CENTRE FOR ABORIGINAL ECONOMIC POLICY RESEARCH

THE AUSTRALIAN NATIONAL UNIVERSITY

Location and Segregation: The Distribution of the Indigenous Population Across Australia's Urban Centres

N. Biddle

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Ministerial Council for Aboriginal
and Torres Strait Islander Affairs

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ABSTRACT

According to the 2006 Census, around three-quarters of Indigenous Australians live in regional areas or major cities. This represents a small, but noticeable increase from previous census years, especially in large regional towns. While most measured socioeconomic outcomes are advantageous relative to remote parts of the country, there are still substantial gaps between Indigenous and non-Indigenous Australians in regional and urban Australia. This paper focuses on which cities and large towns Indigenous Australians live in, how the Indigenous population is distributed by neighbourhood within these cities and towns, and what the characteristics of the neighbourhoods are in which Indigenous Australians are concentrated. This paper is part of a larger body of analysis looking at the circumstances and policy challenges facing Indigenous Australians in urban areas. Future work will consider the processes that result in residential segregation, the effects it has on individual outcomes (positive and negative) and the most appropriate policy responses.

Keywords: Indigenous Australians, residential segregation, socioeconomic, 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. According to the most recent population estimates, only 24.6 per cent of the Indigenous population live in remote or very remote parts of the country. This paper focuses on which cities and large towns Indigenous Australians live in, how the Indigenous population is distributed by neighbourhood within these cities and towns, and finally what the characteristics of the neighbourhoods are in which Indigenous Australians are concentrated. All three aspects of where Indigenous Australians live represent different features of residential segregation.

2. In 2006, the urban centre with the most uneven distribution of the Indigenous population across neighbourhoods was Melbourne. Of the four other large capital cities, Sydney, Perth and Adelaide all had relatively high levels of segregation based on the dissimilarity index. While segregation was generally highest in large cities, there were also a number of large regional towns that had high values on the dissimilarity index. This includes Broome, which ranked second out of the 28 urban centres studied, while Wagga Wagga, Geraldton and the Gold Coast also had relatively high values.

3. Between 2001 and 2006, 17 of the urban centres experienced an increase in the level of unevenness, whereas there was a decrease in only 10.

4. The geographic characteristics of the neighbourhoods in which particular groups are concentrated can influence the experiences and outcomes of these groups. The Indigenous population of Sydney stands out as being much further away from the city centre (1.37 times further on average) and living in neighbourhoods with much fewer people per square kilometre than their non-Indigenous counterparts. Similar patterns were found in the other four large capital cities. However, outside of these, there were about the same number of urban centres where Indigenous Australians lived on average further away from the city centre than the non-Indigenous population (13 urban centres) as there were that lived on average closer (10 urban centres).

5. The neighbourhood type that has the lowest relative concentration of Indigenous Australians in the five large capital cities are those of medium distance to the city centre (11.5–17.3 km) and of the greatest population density (more than 3,780 persons per km^2). While Indigenous Australians are in general less likely to live in high density neighbourhoods, this was not the case when one focuses on outer suburbs only. Indeed, of the Indigenous Australians living 25.5 km or more from the city centre, the greatest relative concentration was in the highest density neighbourhoods.

6. Across Australia Indigenous Australians are concentrated in relatively disadvantaged Collection Districts (CDs) based on the Socio-Economic Indexes for Areas (SEIFA) advantage/disadvantage rank. The urban centre where Indigenous Australians are most concentrated in disadvantaged neighbourhoods (relative to the distribution of the total population in the urban centre) is Wagga Wagga.

7. Apart from those in public housing, there was a greater concentration of Indigenous Australians than other population subgroups in low socioeconomic neighbourhoods. This includes those who are not employed, those with low levels of education, those born overseas, those with a core activity restriction and lone parents.

8. This paper is part of a larger body of analysis looking at the circumstances and policy challenges facing Indigenous Australians in urban areas. Future work will consider the processes that result in residential segregation, the effects it has on individual outcomes (positive and negative) and the most appropriate policy responses.

INTRODUCTION AND OVERVIEW

There is a large and growing literature on the influence of area level or neighbourhood characteristics on the socioeconomic status of individuals. This literature suggests that outcomes including education, labour market participation, income, health, and crime victimisation are influenced by, or at least associated with, a person's area or neighbourhood level context (see Durlauf 2004 for a summary).

While it is often suggested that the respective geographic distribution of the populations is a key factor in explaining socioeconomic disparities between Indigenous and non-Indigenous Australians (Hughes & Warin 2005; Tesfaghiorghis 1991), there is very little direct empirical evidence on the role of area-level characteristics in influencing Indigenous outcomes. However, in the only large-scale study to date (Biddle 2007), it was shown that the level of education completion of older cohorts in an area was positively associated with the education participation of 15–19 year old Indigenous Australians.

Instead, much of the discussion on locational disadvantage of the Indigenous population focuses on their relatively high concentration in remote parts of Australia. There is little doubt that Indigenous Australians in remote areas do not have the same access to labour markets, quality housing and government services as those who live in cities or regional towns. This was shown most recently in Biddle, Taylor and Yap (2008) regarding employment and labour market outcomes, and Biddle (2008) regarding household overcrowding. However, according to the most recent population estimates (ABS 2008a) only 24.6 per cent of the Indigenous population live in remote or very remote parts of the country.

Across urban Australia there is a great deal of diversity in the Indigenous share of the population, the types of areas in which the Indigenous population live, and their own socioeconomic status. This last issue, the distribution in the socioeconomic status of the Indigenous population, is analysed in detail in Biddle (2009). This paper focuses on which cities and large towns Indigenous Australians live in, how the Indigenous population is distributed by neighbourhood within these cities and towns, and finally what the characteristics of the neighbourhoods are in which Indigenous Australians are concentrated.

All three aspects of where Indigenous Australians live represent different features of residential segregation. The term segregation, however, is quite loaded and can mean very different things in different contexts. At its most extreme, it can mean the enforced separation of groups into different physical spaces. The most obvious example of this form of segregation is the apartheid system that was previously in place in South Africa. However, segregation need not be caused directly by specific policies (Massey & Denton 1993). More broadly, segregation can simply mean 'the extent to which individuals of different groups occupy or experience different social environments' (Reardon & O'Sullivan 2004: 122). In the latter context, history, economic forces (for example income, prices or jobs) and social decisions made by individuals are what drive segregation between population subgroups. Such factors are very much amenable to policy intervention, yet they are rarely the intended, or at least stated, aim of specific policies.

Residential segregation that arises through economic and social processes is of policy interest for a number of reasons. Firstly, the lack of interaction between groups at the local level has been identified as a potential threat to social cohesion (Buck 2001; Wilson 1987, 1996). However, these social and cultural costs of isolation need to be traded against living near people with a similar background to oneself. Writing with regards to the experience of migrants, Portes and Sensenbrenner (1993) identified the positive reciprocal relationships between people who share a similar background and who are in spatial proximity to each other. The authors argue that this embeddedness is particularly important for those who are otherwise excluded from the economic mainstream. Following the social capital literature, this trade-off between the positive and negative aspects of segregation is a localised instance of bonding versus bridging social capital. The former refers to the interaction within groups and the latter the interaction

between groups (ABS 2004). A highly residentially segregated city or country makes bonding social capital easier to create, but bridging social capital more difficult.

In addition to the social or cultural aspects, Bolt, Burgers & van Kempen (1998) identify and summarise the potential negative effects of residential segregation on the way people access economic resources and information. They can be grouped as follows:

- **Concentration of economic disadvantage**—If one population group is isolated from another then these groups may also be isolated from certain jobs that require inside knowledge or information. For example, the concentration of those who are chronically unemployed can have negative impacts on the strength of the job networks of those in the area.
- **Norms and values**—The clustering of individuals and households with high levels of socioeconomic and social isolation can lead to a climate that generates attitudes and practices that further the isolation of the local residents. Alternatively, social isolation can lead to the development of identities that are in direct opposition to the dominant culture (Akerlof & Kranton 2002).
- **School interaction**—As the majority of students attend schools in close proximity to where they live, residential segregation can also lead to school-level segregation. As school participation and completion in Australia is strongly associated with one's socioeconomic background (Biddle 2007), school-level segregation can lead to those with relatively disadvantaged backgrounds not interacting with high-achieving role models.
- **Amenities and political power**—To the extent that neighbourhood amenities are funded either directly by residents or indirectly through taxes, concentration of low-income or low-wealth individuals can lead to those neighbourhoods missing out on the amenities (playgrounds, school facilities, health care) that are taken for granted in other areas. This may be exacerbated by the fact that those with the ability to demand better services from their local representatives are those with higher levels of education and status.
- **The development of stereotypes**—The residents of neighbourhoods or areas with high concentrations of individuals with low socioeconomic status may have a negative image amongst the rest of the population of the city. This could disadvantage these residents when they apply for jobs, school places or other positions.

A final reason for identifying high levels of segregation is less to do with causality and more what it signals. That is, that there are one or more groups in the population that might be excluded from proximity to good schools, jobs or houses. This argument for studying segregation therefore necessitates the subsequent step of identifying the types of neighbourhoods in which the population subgroup is concentrated.

All the research to date suggests that Indigenous Australians in urban Australia are concentrated in particular neighbourhoods and that these neighbourhoods have on average poorer socioeconomic outcomes than other parts of the city. Using the well-known index of dissimilarity (outlined in more detail later on in this paper), Atkinson, Taylor and Walter (2008) showed that the Indigenous population of Melbourne had a very high level of residential segregation, with Sydney, Perth and Adelaide also having values greater than 0.4. The authors restricted their analysis to capital cities and found that the four other capitals (Brisbane, Hobart, Canberra and Darwin) all had moderate levels of segregation. Interestingly, the authors also used the Australian Survey of Social Attitudes (AuSSA) to show that a very small proportion of the rest of the population (9%) mixed regularly with Aboriginal Australians.

AuSSA:
Australian Survey of Social Attitudes

Taylor (2006) showed a high concentration of Indigenous Australians in the most disadvantaged city neighbourhoods. Specifically, it was shown that in 2001, over 25 per cent of urban Indigenous Australians lived in the 10 per cent of Census Collection Districts (CDs) that were ranked as the most disadvantaged across a suite of indicators.[1] While highlighting the relative concentration of urban Indigenous Australians in disadvantaged neighbourhoods nationally, Taylor (2006) did not identify the particular cities or regional towns which have the greatest concentration. Furthermore, Atkinson, Taylor and Walter (2008) only analysed the eight capital cities. As will be shown in this paper, however, there are cities and towns that have greater concentrations than others and it is these areas that are of particular policy interest.

CD:
Collection District

Another limitation of the analysis in Atkinson, Taylor and Walter (2008) and Taylor (2006) is that the authors focus on rankings across a single summary measure. There are very different implications depending on the type of socioeconomic indicator across which residential concentration is occurring. For example, concentration in low employment neighbourhoods is likely to have a particularly strong impact on the working-age population and the strength of the job networks that they can access. Low education neighbourhoods, on the other hand, are likely to impact on the social costs and benefits of education participation. There are similar variable-specific arguments for looking at housing, income and other characteristics separately, and hence it is important to identify which cities have the greatest concentration of their resident Indigenous population across a range of indicators.

Given the importance of identifying the types of neighbourhoods in which Indigenous Australians live, as well as the limitations of the existing literature, the aim of this paper is to provide the most comprehensive analysis to date of the residential patterns of urban Indigenous Australians. To achieve this aim, the paper is structured around the following research questions:

- Which urban centres in Australia have the largest Indigenous populations?
- How evenly is the Indigenous population spread across neighbourhoods within these urban centres, and how did this change between 2001 and 2006?
- In what types of neighbourhoods do Indigenous and non-Indigenous Australians live in terms of Indigenous share?
- In what types of neighbourhoods do Indigenous and non-Indigenous Australians live in terms of population density and proximity to city centres?
- What is the level of concentration of the Indigenous population in neighbourhoods with low socioeconomic status?
- How does the concentration of Indigenous Australians with low socioeconomic status compare to other population subgroups?
- Are there particular socioeconomic characteristics (for example employment, education, housing and income) of the neighbourhoods that Indigenous Australians are concentrated in?

Each of these research questions are considered in separate sections of the paper, with the final section providing a summary and conclusion.

Fig. 1. Urban centres with more than 2,000 Indigenous Australians counted as usual residents in 2006

GEOGRAPHIC DISTRIBUTION

UCL:
Urban Centre/ Locality

In absolute terms, Indigenous Australians are a predominantly urban population. Around 43 per cent of the Indigenous population live in the 28 urban centres that have both an Indigenous and non-Indigenous population count greater than 2,000 (using the Urban Centre/Locality (UCL) classification).[2] Fig. 1 shows the location of all 28 urban centres that fit these criteria.[3]

Nine of the 28 urban centres are in Queensland with a further seven in New South Wales. Despite around 30 per cent of the Northern Territory population count identifying as being Indigenous, there were only three urban centres with an Indigenous population greater than 2,000 or more. At the other extreme, although just under one-quarter of the total Australian usual resident count was from Victoria, there was only one urban centre in that State, Melbourne, that had at least 2,000 Indigenous Australians counted as being usual residence on census night.

Table 1 gives some of the characteristics of the 28 urban centres shown in Fig. 1. The Indigenous and non-Indigenous population count in the 2006 Census is given,[4] along with the percentage of the population who identified as being Indigenous. The final two columns contain the share of the total Australian Indigenous and non-Indigenous population respectively, whose usual residence was in that particular urban centre on census night.

Table 1. Indigenous and non-Indigenous population distribution by urban centre, 2006

Urban centre	Usual resident population count			Share of Australian population by urban centre	
	Indigenous	Non-Indigenous	Per cent Indigenous	Indigenous (%)	Non-Indigenous (%)
Sydney	34,279	3,352,848	1.01	7.53	18.35
Brisbane	29,251	1,559,570	1.84	6.43	8.54
Perth	17,950	1,162,666	1.52	3.94	6.36
Melbourne	12,656	3,162,285	0.40	2.78	17.31
Adelaide	12,036	981,471	1.21	2.65	5.37
Cairns	8,429	81,268	9.40	1.85	0.44
Townsville-Thuringowa	7,358	113,867	6.07	1.62	0.62
Newcastle	6,568	269,316	2.38	1.44	1.47
Central Coast	6,237	261,325	2.33	1.37	1.43
Darwin	6,232	54,113	10.33	1.37	0.30
Wollongong	4,415	218,423	1.98	0.97	1.20
Gold Coast	4,206	367,485	1.13	0.92	2.01
Canberra	3,831	303,319	1.25	0.84	1.66
Dubbo	3,713	24,785	13.03	0.82	0.14
Rockhampton	3,617	53,600	6.32	0.79	0.29
Alice Springs	3,617	16,249	18.21	0.79	0.09
Hobart	3,295	118,363	2.71	0.72	0.65
Mount Isa	3,089	13,430	18.70	0.68	0.07
Toowoomba	2,955	88,048	3.25	0.65	0.48
Mackay	2,881	58,651	4.68	0.63	0.32
Tamworth	2,854	29,510	8.82	0.63	0.16
Palmerston	2,770	18,124	13.26	0.61	0.10
Broome	2,337	7,394	24.02	0.51	0.04
Geraldton	2,314	22,907	9.17	0.51	0.13
Port Augusta	2,289	10,227	18.29	0.50	0.06
Wagga Wagga	2,136	43,150	4.72	0.47	0.24
Kalgoorlie-Boulder	2,058	23,087	8.18	0.45	0.13
Sunshine Coast	2,036	172,181	1.17	0.45	0.94
Rest of Australia	259,618	5,679,147	4.37	57.06	31.09
Australia total	**455,027**	**18,266,809**	**2.43**	**100**	**100**

Source: Author's calculations using the ABS 2006 Census.

The urban centres with the largest Indigenous population are also the five capital cities with the largest non-Indigenous population. Of the more than three million people who were counted as being usually resident in Sydney on census night, 34,279 identified as being Indigenous, with Brisbane, Perth, Melbourne and Adelaide also having over 10,000 Indigenous usual residents. However, the percentage of the population who identified as being Indigenous in these cities were all below the Australian average (2.43%), showing that despite having the largest numbers of Indigenous Australians, there was a relative concentration outside these major capital cities.

Outside these large cities there were, however, a number of large urban centres with relatively high Indigenous percentages. These include Cairns, Townsville-Thuringowa and Darwin, all with Indigenous usual resident counts above 5,000. Dubbo, Alice Springs, Mount Isa, Palmerston, Broome and Port Augusta all had more than 10 per cent of the population identifying as being Indigenous. There were also a number of large regional towns or cities in terms of total population omitted from Table 1 because they had a low Indigenous population. These were predominantly in south-east Australia and include Geelong, with 130,185 non-Indigenous usual residents counted on census night, as well as Ballarat, Bendigo and Launceston.

The 28 urban centres listed in Table 1 make up about 43 per cent of the population—a sizable minority of the total Indigenous Australian population. However, in many ways they receive less attention in both the research literature and policy formulation than their non-urban counterparts. This reflects to a certain extent the poorer measured outcomes of Indigenous Australians in remote Australia. Without exception though, the outcomes of urban Indigenous Australians are worse than those of non-Indigenous residents of their city (Biddle 2009). Any policy of 'closing the gap' in Indigenous outcomes cannot ignore urban Australia.

MEASURES OF RESIDENTIAL SEGREGATION: UNEVENNESS AND ISOLATION

The previous section showed that Indigenous Australians were concentrated in certain urban centres with 28 of these across Australia having an Indigenous usual resident population of more than 2,000 on census night. This section looks at how the Indigenous population is distributed within these urban centres using two summary indexes of residential segregation, one capturing unevenness and the other isolation (Massey & Denton 1988). The first of these, the dissimilarity index, measures how evenly the Indigenous population is spread across urban neighbourhoods. Using CDs as a proxy for neighbourhoods,[5] the dissimilarity index measures the degree of departure from a completely even distribution where every CD has the same proportion of Indigenous and non-Indigenous Australians as the city average. The dissimilarity index ranges from 0 to 1 and represents the proportion of Indigenous (or non-Indigenous) Australians who would hypothetically need to move CDs to result in a perfectly even distribution across the city.

The second measure is based on the isolation index, which measures the extent to which the Indigenous population is residentially exposed to other Indigenous Australians as opposed to non-Indigenous Australians. Unlike the dissimilarity index, the standard isolation index is directly influenced by the share of the population who are Indigenous in the area. This is not necessarily a drawback of the index, as there is greater potential for certain aspects of segregation in urban centres with a relatively large Indigenous population. However, to make comparisons across cities, the isolation index is adjusted using the percentage of the urban centre who are Indigenous to create a second measure of exposure, the correlation ratio.

Table 2 gives the values for both segregation measures in 2001, 2006 and the change between the two years (expressed as a percentage of the 2001 value). Because the indices are measured across different scales, to look at the distribution of cities the urban centres are ranked based on their index value in 2006. A ranking of one indicates the most segregated city based on that measure with a ranking of 28 indicating the least segregated.

In 2006, the urban centre with the most uneven distribution of the Indigenous population across neighbourhoods was Melbourne. In this city, around three out of every five Indigenous Australians would have had to change their Census CD of usual residence in order for there to be a completely even distribution of the population. Of the other four large capital cities, Sydney, Perth and Adelaide all had relatively high levels of segregation based on the dissimilarity index. It would seem, therefore, that with the possible exception of Brisbane, Indigenous Australians in large cities tend to be unevenly distributed across neighbourhoods.

Table 2. Segregation indices and rankings by urban centre, 2006

	Dissimilarity index				Correlation ratio			
Urban centre	2001	2006	Change	2006 Rank	2001	2006	Change	2006 Rank
Sydney	0.505	0.528	4.6	3	0.031	0.033	7.3	15
Brisbane	0.386	0.394	2.1	9	0.020	0.022	7.2	19
Perth	0.510	0.510	0.0	4	0.035	0.032	–9.1	16
Melbourne	0.591	0.609	3.2	1	0.009	0.011	24.1	26
Adelaide	0.466	0.473	1.4	5	0.020	0.021	7.6	20
Cairns	0.345	0.338	–1.9	15	0.076	0.071	–6.5	12
Townsville-Thuringowa	0.312	0.311	–0.4	21	0.037	0.041	12.1	13
Newcastle	0.357	0.336	–6.0	16	0.019	0.020	5.5	21
Central Coast	0.295	0.319	8.3	20	0.010	0.015	48.6	24
Darwin	0.293	0.300	2.3	22	0.088	0.081	–8.4	11
Wollongong	0.343	0.342	–0.2	13	0.018	0.018	2.5	23
Gold Coast	0.378	0.402	6.5	8	0.010	0.011	15.7	25
Canberra	0.325	0.340	4.6	14	0.010	0.011	11.1	27
Dubbo	0.376	0.368	–2.3	12	0.139	0.144	3.4	3
Rockhampton	0.270	0.289	7.0	26	0.023	0.036	54.0	14
Alice Springs	0.256	0.266	3.8	23	0.145	0.144	-0.3	2
Hobart	0.365	0.373	2.3	10	0.023	0.025	11.6	17
Mount Isa	0.201	0.243	21.1	27	0.045	0.084	85.4	9
Toowoomba	0.352	0.325	–7.6	19	0.027	0.024	–13.4	18
Mackay	0.267	0.234	–12.1	28	0.021	0.019	–8.8	22
Tamworth	0.318	0.329	3.7	18	0.059	0.084	43.4	8
Palmerston	0.266	0.286	7.7	24	0.045	0.082	80.5	10
Broome	0.519	0.543	4.6	2	0.259	0.293	13.3	1
Geraldton	0.442	0.444	0.4	7	0.092	0.102	11.3	6
Port Augusta	0.307	0.277	–9.7	25	0.138	0.112	–18.3	4
Wagga Wagga	0.417	0.457	9.5	6	0.060	0.092	51.8	7
Kalgoorlie-Boulder	0.335	0.333	–0.4	17	0.119	0.103	–13.9	5
Sunshine Coast	0.384	0.370	–3.8	11	0.011	0.010	–4.6	28

Source: Author's calculations using the ABS 2001 and 2006 Censuses.

While segregation was generally highest in large cities, there were also a number of large regional towns that had high values on the dissimilarity index. The most obvious example is Broome, which ranked second out of the 28 urban centres in Table 2. However, Wagga Wagga, Geraldton and the Gold Coast all had values around or above 0.4. It is not only in large cities that residential segregation occurs.

Between 2001 and 2006, 17 of the urban centres experienced an increase in the level of unevenness, whereas there was a decrease in only 10 (values for Perth stayed more or less consistent across the last intercensal period). Of the urban centres where residential segregation increased, by far the greatest increase was in Mount Isa (21.1% increase). Interestingly, this was the only urban centre which had a sizable decrease in the non-Indigenous population count over the last intercensal period (alongside a moderate Indigenous increase). Although it is not possible to test with the available data, it would appear that the non-Indigenous population who left this urban centre was made up disproportionately of those who lived in similar neighbourhoods to the majority of the Indigenous population.

The other four urban centres with a more than 5 per cent increase in residential segregation (Wagga Wagga, Central Coast, Palmerston and the Gold Coast) also had large increases in the percentage of the population who identified as being Indigenous. It seems that this is a necessary condition for increases in segregation, at least over a 5-year period. It is not a sufficient condition though, as there were a number of urban centres that had a more than 10 per cent increase in the Indigenous share, yet witnessed a fall in this measure of residential segregation. These urban centres were Newcastle, Dubbo, Kalgoorlie, Wollongong, Port Augusta, the Sunshine Coast and Townsville. Clearly, it is possible to incorporate a large increase in the Indigenous population without adversely impacting on segregation.

The second aspect of segregation examined was isolation or the probability that a particular Indigenous Australian lives in the same neighbourhood as another Indigenous person, as opposed to a non-Indigenous person. As mentioned, the isolation index is directly influenced by the percentage of the population in each area who identify as being Indigenous and hence the values are weighted by this percentage. Even after doing so, the urban centres with the highest values were Broome, Alice Springs, Dubbo and Port Augusta. All these urban centres had high Indigenous populations relative to their population size and it would seem, therefore, that urban centres with relatively high Indigenous populations have greater scope for the Indigenous population to become isolated in particular neighbourhoods.

The magnitude of the changes in the correlation ratio between 2001 and 2006 were much larger than the changes in the dissimilarity index. There were six urban centres which experienced a more than 40 per cent increase in the level of isolation experienced by the Indigenous population between 2001 and 2006. The biggest changes were in Mt. Isa and Palmerston, with a more than 80 per cent increase. However, there were also large increases in Rockhampton, Wagga Wagga, the Central Coast and Tamworth. In total, 19 urban centres experienced an increase in isolation compared to eight that experienced a decrease (the decrease in Alice Springs was so small as to be classified as stable).

Given the lack of a strong relationship between the dissimilarity index and the correlation ratio at a particular point in time, it would seem that there are different dimensions of segregation for the Indigenous Australian population relative to the non-Indigenous population. There are, however, other dimensions of residential segregation outlined in Massey and Denton (1988) including concentration, centralisation and clustering, and it is likely that the ranking of the urban centres would be different for the measures within these dimensions as well. Starchenko and Peters (2008) show that the way these different measures relate

to each other are not consistent across different times, places and populations. They illustrated this using the Canadian Aboriginal population, and it is probable that this would also be the case for the Australian Indigenous population. This, alongside spatial measures of segregation is the subject of ongoing research by the author.

While there is only a weak relationship in the level of evenness and the level of isolation (correlation = 0.083) the relationship between the change through time in the two indices is much stronger (0.804). This suggests that historical patterns as well as geographic characteristics of the urban centres (population size, density, Indigenous share) influence the two measures of segregation differently. However, changing demographics and residential patterns influence both measures of segregation in similar ways.

MEASURES OF SEGREGATION: THRESHOLD VALUES

The previous section showed high levels of residential segregation for the Indigenous population in a number of Australia's urban centres, with increases between 2001 and 2006 more common than declines. However, such summary indices are often criticised for being devoid of any real context about how the different populations experience this segregation. An alternative approach, outlined in Johnston, Poulsen and Forrest (2002) is to separate neighbourhoods into a set of categories based on their Indigenous share. The percentage of Indigenous and non-Indigenous Australians who live in such neighbourhoods can then be used to summarise the ethnic composition of the neighbourhood in which the typical resident of the city lives.

Tables 3 and 4 give results for the 28 urban centres introduced earlier, using such a methodology. There are six threshold categories used in Table 3 to show the distribution of the Indigenous population: greater than 0% to less than 1%; from 1% to less than 2.5%; from 2.5% to less than 5%; from 5% to less than 10%; from 10% to less than 50%; and, from 50% to 100%.

The percentage of the Indigenous population who live in neighbourhoods with those threshold values is given in Table 3, alongside the first column of data which gives the percentage of the total urban area who identified as being Indigenous. Although it was not possible for an Indigenous Australian to live in an area where 0 per cent of the population identified as being Indigenous, this was possible (and quite common) for the non-Indigenous population. The relevant column was therefore added to Table 4, which gives the percentage of the non-Indigenous population who live in different neighbourhoods based on their threshold values.

Clearly, Indigenous Australians who live in urban centres with high Indigenous shares are also likely to live in neighbourhoods with a high Indigenous share. There were only five urban centres that had neighbourhoods that were more than 50 per cent Indigenous. In all of these, the Indigenous share of the total urban centre population was over 10 per cent.

Some interesting patterns emerge when urban centres with similar Indigenous shares are compared. For example, despite Sydney having a smaller Indigenous share than all other urban centres in Table 3 apart from Melbourne, the percentage of Indigenous Australians who lived in neighbourhoods with 10 per cent or more of the population who identified as being Indigenous was higher than 11 other urban centres.

Table 3. Indigenous population by Indigenous share of neighbourhood (%), 2006

Urban centre	Indigenous share of urban centre	Indigenous share of neighbourhood					
		0–1%	1–2.5%	2.5–5%	5–10%	10–50%	50% or more
Sydney	1.01	17.3	34.2	23.1	15.2	10.3	0.0
Brisbane	1.84	7.5	30.9	34.7	23.6	3.3	0.0
Perth	1.52	9.0	24.0	31.6	29.3	6.1	0.0
Melbourne	0.40	40.0	47.7	11.1	1.2	0.0	0.0
Adelaide	1.21	12.1	37.1	33.1	15.9	1.8	0.0
Cairns	9.40	0.2	2.1	7.7	20.4	69.6	0.0
Townsville-Thuringowa	6.07	0.4	5.3	15.3	37.0	42.1	0.0
Newcastle	2.38	4.4	25.4	43.2	21.1	5.9	0.0
Central Coast	2.33	4.5	25.6	49.2	20.0	0.7	0.0
Darwin	10.33	0.0	1.3	6.2	18.8	69.8	3.9
Wollongong	1.98	7.1	33.9	33.8	19.3	5.9	0.0
Gold Coast	1.13	14.0	53.4	29.4	3.2	0.0	0.0
Canberra	1.25	13.0	62.0	20.6	3.6	0.7	0.0
Dubbo	13.03	0.0	1.3	3.1	22.2	73.5	0.0
Rockhampton	6.3	0.5	3.5	16.3	42.4	37.3	0.0
Alice Springs	18.2	0.0	1.1	0.0	4.8	90.4	3.7
Hobart	2.71	4.3	21.9	28.4	39.7	5.7	0.0
Mount Isa	18.70	0.0	0.0	0.0	4.9	77.3	17.8
Toowoomba	3.25	3.1	12.4	41.1	31.8	11.6	0.0
Mackay	4.68	0.9	5.1	34.3	43.0	16.7	0.0
Tamworth	8.82	0.0	2.2	10.4	30.9	56.5	0.0
Palmerston	13.26	0.0	0.6	3.9	12.5	80.2	2.8
Broome	24.02	0.0	0.5	0.6	13.2	47.9	37.8
Geraldton	9.17	1.0	1.8	8.7	15.8	72.8	0.0
Port Augusta	18.29	0.0	0.1	1.5	10.3	88.0	0.0
Wagga Wagga	4.72	1.6	10.6	16.5	22.5	48.8	0.0
Kalgoorlie-Boulder	8.18	0.4	1.9	10.4	29.0	58.3	0.0
Sunshine Coast	1.17	15.6	53.2	29.6	1.5	0.0	0.0
Rest of Australia	4.37	2.3	10.9	18.0	17.6	23.5	27.8
Australia total	**2.43**	**5.5**	**17.1**	**20.6**	**18.5**	**22.4**	**15.9**

Source: Author's calculations using the ABS 2006 Census.

Table 4. Non-Indigenous population by Indigenous share of neighbourhood (%), 2006

	Indigenous share of neighbourhood						
Urban centre	0%	0–1%	1–2.5%	2.5–5%	5–10%	10–50%	50% or more
Sydney	42.8	27.1	21.0	6.4	2.0	0.7	0.0
Brisbane	20.6	20.8	33.9	18.1	6.1	0.5	0.0
Perth	36.5	21.4	22.2	12.9	6.3	0.7	0.0
Melbourne	60.5	25.7	12.4	1.4	0.1	0.0	0.0
Adelaide	37.0	21.8	27.0	11.1	2.9	0.2	0.0
Cairns	1.7	3.8	11.7	21.2	25.9	35.8	0.0
Townsville-Thuringowa	2.2	3.4	18.5	25.8	34.0	16.1	0.0
Newcastle	11.6	15.4	36.3	28.4	7.1	1.1	0.0
Central Coast	12.9	14.5	34.4	31.3	6.8	0.1	0.0
Darwin	2.0	0.0	8.3	18.6	27.1	44.0	0.0
Wollongong	13.5	20.8	39.4	19.6	5.8	0.9	0.0
Gold Coast	30.1	23.8	35.5	10.0	0.5	0.0	0.0
Canberra	22.0	23.9	45.9	7.5	0.7	0.0	0.0
Dubbo	0.0	0.0	7.4	11.9	39.2	41.5	0.0
Rockhampton	2.0	6.1	13.4	25.4	35.6	17.6	0.0
Alice Springs	0.0	0.0	10.7	0.0	13.6	75.7	0.0
Hobart	14.5	16.4	32.4	21.1	14.6	1.1	0.0
Mount Isa	1.8	0.0	0.0	0.0	13.2	81.8	3.2
Toowoomba	8.1	15.5	23.2	35.3	15.3	2.6	0.0
Mackay	0.9	6.1	14.0	42.5	30.7	5.8	0.0
Tamworth	0.0	0.0	10.5	26.2	37.9	25.4	0.0
Palmerston	0.0	0.0	3.9	16.8	22.7	56.6	0.0
Broome	2.3	0.0	6.2	3.7	45.2	35.5	7.1
Geraldton	2.2	14.6	11.4	22.6	20.7	28.4	0.0
Port Augusta	0.0	0.0	1.9	7.1	21.6	69.4	0.0
Wagga Wagga	12.4	11.2	28.1	22.7	14.9	10.7	0.0
Kalgoorlie-Boulder	5.9	3.0	8.4	22.0	31.7	28.9	0.0
Sunshine Coast	24.7	27.4	37.6	10.1	0.2	0.0	0.0
Rest of Australia	22.5	13.9	27.3	21.1	10.3	4.7	0.2
Australia total	**33.3**	**20.2**	**24.3**	**13.5**	**6.0**	**2.6**	**0.1**

Source: Author's calculations using the ABS 2006 Census.

Looking at the other end of the distribution, it is not a surprise that Broome has the highest percentage of Indigenous Australians living in neighbourhoods that were more than 50 per cent Indigenous. Not only is Broome the urban centre in Table 3 with the highest Indigenous share overall, it has the highest and the second highest level of segregation for the two indices presented in Table 2. It is noteworthy that in Broome the percentage of the Indigenous population living in neighbourhoods with an Indigenous share of less than 10 per cent is three times higher than Alice Springs and Mount Isa. This is despite the latter two urban centres having quite low levels of segregation.

Perhaps the most interesting column in Table 4 is the percentage of the non-Indigenous population that lives in a neighbourhood with zero Indigenous usual residents. Nationally, one-third of non-Indigenous Australians live in such neighbourhoods. In Melbourne and Sydney, Australia's two largest cities, this rises to 60.5 per cent and 42.8 per cent respectively. Clearly, the findings reported in Atkinson, Taylor and Walker (2008) from the AuSSA that the vast majority of the Australian population does not have regular contact with Indigenous Australians is replicated residentially.

The examples of Alice Springs and Mount Isa were discussed with regards to Table 3, and in particular it was noted that there was a very high percentage of Indigenous Australians who lived in neighbourhoods with large Indigenous shares. However, when this is viewed alongside the results for the non-Indigenous population, it is clear why the level of segregation in these cities is relatively low. In Mount Isa, 85 per cent of the non-Indigenous population live in neighbourhoods that are more than 10 per cent Indigenous with 75.7 per cent of the non-Indigenous population in Alice Springs doing the same. In Broome, on the other hand, only 42.6 per cent of the non-Indigenous population lives in high Indigenous share neighbourhoods, despite having a much higher overall share of the population being Indigenous.

MEASURES OF SEGREGATION: DISTANCE FROM THE CITY CENTRE AND POPULATION DENSITY OF THE NEIGHBOURHOOD

USA: United States of America

Many of the negative consequences of residential segregation relate to the type of neighbourhood in which the particular group being studied lives. Traditionally, much of the research has focused on the United States of America (USA) and the high concentration of the black population living in high density, inner city neighbourhoods. These neighbourhoods are characterised, amongst other things, as having high crime rates and a lack of amenities. However, these are not the only types of neighbourhoods that may potentially have negative consequences for those residents who live there. In large Australian cities in particular, living in outer suburban neighbourhoods may result in long distances from employment in general and professional employment in particular, as well as other services (government or otherwise). The effect of these long distances is further exacerbated if public transport is irregular or relatively expensive.

Apart from the visual analysis via maps presented in Atkinson, Taylor and Walker (2008) there has been very little research on the types of neighbourhoods in which Indigenous Australians live in terms of proximity to the city centre or population density. However, such information is vital for effective allocation and distribution of services to the urban Indigenous population. Furthermore, from a research point of view, such knowledge will help focus on, or develop measures of, segregation that better reflect the spatial distribution of the Indigenous population.

CBD: Central Business District

The results presented in Table 5 go some way to filling this gap in the literature. The first part of the table gives the average distance that Indigenous and non-Indigenous Australians live to the city centre or Central Business District (CBD).[6] The average distance for Indigenous and non-Indigenous Australians in kilometres is given, as well as the ratio between the two. The second set of results focus on the average density of the neighbourhoods in which the populations live in terms of persons per square kilometre. Once again, this is given for Indigenous and non-Indigenous Australians, as well as the ratio between the two.

Table 5. Average distance to city centre and average density of neighbourhoods for Indigenous and non-Indigenous Australians, 2006

	Average distance to city centre (km)			Average density (persons/km²)		
Urban centre	Indigenous	Non-Indigenous	Ratio	Indigenous	Non-Indigenous	Ratio
Sydney	28.2	20.7	1.37	3789	4274	0.89
Brisbane	19.7	16.8	1.17	2004	2124	0.94
Perth	14.5	13.6	1.06	2047	2129	0.96
Melbourne	21.9	19.9	1.10	2835	2898	0.98
Adelaide	15.1	12.5	1.21	2079	2099	0.99
Cairns	5.9	6.6	0.89	1781	1498	1.19
Townsville-Thuringowa	7.4	6.7	1.10	1696	1685	1.01
Newcastle	11.4	10.7	1.06	1797	1855	0.97
Central Coast	16.1	13.5	1.19	1885	1740	1.08
Darwin	8.4	7.8	1.08	1932	1917	1.01
Wollongong	10.7	9.7	1.10	2090	2105	0.99
Gold Coast	10.6	10.0	1.07	2075	2114	0.98
Canberra	11.4	10.4	1.09	1879	1783	1.05
Dubbo	2.5	2.7	0.90	1368	1312	1.04
Rockhampton	3.5	4.1	0.87	1516	1494	1.01
Alice Springs	2.5	2.4	1.06	1408	1264	1.11
Hobart	7.0	5.6	1.26	1674	1675	1.00
Mount Isa	1.8	1.8	0.98	1452	1381	1.05
Toowoomba	3.2	3.6	0.89	1635	1553	1.05
Mackay	5.2	5.3	0.98	1382	1343	1.03
Tamworth	3.3	2.9	1.12	1408	1301	1.08
Palmerston	2.1	1.9	1.11	1923	1857	1.04
Broome	2.6	3.2	0.82	1321	1066	1.24
Geraldton	3.3	3.4	0.98	1102	1040	1.06
Port Augusta	2.5	2.8	0.90	1121	896	1.25
Wagga Wagga	4.0	3.8	1.04	1840	1426	1.29
Kalgoorlie-Boulder	2.9	2.6	1.13	1455	1313	1.11
Sunshine Coast	10.9	11.8	0.92	1691	1580	1.07

Source: Author's calculations using the ABS 2006 Census.

The Indigenous population of Sydney stands out as being much further away from the city centre (1.37 times further on average) and living in neighbourhoods with much fewer people per square kilometre than their non-Indigenous counterparts. However, the other four large capital cities, as well as Newcastle, Wollongong and the Gold Coast also follow this pattern, albeit to a lesser degree. Outside of these large cities, there were a number of urban centres where Indigenous Australians live relatively close to the city centre or in relatively high density neighbourhoods. This was true in both instances for Cairns, Broome and Port Augusta.

Table 6. Ratio of Indigenous to non-Indigenous population percentage by distance to city centre and population density of neighbourhood: Sydney, Brisbane, Perth, Melbourne and Adelaide, 2006

	Distance to city centre (km)					
Population density (persons/km²)	Closest 0–6.7	6.7–11.5	11.5–17.3	17.3–25.5	Furthest 25.5–86.4	Indigenous count
Least dense 0–1529	0.86	0.96	1.15	1.04	1.36	23,418
1530–2233	0.92	1.06	1.14	1.09	1.43	25,154
2234–2815	0.77	0.98	0.90	0.93	1.39	22,209
2815–3780	0.73	0.63	0.66	0.80	1.65	20,230
3780–109,400 Most dense	0.70	0.66	0.43	0.63	1.53	12,546
Indigenous count	11,629	16,170	19,246	22,347	34,165	103,557

Source: Author's calculations using the ABS 2006 Census.

As interesting as the average distance to the city centre and population density alone are, the interaction between the two gives a more complete picture of the distribution of the Indigenous population across the urban centres. The impacts of living in a high density neighbourhood are likely to be very different if that neighbourhood is in, or near, the inner city, as opposed to the outer suburbs. Focusing on the five largest Australian capital cities where the diversity in neighbourhood proximity and density is likely to be greatest, the 18,680 neighbourhoods are separately partitioned into five equally sized groups based first on the distance to the city centre then separately on population density.

The percentage of Indigenous and non-Indigenous Australians who live in the 25 combinations of distance and density are given in Appendix Tables A1.1 and A1.2. The ratio of the Indigenous and non-Indigenous percentages are given in Table 6 in order to show the relative distribution.

Keeping in mind that a value of less than one means that fewer Indigenous Australians live in that combination of distance to city centre and population density (in percentage terms), the results presented in Table 6 confirm that Indigenous Australians are less likely to live close to the city centre (0–11.5 km from CBD). The only exceptions to this are neighbourhoods with between 1,530 and 2,233 persons per square kilometre. Compared to this, Indigenous Australians are disproportionately found in outer suburban neighbourhoods (those 25.5 km or more away from the CBD).

The neighbourhood type that has the lowest relative concentration of Indigenous Australians in the five large capital cities are those of medium distance to the city centre (11.5–17.3 km) and of the greatest population density (more than 3,780 persons per km²). While 2.86 per cent of the non-Indigenous population lived in this combination, there were less than half the number of Indigenous Australians that one would expect based on the non-Indigenous distribution (1.23% or 0.43 times the non-Indigenous rate). The suburbs with the greatest concentration of these neighbourhood types are generally found in Sydney including Auburn, Bankstown (North-East) Hurstville, Kogarah, Rockdale, Canterbury, Warringah and Ryde. The suburbs elsewhere that had a relatively high concentration of these neighbourhood types were Glen Eira (Caulfield) Glen Eira (South) and Whittlesea (South-West) in Melbourne, and Runcorn and Wynnum West in Brisbane.

While Indigenous Australians are in general less likely to live in high density neighbourhoods, this is not the case when one focuses on outer suburbs only. Indeed, of the Indigenous Australians living 25.5 kilometres or more from the city centre, the greatest relative concentration was in the highest density neighbourhoods. In the outer suburbs, 7.88 per cent of Indigenous Australians lived in neighbourhoods with a density between 2,815 and 3,780 square kilometres (1.65 times the non-Indigenous rate) with a further 2.01 per cent living in the highest density outer suburban neighbourhoods (1.53 times the non-Indigenous rate). Once again, the greatest concentration of these neighbourhood types was in Sydney including parts of Fairfield, Blacktown, Liverpool, Campbelltown and Penrith. In the Melbourne area, Dandenong, Knox and Kingston had a high share of this neighbourhood type.

In many ways, these outer suburban, high density neighbourhoods have the greatest potential for entrenching disadvantage amongst their residents. They represent the dual difficulties of being relatively far away from the large number of high paying industries, established tertiary institutions and other services that cluster around the city centres, whilst potentially lacking in the amenities that at least in per capita terms are difficult to provide in high density city neighbourhoods. These include open spaces and other recreational facilities, adequate public transport as well as health, education and other services.

THE DISTRIBUTION OF INDIGENOUS AUSTRALIANS BY SEIFA ADVANTAGE/DISADVANTAGE RANK

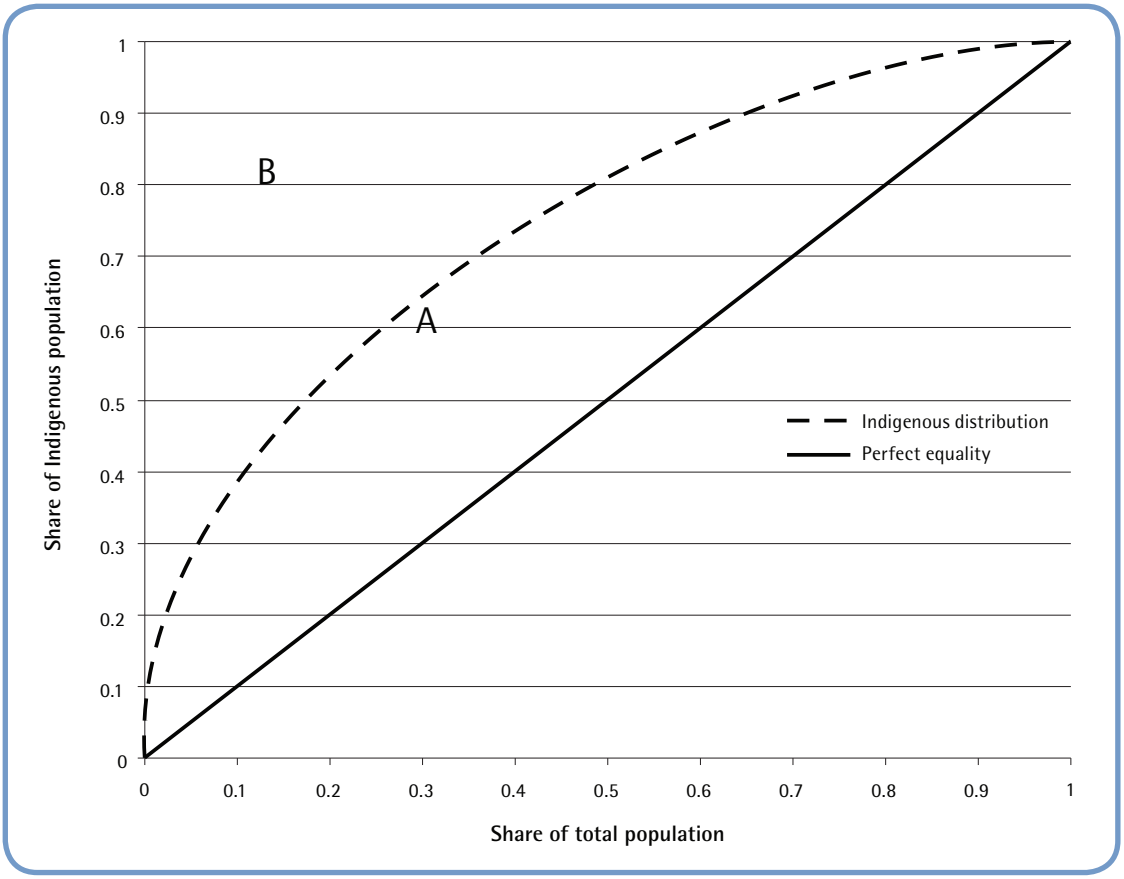
The previous sections of this paper identified a high degree of segregation of the Indigenous population in a number of urban centres in Australia. Furthermore, at least in the largest capital cities, Indigenous Australians were found to be concentrated in high density outer suburban neighbourhoods. Ultimately though, the likely impact of this segregation will be determined in part by the average socioeconomic outcomes of the neighbourhoods that Indigenous Australians are concentrated in. If the neighbourhoods have similar socioeconomic characteristics to the rest of the city then it is mainly the social and cultural advantages/disadvantages outlined earlier that need to be considered. However, if Indigenous Australians are concentrated in less well-off neighbourhoods then the economic aspects take on a much greater prominence.

SEIFA: Socio-Economic Indexes for Areas

To consider whether Indigenous Australians are concentrated in disadvantaged neighbourhoods, the Socio-Economic Indexes for Areas (SEIFA) advantage/disadvantage index outlined in ABS (2008b) is used,[7] with the national distribution of Indigenous Australians summarised in Fig. 2. Analogous to the Lorenz curves used to study income inequality (Gastwirth 1972) all Census CDs are ranked based on their SEIFA advantage/disadvantage score, with 1.0 being the most disadvantaged and 37,457 the most advantaged. The cumulative share of the Indigenous population is then calculated, beginning with 0.00007176 for the most disadvantaged CD and continuing through to 1.0 for the most advantaged.

If the Indigenous population was not concentrated in any particular type of neighbourhood then 10 per cent of the Indigenous population would be in the bottom 10 per cent of CDs (weighted by their total population) 50 per cent would be in the bottom 50 per cent of CDs and so on. However, if Indigenous Australians are concentrated in disadvantaged CDs then the cumulative share of the Indigenous population would be greater than the cumulative share of the total population at each point along the curve until all CDs are counted. On the other hand, if Indigenous Australians are concentrated in advantaged CDs then the cumulative share of the Indigenous population would be less than the cumulative share of the total population.

Fig. 2. Cumulative share of Indigenous population by cumulative share of total population across SEIFA advantage/disadvantage rankings, 2006



Note: 0 is the most disadvantaged and 1 the most advantaged Census CD.
Source: Author's calculations using the ABS 2006 Census.

The actual distribution of the Indigenous population is shown by the dashed line in Fig. 2. The solid line is the hypothetical distribution that would occur if Indigenous Australians were distributed evenly across CDs in Australia.

The dashed line in Fig. 2 representing the Indigenous population distribution is quite far above the line that would represent an even distribution across CDs. It is clear, therefore, that across Australia, Indigenous Australians are concentrated in relatively disadvantaged CDs based on the SEIFA advantage/disadvantage rank. To give some examples, 38.3 per cent of the Indigenous population are in the most disadvantaged 10 per cent of CDs and nearly 60 per cent are in the bottom 25 per cent. Alternatively, only 18.5 per cent of Indigenous Australians were in the most advantaged 50 per cent of CDs.

Much of the socioeconomic concentration outlined in Fig. 2 may be an indication of the relative concentration of Indigenous Australians in remote parts of Australia, where measured outcomes are relatively poor. It is of course not feasible to presents graphs similar to Fig. 2 for each of the urban centres analysed in this paper. However, just as the curve presented above is analogous to the Lorenz curves used to study income inequality, it is also possible to summarise the degree of socioeconomic concentration using an index related to the Gini coefficient or index (Gastwirth 1972). Relating back to Fig. 2, this modified Gini coefficient is calculated by dividing the area between the Indigenous distribution and the line of perfect equality (A) by the total possible area (A + B).

Table 7. Concentration of Indigenous Australians by advantage/disadvantage rank of neighbourhoods within urban centres, 2006

	Gini coefficient		Indigenous		Non-Indigenous	
Urban centre	Value	Urban centre rank	Average rank	Percentage in bottom decile	Average rank	Percentage in bottom decile
Sydney	–0.408	4	41.8	25.1	65.2	5.4
Brisbane	–0.380	7	37.6	21.5	57.3	6.5
Perth	–0.485	2	36.2	13.0	60.2	3.2
Melbourne	–0.294	17	42.6	13.1	57.4	6.0
Adelaide	–0.406	5	24.0	35.3	42.9	13.2
Cairns	–0.366	10	29.8	19.6	48.9	5.8
Townsville-Thuringowa	–0.311	13	34.1	17.6	47.9	5.7
Newcastle	–0.305	15	30.8	22.4	44.8	9.3
Central Coast	–0.213	25	32.7	12.5	42.1	7.5
Darwin	–0.269	19	48.0	7.7	60.5	1.4
Wollongong	–0.303	16	28.9	35.4	42.8	15.9
Gold Coast	–0.205	26	48.8	3.4	57.3	1.6
Canberra	–0.240	20	70.6	1.4	78.1	–0.4
Dubbo	–0.346	11	20.7	34.3	35.0	11.9
Rockhampton	–0.232	22	21.3	28.4	32.3	18.4
Alice Springs	–0.219	24	46.9	3.7	58.1	–0.0
Hobart	–0.402	6	23.0	45.8	43.5	19.1
Mount Isa	–0.225	23	33.2	17.8	43.0	3.2
Toowoomba	–0.335	12	26.5	21.3	40.9	8.2
Mackay	–0.164	27	40.0	5.1	47.3	2.3
Tamworth	–0.372	8	18.9	41.7	34.3	18.6
Palmerston	–0.306	14	34.1	21.5	51.5	6.6
Broome	–0.366	9	30.7	22.4	58.8	6.6
Geraldton	–0.477	3	15.0	52.1	36.0	18.2
Port Augusta	–0.238	21	11.3	60.1	18.5	39.1
Wagga Wagga	–0.553	1	19.5	53.6	44.7	13.6
Kalgoorlie-Boulder	–0.269	18	37.2	6.8	48.8	2.9
Sunshine Coast	–0.146	28	45.9	3.2	51.8	3.0
Rest of Australia	–0.488	n.a.	17.2	51.6	35.6	15.6
Australia total	**–0.500**	**n.a.**	**25.5**	**38.3**	**50.6**	**9.3**

Source: Author's calculations using the ABS 2006 Census.

To reflect the fact that larger values for the SEIFA advantage/disadvantage ranking indicate less disadvantaged areas and hence the Lorenz curve is above the line of perfect equality, the Gini coefficient is expressed as a negative value. In latter tables with variables that have high values indicating greater disadvantage (like unemployment) the Lorenz curve is likely to be below the line. In this case, the Gini coefficient will be positive if Indigenous Australians are concentrated in disadvantaged neighbourhoods.

Theoretically, the coefficient ranges from –1 if all Indigenous Australians were in the most disadvantaged neighbourhood, through 0 if the Indigenous population is evenly spread across all types of CDs, to +1 if all Indigenous Australians lived in the most advantaged neighbourhood. As can be seen from Table 7, the implied Gini coefficient for Australia as a whole is –0.500.

Of course the urban centres themselves are likely to have quite different levels of disadvantage averaged across all neighbourhoods. This means that the level of concentration for Australia as a whole may be larger than that for the majority of the individual urban centres. So, to put the Gini coefficient into context, the average ranking of CDs for the Indigenous and non-Indigenous populations in that urban centre is given. The national rankings are used and normalised to between 0 for the most disadvantaged neighbourhood and 100 for the most advantaged. Alongside this is the percentage of Indigenous and non-Indigenous Australians from that urban centre who lived in the most disadvantaged 10 per cent of CDs in 2006.

The urban centre where Indigenous Australians are most concentrated in disadvantaged neighbourhoods (relative to the distribution of the total population in the urban centre) is Wagga Wagga. With an estimated Gini coefficient of –0.553 there is a greater concentration of Indigenous Australians in this urban centre than there is for Australia as a whole. With an average rank of 19.5 out of 100, the neighbourhoods in Wagga Wagga that Indigenous Australians live in are clearly more disadvantaged than the neighbourhoods that non-Indigenous Australian live in (with an average rank of 44.7). Geraldton is another regional town with a high relative concentration of Indigenous Australians in disadvantaged neighbourhoods, as well as the large cities of Perth, Sydney, Adelaide and, to a lesser extent, Brisbane.

Although on average the Indigenous population lives in more disadvantaged neighbourhoods in every urban centre in the table, the difference is reasonably low in some. For example, the average ranking out of 100 for the neighbourhoods that Indigenous Australians in the Sunshine Coast urban centre live in (45.9) is quite close to that of the non-Indigenous population (51.8). This was also the case for Mackay, the Central Coast and the Gold Coast. The last of these urban centres, along with Melbourne, are interesting cases in that they had high levels of segregation based on the dissimilarity index in Table 2, but a reasonably even spread of the Indigenous population based on the socioeconomic characteristics of the area in which they lived according to Table 7.

COMPARING THE DISTRIBUTION OF INDIGENOUS AUSTRALIANS BY SEIFA ADVANTAGE/DISADVANTAGE RANK WITH OTHER POPULATION GROUPS

The previous section showed that across Australia and across most large urban centres the Indigenous population is concentrated in neighbourhoods (as proxied by Census CDs) that ranked relatively poorly using the SEIFA advantage/disadvantage index constructed by the ABS. Apart from being bounded by –1 and +1 (with a value of 0 representing a completely even distribution) there is no intuitive meaning that can be ascribed to the scale of the modified Gini coefficient used to summarise this concentration. As it is therefore in many ways a relative measure, the results in this section compare the concentration of Indigenous Australians into low ranking neighbourhoods with the concentration of other population subgroups.

Table 8. Concentration of Indigenous Australians and economic subgroups by advantage/disadvantage rank of neighbourhoods within urban centres, 2006

		All residents			
Urban centre	Indigenous	Unemployed	NILF	Low income	No Year 12
Sydney	–0.408	–0.202	–0.088	–0.116	–0.092
Brisbane	–0.380	–0.133	–0.090	–0.055	–0.107
Perth	–0.485	–0.114	–0.060	–0.043	–0.091
Melbourne	–0.294	–0.142	–0.084	–0.087	–0.094
Adelaide	–0.406	–0.146	–0.082	–0.079	–0.070
Cairns	–0.366	–0.191	–0.107	–0.067	–0.019
Townsville-Thuringowa	–0.311	–0.124	–0.121	–0.067	–0.054
Newcastle	–0.305	–0.148	–0.109	–0.085	–0.056
Central Coast	–0.213	–0.111	–0.120	–0.071	–0.043
Darwin	–0.269	–0.141	–0.101	–0.101	–0.045
Wollongong	–0.303	–0.154	–0.108	–0.093	–0.052
Gold Coast	–0.205	–0.105	–0.050	–0.033	–0.028
Canberra	–0.240	–0.133	–0.023	–0.055	–0.085
Dubbo	–0.347	–0.232	–0.124	–0.104	–0.018
Rockhampton	–0.233	–0.201	–0.070	–0.061	–0.020
Alice Springs	–0.219	–0.248	–0.053	–0.020	–0.024
Hobart	–0.402	–0.098	–0.049	–0.063	–0.122
Mount Isa	–0.225	–0.200	–0.063	–0.009	0.008
Toowoomba	–0.335	–0.129	–0.071	–0.042	–0.048
Mackay	–0.164	–0.151	–0.102	–0.053	–0.014
Tamworth	–0.372	–0.224	–0.093	–0.090	–0.032
Palmerston	–0.306	–0.225	–0.149	–0.095	–0.015
Broome	–0.365	–0.198	–0.152	–0.130	–0.011
Geraldton	–0.477	–0.253	–0.095	–0.075	–0.029
Port Augusta	–0.237	–0.163	–0.087	–0.070	0.015
Wagga Wagga	–0.553	–0.242	–0.104	–0.091	–0.040
Kalgoorlie-Boulder	–0.269	–0.164	–0.091	–0.072	–0.067
Sunshine Coast	–0.146	–0.064	–0.098	–0.069	–0.044
Rest of Australia	–0.488	–0.173	–0.114	–0.089	–0.032
Australia total	**–0.500**	**–0.157**	**–0.101**	**–0.090**	**–0.099**

Source: Author's calculations using the ABS 2006 Census.

NILF:
Not in the labour force

The first set of results presented in Table 8 compare the concentration of Indigenous Australians with the concentration of four other all-resident subgroups based on their economic status. These are those who are unemployed, those not in the labour force (NILF), those who have a low gross individual income (defined as less than $250 per week or roughly half the Australian median), and those who have not completed Year 12 (excluding those who are still at school).

Looking at the bottom line of Table 8 first, across all of Australia there is a greater concentration of Indigenous Australians in poorly ranking neighbourhoods than the four economically-based population subgroups considered. At –0.157, the unemployed have the next highest level of concentration, with the other three categories having similar levels of concentration of around –0.090 to –0.101.

Looking down the table, there was a fair degree of variation in the concentration of the unemployed across the urban centres. In Alice Springs, for example, the level of concentration was higher for the unemployed than it was for the Indigenous population. In general, those areas with high levels of concentration of the Indigenous population also had high levels of concentration of the unemployed. There were, however, a few exceptions. Hobart had a relatively high concentration of the Indigenous population in low socioeconomic neighbourhoods, with relatively low concentrations of the unemployed. The opposite was the case in Alice Springs as well as the urban centres of Mackay, Mount Isa and Rockhampton.

The next table looks at the concentration of four other all-resident subgroups, this time based on demographic, housing or health characteristics. Specifically, these are people who were born overseas, households who rent from public or community housing organisations, people who have a core activity need for assistance (people who report a need for assistance due to a 'profound or severe core activity limitation'), and those who live in a lone-parent family.

Nationally, there was a greater concentration of public or community rental households than Indigenous Australians in poorly ranked neighbourhoods. This held true for all but three urban centres, namely Broome, Geraldton and Kalgoorlie-Boulder. Given the likely variation in property and rental prices across the urban centres it is not a surprise that, with a given budget, government and community housing organisations would provide housing in the cheapest possible locations. However, the scale of this concentration is often quite large. For example, at –0.775 the level of concentration in Wagga Wagga is high by any standard. Furthermore, Sydney, the Gold Coast and Tamworth all have values greater than –0.600.

It is worth noting that for Australia as a whole, the population born overseas was concentrated in relatively high socioeconomic status neighbourhoods (as indicated by the positive value). However, the opposite was true for a number of urban centres, with those born overseas all concentrated in low socioeconomic neighbourhoods in Sydney, Melbourne, Adelaide, Darwin and Wollongong. This is likely to reflect the characteristics of the particular migrants in each urban centre in terms of source country, length of stay in Australia, English language ability and other human capital characteristics.

Lone parents and the population who reported a core activity need for assistance both had moderate levels of concentration in low socioeconomic status neighbourhoods. The values for these population subgroups were reasonably consistent across the urban centres.

It should be kept in mind that apart from the unemployed and those NILF, the other population subgroups considered in both Tables 8 and 9 are not mutually exclusive. Were the data available, it is quite likely that those who fall into two or more of the categories would have even greater levels of concentration in low ranking neighbourhoods. So, for example, although the greatest level of concentration nationally and in most urban centres is of households in public or community rental, Indigenous Australians who rely on such tenure types are likely to have even higher levels of concentration. Subject to sample size constraints, these interactions are a useful avenue of future research.

Table 9. Concentration of Indigenous Australians and social subgroups by advantage/disadvantage rank of neighbourhoods within urban centres, 2006

		All residents			
Urban centre	Indigenous	Born overseas	Public/ community housing	Core activity need for assistance	Lone parent
Sydney	-0.408	-0.071	-0.610	-0.211	-0.216
Brisbane	-0.380	0.029	-0.543	-0.216	-0.212
Perth	-0.485	0.011	-0.530	-0.202	-0.185
Melbourne	-0.294	-0.079	-0.498	-0.187	-0.202
Adelaide	-0.406	-0.029	-0.542	-0.172	-0.205
Cairns	-0.366	0.018	-0.570	-0.216	-0.184
Townsville-Thuringowa	-0.311	0.073	-0.539	-0.192	-0.226
Newcastle	-0.305	0.030	-0.593	-0.256	-0.185
Central Coast	-0.213	0.035	-0.507	-0.194	-0.118
Darwin	-0.269	-0.030	-0.471	-0.164	-0.177
Wollongong	-0.303	-0.064	-0.570	-0.209	-0.210
Gold Coast	-0.205	0.015	-0.662	-0.204	-0.146
Canberra	-0.240	0.012	-0.417	-0.123	-0.162
Dubbo	-0.347	0.055	-0.557	-0.226	-0.228
Rockhampton	-0.233	0.051	-0.273	-0.113	-0.150
Alice Springs	-0.219	0.107	-0.382	-0.109	-0.168
Hobart	-0.402	0.190	-0.504	-0.200	-0.210
Mount Isa	-0.225	-0.003	-0.400	-0.165	-0.202
Toowoomba	-0.335	0.081	-0.492	-0.120	-0.176
Mackay	-0.164	0.041	-0.458	-0.201	-0.157
Tamworth	-0.372	0.051	-0.638	-0.138	-0.233
Palmerston	-0.306	0.021	-0.520	-0.132	-0.258
Broome	-0.365	0.094	-0.255	-0.170	-0.292
Geraldton	-0.477	0.060	-0.381	-0.170	-0.241
Port Augusta	-0.237	0.025	-0.372	-0.153	-0.191
Wagga Wagga	-0.553	0.072	-0.775	-0.206	-0.299
Kalgoorlie-Boulder	-0.269	0.031	-0.073	-0.242	-0.153
Sunshine Coast	-0.146	0.032	-0.501	-0.250	-0.118
Rest of Australia	-0.488	0.087	-0.582	-0.215	-0.188
Australia total	**-0.500**	**0.068**	**-0.534**	**-0.209**	**-0.185**

Source: Author's calculations using the ABS 2006 Census.

THE DISTRIBUTION OF INDIGENOUS AUSTRALIANS BY SOCIOECONOMIC CHARACTERISTICS OF THE AREA

The previous two sections show that across Australia in general, and within most urban centres, the Indigenous population was concentrated in areas which ranked relatively poorly. Furthermore, this level of concentration was generally higher than it was for a range of other population subgroups that are often the focus of policy concern. The only exception to this was public/community housing tenants, which had a higher concentration according to the modified Gini coefficient.

This concentration in poor city neighbourhoods has implications for service delivery as well as the likely success of any policy designed to bring about an improvement in socioeconomic outcomes. That is, in addition to the interrelated nature of individual measures of disadvantage, the Indigenous population is also likely to experience a high degree of locational disadvantage that is not confined to remote Australia.

As mentioned previously, the SEIFA advantage/disadvantage index used in the previous two sections is a composite index with variables across a number of dimensions of advantage and disadvantage. However, there will be somewhat different policy responses that deal directly with this concentration of Indigenous Australians depending on the main aspect of disadvantage that characterises the neighbourhoods where Indigenous Australians live. Living in a low employment area will have very different implications to living in a low education area, for example.

The results presented in this section compare the concentration of Indigenous Australians across a range of specific variables that are likely to impact on individuals within a neighbourhood. Most of these variables or at least variants of them are used in the construction of the SEIFA advantage/disadvantage index. Variables related to employment, education, housing, income, volunteering and internet access are considered in turn.

EMPLOYMENT

The neighbourhood effect that gets perhaps the most attention, in the economics literature at least, is the influence of poor employment outcomes (Durlauf 2004). Individuals who live in neighbourhoods or areas where few people are employed are believed to miss out on the employment networks that are often used to find jobs, particularly amongst those who are starting out in the labour market. In addition, if those who are employed are less likely to be employed in high-skilled jobs then access to relatively well-paid jobs may also be curtailed. Finally, there are the potential role model effects where an absence of people working in the area leads to social norms which place little value on working. Biddle and Webster (2007) showed that Indigenous Australians who lived in areas with poor employment outcomes were more likely to have poor employment outcomes themselves, even after controlling for their individual human capital characteristics.

The concentration of Indigenous Australians based on the employment characteristics of the neighbourhoods in which they live is summarised in Table 10. Three variables are used: the unemployment rate; the percentage of the population employed; and the percentage of the population employed as a manager or professional. All three variables are calculated using the population aged 15 years and over in the neighbourhood.

The positive value for the unemployment rate in the area indicates that across Australia in general and for all urban centres, Indigenous Australians are more likely to live in areas with high unemployment rates. The two urban centres with the greatest concentration are Wagga Wagga and Geraldton. The Gold Coast and the Sunshine Coast both have relatively low levels of concentration.

Table 10. Concentration of Indigenous Australians by employment characteristics of neighbourhoods within urban centres, 2006

Urban centre	Unemployment rate[a]	Percentage employed[a]	Percentage employed as a manager or professional[a]
Sydney	0.317	−0.214	−0.360
Brisbane	0.281	−0.242	−0.338
Perth	0.309	−0.267	−0.410
Melbourne	0.201	−0.128	−0.254
Adelaide	0.328	−0.273	−0.367
Cairns	0.297	−0.273	−0.340
Townsville-Thuringowa	0.261	−0.197	−0.292
Newcastle	0.260	−0.204	−0.269
Central Coast	0.205	−0.110	−0.186
Darwin	0.215	−0.210	−0.236
Wollongong	0.233	−0.203	−0.272
Gold Coast	0.131	0.081	−0.182
Canberra	0.139	−0.000	−0.196
Dubbo	0.320	−0.263	−0.342
Rockhampton	0.218	−0.138	−0.210
Alice Springs	0.191	−0.216	−0.200
Hobart	0.286	−0.222	−0.370
Mount Isa	0.181	−0.167	−0.164
Toowoomba	0.253	−0.170	−0.286
Mackay	0.140	−0.054	−0.147
Tamworth	0.324	−0.311	−0.365
Palmerston	0.272	−0.239	−0.306
Broome	0.261	−0.314	−0.248
Geraldton	0.433	−0.373	−0.439
Port Augusta	0.213	−0.181	−0.145
Wagga Wagga	0.505	−0.449	−0.527
Kalgoorlie-Boulder	0.227	−0.113	−0.240
Sunshine Coast	0.095	0.107	−0.094
Rest of Australia	0.182	−0.218	−0.278
Australia total	**0.223**	**−0.225**	**−0.345**

Note: a. Restricted to those aged 15 years and over.
Source: Author's calculations using the ABS 2006 Census.

A negative value nationally for the percentage of the population employed indicates a concentration of Indigenous Australians in low employment areas. Once again, Wagga Wagga and Geraldton both have high levels of concentration. However, there are two urban centres—the Gold Coast and the Sunshine Coast—where the negative value indicates that Indigenous Australians are more likely to live in areas with high rates of employment than the total population. Furthermore, the value of zero for Canberra indicates an even distribution across the neighbourhoods of that urban centre. The results for the final employment variable considered, the percentage of the population employed as a manager or professional show a high level of concentration of Indigenous Australians in low percentage areas. This is true nationally, with a value of –0.345 as well as across a number of urban centres.

With a few exceptions, Indigenous Australians are more likely to live in neighbourhoods with high rates of unemployment, low rates of employment in general, and low rates of employment as managers or professionals in particular. This is likely to make it more difficult for Indigenous Australians themselves to obtain employment and may also lessen the social benefits of doing so.

EDUCATION

The main way in which education characteristics of the area are likely to impact on individual outcomes is through role model or peer group effects. Human capital theory suggests that individuals decide to undertake education based in part on whether the benefits of doing so outweigh the costs (Becker 1964). Traditionally this has been taken to mean economic costs and benefits only, however there is a large body of literature that suggests social costs and benefits are also important. If there are few people in the area who have completed or who are attending formal education, then the social benefits of doing so oneself are reduced and there may even be social costs (Akerlof & Kranton 2002). Furthermore, in order to gauge the economic benefits of undertaking education it is useful to be able to compare the outcomes of those who have and have not done so. An absence of the former can lead to uncertainty with regards to this decision. Biddle (2007) showed that there was an association between both role model and peer group effects in terms of high school participation for Indigenous youth.

ERP:
Estimated Resident Population

One potential neighbourhood effect identified by Bolt, Burgers & van Kempen (1998) is the lack of political power or voice in low socioeconomic status neighbourhoods. In a parliamentary system where the Estimated Resident Population (ERP) is used to allocate electoral boundaries, there are unlikely to be direct effects on political representation. However, there are other aspects of democracies that play a role in how resources are allocated. This includes representation in the media, persuasive letters to parliamentarians or newspapers, and policy research. Individuals who are more highly educated are much more likely to successfully participate in these activities, and hence those neighbourhoods with a relatively lowly educated population may miss out on such advocacy.

Table 11 shows the level of concentration of Indigenous Australians by the education characteristics of the area. The first two variables capture education completion (high school and post-school qualifications respectively) and the third captures education attendance of 15–24 year olds.

There is a high level of concentration across Australia and for most urban centres in terms of the education characteristics of the area. Wagga Wagga and Geraldton once again stand out as having a high level of concentration with Sydney and Perth also ranking relatively highly. With regards to education participation, there were two urban centres, Darwin and Broome, that had positive values. Although the magnitudes were small, the results do imply that in these two urban centres, Indigenous Australians were living on average in neighbourhoods with greater levels of participation. These two exceptions aside, the results in Table 11 show that if Indigenous Australians use those in their neighbourhood as a guide, then they may be less likely to see the benefits of education and more likely to feel the social costs.

Table 11. Concentration of Indigenous Australians by education characteristics of neighbourhoods within urban centres, 2006

Urban centre	Percentage completed Year 12[a]	Percentage with post-school qualification[a]	Percentage of 15–24 year olds attending education
Sydney	–0.400	–0.362	–0.336
Brisbane	–0.312	–0.329	–0.287
Perth	–0.379	–0.396	–0.367
Melbourne	–0.237	–0.237	–0.237
Adelaide	–0.353	–0.364	–0.305
Cairns	–0.286	–0.340	–0.184
Townsville-Thuringowa	–0.292	–0.279	–0.169
Newcastle	–0.242	–0.282	–0.237
Central Coast	–0.215	–0.195	–0.150
Darwin	–0.275	–0.249	0.010
Wollongong	–0.274	–0.280	–0.231
Gold Coast	–0.164	–0.143	–0.110
Canberra	–0.199	–0.184	–0.171
Dubbo	–0.323	–0.345	–0.269
Rockhampton	–0.179	–0.200	–0.175
Alice Springs	–0.179	–0.193	–0.110
Hobart	–0.379	–0.385	–0.325
Mount Isa	–0.151	–0.170	–0.105
Toowoomba	–0.239	–0.263	–0.243
Mackay	–0.105	–0.118	–0.053
Tamworth	–0.364	–0.357	–0.261
Palmerston	–0.305	–0.280	–0.153
Broome	–0.221	–0.311	0.008
Geraldton	–0.424	–0.440	–0.303
Port Augusta	–0.139	–0.194	–0.163
Wagga Wagga	–0.485	–0.521	–0.452
Kalgoorlie-Boulder	–0.257	–0.269	–0.190
Sunshine Coast	–0.107	–0.097	–0.081
Rest of Australia	–0.372	–0.426	–0.394
Australia total	**–0.460**	**–0.429**	**–0.441**

Note: a. Restricted to those aged 15 years and over.
Source: Author's calculations using the ABS 2006 Census.

HOUSING

More than any other set of characteristics captured in the census, housing variables provide a good indication of the built environment of a neighbourhood. While the census does not include information on the state or quality of houses, it is possible to get an indication of the pressure on the housing stock from usual residents via the average number of people per bedroom. The second variable, the percentage of houses rented from State or Territory housing authorities or community organisations, is likely to indicate areas with low quality housing where the residents have little incentive to maintain and improve the houses. The final column is the median monthly loan repayment in the neighbourhood. While not perfect (it is strongly influenced by how recently the home was purchased) it is a useful proxy for house prices in the neighbourhood. Although the effect isn't as strong as in the USA, where local taxes play a strong role in determining local expenditure including on schools. In Australia—where rates are in part linked to property prices—areas with high median loan repayments may signify a greater capacity for expenditure on amenities.

While not perfect, the number of people per bedroom is a good proxy for the level of household overcrowding in an area for the Indigenous population (Biddle 2008). The positive value for Australia as a whole, and for most urban centres, indicates that Indigenous Australians are more likely to live in areas with a high number of people per bedroom, or that are likely to be overcrowded. The greatest level of concentration is in Wagga Wagga followed by Broome, Perth, Cairns and Tamworth. There was a negative value for Port Augusta indicating that Indigenous Australians in this urban centre lived in neighbourhoods with fewer people per bedroom than the total population. It is worth noting that although positive, the values for Sydney and Melbourne were quite low. This is probably an indication that Indigenous Australians are not living in a number of the expensive inner city neighbourhoods that have relatively small houses but other desirable characteristics.

The second column shows that Indigenous Australians are more likely to live in neighbourhoods that have a high percentage of houses under public or community rental.[8] Apart from the Central Coast, there were moderate to high levels of concentration across most urban centres in Table 12. This shows that not only are Indigenous Australians more likely themselves to live in houses rented from public or community organisations, they are also more likely to live in neighbourhoods where that is the dominant tenure type. The final column of Table 12 shows that Indigenous Australians are less likely to live in areas with high median monthly loan repayments, with Mount Isa being somewhat of an exception.

INCOME, VOLUNTEERING AND ACCESS TO THE INTERNET

Income is the main way in which individuals gain access to goods and services at a particular point in time and how they build wealth through time. Neighbourhoods where a high percentage of the population receive a low income (defined as less than $250 per week or roughly half the Australian median) are likely to be lacking in those goods and services. To the extent that some of that income is spent locally, or there are externalities from one person's expenditure, low income in the neighbourhood is likely to negatively impact on other residents. The second variable included in Table 13 measures the concentration of Indigenous Australians into neighbourhoods based on the level of volunteering for an organisation or group. Much of the discussion in the USA with regards to the decline in social capital at the neighbourhood level focuses on the role of volunteering (Putnam 2000). To the extent that the volunteering is done at the local level, a high level of volunteering is an indication of additional goods and services being provided.

The final variable included in Table 13 is the percentage of houses that have access to the internet. Access to the internet is a useful way for people find to jobs, information about goings on in the local area and connect to people with similar interests to themselves. To the extent that this information is shared within neighbourhoods, low levels of access to the internet can be an indication of individuals missing out on this information.

Table 12. Concentration of Indigenous Australians by housing characteristics of neighbourhoods within urban centres, 2006

Urban centre	Average number of people per bedroom	Percentage of houses under public or community rental	Median monthly loan repayment
Sydney	0.054	0.341	–0.316
Brisbane	0.196	0.267	–0.285
Perth	0.248	0.387	–0.359
Melbourne	0.108	0.201	–0.226
Adelaide	0.107	0.293	–0.316
Cairns	0.234	0.289	–0.235
Townsville-Thuringowa	0.163	0.273	–0.209
Newcastle	0.102	0.224	–0.175
Central Coast	0.114	0.086	–0.120
Darwin	0.148	0.238	–0.159
Wollongong	0.154	0.281	–0.174
Gold Coast	0.061	0.150	–0.131
Canberra	0.103	0.187	–0.122
Dubbo	0.033	0.262	–0.282
Rockhampton	0.121	0.162	–0.194
Alice Springs	0.109	0.187	–0.178
Hobart	0.153	0.301	–0.348
Mount Isa	0.184	0.216	–0.067
Toowoomba	0.107	0.242	–0.262
Mackay	0.115	0.175	–0.110
Tamworth	0.234	0.301	–0.274
Palmerston	0.152	0.269	–0.284
Broome	0.284	0.250	–0.244
Geraldton	0.205	0.346	–0.422
Port Augusta	–0.107	0.229	–0.158
Wagga Wagga	0.320	0.466	–0.493
Kalgoorlie-Boulder	0.108	0.173	–0.178
Sunshine Coast	0.125	0.147	–0.123
Rest of Australia	0.366	0.450	–0.403
Australia total	**0.243**	**0.409**	**–0.425**

Source: Author's calculations using the ABS 2006 Census.

Table 13. Concentration of Indigenous Australians by level of income, volunteering and access to the internet of neighbourhoods within urban centres, 2006

Urban centre	Percentage with low gross personal income[a]	Percentage who volunteered for an organisation or group	Percentage of houses with access to the internet
Sydney	0.242	−0.238	−0.357
Brisbane	0.223	−0.245	−0.331
Perth	0.270	−0.276	−0.406
Melbourne	0.159	−0.197	−0.228
Adelaide	0.322	−0.283	−0.329
Cairns	0.280	−0.211	−0.317
Townsville-Thuringowa	0.224	−0.175	−0.209
Newcastle	0.229	−0.212	−0.236
Central Coast	0.172	−0.177	−0.136
Darwin	0.267	−0.094	−0.214
Wollongong	0.241	−0.224	−0.210
Gold Coast	0.028	−0.029	−0.095
Canberra	0.119	−0.159	−0.157
Dubbo	0.326	−0.342	−0.253
Rockhampton	0.153	−0.199	−0.209
Alice Springs	0.155	−0.115	−0.194
Hobart	0.318	−0.369	−0.326
Mount Isa	0.168	−0.123	−0.183
Toowoomba	0.179	−0.248	−0.286
Mackay	0.093	−0.117	−0.089
Tamworth	0.353	−0.301	−0.312
Palmerston	0.219	−0.076	−0.275
Broome	0.363	−0.174	−0.294
Geraldton	0.406	−0.401	−0.406
Port Augusta	0.224	−0.179	−0.200
Wagga Wagga	0.454	−0.466	−0.501
Kalgoorlie-Boulder	0.227	−0.254	−0.195
Sunshine Coast	0.028	−0.075	−0.069
Rest of Australia	0.337	−0.217	−0.466
Australia total	**0.267**	**−0.055**	**−0.457**

Note: a. Restricted to those aged 15 years and over.
Source: Author's calculations using the ABS 2006 Census.

Given the strong correlation between income and a number of the other variables already presented, it is no surprise that similar patterns emerge with regards to the concentration of Indigenous Australians in areas of low income. Wagga Wagga and Geraldton have the highest level of concentration, with the Gold Coast and the Sunshine Coast having relatively low levels. This was also true for the levels of concentration in neighbourhoods based on access to the internet. Indigenous Australians within the 28 urban centres were less likely to live in neighbourhoods with high levels of volunteering than the general population. In addition to the Gold Coast and the Sunshine Coast, there was a relatively low level of concentration in Darwin and Palmerston.

SUMMARY: CLASSIFYING URBAN CENTRES

Compared to the non-Indigenous population, Indigenous Australians are much more likely to live in remote areas. This explains to a certain extent the focus on remote Australia when explaining socioeconomic disparities between the two populations. However, in absolute terms, over three-quarters of the Indigenous population lived in urban or regional areas in 2006, with 43 per cent of the population concentrated in 28 large urban centres. Because of this, Biddle, Taylor and Yap (2008) and Biddle (2009) showed that to achieve any reduction in the socioeconomic disparities between Indigenous and non-Indigenous Australians, the greatest absolute number of jobs and houses respectively will need to be provided in capital cities and other urban regions.

One of the potential difficulties in improving socioeconomic outcomes in urban and regional areas relative to the non-Indigenous population is the fact that the Indigenous population is concentrated in the poorest neighbourhoods. Taylor (2006) showed that in 2001 over 25 per cent of urban Indigenous Australians lived in the most disadvantaged 10 per cent of neighbourhoods. Not only do urban Indigenous Australians themselves have worse outcomes than their non-Indigenous counterparts, they live in areas where those around them also have poor outcomes.

There are four sequential strands of research that follow from this concentration in poor city and urban neighbourhoods: the questions of 'what?' or 'where?'; the questions of 'why?' or 'how?'; the question of 'so what?'; and the question of 'what next?'. That is, which urban areas have the greatest level of concentration of the Indigenous population and what are the characteristics of the areas that Indigenous Australians are concentrated in (the questions of 'what?' or 'where?')? How do these levels of segregation come about and what are the reasons and motivations for Indigenous Australians living in particular areas (the questions of 'why?' or 'how?')? How does this level of concentration impact on individual outcomes (the question of 'so what?')? And if there are negative impacts, what are the potential policy responses (the question of 'what next?')? The aim of this paper is to answer the first research question in the most comprehensive manner to date, in order to set up a stream of ongoing research that will attempt to answer the latter three (as outlined at the end of this section).

In general, the results presented in this paper confirmed that there were high levels of residential segregation in most large urban centres. Using the standard dissimilarity index, there were four urban centres with values greater than 0.5 in 2006. This means that hypothetically more than half of the Indigenous (or non-Indigenous) population would have to change neighbourhoods in Sydney, Perth, Melbourne and Broome for there to be an even distribution of the two populations. For the most part, residential segregation using this measure is increasing, with 17 of the 28 urban centres witnessing a rise in the dissimilarity index during the last intercensal period.

The type of neighbourhoods that Indigenous Australians are concentrated in varies by urban centre. Outside of the five large capital cities, there were about the same number of urban centres where Indigenous

Australians lived on average further away from the city centre than the non-Indigenous population (13 urban centres) as there were that lived on average closer (10 urban centres). However, in 19 of the 23 urban centres outside the large capital cities Indigenous Australians were found in neighbourhoods that had higher than average population densities. Compared to this, in the five largest capital cities (in particular Sydney) Indigenous Australians were concentrated in high density outer suburban neighbourhoods. These neighbourhoods have the double problem of being relatively far away from good jobs and other services, whilst lacking the amenities and open spaces that residents of other neighbourhood types have access to.

Not only did the paper show that the geographic characteristics of the neighbourhoods in which Indigenous Australians live vary across the urban centres, but so too do the socioeconomic characteristics. Although Taylor (2006) showed that Indigenous Australians were more likely to live in low socioeconomic neighbourhoods, for the first time the results presented in this paper show that, apart from those in public housing, there was a greater concentration of Indigenous Australians than other population subgroups. This includes those who are not employed, those with low levels of education, those born overseas, those with a core activity restriction and lone parents. Of course, Indigenous Australians are disproportionately found in public housing (Biddle 2008). Hence, it is quite likely that the concentration of Indigenous public housing tenants will be greater still.

Ultimately, the policy response to high socioeconomic concentration will be different depending on the particular variable. While there was some correlation, it is not always the case that urban centres with a high concentration of Indigenous Australians based on one variable had high concentrations based on another. In providing employment support services, for example, those urban centres with high concentrations of Indigenous Australians in low employment neighbourhoods may require a different policy setting to those urban centres where Indigenous Australians are evenly spread.

Despite the need to look at the concentration of Indigenous Australians by different socioeconomic variables, there are some general patterns that emerged for the urban centres. To summarise these patterns, all 28 urban centres are grouped in the following table based on their level of segregation and socioeconomic concentration. Based in part on a cluster analysis of the results already presented in this paper, as well as a subjective evaluation using the results presented earlier, the urban centres are separated into six groups.

The first group of urban centres have a relatively high level of segregation based on the dissimilarity index (ranked seventh and sixth respectively) alongside consistently very high levels of socioeconomic concentration. These two urban areas were ranked third and first in terms of their concentration in neighbourhoods according to the SEIFA summary index of socioeconomic advantage/disadvantage and were consistently ranked in the top two across individual variables. Geraldton and Wagga Wagga were the two urban centres in Australia in 2006 where Indigenous Australians were most likely to suffer the negative consequences of living in poor neighbourhoods.

The second group includes two urban centres, Melbourne and Broome. These urban centres had the two most uneven distributions of the Indigenous population across neighbourhoods. Sixty-one per cent (Melbourne) and 54 per cent (Broome) of the Indigenous population in these urban centres would have had to change the neighbourhood in which they live in order to have a completely even distribution of the Indigenous population. This is a high level of segregation by most standards. However, both urban centres had only moderate levels of concentration in disadvantaged neighbourhoods. In other words, Indigenous Australians in Melbourne and Broome lived in neighbourhoods that had a high proportion of other Indigenous Australians relative to the rest of the city. However, these neighbourhoods were not particularly disadvantaged in terms of socioeconomic outcomes, at least compared to the other cities in the sample.

Table 14. Groupings of urban centres based on their level of segregation and socioeconomic concentration, 2006

Group	Characteristics	Urban centres
1	High unevenness, very high socioeconomic concentration	Geraldton Wagga Wagga
2	Very high unevenness, moderate socioeconomic concentration	Melbourne Broome
3	High unevenness, high socioeconomic concentration	Sydney Brisbane Perth Adelaide Cairns Dubbo Hobart Tamworth
4	Moderate unevenness, moderate socioeconomic concentration	Newcastle Wollongong Alice Springs Toowoomba Kalgoorlie-Boulder
5	Moderate unevenness, moderate socioeconomic concentration, low volunteering and education participation concentration	Townsville-Thuringowa Darwin Palmerston
6	Low to moderate unevenness, low socioeconomic concentration	Central Coast Gold Coast Canberra Rockhampton Mount Isa Mackay Port Augusta Sunshine Coast

Note: Within the groups, the urban centres are ordered based on the size of the Indigenous population.
Source: Author's calculations using the ABS 2006 Census.

The next group of urban centres have both high levels of unevenness or residential segregation and high levels of socioeconomic concentration. They were generally not as high as in the first two groups, but still high enough for there to be potentially large neighbourhood effects on individual outcomes. The four remaining large capital cities are included in this group alongside Cairns, Dubbo, Hobart and Tamworth.

The next two groups have moderate levels of unevenness or segregation and moderate levels of socioeconomic concentration on average. The difference between the two is that for Group 4, the level of socioeconomic concentration is consistent across the specific socioeconomic variables. In Group 5, however, there was a low level of concentration in terms of volunteering and education participation. What this shows is that although there is a fairly strong relationship across the individual variables,

there are some outcomes like volunteering or education participation where Indigenous Australians live in neighbourhoods with relatively favourable outcomes. For this reason, potential neighbourhood effects need to be studied separately with policy targeted accordingly.

In the final group there were relatively low levels of concentration of the Indigenous population based on the socioeconomic characteristics of neighbourhoods with some variation in the degree of unevenness. This does not mean that Indigenous Australians in these urban centres do not have low socioeconomic outcomes themselves. Rather, in these urban centres Indigenous Australians are living in neighbourhoods that are not overly disadvantaged compared to the rest of the city. There are likely to be very different policy responses to poor individual outcomes as opposed to living in poor neighbourhoods.

The results presented in this paper are only the first part of a longer term stream of research outputs. Having shown that Indigenous Australians are indeed concentrated in relatively poor urban neighbourhoods but that the extent to which this occurs depends on the urban centre and the particular measure of disadvantage, the next step is to better understand the processes that lead to this segregation. One of the major determinants of the change in segregation patterns is migration into and out of the urban centre as well as movement across suburbs within a city. Between 2001 and 2006, census migration count data shows that 14,774 Indigenous Australians moved into urban areas (broadly defined)[9] resulting in a net increase of the population of 4,535. Subsequent analysis will consider where these people—and those who moved within urban Australia—moved to, and how this relates to the segregation results presented in this paper. Things like the provision of public housing, house prices, employment opportunities and the provision of health, education and other services are all likely to influence a person's destination decisions.

As mentioned earlier, the implications of the results presented in this paper will depend heavily on the extent to which residential segregation impacts on an individual's outcomes. So, while it has been shown in this paper that Indigenous Australians are more likely to live in relatively poor urban neighbourhoods, it is not clear whether doing so makes people less well off themselves. Although a number of potential effects were outlined in the introductory section of this paper, there is very little, if any, empirical evidence on the extent to which this holds in Australia in general, or for the Indigenous population in particular. Furthermore, there are potential positive aspects of living near people with similar characteristics to oneself that need to be balanced against the potential negative effects.

There is a complex and reinforcing relationship between area level measures of disadvantage and the prospects of those who live in disadvantaged areas. The former is often measured as the sum or average of individual disadvantage, however it goes beyond such aggregates and includes the environment, outside perceptions and the relationships between individuals. While the choice made by individuals to live in a particular area is made under a number of constraints, it is still a choice that individuals make, meaning the direct impact of a living in a particular area is difficult to isolate from the unobserved characteristic of those who live there. Census data may provide some insights into some of the effects of residential segregation, although the scope to undertake individual level analysis is limited and there is no longitudinal information available to identify causality. In other words, publicly available census data is not well suited to separately identifying the effect of the neighbourhood context on an individual. So, while the census is crucial in identifying the extent of residential segregation (that is, the focus of this paper) the most fruitful research on causation will involve creatively linking area level data from the census or other sources to other specially targeted surveys or administrative data.

Ultimately, convincing crucial evidence for the impact of residential segregation will come from speaking to those Indigenous Australians currently living and working in disadvantaged urban neighbourhoods. Doing so will provide the details and substance around the questions of 'why?' and 'so what?' and will form the evidence base for answering the crucial question of 'what next?'.

NOTES

1. Of course, if the population was distributed evenly across the distribution of CDs by socioeconomic status then only 10% of the Indigenous population would live in the bottom 10% of CDs.
2. The results presented in this paper are all based on usual residence counts. This will give a slightly different picture than place of enumeration or where people were on census night. However, it is a better indicator of long-term residential patterns. Usual resident counts of urban centres are subject to an unknown undercount for people who were missed from the census (or incorrectly not identified as being Indigenous). The ABS's attempts to control for this via the Estimated Resident Population (ERP) do not extend to urban centres or census CDs, the two levels of geography utilised in this paper. However, it would seem that the very high undercount at the State or national level of the Indigenous population is less of an issue in urban as opposed to remote areas (ABS 2007).
3. This is a somewhat arbitrary cut-off made mainly for presentational purposes. Measures of segregation are available from the author for other, smaller urban centres. There were of course many urban centres that had a non-Indigenous population count greater than 2,000 according to the 2006 Census, but an Indigenous population count less than 2,000. However, there was only one urban centre that had a high Indigenous population but low non-Indigenous population—Yarrabah near Cairns, Queensland. As there were only 49 non-Indigenous Australians counted in Yarrabah, it was not included separately in Table 1 or any other tables in this paper.
4. Unfortunately an Estimated Resident Population (ERP) is not available for the geographic classification used in this paper.
5. The use of the term 'neighbourhood' in this paper is meant to be taken in the generic sense. In broad terms, this paper follows the definition given in Chaskin (1995: 1) that neighbourhoods are a 'geographically bound unit in which residents share proximity and the circumstances within that proximity.' For applied analysis within Australia, researchers are constrained by the lowest level of data for which the ABS provides estimates. In the case of Indigenous Australians, this is the Census CD. An interesting avenue of further empirical research is whether these units can be aggregated to create more homogeneous groupings of Indigenous Australians by space.
6. The coordinates of the urban centre were found using Google Earth. The exception was Canberra, where Parliament House was given as the centre of the city. As this does not reflect the commercial centre of Canberra, the middle of London Circuit was used instead. For urban centres with multiple city centres, the following suburbs or parts of the city were used: Central coast—Gosford; Gold Coast—Surfers Paradise; Sunshine Coast—Maroochydore.
7. Although the SEIFA disadvantage index is more commonly used for such analysis, it is not suitable for Indigenous Australians. This is because the proportion of the population who are Indigenous is used as an indicator of disadvantage, meaning that it is biased towards neighbourhoods with high Indigenous populations.
8. The concentration of Indigenous Australians in neighbourhoods based on the percentage of houses owned or being purchased was also calculated. Without exception, a high negative value for community/public rental was associated with a high positive value for home ownership (correlation of –0.676).
9. Migration data is not available for the urban centre localities used in this paper. This figure refers to the number of people who moved in major cities and inner regional areas (using the Accessibility/Remoteness Index of Australia classification) as well as Townsville, Cairns, Mount Isa, Kalgoorlie, Geraldton, Port Hedland, Broome, Darwin and Alice Springs.

APPENDIX 1

FORMULAE FOR MEASURES OF SEGREGATION AND SOCIOECONOMIC CONCENTRATION

UNEVENNESS/DISSIMILARITY INDEX

Letting:

n_j be the total number of neighbourhoods (CDs) in the j^{th} urban centre;

$p_{1,i}$ be the Indigenous population in the i^{th} CD;

$P_{1,j}$ be the total Indigenous population in the j^{th} urban centre;

$p_{2,i}$ be the non-Indigenous population in the i^{th} CD; and

$P_{2,j}$ be the total non-Indigenous population in the j^{th} urban centre;

Then, the dissimilarity index, D_j can be calculated using the following formula:

$$D_j = \frac{1}{2}\sum_{i=1}^{n_j}\left|\frac{p_{1,i}}{P_{1,j}} - \frac{p_{2,i}}{P_{2,j}}\right|$$

ISOLATION/CORRELATION RATIO

Using the same notation as above, the isolation index can be defined as follows:

$$P_j^* = \sum_{i=1}^{n_j}\left(\frac{p_{1,i}}{P_{1,j}}\right)\left(\frac{p_{1,i}}{p_{1,i}+p_{2,i}}\right)$$

To adjust for population size, the correlation ratio can be defined as follows:

$$V_j = \frac{\left(P_j^* - \frac{P_{1,j}}{P_{1,j}+P_{2,j}}\right)}{\left(\frac{P_{2,j}}{P_{1,j}+P_{2,j}}\right)}$$

APPENDIX 1 *continued*

SOCIOECONOMIC CONCENTRATION – MODIFIED GINI COEFFICIENT

To calculate the modified Gini coefficient, the first step is to sort each neighbourhood (*i*) within a given urban centre (*j*) based on the particular characteristic (for example the SEIFA advantage/disadvantage index). Letting:

$p_{t,i}$ be the proportion of the total population in neighbourhood *i*.

Then using the previous notation, the cumulative share of the population in the i^{th} neighbourhood for the Indigenous and total populations can be calculated (respectively) by summing across all of the *k* neighbourhoods with a socioeconomic status less than or equal to the i^{th} neighbourhood as follows:

$$c_{1,i} = \sum_{k=1}^{i} p_{1,i} \quad \forall k \leq i$$

and

$$c_{t,i} = \sum_{k=1}^{i} p_{t,i} \quad \forall k \leq i$$

The modified Gini Coefficient is then calculated as follows:

$$G_j = 2\sum_{i=1}^{n_j} \left(c_{t,i} - c_{1,i} \right)$$

APPENDIX 2

DISTANCE TO CITY CENTRE AND POPULATION DENSITY

Table A2.1. Indigenous population percentage by distance to city centre and population density of neighbourhood: Sydney, Brisbane, Perth, Melbourne and Adelaide, 2006

	Distance to city centre (km)					
Population density (persons/km²)	Closest 0–6.7	6.7–11.5	11.5–17.3	17.3–25.5	Furthest 25.5–86.4	Indigenous count
Least dense 0–1529	0.75	2.42	3.89	5.56	9.99	23,418
1530–2233	1.77	4.10	5.75	5.90	6.78	25,154
2234–2815	1.90	4.00	4.48	4.74	6.33	22,209
2815–3780	1.83	2.42	3.23	4.16	7.88	20,230
3780–109,400 Most dense	4.98	2.67	1.23	1.23	2.01	12,546
Indigenous count	11,629	16,170	19,246	22,347	34,165	103,557

Source: Author's calculations using the ABS 2006 Census.

Table A2.2. Non-Indigenous population percentage by distance to city centre and population density of neighbourhood: Sydney, Brisbane, Perth, Melbourne and Adelaide, 2006

	Distance to city centre (km)					
Population density (persons/km²)	Closest 0–6.7	6.7–11.5	11.5–17.3	17.3–25.5	Furthest 25.5–86.4	Non-Indigenous count
Least dense 0–1529	0.88	2.52	3.39	5.32	7.35	1,981,310
1530–2233	1.92	3.88	5.02	5.39	4.73	2,132,058
2234–2815	2.47	4.06	4.96	5.08	4.54	2,150,202
2815–3780	2.50	3.87	4.88	5.22	4.79	2,164,544
3780–109,400 Most dense	7.07	4.04	2.86	1.94	1.31	1,753,704
Non-Indigenous count	1,510,443	1,869,586	2,150,775	2,337,242	2,313,772	

Source: Author's calculations using the ABS 2006 Census.

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