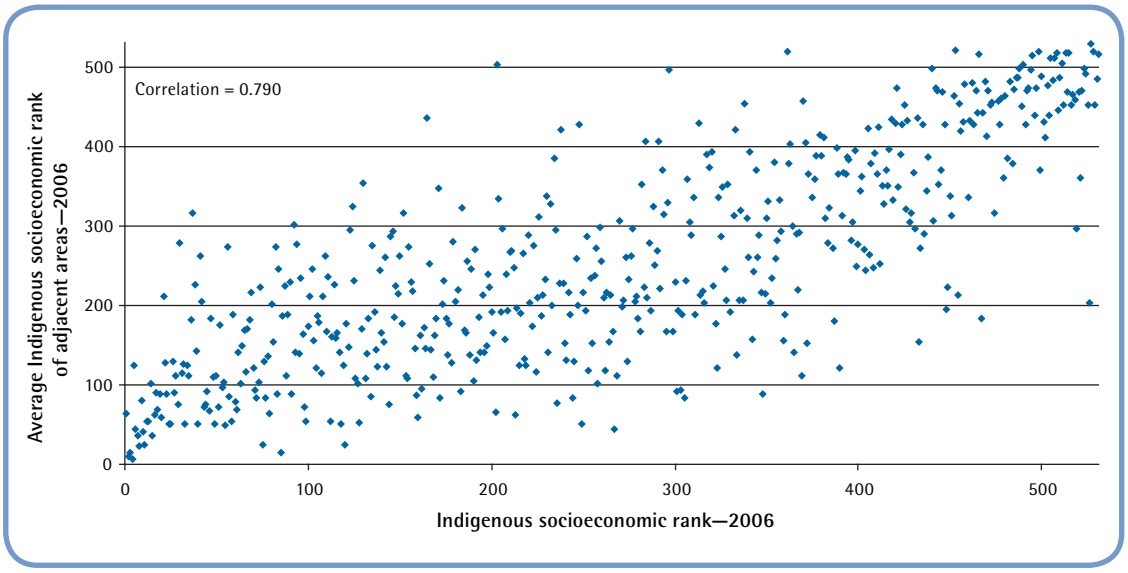


Fig. 10. Indigenous socioeconomic rank by per cent of Indigenous population who speak an Indigenous language at home, 2006

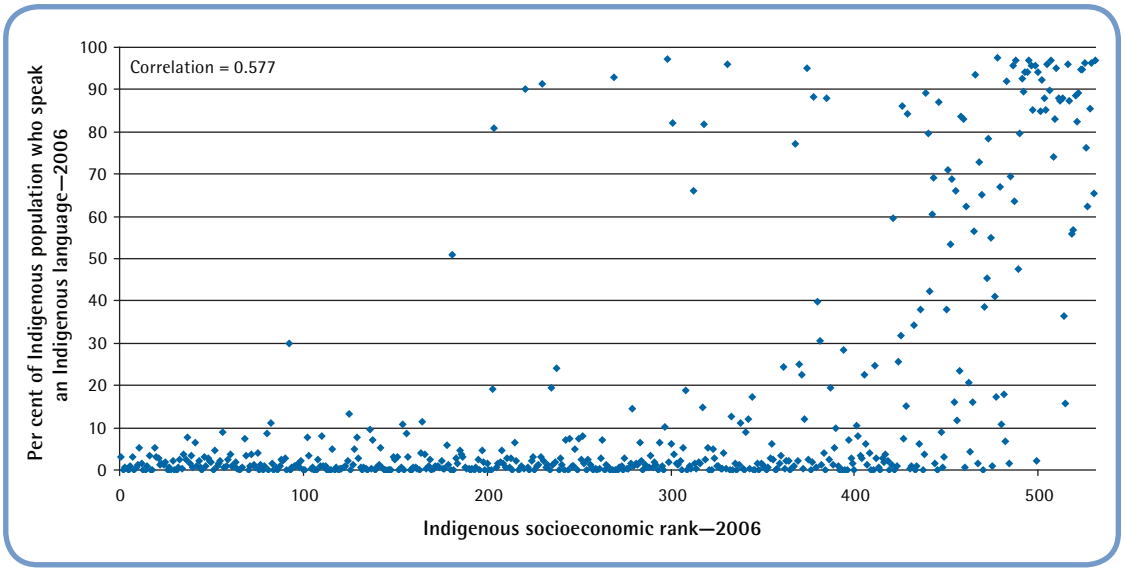
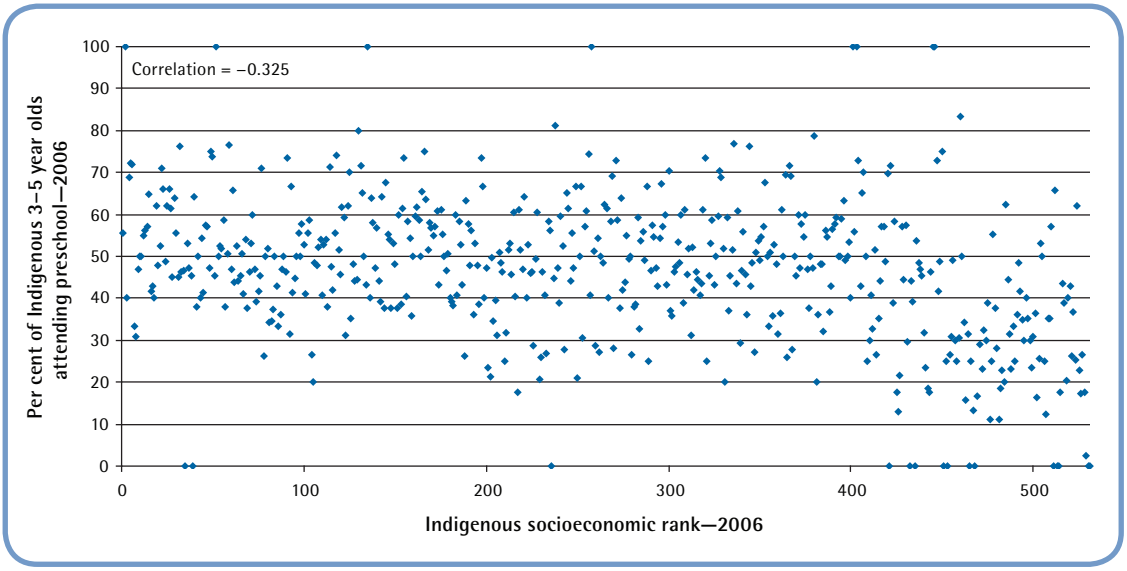


Fig. 11. Indigenous socioeconomic rank by per cent of Indigenous 3–5 year olds attending preschool, 2006



RELATIONSHIP BETWEEN INDIGENOUS AREA SOCIOECONOMIC RANK AND THE PERCENTAGE OF POPULATION WHO SPEAK AN INDIGENOUS LANGUAGE AT HOME IN 2006

One of the strongest criticisms of socioeconomic indices created from census data is that they don't capture all aspects of Indigenous wellbeing, such as participation in Indigenous cultural activities, access to traditional lands, use of Indigenous language, and observance of Indigenous protocols (Taylor 2008). This is usually because such concepts are not captured as part of official collections. However, even when they are, they often don't fit easily into the standard methodological approaches. This is demonstrated through the relationship between the socioeconomic rank of the Indigenous Areas and the percentage of the population who speak an Indigenous language at home (Fig. 10). While not perfect (for example there is no indication of how well that person speaks the language) it is still a good proxy for cultural maintenance.

Keeping in mind that a high number along the x-axis indicates high levels of disadvantage, Fig. 10 shows a high positive correlation between socioeconomic disadvantage and the percentage of the population who speak an Indigenous language at home. However, there are a large number of areas where less than one per cent of the Indigenous population speak an Indigenous language (39.7% of all areas) making it difficult to see the relationship clearly in the scatter plot. Indeed when these areas are removed from the correlation analysis, the strength of the association is slightly stronger at 0.618.

While it is not possible to establish the direction of causality, it does show that those areas that rank relatively highly on the standard socioeconomic measures have relatively low levels of Indigenous language retention. Furthermore, although likely to be related to remoteness, this result highlights one of the limitations of an analysis that produces a single index based on census data only. Were they available, it is likely that other variables representing cultural maintenance would also have a similar relationship. This needs to be taken into account in any regionally based policy designed to improve Indigenous wellbeing. Ideally, rather than there being a trade-off, development planning should incorporate both Indigenous-specific aspirations and the variables included in the index for this paper.

RELATIONSHIP BETWEEN INDIGENOUS AREA SOCIOECONOMIC RANK AND THE PERCENTAGE OF 3–5 YEAR OLDS ATTENDING PRESCHOOL IN 2006

The final relationship considered in this section is between an area's socioeconomic rank and the percentage of 3–5 year olds attending preschool (excluding those who have already started school). Since early childhood education is the key to sustained development, just as there is a relationship within the household in terms of socioeconomic status and preschool participation (Biddle 2007), it is important to test whether the same relationship holds at the area level.

The results presented in Fig. 11 show, with a correlation of -0.325, a weak negative relationship between area level socioeconomic disadvantage and preschool attendance. Looking at the scatter plot, it appears that only beyond a ranking of 420–30 is there a lower level of preschool participation for 3–5 year olds.

This lack of a strong relationship may reflect the small sample sizes involved in the preschool variable—there are often only a few Indigenous 3–5 year olds eligible for preschool in an area upon which to calculate the percentages. Nonetheless, there are two important points that can be made from the results. Firstly, the finding in a number of other contexts that adult and child socioeconomic outcomes are distributed very differently at the area level (Barnes et. al 2007) appears to hold for the Indigenous Australian population. To look at the distribution of child outcomes, a separate index is therefore necessary. The second point that follows from this is that in targeting policy to improve preschool participation, area level characteristics calculated using adults are not a good guide (apart from at the extreme lower end of the distribution). Rather, policy may better be directed towards households or specific preschools. One potential intervention with regards to the latter is increasing the number of preschool workers who are themselves Indigenous, as Biddle (2006) found this had a strong positive association with attendance.

SUMMARY AND IMPLICATIONS

The first impression from the results presented in this paper, especially at the broad regional level, is that there has been very little change in the relative distribution of Indigenous socioeconomic outcomes since such indices were first calculated in Tesfaghiorghis (1991). Then, as now, capital city regions ranked relatively well, whereas remote regions, especially in the Northern Territory, did relatively poorly. Regional Australia fell somewhere in between. If anything, the remote/non-remote disparity was more pronounced using this most recent Census. The reasons for this disparity are also likely to be similar. Based on results from the 1986 Census, Tesfaghiorghis (1991: 12) argued that 'remote regions face a high degree of locational disadvantage as they cannot access mainstream programs to the same extent as the residents of urban areas. They are also locationally disadvantaged with respect to access to mainstream labour markets.' The same could easily be said 20 years later.

When one looks beyond these broad regional patterns, however, the results become a lot more interesting. Firstly, by repeating the analysis using 2001 data it was shown that there were three regions that improved their ranking by three places or more across the most recent intercensal period, and a further three whose ranking worsened by the same amount. Looking at regions specifically rather than broad remote/non-remote groupings, a certain level of dynamism begins to emerge. The two regions of Townsville and Alice Springs were discussed as pertinent examples. Both had high rates of inward migration, but whereas the former region's ranking improved substantially, there was a substantial decline for the latter. A discussion of migration patterns points to the key role source area plays in the likely costs or benefits of large scale inward migration into a region.

A socioeconomic index was also calculated for a much smaller level of geography, the Indigenous Area. This is the first time such an analysis has been undertaken for so small a level of geography, however doing so produced a number of interesting results. Firstly, it was possible to show that for a number of Indigenous Regions (which remember are based to a large extent on former ATSIC Regions) there was substantial variation across the underlying Indigenous Areas. The example of Sydney was analysed in some detail, showing that despite having the highest ranking Indigenous Area across all of Australia, the Indigenous population in areas of Sydney including Blacktown and Campbelltown had outcomes that were closer to those found in remote parts of the country. Even in a number of the more remote Indigenous Regions there was substantial variation, showing that a geographically targeted strategy of 'closing the gaps' must go below the broad regional level. By focusing on those Indigenous Areas that ranked relatively poorly in both 2001 and 2006, pockets of entrenched disadvantage can clearly be identified. Given the strong correlation between the different dimensions of disadvantage (both theoretically and observed), targeting based on a summary indicator may be a cost-effective complement to looking at the underlying variables in isolation.

By calculating a separate index of socioeconomic outcomes for each Indigenous Area, it was also possible to look at variation alongside a number of other characteristics of the area. Firstly, by looking at the correlation between the 2001 and 2006 outcomes, the stable or even entrenched nature of Indigenous disadvantage is apparent. There were exceptions and these provide potential sights for interesting case-study style analysis in terms of what policies or circumstances might lead to substantial gains or losses in relative socioeconomic status. However, with very few exceptions the areas that did move substantially between 2001 and 2006 (either upwards or downwards) did so on the back of large net inward migration or population turnover. Using this as a policy lever is unlikely to be effective, as it is in many ways a zero-sum game. What is interesting, however, is the way in which source destination and individual characteristics interact with the effect of large scale migration on an area's socioeconomic rank. This is an issue taken up in future research outputs.

The parallel attempts to calculate a similar socioeconomic index for the non-Indigenous population using the AIGC resulted in a number of difficulties which were interesting in themselves. Unlike for the Indigenous population, there was little evidence either at the Indigenous Region or Indigenous Area level that a single index summarises the variation in the nine socioeconomic outcomes sufficiently. There were two variables—youth education attendance and home ownership—that had a large negative correlation with the first component. This changed somewhat when population weights were used, though the correlation with home ownership remained negative (albeit with a much smaller magnitude). This shows that because of the large variation in population size and perhaps the high level of population turnover in a number of low population remote areas, the AIGC is problematic for Indigenous versus non-Indigenous socioeconomic comparisons.

The difficulty with calculating indices that are useful for both the Indigenous and non-Indigenous population was further highlighted by the very low correlation between the Indigenous and non-Indigenous rankings in 2006 even after using population weights. There was a positive and reasonably strong relationship when the CD level SEIFA advantage/disadvantage ranking was correlated with the Indigenous rank at the Indigenous Area level. However, there was still far from a one-to-one relationship, demonstrating the limitations in the standard SEIFA measures for looking at the distribution of Indigenous socioeconomic outcomes.

There was a reasonably clear relationship between the rank of a particular Indigenous Area and the average rank of adjacent Indigenous Areas. This spatial relationship opens up two areas of analysis that can provide key insights into policy evaluation and targeting. Firstly, as was done in this paper, it is possible to identify outliers or areas that rank substantially better or worse than adjacent Indigenous Areas. These areas can then be used as a basis for local case-studies that identify particular policies or circumstances that impact

on Indigenous socioeconomic outcomes. The second type of analysis involves identifying clusters of areas of socioeconomic disadvantage. While beyond the scope of this paper, such methodologies can identify groups of areas of particular policy concern that align spatially.

The final point to make from the results presented in this paper is the limitations of such indices. This was highlighted first by the low correlation between preschool participation and socioeconomic status calculated using variables based on adult outcomes. What this shows is the necessity of calculating child-specific indices to support related policy development and delivery, as well as the role that individual households and families play in child development outcomes. The second limitation of using a single index is that a number of variables that have been identified by Indigenous Australians as important are either not available from the census (for example health outcomes or crime and feelings of safety) or are negatively correlated with the standard measures of socioeconomic outcomes. An example of the latter given in this paper was the percentage of the population who speak an Indigenous language at home.

The limitations of this style of analysis have a number of implications for future research and the policy responses that flow from it. Firstly, to get a complete picture of the distribution of socioeconomic status, information from additional data sources is required. Examples include information on levels and perception of crime, life expectancy and other health related measures, and community level information like the presence or absence of key infrastructure. There are a number of methodological and access issues involved in doing so (as outlined in ABS 2000), mostly concerning the matching of administrative to census data. However the costs of ignoring the issue are also high.

The second implication is that a single index may not always be appropriate. Rather, two or more separate indices that occasionally move in different directions may be useful, thereby highlighting the potential complexity and trade-offs. The final implication relates to this trade-off in that policies designed to improve the levels of employment, education, housing and income need to reflect the aspirations of those in the area.

Regardless of the above limitations, the results presented in this paper and more importantly the index values that they were based on can, if done with caution, be used effectively to target policy and resources. By providing a single summary measure of outcomes across the categories of employment, education, housing and income it is possible to identify regions or specific areas of greatest need. This is vital for location-specific policies designed to bring about an improvement in Indigenous outcomes.

NOTES

1. In 1993 there were legislative changes reducing the number of ATSIC regions from 60 to 36.
2. The use of Indigenous status in the Index of Relative Socio-economic Disadvantage may have a practical purpose in that there are number of aspects of disadvantage that are not captured well in the census (for example health, exposure to the criminal justice system and lack of political power) that may be correlated with it. However, it is difficult to see how it fits within the general definition of advantage/disadvantage as 'people's access to material and social resources, and their ability to participate in society' (ABS 2008: 5). There are other demographic characteristics from the census that also correlate highly with measures of advantage or disadvantage (for example the proportion of the population who were born overseas or who hold certain religious beliefs). These groups are rightly not included in the index as it will preclude any analysis of how they are distributed across disadvantages CDs. It is unfortunate that such analysis cannot be undertaken for the Indigenous population.
3. As the 2001 and 2006 Censuses are based on different census CDs it is not possible for the ABS to construct official population-based concordances. However, after finding a number of anomalous results using the area-based concordances supplied by the ABS, we constructed our own concordances that more explicitly take into account the uneven nature of boundary changes. Specifically, we used an area-based concordance for 2001 Census CDs to 2006 Indigenous Regions. We then used the usual resident total population for the Census CDs in 2001, weighted them by the area-based ratio of the 2001 Census CD in the 2006 Indigenous Regions and summed them up to 2001 Indigenous Areas. This gave an estimate of the ratio of the population in each of the 2001 Indigenous Areas that would have been classified into each of the 2006 Indigenous Regions using that classification scheme. These concordances are available from the authors upon request.
4. The major difference between the approach outlined in ABS (2000) and the one used in this paper is that, for our purposes, the source of data has already been chosen.
5. While income is usually earned individually, it is often shared at the household level. However, household income suffers from the fact that it is not collected separately but rather calculated by summing across individuals in the household. Persons temporarily absent therefore make calculating accurate household income difficult. Furthermore, household income would need to be equivalised to take into account household composition. This was not available for the Indigenous population without cost for 2006 and was not available at all for 2001. Ultimately though, averaging across individuals in the area means there would very little difference if household income was used and comparability across years was deemed to be more important than including equivalised rather than personal income.
6. Importantly, when undertaking a weighted PCA for the Indigenous population, the results hardly varied (there was a correlation of 0.9998 between the ranks calculated using weighted and unweighted PCA for the Indigenous population). The reason why there was difference for the non-Indigenous population and not the Indigenous population is because Indigenous Areas are delineated with the latter in mind and hence have much more consistent population sizes. The Indigenous usual resident count across the Indigenous Areas has a mean of 854 people with a standard deviation of 745. The non-Indigenous count on the other hand has a mean of 34,328 people with a standard deviation of 52,340.
7. It should be noted that this correlation is related to but slightly different from the commonly used Moran's I.

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APPENDIX 1

CONSTRUCTING THE INDICES

PCA: Principal Components Analysis

To construct a single index that summarises the nine measures of socioeconomic advantage, the empirical results presented in this paper are based on a Principal Components Analysis (PCA). PCA is a statistical technique that turns a set of variables into the same number of uncorrelated components. These components are ordered such that the first component explains the largest amount of variation across the original variables, the second component the next largest amount and so on. The components are constructed as a linear combination of the original variables using a component score that is calculated based on a correlation matrix of the original variables (Darlington 1997).

One of the implications of using PCA is that the component scores that are produced are highly contingent on the underlying data and the resultant correlation matrix. This means that, even when using the same set of variables, a PCA for the same population in different years or different populations in the same year may result in quite different scores for each variable. This is because the relationship between the variables may change through time or across population subgroups. For example, Biddle (2007) showed that the association between education and employment was quite different for the Indigenous compared to the non-Indigenous population. Given this potentially different relationship, rather than using the same component scores, a separate PCA is undertaken for the Indigenous and non-Indigenous population and for 2001 and 2006.

RESULTS: CONSTRUCTING THE PRINCIPAL COMPONENTS

In Table A1 the scaled eigenvalues are presented for the estimation for Indigenous and non-Indigenous Australians using 2001 and 2006 data (that is, four sets of results in total). These eigenvalues represent the amount of variation explained by each of the nine principal components and are expressed as a percentage of the total variation across the nine variables.

Table A1. Eigenvalues expressed as per cent of variation explained by each component: Indigenous Regions

	Indigenous		Non-Indigenous	
Component	2001	2006	2001	2006
Component 1	72.0	73.7	69.3	68.5
Component 2	14.2	14.2	14.3	15.4
Component 3	6.2	5.9	6.8	6.4
Component 4	3.0	2.6	4.5	5.8
Component 5	2.4	1.5	2.2	1.6
Component 6	1.2	1.0	1.2	1.1
Component 7	0.5	0.5	1.0	0.7
Component 8	0.3	0.4	0.6	0.3
Component 9	0.2	0.3	0.3	0.1

The pattern of variation explained across the nine components is remarkably similar for each of the four estimations. Between 68.5 and 72.0 per cent of the variation is explained by the first component. The maximum per cent of variation explained by the second component is correspondingly low ranging from 14.2 to 15.4 per cent. While the eigenvalues for this second component were greater than one (a common cut-off used in PCA) because of the large difference between it and the first component (an alternate criteria) and the fact that the aim of the paper was to summarise socioeconomic status as succinctly as possible, only one principal component was used for the remainder of the analysis.

Although there were similar results across the two Censuses and for Indigenous and non-Indigenous Australians in terms of the amount of variation explained by each of the components, this was not the case with the eigenvectors or the correlation between the individual variables and the retained component, as shown in Table A2.

Table A2. Eigenvectors or correlation between the input variables and first component: Indigenous Regions

	Indigenous		Non-Indigenous	
Variable	2001	2006	2001	2006
Employed (aged 15 years and over)	0.1581	0.2116	0.3881	0.3923
Employed as a manager or professional (aged 15 years and over)	0.3100	0.2610	0.3145	0.3145
Employed full-time in the private sector (aged 15 years and over)	0.3229	0.3504	0.3230	0.3141
Completed Year 12 (aged 15 years and over)	0.3369	0.3373	0.2197	0.2353
Completed a qualification (aged 15 years and over)	0.3817	0.3742	0.3586	0.3526
15 to 24 year olds attending an educational institution	0.3578	0.3630	–0.3099	–0.3046
Income above half the Australian median (aged 15 years and over)	0.3629	0.3696	0.3805	0.3867
Lives in a house that is owned or being purchased	0.3498	0.3401	–0.3630	–0.3698
Lives in a house with at least one bedroom per usual resident	0.3652	0.3557	–0.3110	–0.2998

Focusing on the Indigenous population to start with, all of the variables had a positive correlation with the first retained component, indicating that it is a reasonable summary index for positive socioeconomic outcomes in the region. However, in 2001 especially, the correlation between the first variable (the percentage of the working age population employed) had a relatively low correlation with the retained component. The most likely explanation for this is the effect that the CDEP scheme has on measured employment outcomes. Biddle, Taylor and Yap (2008) showed that CDEP employment is generally concentrated in remote parts of Australia which, as shown in other parts of this paper, tend to rate poorly on other measures of socioeconomic outcomes.

Despite the relatively low correlation with the employment to population percentage, it was still retained as one of the input variables. This was done for three reasons. Firstly, as mentioned, the correlation was still positive. Secondly, the absence of CDEP employment alongside relatively poor outcomes for the other variables is likely to be a strong indicator of a region requiring substantial investment on infrastructure or the population. Finally, the employment to population percentage is one of the key targets as part of the Federal Government and COAG's 'closing the gaps' agenda.

The results for the non-Indigenous population are much more problematic than those for the Indigenous population. Specifically, three of the nine variables have a large negative correlation with the first retained component. Given the fact that all the variables are constructed as positive aspects of socioeconomic status, it would appear that the first retained component is a poor candidate for summarising socioeconomic status. While more research is needed into why these three variables are negatively correlated at the Indigenous Region level, one possible reason is the high rate of non-Indigenous mobility into and out of a number of remote Indigenous Regions. Such high rates of mobility mean that only a minority of the non-Indigenous population who were working in the regions will be those who attended school there or who would consider purchasing a home (for example).

Whatever the reasons for the negative correlations, in the analysis on Indigenous Regions, only the PCA results for the Indigenous population are presented. The results will still therefore be useful for targeting resources to Indigenous Australians in particular regions or areas. However, a neat comparison with the non-Indigenous distribution will not be possible.

The following two tables present a similar set of results using Indigenous Areas as the unit of analysis. The first two columns in each of the tables are based on an unweighted analysis (similar to that presented in Tables A1 and A2 for Indigenous Regions). Given the heterogeneity in the size of the non-Indigenous population across the Indigenous Areas, the final column gives the results for a weighted PCA of non-Indigenous socioeconomic outcomes. The third column gives the Indigenous results that these should be compared against.

Table A3. Eigenvalues expressed as per cent of variation explained by each component: Indigenous Areas

	Indigenous			Non-Indigenous
Component	2001 (unweighted)	2006 (unweighted)	2006 (weighted)	2006 (weighted)
Component 1	61.2	62.5	64.4	50.0
Component 2	14.8	13.8	12.6	19.1
Component 3	8.1	7.9	8.0	13.8
Component 4	4.3	4.4	5.0	11.1
Component 5	3.6	3.9	3.5	2.0
Component 6	2.8	2.5	2.1	1.9
Component 7	2.4	2.0	1.7	1.1
Component 8	1.8	1.7	1.5	0.7
Component 9	1.1	1.4	1.3	0.4

Table A4. Eigenvectors or correlation between the input variables and first component: Indigenous Areas

	Indigenous			Non-Indigenous
Variable	2001 (unweighted)	2006 (unweighted)	2006 (weighted)	2006 (weighted)
Employed (aged 15 years and over)	0.1863	0.2094	0.2459	0.3612
Employed as a manager or professional (aged 15 years and over)	0.3275	0.2747	0.2616	0.4256
Employed full-time in the private sector (aged 15 years and over)	0.3232	0.3575	0.3600	0.2617
Completed Year 12 (aged 15 years and over)	0.3399	0.3487	0.3422	0.4121
Completed a qualification (aged 15 years and over)	0.3981	0.3844	0.3821	0.4350
15 to 24 year olds attending an educational institution	0.3273	0.3332	0.3346	0.2568
Income above half the Australian median (aged 15 years and over)	0.3547	0.3728	0.3706	0.3936
Lives in a house that is owned or being purchased	0.3262	0.3190	0.3208	-0.1316
Lives in a house with at least one bedroom per usual resident	0.3745	0.3630	0.3552	0.1508