Australian National University

CAEPR Indigenous Population Project

2011 Census Papers

Paper 8
Education Part 2: School education

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The 2011 Census Paper Series

In July 2012, the Australian Bureau of Statistics began releasing data from the 2011 Census of Population and Housing. One of the more important results contained in the release was the fact that the number of people who identified as being Aboriginal and/or Torres Strait Islander (Indigenous) had increased by 20.5 per cent since the 2006 Census. There were also significant changes in the characteristics of the Indigenous population across a number of key variables like language spoken at home, housing, education and other socioeconomic variables. In this series, authors from the Centre for Aboriginal Economic Policy Research (CAEPR) document the changing composition and distribution of a range of Indigenous outcomes. The analysis in the series was funded by the Commonwealth Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) through the Strategic Research Project as well as FaHCSIA and State/Territory governments through the Indigenous Populations Project.

The opinions expressed in the papers in this series are those of the authors alone and should not be attributed to CAEPR, FaHCSIA or any other government departments.

CAEPR Indigenous Population Project
2011 Census Papers
No. 8/2013

http://caepr.anu.edu.au/publications/censuspapers.php

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Abstract

The aim of this paper is to use data from the two most recent censuses, the Longitudinal Surveys of Australian Youth (LSAY) and the Longitudinal Study of Australian Children (LSAC) to provide an up-to-date picture of the schooling experience of Indigenous children. The major finding from the census analysis is that there have been significant improvements in the rate of Indigenous high school completion, both in absolute terms and relative to the non-Indigenous population. Large gaps still remain though and in all regions of Australia apart from the Torres Strait, Indigenous youth are less likely to complete Year 12 than their non-Indigenous counterparts. Geography explains some of this difference. However, even if Indigenous Australians had the same geographic distribution as the non-Indigenous population, Year 12 completion rates would still be lower. Analysis of the LSAY showed that socioeconomic status and school sector explains some, but not all of the difference in maths, reading and science test scores amongst a nationally representative cohort of Indigenous and non-Indigenous students who were aged 15 in 2009. Indigenous students are less likely to be attending a non-government school than their non-Indigenous counterparts. However, even within a particular school sector, there appears to be significant differences in the schooling context of Indigenous and non-Indigenous students.

Acknowledgements

A number of comments on this paper were received from and/or collated by members of the Steering Committee of the Indigenous Populations Project, and were much appreciated. In addition, the authors would like to thank the Department of Education, Employment and Workplace Relations (DEEWR) for providing and collating a number of additional comments. This paper was edited and formatted by Gillian Cosgrove from CAEPR for which I am very grateful.

List of Acronyms

ABS	Australian Bureau of Statistics
AIGC	Australian Indigenous Geographic Classification
ANU	Australian National University
CAEPR	Centre for Aboriginal Economic Policy Research
DEEWR	Commonwealth Department of Education, Employment and Workplace Relations
ERP	Estimated resident population
FaHCSIA	Commonwealth Department of Families, Housing, Community Services and Indigenous Affairs
HILDA	Household, Income and Labour Dynamics in Australia (survey)
LSAC	Longitudinal Study of Australian Children
LSAY	Longitudinal Surverys of Australian Youth
NAPLAN	The National Assessment Program – Literacy and Numeracy
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment

Introduction and overview

Education, and in particular the funding of education, has achieved a very high level of prominence and debate within Australia since the release of the *Review of Funding for Schooling* by the Department of Education, Employment and Workplace Relations (DEEWR 2011). Often referred to as the 'Gonski Review' (named after the chair of the review committee), the Executive Summary of the report identified three main issues with regards to education in Australia:

> …over the last decade the performance of Australian students has declined at all levels of achievement, notably at the top end… Australia has a significant gap between its highest and lowest performing students … [and] there is also an unacceptable link between low levels of achievement and educational disadvantage, particularly among students from low socioeconomic and Indigenous backgrounds (DEEWR 2011: xiii).

There is a specific section within the review that focuses on the relationship between education outcomes and Indigenous status. Using results from the 2009 Programme for International Student Assessment (PISA), the report refers to data presented in Thompson et al. (2011) and states that:

> …the mean outcomes of Indigenous students are significantly lower than their non-Indigenous peers, and are also lower than the OECD average [and the] difference in mean scores between Indigenous and non-Indigenous students was estimated to be equivalent to approximately two full years of schooling (DEEWR 2011: 116).

These low levels of education amongst the Indigenous population are recognised by both State or Territory and Commonwealth governments and underpin their joint efforts around the 'Closing the Gap' targets. Although the target to close the life expectancy gap within a generation receives the most media attention, it is important to note that numerically, education dominates, with three of the six targets identified by the Council of Australian Governments being concerned with improving the accountability of governments in relation to education participation and attainment.

In a previous paper in this series (Biddle 2013) I looked at data related to the early childhood education target. The five main results from the census analysis in that paper were that:

- there has been a decline over the last intercensal period in the gap between Indigenous and non-Indigenous children in terms of preschool participation;
- this decline was mainly due to reductions in the non-Indigenous rates, as well as a change in the geographic distribution of the Indigenous population;
- despite consistency at the national level, there was considerable regional variation, with 26 out of the 37 Indigenous Regions used in the analysis experiencing a significant increase in preschool participation;
- many remote regions are catching up to non-remote regions in rates of participation; but
- large gaps still remain between Indigenous and non-Indigenous children once geography and other characteristics are controlled for.

In addition to early childhood education, the remaining two education-related Closing the Gap targets are concerned with schools. Specifically, the government has committed to:

- Halve the gap for Indigenous people aged 20–24 in Year 12 attainment or equivalent attainment rates (by 2020); and
- Halve the gap in reading, writing and numeracy achievements for children within a decade (FaHCSIA 2009).

The aim of this paper is to assess changes in Indigenous school outcomes between 2006 and 2011 using the relevant Censuses of Population and Housing. However, it is also recognised that the census can only tell us so much about Indigenous education and hence results from two additional data sources are integrated into the analysis—the Longitudinal Survey of Australian Youth (LSAY) and the Longitudinal Study of Australian Children (LSAC).

The first section of results presented in the paper looks at Year 12 completion, while the second section focuses on literacy and numeracy outcomes. This is followed by an analysis of outcomes in the early years of schooling, with the final section of results examining non-government school attendance. The last section of the paper provides some discussion and concluding comments. Initially, however, I discuss the demography and geography of the Indigenous population, as well as the data used in the analysis.

Data

Results presented in this paper are based on analysis of the 2006 and 2011 Censuses of Population and Housing. In 2006, the estimated resident population (ERP) of Indigenous Australians was around 517,000. By 2011, the preliminary ERP had increased to around 670,000. This population growth was much faster than suggested by the number of births of Indigenous children minus deaths within the population, meaning that some of those people who were identified as being Indigenous in 2011 were either missed from the 2006 Census or were identified as being non-Indigenous.

According to the 2011 Census, there were 188,868 children and young adults of roughly school age (5–19 years as of August 2011) who were counted and identified as being Indigenous alongside a total of 3,745,925 children and young adults of the same age counted and identified as being non-Indigenous. There is, however, a substantial undercount amongst the Indigenous population and, after applying State/Territory-specific and age-specific undercount factors, it is estimated that there were 229,309 Indigenous Australians aged 5–19 years, or 5.4 per cent of the relevant Australian population.

To undertake analysis at the regional and local level, the 2011 Census paper series[1] use the Australian Indigenous Geographic Classification (AIGC).[2] The most aggregated level of geography in the AIGC is Indigenous Regions. There were 57 of these in the 2011 version of the AIGC. After excluding administrative regions, Jervis Bay and the Christmas–Cocos (Keeling) Island regions (both of which have very few Indigenous Australians in the age range), this leaves 38 Indigenous Regions used in the analysis for this paper.

The 2011 Indigenous Regions are shown in Figure 1. The shading for the regions indicates the percentage of the 5–19-year-old population in the region who were estimated to be Indigenous, ranging from a little under the national average (5.0%) in the lightest shading to more than half of the population (the darkest shading). The numbers after the Indigenous Region name refer to the percentage of the total 15–19-year-old Indigenous ERP who identified that region as their place of usual residence on the night of the census.

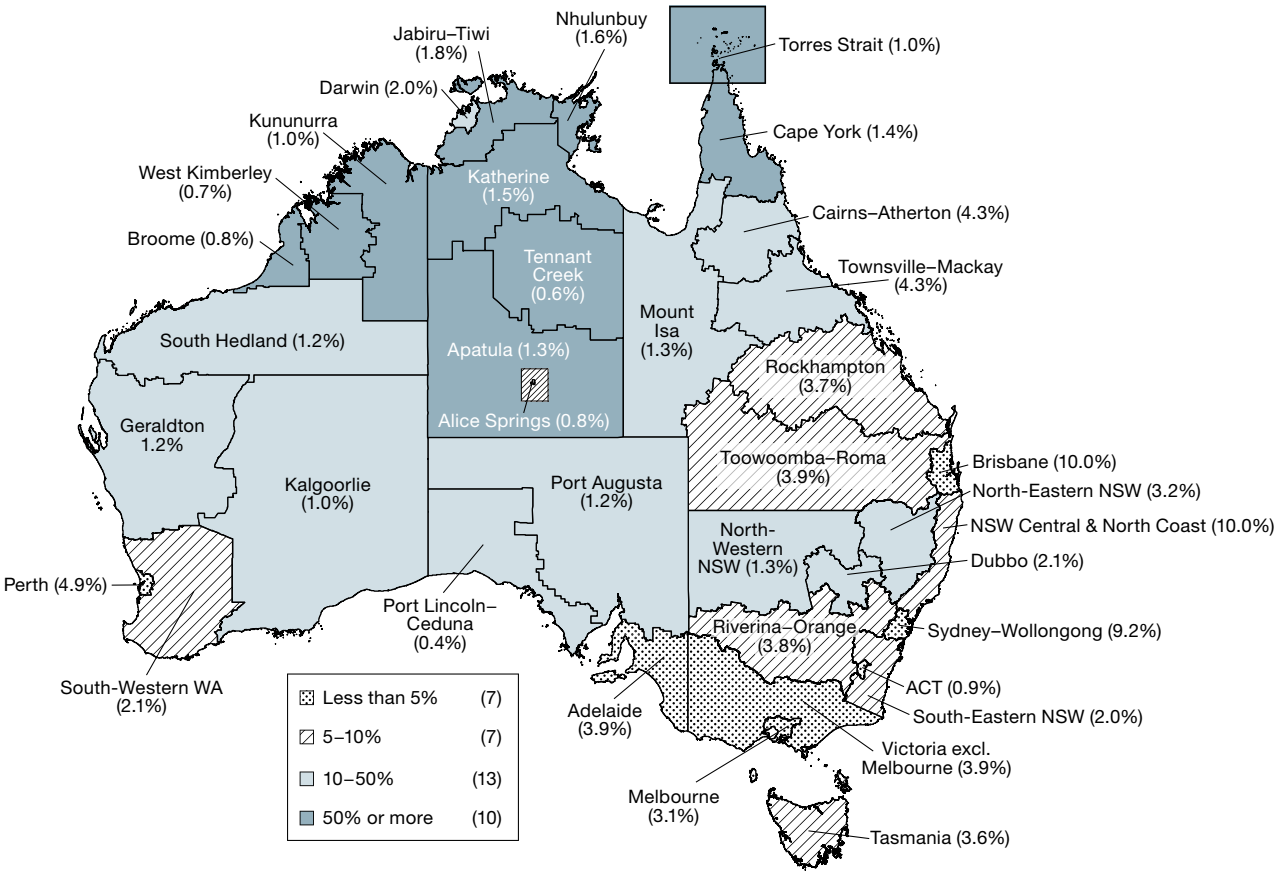
There are two key points that emerge from Figure 1. First, it is in more remote regions that the share of the population who identify as being Indigenous is highest. There are 10 regions where more than half of the estimated population aged 5–19 years in 2011 were identified as being Indigenous, with the Torres Strait (93.9%), Apatula (93.7%), Jabiru–Tiwi (91.7%), Tennant Creek (86.1%) and the West Kimberley (83.5%) all having more than four out of every five usual residents being Indigenous.

While it is remote regions in north, central and western parts of the country that have the highest percentage of the population being Indigenous, the regions with the greatest absolute number of Indigenous Australians are in the south and east of the country. The Brisbane, New South Wales Central and North Coast, and Sydney–Wollongong regions all have an Indigenous population estimate for the 5–19-year age group of 20,000 people or higher, whereas most of the remote regions have populations of around 4,000 Indigenous children or fewer. While a higher proportion of the Indigenous population lives in remote areas than the non-Indigenous population, the majority of the Indigenous population lives in urban areas.

In the 2011 Census, respondents were asked (usually on the behalf of others) 'Is the person attending a school or any other educational institution?.' Instructions were given to those filling out the form to 'include pre-school and external or correspondence students'. The respondents who were identified as attending an institution were then asked about the type of institution they were attending, with the first option being preschool, followed by types of infants/primary school (government, catholic, other non-government); different types of secondary school (government, catholic, other non-government again); and tertiary institutions. Although respondents were instructed to 'visit www.abs.gov.au/censushelp for more information about year equivalents', given the variety of names for different levels of early childhood education, it is likely that

1. Other papers in the series can be downloaded from <http://caepr.anu.edu.au/population/censuspapers.php>.
2. The AIGC is a four-level structure that builds up from the Statistical Area Level 1, which is common to both the AIGC and the Australian Statistical Geography Standard. The next level above the Statistical Area Level 1 in the AIGC is Indigenous Locations, of which there were 1,116. The next level above Indigenous Locations are Indigenous Areas, of which there were 429. This number lowers to 411 substantive areas after excluding administrative codes representing those in a particular State or Territory who did not give any additional detail on their place of usual residence, or who were migratory on the night of the census.

FIGURE 1. Proportion of population aged 5–19 that is Indigenous (shading) by Indigenous Region and proportion of total Indigenous population aged 5–19 in each region (text), 2011



Source: Customised calculations using the 2011 Census.

there was a fair degree of compromised classification, particularly in jurisdictions which do not use the standard preschool/kindergarten labels for the two years preceding Year 1 (see Table 1 in Biddle 2013).

A further set of education-related questions were asked about those aged 15 years and over. Specifically, respondents were asked 'What is the highest year of primary or secondary school the person has completed?', ranging from 'did not go to school', 'Year 8 or below' and 'up until Year 12 or equivalent'. Respondents were then asked 'Has the person completed any educational qualification (including a trade certificate)?', with an additional question asking 'What is the level of the highest qualification the person has completed?' While answers to this second question on qualifications are in the form of free text, the following examples are given: trade certificate, bachelor degree, associate diploma, certificate II, advanced diploma.

The main benefit of using the census for analysing Indigenous school outcomes is that one can look at very small geographies and population subgroups. However, beyond participation and past completion, there is very little information on school outcomes. Furthermore, it is currently not possible with the census to track individuals through time and analyse development and change. The three most commonly used longitudinal databases in Australia are the Household Income and Labour Dynamics in Australia (known as the 'HILDA') survey, the LSAY and the LSAC. The HILDA has information on a range of outcomes across the lifecourse, starting in young adulthood. However, the Indigenous sample is reasonably small and not necessarily representative of the Indigenous population (especially those in remote areas). The LSAY, on the other hand, focuses on youth outcomes and transitions, and has a large and much more representative Indigenous sample.

In this paper, data from the 2006 and 2009 cohorts of the LSAY are analysed in detail. Wave 1 of the 2006 cohort includes information on 14,170 respondents who were aged about 15 years at the time of the survey. Of these, 1,080 were Indigenous, with 42.3 per cent of the Indigenous sample attending a school in a major city, 46.7 per cent attending a school in provincial Australia, and the remaining 11.0 per cent attending a school in remote Australia. Unfortunately, there is no geographic information on the child's place of usual residence—only where their school is located. The 2009 LSAY had information on 14,251 children, also aged 15 years at the time of the survey. The Indigenous sample in 2009 was even larger than in 2006, with 1,143 respondents—48.9 per cent of the Indigenous sample were attending a school in a major city, 42.3 per cent were attending a school in provincial Australia, and the remaining 8.8 per cent were attending a school in remote Australia.

While the LSAY has a range of useful information on young adults and their progression from school into the labour market and post-school education, there is very little information on the early school years. For this reason, in this paper I also use data from the LSAC, (sometimes referred to as *Growing Up in Australia*). According to the *Data User Guide* for the survey, 'LSAC aims to provide a database for a comprehensive understanding of children's development in Australia's current social, economic and cultural environment' (Australian Institute of Family Studies 2011: 8).

The LSAC was constructed around two cohorts—the B cohort (born March 2003–February 2004) and the K cohort (born March 1999–February 2000). In order to obtain as much information on the school years as possible, the analysis in this paper is based on the second of these, the K cohort. In Wave 1 of the survey, there were 4,983 children aged 4–5 years, of which 187 were identified as being Indigenous (3.8% of the sample). By Wave 4, when the children were aged 10–11 years, there were 3,940 children left in the sample, of which 105 (2.7%) were identified as being Indigenous. Clearly this is a very small sample of Indigenous children and does not allow for detailed analysis within the population. Indeed, that is why the Longitudinal Study of Indigenous Children is being undertaken. However, the sample is large enough to make some broad comparisons between Indigenous and non-Indigenous children.

Year 12 completion by geography

The headline 'Closing the Gap' target related to Year 12 completion is to 'Halve the gap for Indigenous people aged 20–24 in Year 12 attainment or equivalent attainment rates (by 2020)' (FaHCSIA 2009). According to the Closing the Gap progress report, based on data from the 2006 and 2011 Censuses, this target is on track to be met (Australian Government 2013). The following table documents changes in Year 12 completion or equivalent (defined as having completed a Certificate II or higher) between 2006 and 2011. Results are presented by sex.

According to the 2006 Census, 54.1 per cent of Indigenous males and 50.7 of Indigenous females who were then aged 20–24 years had neither completed Year 12, nor obtained a Certificate II or higher post-school qualification. This was 35.8 percentage points and 37.3 percentage points higher than the respective non-Indigenous population. By 2011, the percentages had fallen to 47.4 per cent of Indigenous males and 44.4 per cent of Indigenous females, with the gaps narrowing to 31.6 and 32.8 per cent respectively. So, although Indigenous males still have lower levels of education completion than females, there was an absolute and relative improvement in the level of education in the level of education for the 2011 Indigenous population aged 20–24 years compared to the 2006 population.

I will return to the analysis of post-school qualifications in a later paper in this series. In the remainder of this paper, I focus on the first part of the 'Year 12 or equivalent' Closing the Gap target. As can be seen in Table 1, there is still a considerable gap between Indigenous and non-Indigenous males and females in the percentage of 20–24-year-olds who had completed Year 12. Table 2 demonstrates that a large part of the variation within the Indigenous population can be explained by geography.

Table 2 looks at the percentage of Indigenous and non-Indigenous 15–24-year-olds who have completed Year 12. This table, which excludes those who are current students and who do not give sufficient information on their level of education, gives rates of completion by sex and Indigenous Region. Although the data is from the 2011 Census, results are presented based on the Indigenous Region of usual residence in 2006.[3] This is done to get as close as possible to the area in which the individual lived at the time they made the education decision to leave high school early or to complete Year 12.

3. This is based on Question 10 on the 2011 Census 'Where did the person usually live five years ago (at 9 August 2006)?' The answer to this question is coded by the ABS to the Statistical Area 2 (SA2) of usual residence which is converted to 2011 Indigenous Regions using a concordance provided by the ABS.

TABLE 1. Percentage of Indigenous 20–24-year-olds by Year 12 completion and qualification, by Indigenous status and sex, 2006 and 2011

	Indigenous		Non-Indigenous	
Explanatory variables	**Male**	**Female**	**Male**	**Female**
2006				
No Year 12—No qualification or Certificate I only	54.1	50.7	18.3	13.4
No Year 12—Certificate II or above	10.7	8.9	10.5	6.4
Year 12 and above	35.2	40.4	71.2	80.2
2011				
No Year 12—No qualification or Certificate I only	47.4	44.4	15.8	11.6
No Year 12—Certificate II or above	13.0	10.5	11.1	6.8
Year 12 and above	39.7	45.2	73.1	81.6

Source: Customised calculations based on the 2006 and 2011 Censuses.

The region which had the highest Year 12 completion rate of its Indigenous male 2006 usual residents was the Torres Strait region. Of those aged 20–24 years in 2011 and living in this region in 2006, 72.1 per cent had completed Year 12 by the time of the most recent census. This rate was substantially higher than the corresponding non-Indigenous rate, the only region for which this is the case. Other regions with high Indigenous Year 12 completion rates were Brisbane and the ACT (51.1% and 49.2% respectively). Cape York, Rockhampton, Townsville–Mackay and Broome all had rates for Indigenous males that were at least 70 per cent as high as the non-Indigenous male rate.

At the other end of the distribution, Apatula had the lowest rate of completion, with less than 5 per cent of those Indigenous males who lived there in 2006 having completed Year 12 in 2011. While not as low as Apatula, the Indigenous Regions of Nhulunbuy, Tennant Creek and Katherine all had completion rates of between 11.2 and 12.4 per cent.

As with Indigenous males, those Indigenous females who lived in the Torres Strait and Brisbane regions had the highest rates of completion across all regions. One difference between the distribution of Indigenous male and female rates is the ACT Indigenous Region. Indeed, along with Alice Springs, these are the only two regions for which Indigenous males had a substantially higher rate than Indigenous females.

Given the distribution of Indigenous Year 12 completion by Indigenous Region presented in Table 2, it is tempting to conclude that the main reason for low levels of Year 12 completion is the areas in which Indigenous Australians live. The logical policy conclusion from this would be that an attachment to remote living is what is holding back Indigenous education and that Indigenous people should be encouraged to move to more urban parts of the country.

It is true that, with the exception of the Torres Strait, those regions with a high Indigenous share (as shown in Figure 1) were those with low completion rates (in Table 2). However, Table 2 also showed that only a small minority of regions had a higher or comparable rate of completion for Indigenous young adults compared to their non-Indigenous counterparts. Furthermore, a more detailed geographic standardisation using Indigenous Areas showed that only a small proportion of the difference between Indigenous and non-Indigenous completion rates was explained by the areas in which Indigenous Australians lived.[4]

Specifically, 34.9 per cent of Indigenous males aged 15–24 (who were not school students) had completed school in 2011.[5] The corresponding percentage of non-Indigenous males was 66.7 per cent. For Indigenous females, the completion rate was 40.8 per cent and for non-Indigenous

4. Similar to age standardisation of disease rates (Ahmad et al. 2000), geographic standardisation uses the proportion of the Indigenous population in each geographic location (in this case Indigenous Areas, the level of geography below Indigenous Regions) as the basis of the calculations, but weights each location by the share of the non-Indigenous population in that region as opposed to the Indigenous population when calculating national percentages.
5. The percentages presented in this paragraph are slightly different to those in Table 2 due to the fact that those for whom we do not know their Indigenous Area of usual residence are excluded from the analysis.

TABLE 2. Percentage of Indigenous and non-Indigenous 15–24-year-olds who have completed Year 12 (excluding current students), by sex and Indigenous Region of usual residence in 2006

	Males			Females		
Indigenous Region name	Indigenous	Non-Indigenous	Rat io	Indigenous	Non-Indigenous	Ratio
Dubbo	28.8	51.9	0.555	41.0	68.8	0.596
North-Eastern NSW	28.9	54.1	0.534	35.8	69.8	0.514
North-Western NSW	23.4	49.5	0.473	31.3	60.2	0.520
NSW Central and North Coast	33.9	54.4	0.623	39.7	65.7	0.604
Riverina–Orange	26.7	51.3	0.521	36.1	68.4	0.528
South-Eastern NSW	34.4	56.8	0.605	39.8	68.0	0.584
Sydney–Wollongong	37.7	72.6	0.520	46.2	81.2	0.569
Melbourne	39.9	72.4	0.551	48.7	83.6	0.583
Victoria excl. Melbourne	29.0	57.1	0.507	38.7	73.7	0.526
Brisbane	51.1	74.0	0.691	59.6	80.9	0.736
Cairns–Atherton	46.1	66.8	0.690	48.5	78.8	0.616
Cape York	41.6	50.3	0.827	41.6	70.0	0.595
Mount Isa	26.9	60.1	0.447	35.0	72.8	0.480
Rockhampton	46.2	63.5	0.728	49.6	74.6	0.664
Toowoomba–Roma	39.4	65.3	0.603	48.2	76.7	0.629
Torres Strait	72.1	48.0	1.502	75.4	71.4	1.056
Townsville–Mackay	47.1	65.0	0.725	49.7	77.6	0.641
Adelaide	37.0	63.3	0.585	47.3	75.8	0.624
Port Augusta	18.9	48.5	0.391	23.3	64.4	0.362
Port Lincoln–Ceduna	24.4	53.0	0.460	31.8	74.2	0.428
Broome	37.6	53.1	0.708	38.7	67.0	0.578
Geraldton	33.1	51.2	0.647	32.9	66.5	0.494
Kalgoorlie	20.5	49.6	0.414	22.9	60.3	0.380
Kununurra	18.5	55.7	0.332	18.9	68.2	0.278
Perth	38.1	68.1	0.559	42.3	77.5	0.546
South Hedland	28.4	51.1	0.555	36.0	65.5	0.550
South-Western WA	33.3	53.2	0.626	33.3	65.8	0.506
West Kimberley	22.9	51.7	0.442	21.8	45.5	0.479
Tasmania	27.0	49.6	0.543	38.5	59.8	0.643
Alice Springs	33.0	55.2	0.598	29.2	64.9	0.450
Apatula	4.4	75.0	0.059	8.6	65.3	0.132
Darwin	31.0	59.2	0.523	35.5	67.7	0.525
Jabiru–Tiwi	19.1	45.1	0.423	18.3	56.7	0.322
Katherine	12.4	43.8	0.283	18.7	58.6	0.319
Nhulunbuy	11.2	56.5	0.199	16.6	71.1	0.234
Tennant Creek	11.7	53.4	0.220	14.6	56.7	0.258
Australian Capital Territory	49.2	79.3	0.620	42.1	83.0	0.508
Australia (total)	34.8	66.6	0.522	40.7	77.2	0.527

Source: Customised calculations based on the 2011 Census.

females, the rate was 77.2 per cent. If, however, the Indigenous population had the same geographic distribution as the non-Indigenous population, then completion rates would be 42.6 per cent for males and 50.0 per cent for females. While this is closer to the non-Indigenous rates than the unstandardised percentages, only around a quarter of the difference between the Indigenous and non-Indigenous populations were explained by differences in the regional share of Indigenous and non-indigenous populations.

The broad policy implications of the geographic distribution of Indigenous education completion is reasonably straightforward. The lowest rates of education completion tended to be in remote areas and this is where need would appear to be greatest. However, there would appear to be considerable constraints on all Indigenous Australians in terms of education completion, whether they live in urban, regional or remote parts of the country.

Literacy and numeracy outcomes

Although Year 12 completion is important (especially as a signalling device), in a school system like Australia's where grade progression is rarely based on the achievement of minimum standards, measures of what is learnt whilst at school are equally important. This includes rankings and scores for admission into tertiary institutions, marks achieved in individual subjects, and measures of literacy and numeracy. It is not surprising, therefore, that one of the Closing the Gap targets is to 'halve the gap in reading, writing and numeracy achievements for children within a decade'. Unlike the progress towards halving the gap in Year 12 attainment, however, progress in reading, writing and numeracy has been less positive. According to the *Closing the Gap: Prime Minister's Report 2013:*

> For reading and numeracy, only three of the eight outcomes for Indigenous students in 2012 at the national level were either above the points or very close to the agreed trajectory points for 2012 (Year 3 and 7 in reading and Year 9 in numeracy). In the other five instances where the 2012 trajectory points have not been met, the rate of progress needs to accelerate if the targets are to be achieved (Australian Government 2013: 27).

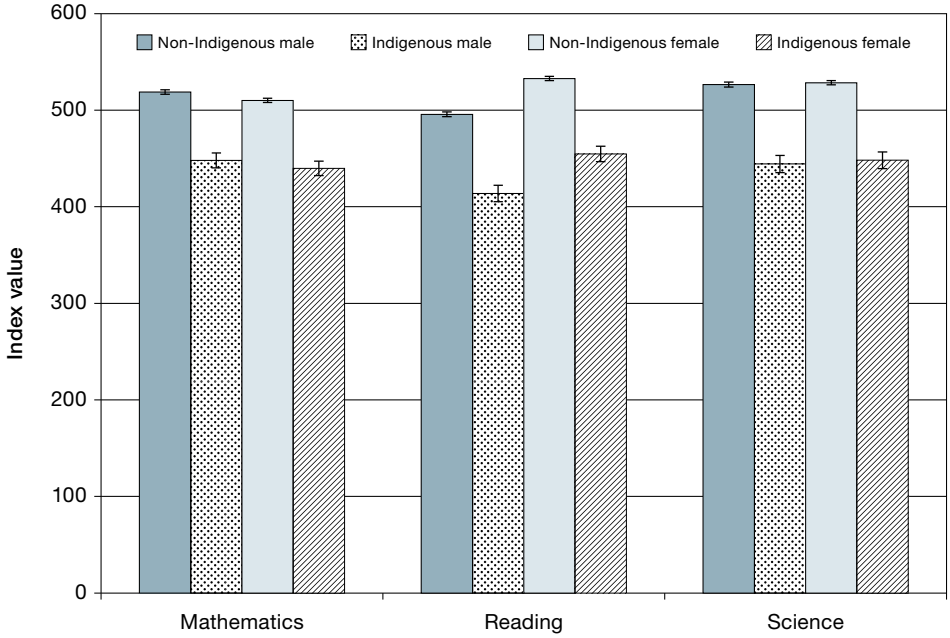
For some of the measures (Years 3 and 9 reading), there was actually a significant decline over the last year of measurement in the percentage of the Indigenous population at, or above, the national minimum standards. It remains to be seen whether this is just a statistical blip reflecting year-to-year variation, or whether it represents a reversal in previously identified positive trends.

From an accountability point of view, identifying the direction of trends in outcomes is important. However, from a design point of view, what is equally important is the extent to which poor outcomes for the Indigenous population are explained by other factors like the types of school attended by Indigenous Australians, the areas in which they live, or the socioeconomic characteristics of their family. If, after controlling for these characteristics, there is no significant difference in reading, writing and numeracy between Indigenous and non-Indigenous students, then it is these background characteristics that are arguably the most important avenue of policy targeting. If, on the other hand, there remains a difference between Indigenous and non-Indigenous students once these characteristics are controlled for, then a much stronger case can be made that Indigenous students should receive additional attention within the policy environment.

Unfortunately, there is no information on reading, writing and numeracy in the census. However, the LSAY has a module that is broadly comparable to the National Assessment Program Literacy and Numeracy (NAPLAN) tests that the Closing the Gap targets are based on. In addition, the LSAY has information on a student's level of science knowledge, something that is missing from the NAPLAN-based Closing the Gap targets. Figure 2 shows the mathematics, reading and science scores[6] for Indigenous and non-Indigenous males and females aged approximately 15 years in 2009.[7]

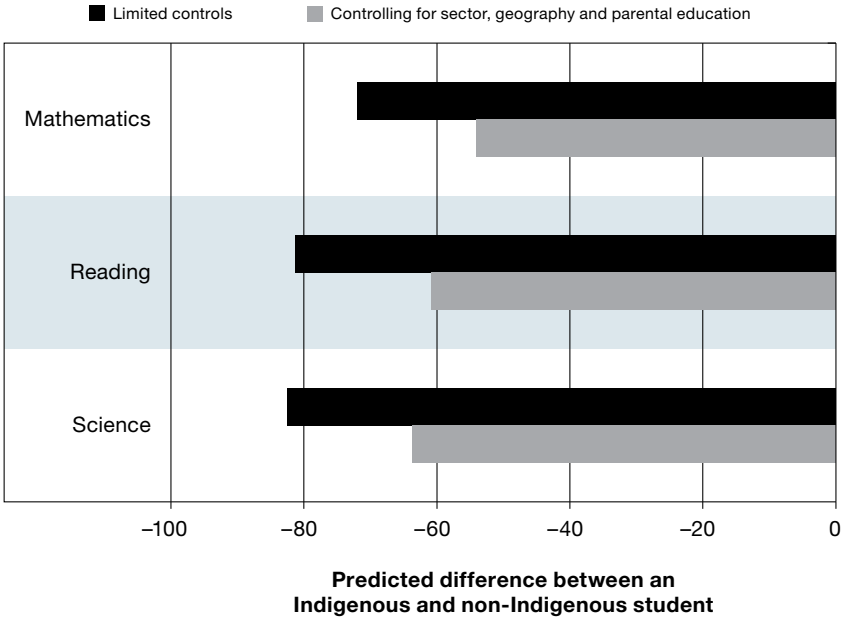
6. The 2006 and 2009 LSAYs actually contain five 'plausible values' for each of the subject areas. These are multiple estimates of individual student performance which are used in PISA (and hence the LSAY), because PISA sample members did not take the full set of assessment items. Due to time constraints, only the first of these plausible values was used. While this will result in an unbiased estimate, the standard errors used in the analysis may be inaccurate. Future analysis will utilise all five plausible values.
7. The bars around the estimates represent 95 per cent confidence intervals. What they in essence mean is that if a sample of the same size was repeatedly taken from the population, and the true population value was the same as the value from this particular sample, then 95 per cent of the samples would fall within that range.

FIGURE 2. Test scores for Indigenous and non-Indigenous males and females, 2009



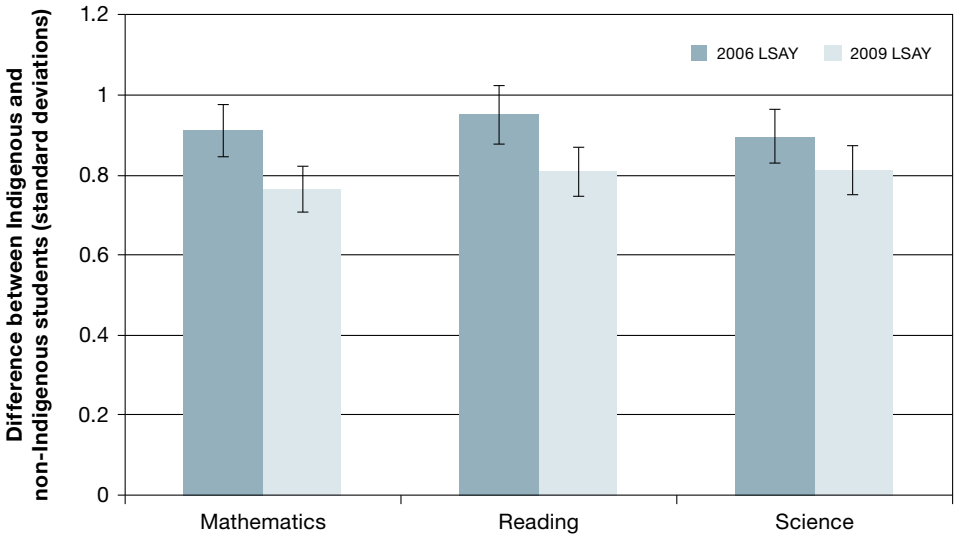
Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.

FIGURE 3. Predicted difference in test scores between Indigenous and non-Indigenous students, with and without controls, 2009



Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.

FIGURE 4. Difference in standardised test scores between Indigenous and non-Indigenous students, 2006 and 2009



Source: Customised calculations based on Wave 1 of the 2006 and 2009 LSAY cohorts.

Results presented in Figure 2 confirm that there are large and significant differences in all three scores by Indigenous status. Furthermore, in the case of reading, there were large differences between Indigenous males and females, with girls having significantly higher reading outcomes than boys.

Part of the explanation for the differences in test scores between Indigenous and non-Indigenous students can be explained by background characteristics. For example, Indigenous students in the LSAY were significantly less likely to be attending a non-government school (as documented in more detail later in this paper), less likely to be living in a metropolitan area, and had parents with lower levels of education than their non-Indigenous counterparts. All three of these characteristics were associated with higher test scores. However, as shown in Figure 3, there is still a significant difference in Indigenous test scores once these characteristics are controlled for.[8]

Figure 3 shows the predicted difference in mathematics, reading and science test scores between an Indigenous and non-Indigenous student, based on Table A1 (found in the appendix to this paper). The black bar shows the difference after controlling for the sex, age and grade level of the students only. The grey bar, on the other hand, shows the difference in predicted test scores after also controlling for the education sector that the student is attending; whether they live in a provisional or remote area (compared to a metropolitan area); and the number of years of education of their whichever parent had the greatest number of years.

All the differences presented in Figure 3 are statistically significant at the 1% level of significance. The figure shows that there is still a large difference in predicted test scores between an Indigenous and non-Indigenous student in the LSAY, once sector, geography and parent education is controlled for. It is true that the difference declines once these characteristics are controlled for—by 25 per cent for mathematics and reading and 23 per cent for science. However, there is still a very large difference.

While there was a large difference between Indigenous and non-Indigenous students in the 2009 LSAY sample, the difference was larger still in 2006. While it is not possible to discount the possibility that one (or both) of the samples was not representative of the total Indigenous population at the time, the results do give some evidence that the gap in mathematics, reading and science between Indigenous and non-Indigenous students declined between 2006 and 2009. This is demonstrated in Figure 4.

In order to control for the fact that test scores for the non-Indigenous population are also changing through time, results in Figure 4 are based on standardised data. Specifically, I calculate the mean and standard deviation

8. These differences are estimated from a model that includes a single term for Indigenous status and holding the association with other characteristics constant between Indigenous and Indigenous students. This assumption is relaxed in a later section of this paper, but has no qualitative effect on the findings reported in Figure 3.

for the test scores of non-Indigenous students for each of the three subject areas and for each of the cohorts. I then standardise the relevant test scores for Indigenous and non-Indigenous students by taking away this mean and then dividing by the standard deviation. For the non-Indigenous population, this results in a test score for each subject area and year with a mean of zero and a standard deviation of one. For the Indigenous population, their mean score is then expressed as a proportion of a standard deviation for the non-Indigenous population.

The standardised scores show that there was a statistically significant decline in the gap between Indigenous and non-Indigenous students in terms of mathematics and reading between 2006 and 2009. In 2006, the Indigenous population had an average math score that was 0.91 standard deviations lower than the non-Indigenous population. By 2009, this gap had fallen to 0.77 standard deviations. For reading, the decline was about as large—from 0.95 standard deviations in 2006 to 0.81 standard deviations in 2009. There was a measured decline in the gap for science, but this was not large enough to be deemed statistically significant.

One possible reason for a reduction in the gap between Indigenous and non-Indigenous students between 2006 and 2009 is the improved socioeconomic status of the population over the period. Changes in employment and income between 2006 and 2011 for the total Indigenous population will be documented later in this series. However, there is also an index of family wealth available for the 2006 and 2009 LSAYs. In 2006, the Indigenous sample had a value that was 0.58 standard deviations lower than the non-Indigenous sample. By 2009, the gap was only 0.50 standard deviations. An obvious question, therefore, is whether the reduction in the gap between Indigenous and non-Indigenous students was driven mainly by the improvement in relative socioeconomic outcomes between 2006 and 2009, or whether there was also a reduction in the gap after holding socioeconomic status constant?

It is not possible to test for causal relationships with the data available. However, it is possible to look at associations, and test whether an Indigenous student in 2009 has the same predicted test scores as an Indigenous student in 2006 with otherwise identical socioeconomic outcomes characteristics, attending the same school sector and living in a similar geographic area. In order to test for this, I pooled the 2006 and 2009 LSAY cohorts into the one dataset. Using standardised test scores for mathematics, reading and science as the dependent variables, I then ran a regression analysis that had sex, age, school grade, school sector, location, parental education and the standardised wealth index as explanatory variables.

The final explanatory variable in the econometric analysis is an indicator for whether that particular student was surveyed in 2009 as opposed to 2006. A positive and significant value for this last variable indicates that there was an improvement in the relative gap between Indigenous and non-Indigenous students in standardised test scores, after controlling for changes in the other observed characteristics in the model. A negative value implies that there would have been a worsening in relative test scores were it not for changes in socioeconomic status and other characteristics, with a value that is not significantly different from zero implying that there would not have been any change.

Table 3 summarises the results from the econometric analysis of mathematics, reading and science test scores. For comparison, a simple model is also presented that includes only one explanatory variable—the year of the survey. Values presented in the table represent slope coefficients, with the stars next to the tables indicating the statistical significance of the coefficients (as noted underneath the table).

There are three main results from Table 3. First, the results confirm those from Figure 4 that Indigenous students in 2009 had higher standardised test scores (that is relative to the non-Indigenous population) than they did in 2006. Second, there was still a significant difference in mathematics and reading test scores over the period, after controlling for the distribution of students by socioeconomic outcomes (via the standardised wealth index), school sector and location. There may be other characteristics that have also changed over the period that are driving the results. However, it would appear that an Indigenous student in a given school sector and location, with parents that have a given level of education and wealth, was doing better in terms of mathematics and reading than in 2006. The third major finding from the analysis was that there was no such improvement in relative science test scores. It is true that science outcomes were not a focus of the Closing the Gap policy agenda. However, it will be shown in a later paper in this series that many of the occupations and industries that are relatively well remunerated and make up a relatively low share of the Indigenous workforce would benefit from skills and knowledge in the sciences. Results presented in Table 3 suggest a need for a greater focus on the level of science education of Indigenous children.

The introduction to this section pointed to a possible decline in a number of the NAPLAN results between 2011 and 2012 for the Indigenous population. A new LSAY cohort was commenced in 2012 and it will be important to replicate the analysis presented in this paper when that data becomes publicly available. However, it is possible

TABLE 3. Difference in standardised test scores between 2006 and 2009 after controlling for changes in observed characteristics, Indigenous students

	Mathematics		Reading		Science	
Explanatory variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Female		–0.152***		0.351***		0.003
Grade		0.300***		0.295***		0.248***
Age		–0.016		0.012		0.023
Catholic school		–0.010		0.058		0.003
Independent school		–0.485***		–0.738***		–0.587***
Attends school in provincial area		–0.294***		–0.315***		–0.285***
Attends school in a remote area		–0.674***		–0.780***		–0.682***
Highest number of years of education of parents		0.051***		0.059***		0.058***
Standardised wealth index		0.178***		0.173***		0.154***
Surveyed in 2009	0.145***	0.108**	0.139***	0.093**	0.084*	0.037
Constant	–0.910***	–3.854***	–0.949***	–4.608***	–0.896***	–4.106***
Adjusted R-Squared	0.0044	0.1551	0.0032	0.1916	0.0010	0.1299
Sample size	2,233	2,051	2,233	2,051	2,233	2,051

Source: Customised calculations based on Wave 1 of the 2006 and 2009 LSAY cohorts.
Note: Variables for which the coefficient is statistically significant at the 1% level of significance are labelled ***; those statistically significant at the 5% level of significance only are labelled **, whereas those statistically significant at the 10% level of significance only are labelled *.

to say there was some relative and absolute improvement between the 2006 and 2009 LSAY samples in terms of mathematics and reading. While the results were not as positive for science, the results would suggest that the level of skills and knowledge of young Indigenous adults is improving.

The early years of schooling

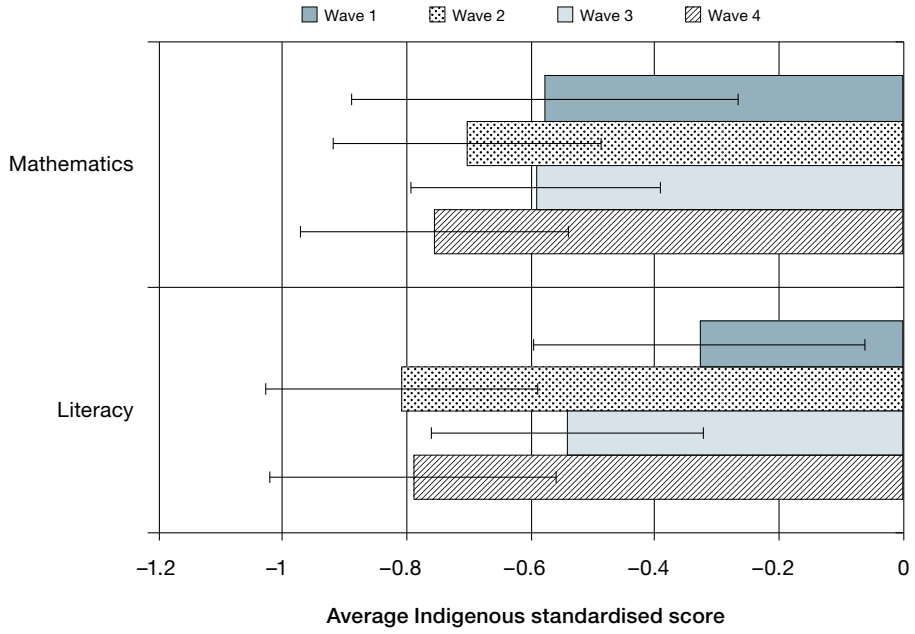
The analysis presented earlier in this paper showed that although there had been some improvement in Indigenous mathematics, reading—and to a lesser extent science—test scores between 2006 and 2009, there was still a significant gap between Indigenous and non-Indigenous students at the end of the period. Furthermore, this gap was reduced, but not eliminated, when a range of background characteristics were controlled for. One of the potential reasons for this gap is the education experience of Indigenous children leading up to the age of 15.

In a previous paper in this series (Biddle 2013), I showed that Indigenous students in their first year of schooling in 2009 were significantly more likely to be rated as developmentally vulnerable by their teachers than their non-Indigenous counterparts. Some of this gap was explained by lower rates of preschool participation. However, even after controlling for preschool participation, a large gap still remained. Regardless of whether they attended preschool or not, Indigenous students started school at a significant disadvantage compared to their non-Indigenous peers.

In this section, I attempt to test whether this difference widens across the early years of schooling. To undertake the analysis, I utilise data from the K cohort of the LSAC. In Wave 1 of the LSAC (enumerated in 2004), the cohort was aged between four and five years. The carers of this cohort were asked a series of questions about the child's reading, writing and numerical competencies. Three indices were created from these questions, which I then scaled into two variables with a mean of zero and standard deviation of one for the non-Indigenous population. There is a mathematics index and a literacy index which combines the reading and writing competencies.

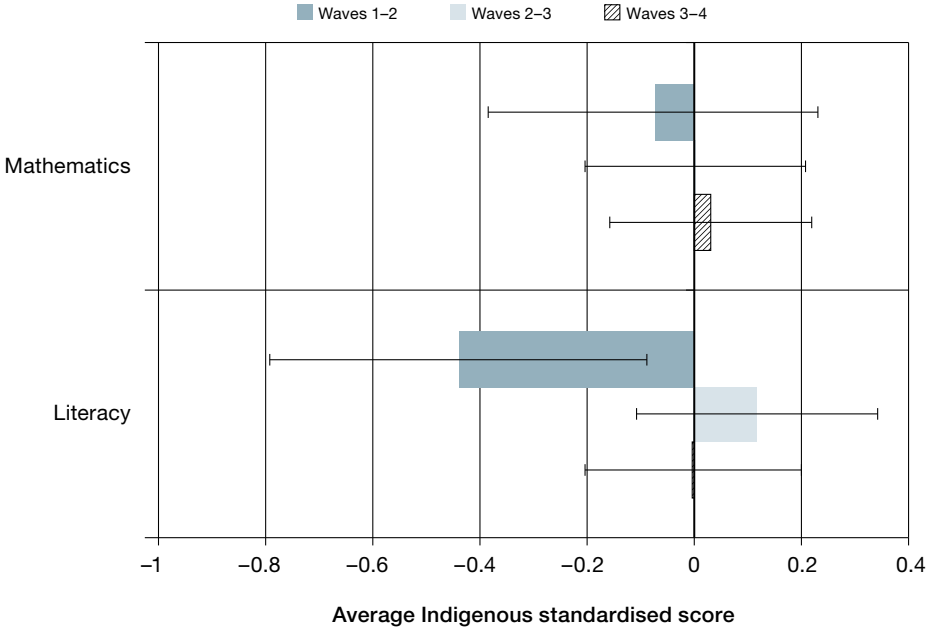
Wave 2 of the LSAC was carried out in 2006 when the children were aged between six and seven years. For this cohort, the children's teachers were asked to rate the child across two domains within the Academic Rating Scale—mathematical thinking, and language and literacy. These

FIGURE 5. Mean literacy and numeracy outcomes for Indigenous children, Waves 1–4, K cohort (2004–10)



Source: Customised calculations based on Waves 1–4 of the LSAC Kid cohort—2004, 2006, 2008 and 2010.

FIGURE 6. Mean change in literacy and mathematics outcomes for Indigenous children, Waves 1–4, K cohort (2004–10)



Source: Customised calculations based on Waves 1–4 of the LSAC K cohort—2004, 2006, 2008 and 2010.

teacher responses were then collapsed into two indices, which I then scaled to have a mean of zero and a standard deviation of one for the non-Indigenous population. While these Wave 2 indices are not strictly comparable to those created for Wave 1 based on the carer ratings, improvement or deterioration in the relative position within them can provide some indication of relative progression or regression in the first couple of years of schooling.

Waves 3 and 4 of the LSAC were carried out in 2008 and 2010. Although different questions were asked, a similar set of Academic Rating Scales were constructed for 8–9-year-olds and 10–11-year-olds respectively. Once again, these were scaled to have a mean of zero and a standard deviation of one for the non-Indigenous population.

The Indigenous sample in the LSAC is relatively small, with only 105 children from the K cohort still present in Wave 4 of the survey, and not all Indigenous children having valid responses for the literacy and numeracy outcomes in each of the waves. Furthermore, due to the sampling methodology of the survey which did not go to remote Australia, it is not necessarily representative of the total Indigenous population. Nonetheless, it is large enough and diverse enough to make broad comparisons between Indigenous and non-Indigenous children in non-remote areas and how their literacy and numeracy outcomes change in the early years of schooling.

Figure 5 shows the mean literacy and numeracy outcomes for Indigenous children in each of the four waves. As with the LSAY analysis, the indices are scaled in such a way that the values represent the average difference between Indigenous and non-Indigenous students as a proportion of the standard deviation of the non-Indigenous scores. The mean values for the non-Indigenous population are, by definition, zero.

Because of the relatively low Indigenous sample in the LSAC, there are very large confidence intervals around the Indigenous estimates. There is some evidence that the relative literacy outcomes of Indigenous children worsened between the ages of 4–5 (when most were not attending school) and the ages of 6–7 (when most were in Year 1 or 2). However, all other changes, while sometimes large in absolute terms, were not significant in a statistical sense.

One of the benefits of using the LSAC is that it is not necessary to use repeated cross-sections to look at the change in outcomes through time. Instead, it is possible to look at changes through time in the relative mathematics and literacy outcomes for individual children. I do this by subtracting Wave 1 outcomes from Wave 2 ones, Wave 2 outcomes from Wave 3 ones and Wave 3 outcomes from Wave 4 ones. Results are given in Figure 6.

Results presented in Figure 6 confirm that on average there is a statistically significant worsening in literacy outcomes between Waves 1 and 2 for Indigenous children. Leaving aside the possibility that the result is a statistical fluke (that is, there is a small sample of Indigenous children in the LSAC and that sample may not be representative of the actual Indigenous population) there are two possible substantive explanations for this finding. The simplest explanation is that the relative literacy levels of these children actually do worsen in the first year or two of formal schooling. That is, Indigenous children fall further behind their non-Indigenous peers. This is possible as will be shown in later sections of this paper the types of schools that Indigenous children attend are very different to those that non-Indigenous students attend.

Keeping in mind that Wave 1 data is carer-assessed but Wave 2 data is teacher-assessed, the second possible explanation is that the carers of Indigenous children rate the literacy levels of their children in Wave 1 more highly than do the teachers of those children in Wave 2. That is, either the carers of Indigenous children over-estimate their child's ability, the carers use a different set of criteria compared to non-Indigenous children or the teachers of Indigenous students are underestimating the child's ability at the commencement of formal schooling. Such findings have been demonstrated in other contexts through field experiments (Hanna and Linden 2009) and is a potentially highly policy relevant finding. If teachers of Indigenous children do underestimate the child's ability, then this may be internalised with later effort and confidence suffering.

This issue could be explored by combining the large Indigenous sample in the Longitudinal Study of Indigenous Children with the appropriate waves of the LSAC. However, this creates different complexities in terms of comparing results across two different collections. Another alternative would be to look at changes in the NAPLAN results for Indigenous children between Years 3 and 5; between Years 5 and 7; and between Years 7 and 9. However, such analysis would rely on the integrity of the unique student identifiers in the relevant administrative databases, a particular issue for a population that has been shown to be relatively mobile.

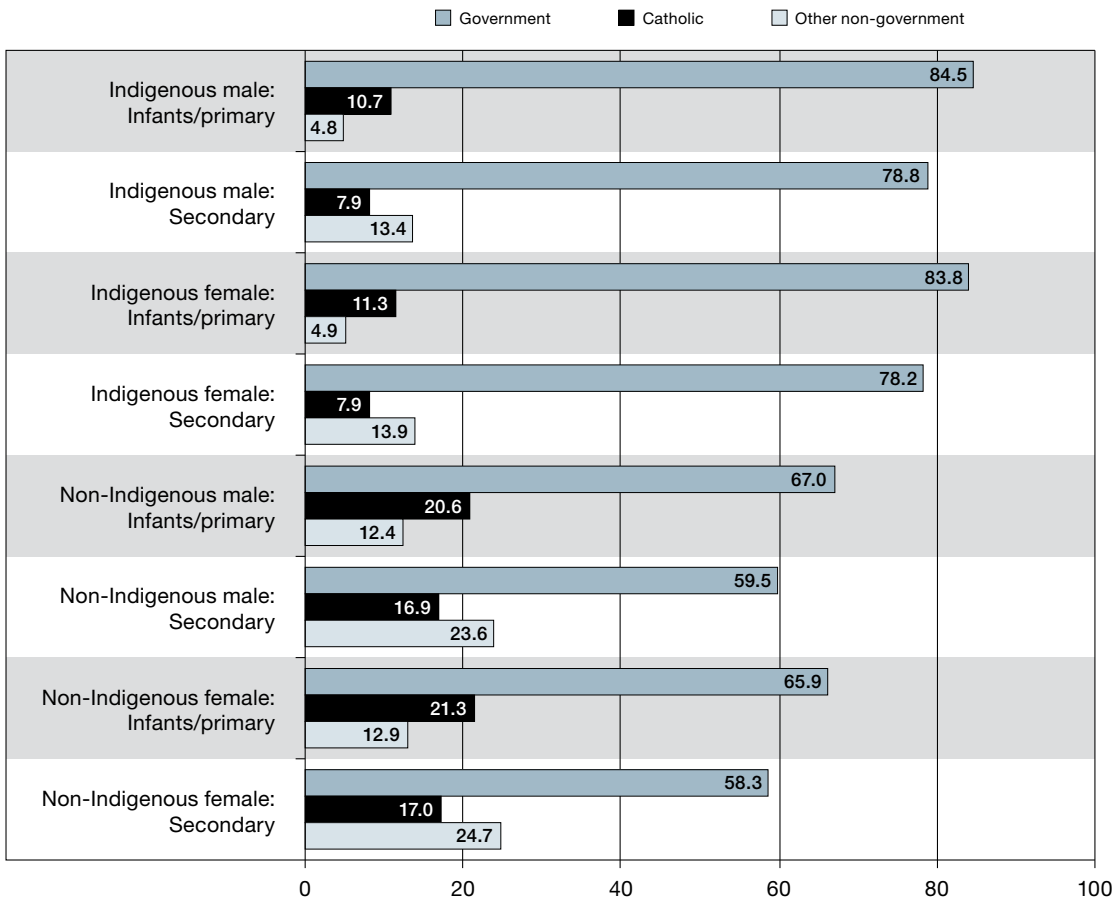
In the absence of such additional analysis, the results presented in this section have shown that Indigenous children start school with lower levels of literacy and mathematics, and that the gap in literacy may even widen over the early years of schooling. This is a strong possible explanation for the differences in outcomes by the age of 15 that were demonstrated in the previous section. Another potential explanation—school sector—is explored in the next section of the paper.

TABLE 4. Average net recurrent income per student, by school sector, all funding sources, 2010 ($)

Source of income	Government schools	Catholic schools	Independent schools
Australian government	1,668	6,229	4,993
State and territory government	9,200	2,057	1,865
Private sources	680	2,918	9,437
– Fees, charges, parental contributions	427	2,383	8,468
– Other private sources	253	535	969
Less deductions	24	861	1,780
Net recurrent income	11,523	10,344	14,456

Source: Harrington 2013: 32.

FIGURE 7. School type by Indigenous status and sex, 2011



Source: Customised calculations based on the 2011 Census.

Non-government school attendance

In addition to preschool attendance, one of the potential reasons for differential development of academic ability is the type of school sector that Indigenous and non-Indigenous students attend. In Australia, there are three main education sectors: government schools (administered by the applicable State or Territory education departments), the catholic school system, and other non-government schools. Government or public schools do not charge compulsory fees and generally accept students based on geographic criteria. The other two sectors also receive funding from the government, but in addition they charge fees for attendance.

Although they follow a similar curriculum to the government sector, catholic and other non-government schools have greater autonomy in how they provide education and how they accept students into the school. Some schools will use academic or sporting/artistic criteria, whereas others will accept students primarily based on the order in which they enrol. While almost all non-government schools charge some form of fee for attendance, these are often waived through the provision of scholarships, often on equity grounds.

Results presented in Appendix Table A1 show that those students who were attending a non-government school had a higher predicted test score than those who were attending a government school. The difference is slightly less for those in the catholic school system, but coefficients for both sectors were large and statistically significant at the 1 per cent level of significance. This is not necessarily a causal relationship as students are clearly not randomly allocated across the school systems. It is true that these results hold after controlling for parental education. However, there are likely to be other unobserved characteristics that are associated with both school sector and academic outcomes.

Despite this caveat, in Australia the resources devoted to students in non-government schools are on average higher than those in government schools (Le & Miller 2003). However, as shown in the Table 4 (taken from Harrington 2013), there are significant differences in the source of that funding, as well as between catholic and other non-government schools.

After excluding deductions (which includes recurrent income allocated for capital purposes), government schools have a slightly higher net recurrent income than catholic schools (per student). However, independent or other non-government schools have a substantially higher income than both. What the above table does not take into account, however, is the fact that the students across the different sectors are going to have very different needs on average and therefore are likely to vary substantially in their funding requirements.

Vella (1999) and Le and Miller (2003) showed that even after controlling for the type of student that attends, non-government school students had a higher rate of Year 12 completion than those in government schools. Economic resources are not the only input into a quality school environment and most government schools continue to provide a high quality education by international standards. Nonetheless, parents would not be spending significant amounts of money sending their children to non-government schools if they did not think it would lead to better outcomes for their children, whether it be academic outcomes or social, sporting or cultural ones.

Indigenous students are much less likely to be attending catholic or other non-government schools than their non-Indigenous counterparts. This is demonstrated in Figure 7, which is based on the 2011 Census and examines the proportion of Indigenous and non-Indigenous males and females attending the three main school types. Results are presented separately for infants/primary and secondary school students.

Across the student population, 18.5 per cent of Indigenous students were attending a catholic or other non-government school compared to 37.6 per cent of non-Indigenous students. Looking specifically at Figure 7, the other thing that one can see is that there is a larger difference amongst secondary students compared to infants/primary students. For secondary students, the gap between Indigenous and non-Indigenous students is greatest for other non-government schools, whereas for infants/primary students, the difference is greatest in terms of attendance at catholic schools.

TABLE 5. Percentage of Indigenous and non-Indigenous students attending a non-government school, by school level and region of usual residence, 2011

	Infants/primary			Secondary		
Indigenous Region name	Indigenous	Non-Indigenous	Ratio	Indigenous	Non-Indigenous	Ratio
Dubbo	18.0	43.7	0.412	14.1	37.3	0.378
North-Eastern NSW	14.8	33.5	0.442	15.0	34.2	0.439
North-Western NSW	17.5	23.6	0.739	5.4	8.0	0.683
NSW Central and North Coast	16.7	29.6	0.564	17.7	32.9	0.537
Riverina–Orange	16.3	35.1	0.466	18.8	36.2	0.518
South-Eastern NSW	15.1	28.5	0.530	17.8	38.2	0.467
Sydney–Wollongong	18.0	34.1	0.527	26.0	44.8	0.580
Melbourne	15.5	35.0	0.444	22.2	45.8	0.484
Victoria exc. Melbourne	15.5	31.6	0.492	23.3	40.2	0.581
Brisbane	16.7	32.9	0.508	23.8	43.2	0.552
Cairns–Atherton	14.2	38.7	0.366	21.1	34.6	0.608
Cape York	1.3	2.5	0.510	11.9	4.9	2.439
Mount Isa	8.4	32.5	0.259	21.1	34.1	0.621
Rockhampton	12.5	29.2	0.427	23.0	35.4	0.650
Toowoomba–Roma	17.9	34.2	0.522	22.0	38.6	0.570
Torres Strait	6.4	31.3	0.203	18.4	13.6	1.347
Townsville–Mackay	19.4	36.5	0.531	26.9	42.4	0.633
Adelaide	17.5	37.2	0.469	21.9	44.3	0.496
Port Augusta	7.5	30.5	0.247	9.5	33.4	0.284
Port Lincoln–Ceduna	13.7	20.2	0.675	12.6	26.0	0.486
Broome	31.7	21.8	1.451	36.8	27.5	1.338
Geraldton	14.6	39.8	0.367	21.3	54.2	0.393
Kalgoorlie	8.9	22.6	0.396	25.9	33.2	0.781
Kununurra	44.0	26.7	1.645	39.1	11.5	3.386
Perth	13.0	33.5	0.389	32.4	52.6	0.616
South Hedland	9.0	15.2	0.592	16.0	24.9	0.641
South-Western WA	11.0	30.5	0.359	16.0	36.4	0.439
West Kimberley	21.9	50.7	0.432	24.6	25.6	0.962
Tasmania	20.8	29.3	0.709	22.7	39.8	0.570
Alice Springs	22.1	56.8	0.390	48.9	74.5	0.656
Apatula	10.0	16.5	0.607	31.8	32.1	0.989
Darwin	15.7	29.0	0.542	38.4	33.6	1.144
Jabiru–Tiwi	31.7	12.4	2.570	44.8	12.0	3.732
Katherine	4.6	20.2	0.230	25.8	25.7	1.003
Nhulunbuy	2.9	21.2	0.138	11.4	12.2	0.934
Tennant Creek	2.0	5.3	0.370	18.9	10.0	1.895
Australian Capital Territory	21.0	40.6	0.518	28.2	46.9	0.601
Australia (total)	15.9	33.5	0.474	22.7	42.9	0.530

Source: Customised calculations based on the 2011 Census.

One possible reason for the differences between Indigenous and non-Indigenous students in terms of school sector is the geographic distribution of the two populations. It may simply be the case that Indigenous students are less likely to be living in areas where non-government schools are located. In order to explore this, Table 5 looks at the percentage of Indigenous and non-Indigenous students attending a non-government school by region of usual residence. Once again, results are presented separately by school level, with infants/primary school students presented in the first three columns and secondary school students presented in the last three columns.

Table 5 shows significant variation in non-government school attendance across the Indigenous Regions. For example, in the Cape York, Tennant Creek, Nhulunbuy and Katherine regions, less than 5 per cent of Indigenous infants/primary students were attending a non-government school. This is compared to 30 per cent or more of the Indigenous population in Broome, Jabiru–Tiwi and Kununurra. For secondary students, less than 10 per cent of Indigenous students in North-Western NSW and Port Augusta were attending a non-government school, compared to 40 per cent or more of Indigenous students in Jabiru–Tiwi and Alice Springs. There is some relationship between non-government school attendance in infants/primary schools and secondary schools. However, with an inter-regional correlation of only 0.59, there are clearly school-specific factors impacting on what type of school an Indigenous student attends.

Despite this variation by geography for the Indigenous population, it is still the case that in the majority of regions, Indigenous school students are less likely to be attending a non-government school than their non-Indigenous counterparts. There are some exceptions, with Indigenous infants/primary students in Broome, Kununurra and Jabiru–Tiwi more likely to be attending a non-government school than non-Indigenous students in those regions. There were even more regions where Indigenous secondary students were more likely to be attending a non-government school, with three of them (Jabiru–Tiwi, Kununurra and Cape York) all having percentages that were twice as high as the non-Indigenous ones.

Despite these exceptions, it is still the case that the majority of Indigenous Regions have a higher non-Indigenous rate of attendance compared to the Indigenous rate. Furthermore, those regions with a high Indigenous rate relative to the non-Indigenous rate tend to be those with relatively few Indigenous students living there. Putting this another way, even if Indigenous students had the same geographic distribution as non-Indigenous students, their rates of attendance at non-government schools would still be lower.

It is possible to quantify this by using geographic standardisation. Specifically, if Indigenous students had the same geographic distribution across Indigenous Areas as the non-Indigenous population, but maintained their own rate of non-government school attendance, then 17.5 per cent of Indigenous infants/primary students and 27.1 per cent of secondary students would be attending a non-government school. This is higher than the 15.9 per cent and 22.7 per cent of students who attend based on the actual distribution of Indigenous students. However, it is still substantially lower than the non-Indigenous rates of attendance, which were 33.5 per cent and 42.9 per cent for infants/primary and secondary students respectively.

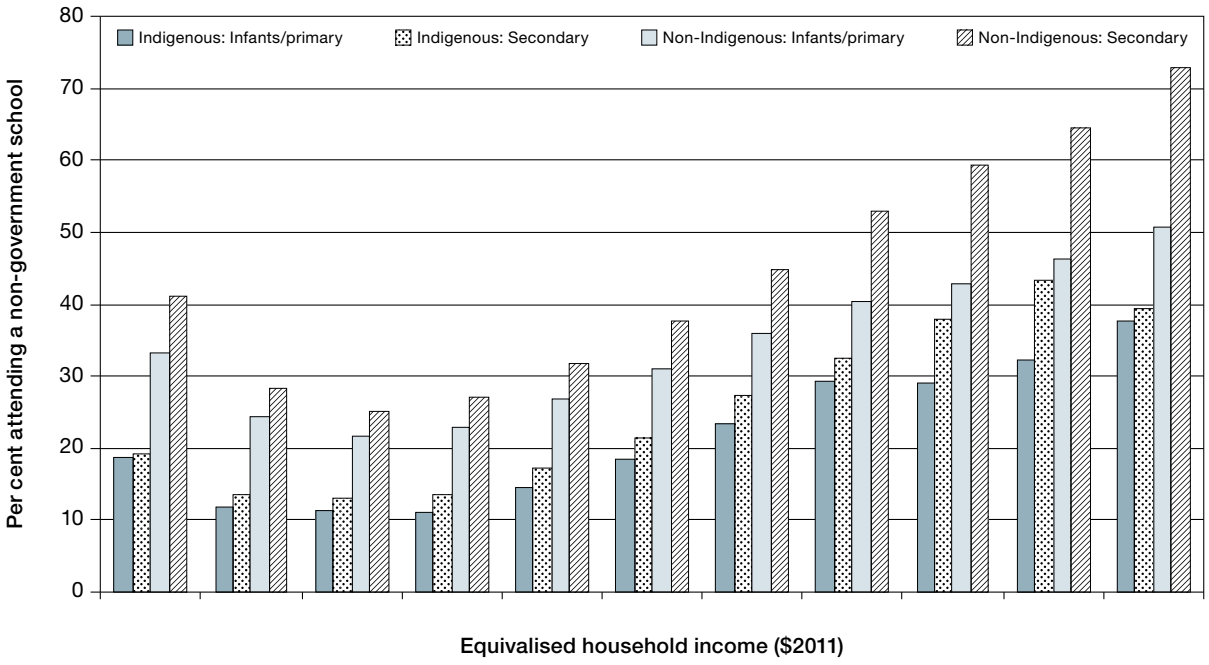
Geography is only one potential characteristic that both predicts non-government school attendance and also varies significantly between Indigenous and non-Indigenous students. Income is also likely to be quite important. Although the fees required to attend non-government schools vary considerably across school sectors and across individual schools, it is nonetheless a distinct possibility that many families who would otherwise send their children to a non-government school do not do so because it is prohibitively expensive. And, as will be shown later in this series, the families of Indigenous children tend to have significantly lower levels of income than the families of non-Indigenous children.

This relationship between income and non-government school attendance is demonstrated in Figure 8. This figure gives the rate of non-government school attendance for Indigenous and non-Indigenous infants/primary and secondary students for 11 household-equivalised[9] income groupings, ranging from negative or zero income on the left of the chart to the equivalent of $2,000 or more per week on the right.

Focusing on Indigenous students to start with, those who live in a household with negative or zero income have a relatively high rate of attendance at non-government schools—roughly the same as those students who live in a household with the equivalent of $600–799 per week. This demonstrates that those on zero or negative incomes are not necessarily lacking in access to economic

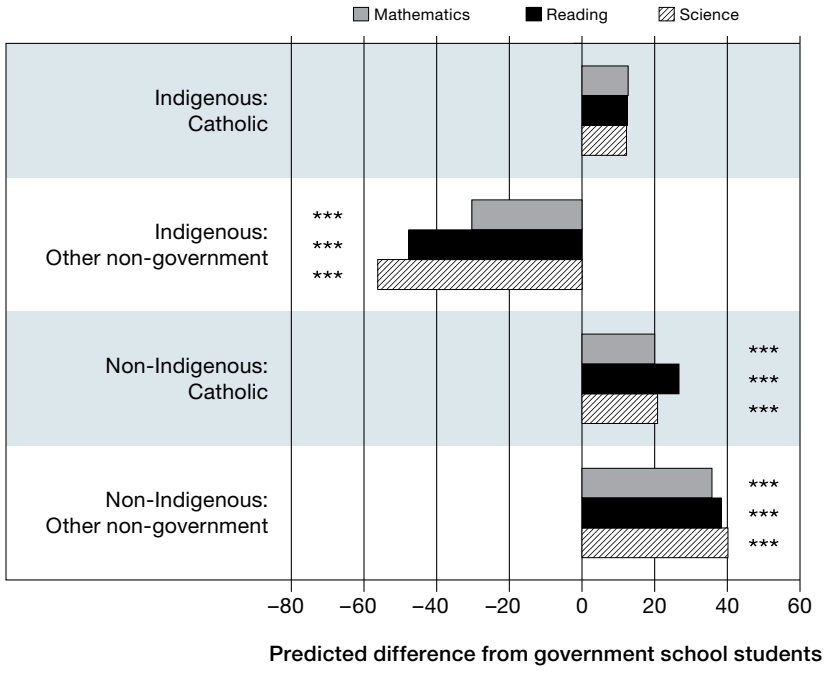
9. Equivalisation takes into account the fact that, for a given level of household income, an additional person in the household will require some additional resources, but not as many resources as the for the first person in the household. For example, while additional food will need to be purchased, household members are generally able to share the costs of heating. The ABS uses the modified OECD scale, which assumes each additional adult costs 0.5 times as much as the first adult, and each additional child (under 15 years) costs 0.3 times as much. Numbers expressed in Figure 4 are therefore equivalent to the income of a single-person household.

FIGURE 8. Non-government school attendance by Indigenous status and household-equivalised income, 2011



Source: Customised calculations based on the 2011 Census.

FIGURE 9. Difference in predicted test scores by school sector, Indigenous and non-Indigenous students, 2009



Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.

resources and may actually be in that situation because they have high rates of accumulated wealth or are able to draw on other resources, perhaps through a business. Leaving this group aside as it makes up only a very small proportion of Indigenous students, there is a reasonably consistent increase in non-government school participation from the $400–599 per week group. Those Indigenous students who live in a household right at the upper end of the income distribution are around three times as likely to be attending a non-government school as those living in households at the lower end of the income distribution.

Once again, despite this variation within the Indigenous population, it is still the case that for a given level of household-equivalised income, an Indigenous student is substantially less likely to be attending a non-government school than a non-Indigenous student. Indeed, when one looks at the ratio of the Indigenous to non-Indigenous rates of participation, they stay reasonably consistent across the income distribution, ranging from a little under 0.5 for those in households with equivalised incomes of $1–199 to around 0.7 for those in households with equivalised incomes of $1,000 or more.

When individual data from the census becomes available in late 2013, an analysis of non-government school attendance at the individual level would be of benefit. This would allow one to look at rates of attendance after simultaneously controlling for geography, demography and socioeconomic status. However, the results presented in this paper, as well as previous work undertaken on the 2006 Census, would suggest that even after controlling for a wide range of characteristics, differences in participation rates would still remain.

Because Indigenous Australians attend non-government schools at a relatively low rate (both before and after controlling for other characteristics), they may be missing out on many of the benefits that such schools can have on student outcomes. This means that their skills development may lag behind that of the non-Indigenous population, potentially explaining at least some of the gap in school outcomes and completion discussed in previous sections of this paper.

It might be the case that the families of Indigenous students think that non-government schools have fewer benefits than do the families of an otherwise identical non-Indigenous student. Alternatively, they may experience higher or different costs. This is an area of research that would benefit from specifically targeted qualitative and quantitative data collection, where students and their families are asked about why they chose the school that they did.

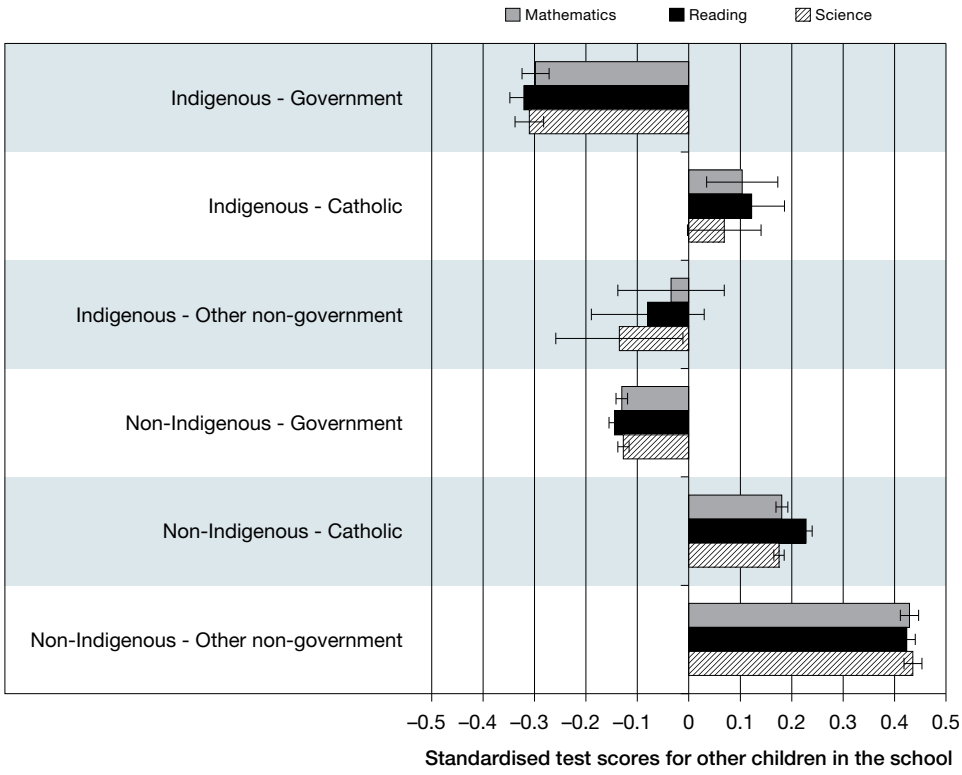
One potential cost faced by Indigenous students attending a non-government school is that they are likely to be one of the few Indigenous students in that school. This means there are less likely to be Indigenous-specific programs in the schools that they attend, but also that they may experience social isolation and perceived unfair treatment from teachers or their classmates. It is unfortunate, therefore, that although there was a series of questions in the 2008 NATSISS on such treatment, there was no information on the school sector in which the respondent was attending.

To the extent that there are academic benefits from attending non-government schools for the non-Indigenous population (and this is very difficult to answer definitively), it would appear from an initial analysis of the LSAY that these may not be accruing to Indigenous students. This is demonstrated in Figure 9, which shows the difference in the predicted test scores across mathematics, reading and science by school sector separately for Indigenous and non-Indigenous students. Differences are given separately for those attending catholic and other non-government schools, with both comparisons made against those who are attending government schools. Results are based on a regression analysis (with full results given in Appendix Table A2) after controlling for sex, age, school grade, location and parental education.

The three asterisks that appear next to some of the categories indicate that students attending these schools (and with a particular Indigenous or non-Indigenous status) have a predicted test score that is significantly different from government schools at the 1 per cent level of significance. There was not a significant difference for Indigenous students attending a catholic school. What is most important to note, however, is the different direction in the association between Indigenous and non-Indigenous students attending an other non-government school (the top section of the chart). For non-Indigenous students, such attendance is associated with higher test scores across mathematics, reading and science. For Indigenous students, it is associated with lower test scores.

It is quite possible that there are selection effects with regards to the results presented in Figure 9. It is highly unlikely that Indigenous students who attend a non-government school have the same unobserved characteristics as one attending a government school. However, these differences would need to be working in the opposite direction to that of the rest of the population to explain the results. This is possible, as a number of non-government schools offer scholarships to Indigenous students from remote areas who might otherwise have lower school outcomes.

FIGURE 10. Average test scores for the peers of Indigenous and non-Indigenous students, by school sector, 2009



Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.

The income level and geographic location of non-government school attendees presented earlier in this section would suggest that not all Indigenous students attending non-government schools are socioeconomically and geographically disadvantaged. On the contrary—there are higher rates of attendance than the national average at a number of highly urban Indigenous Regions, as well as a higher rate of attendance at the upper end of the income distribution. Nonetheless, in the absence of random or exogenous variation in school sector, it is not possible to reject these selection effects. While they are not free from issues, a comparison of 'student gains' in NAPLAN results of Indigenous and non-Indigenous students in government, catholic and other non-government schools would appear to be an urgent research priority.

Another potential reason for why Indigenous students who are attending an other non-government school have lower test scores than those attending a government school (after controlling for other characteristics) when the opposite is true for non-Indigenous students is that the types of other non-government schools attended by Indigenous students might be quite different. There is some empirical support for this from the LSAY, as summarised in Figure 10. This figure gives the average standardised test score for the LSAY sample in the schools that Indigenous and non-Indigenous students attend, estimated separately by school sector. These averages do not include the Indigenous or non-Indigenous child themselves and therefore represent the average test scores of a child's peers. It should be kept in mind that the test scores are standardised to have a mean of zero and a standard deviation of one.

The results presented in Figure 10 are reasonably complicated, so it is worth stepping through a few of the results. Focusing on mathematics, the students who are in the same school as Indigenous government school students have an average standardised test score of –0.298. By comparison, the students who are in the same school as non-Indigenous government school students have an average standardised test score of –0.130. Both are less than zero, meaning that the peers of Indigenous and non-Indigenous government school students have lower test scores than the average in the survey. However, the peers of Indigenous government school students are even further below the average.

Looking at the rest of the results now, although the Indigenous results are measured with considerable imprecision (hence the large error bars), the results presented in Figure 10 show a very different school context for Indigenous Australians compared to non-Indigenous ones. Looking at the non-Indigenous results to start with, the peers of non-Indigenous students in government schools had slightly lower test scores than the average, those in catholic schools had slightly higher ones than average and those in other non-government schools had substantially higher scores than average. For the Indigenous population, the peers of those attending government schools had substantially lower test scores than average and significantly lower scores than the peers of non-Indigenous students in government schools. Indigenous students in the government sector appear to be attending lower performing schools than non-Indigenous students in government schools.

For those Indigenous students attending a catholic school, their peers appear to have slightly above average test scores. While they are still significantly lower than the peers of non-Indigenous students, the difference is relatively small. The biggest difference, on the other hand, is between the peers of Indigenous and non-Indigenous students in other non-government schools. Rather than being higher than average (as they are for the non-Indigenous population) they are if anything slightly lower than average. These results highlight that even within a particular school sector, the schooling context of Indigenous and non-Indigenous students can be quite different.

The results presented in this section raise serious questions for catholic and to a greater extent high performing other non-government schools, as well as the governments that fund them. Why is it that Indigenous students are so much less likely to be attending such schools than non-Indigenous students? Is it because of access issues, with Indigenous students being financially or geographically excluded? Alternately, is it because the parents of Indigenous students feel that those who attend such schools would have worse outcomes than if they attended a government school? If it is the case that Indigenous students and their families are voting with their feet (or school bags), then this raises further questions as to why catholic and to a greater extent other non-government schools do not appear to be providing the education experience that Indigenous students need.

Summary and concluding comments

There were 81,554 Indigenous infants/primary students counted in the 2011 Census, alongside 50,985 secondary students. Although there are legitimate avenues of research related to attendance rates, it should never be ignored that the vast majority of these Indigenous students get out of bed most weekdays, get dressed in their uniforms if their schools have them, pack their homework away from the night before and head off to school. They are met there by thousands of dedicated teachers who try to engage these students in mathematics, English, science, art, history and all the other subjects that students love and loathe. Six or so hours later, these kids head home, unpack their bags and get ready to do it all again.

When multiplied together, the thousands of hours that these hundreds of thousands of kids spend at school and preparing for school represents a massive investment by themselves, their families, their communities and the public. There are well documented pay-offs to this investment, with Biddle and Cameron (2012), for example, showing that Indigenous adults with higher levels of education have significantly and substantially better outcomes than those Indigenous adults who left school early and who did not undertake post-school education.

Despite this investment, the fact remains that Indigenous Australians are still less likely to undertake and complete high school. According to the 2011 Census, 47.4 per cent of Indigenous males aged 20– 24 years and 44.4 per cent of Indigenous females of the same age had not completed Year 12 and had no post-school qualifications beyond the Certificate I level. The corresponding estimates for non-Indigenous males and females are 15.8 and 11.6 respectively. This actually represents a significant decline since 2006 in both absolute and relative terms, meaning that the 2011 Indigenous young adult population was much more educated than the 2006 one.

We don't yet have survey data on Indigenous mathematics, literacy and science outcomes for 2012. However, between 2006 and 2009 there was a significant improvement in relative scores, showing that there may be more Indigenous students completing Year 12, but also that they may be doing so with a higher level of skills and achievement. Looking through time, this is a positive story and one that will hopefully continue when information on the 2012 cohort is available.

Despite this positive trajectory, there is still a large gap between Indigenous and non-Indigenous students that remains once socioeconomic status and geography are controlled for. It is not just that Indigenous students are more likely to live in relatively remote areas, live in households with relatively low income/wealth and have parents with relatively low education themselves. For a given region, income or parental education level, Indigenous students are less likely to complete high school or have high test scores than their non-Indigenous peers.

Two of the potential reasons for this have been discussed in this paper and series—low levels of preschool participation and school readiness (Biddle 2013), and lower participation in non-government schools. However, it should be noted that the results in this paper suggested that even within a particular school sector, Indigenous students appear to be attending very different schools compared to non-Indigenous ones.

As this paper is being written, there are debates in the media about the impact of class sizes on student outcomes.[10] Rightly or wrongly, these debates have paid little specific attention to Indigenous students. However, there are a number of school-related research questions that are specific to the Indigenous population that we really know very little about:

- Does the positive association with preschool attendance last beyond the first year of school and is there a causal effect of preschool on school outcomes?
- Do the schools that Indigenous Australians attend and the peers to whom they are exposed influence later education outcomes?
- Would a reduction in class sizes specifically for Indigenous students significantly reduce the achievement gap?
- Would an intensive focus on early English literacy for Indigenous children reduce gaps in later grades?
- Would the introduction of specially trained Indigenous teachers or mentors at key points in the school year, or across years, improve the outcomes of Indigenous (and other) children?
- Do Indigenous children who attend boarding schools in cities as opposed to their local school in regional or remote areas have better outcomes than if they stayed where they were?
- Are there specific technology aids that could be incorporated into schools to improve Indigenous student outcomes?
- Would a financial incentive to improve school performance lead to better outcomes?
- What other incentives might lead to better school outcomes and how does the effectiveness of such approaches compare to making welfare payments conditional on attendance?

Carefully collected qualitative data could assist in answering such questions by providing rich details on the how and the why. However, in order to know what specific policies or interventions will encourage an Indigenous child or youth (who would otherwise drop out of school or post-school study) to attend or complete school, new quantitative data is needed. Such data will need to be collected through longitudinal databases, ethically and rigorously conducted randomised controlled trials and creative uses of administrative datasets. It is important to be able to track the progress of Indigenous outcomes relative to the non-Indigenous population and for this analysis of censuses and cross-section databases will continue to be important. However, as I argued previously in a paper written with Timothy Cameron:

> With such a large focus on Indigenous education policy in Australia and considerable resources devoted to improving the overall wellbeing of the Indigenous population, all levels of government should be steadfastly committed to doing so in the most effective, efficient and equitable way possible. A strong commitment to data collection and dissemination is the most effective way to design policy that meets these three aims (Biddle & Cameron 2012: 32).

10. See David Zyngier in *The Conversation* for the view that class sizes do matter (http://theconversation.com/class-size-gonski-and-schools-funding-what-are-the-facts-8934) and Dean Ashenden in *Inside Story* for the opposing view (http://inside.org.au/class-sizes-and-the-dead-hand-of-history/).

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TABLE A1. Factors associated with standardised test scores, 2009

	Mathematics		Reading		Science	
Explanatory variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Female	–11.9***	–14.2***	34.5***	31.7***	–0.9	–3.5**
Grade	–6.9**	–4.6*	–4.4	–1.9	–3.6	–1.5
Age	37.2***	35.4***	32.9***	30.7***	33.5***	31.6***
Catholic school		19.1***		25.4***		19.7***
Independent school		33.2***		34.9***		36.4***
Attends school in provincial area		–11.8***		–14.5***		–7.9***
Attends school in a remote area		–25.5***		–24.8***		–24.1***
Highest number of years of education of parents		11.8***		12.1***		12.8***
Indigenous student	–72.0***	–54.1***	–81.2***	–60.9***	–82.4***	–63.7***
Constant	255.4***	78.1**	234.7***	53.5	247.6***	59.2
Adjusted R-Squared	0.0843	0.1756	0.1086	0.1952	0.0747	0.1593
Sample size	14,251	13,649	14,251	13,649	14,251	13,649

Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.
Note: Variables for which the coefficient is statistically significant at the 1% level of significance are labelled ***; those statistically significant at the 5% level of significance only are labelled **, whereas those statistically significant at the 10% level of significance only are labelled *.

TABLE A2. Factors associated with standardised test scores, by Indigenous status, 2009

	Mathematics		Reading		Science	
Explanatory variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Female	–12.9**	–14.1***	36.4***	31.4***	0.2	–3.7**
Grade	–3.8	–4.6	–1.3	–1.8	–3.1	–1.2
Age	27.4***	35.9***	24.3***	31.1***	25.1***	31.9***
Catholic school	12.7	20.0***	12.5	26.7***	12.2	20.7***
Independent school	–30.3***	35.8***	–47.6***	38.3***	–56.2***	40.1***
Attends school in provincial area	–23.4***	–10.1***	–28.7***	–12.3***	–23.7***	–5.4***
Attends school in a remote area	–56.4***	–18.1***	–66.7***	–15.0***	–65.4***	–14.5***
Highest number of years of education of parents	4.4***	12.4***	4.1**	12.8***	4.1**	13.5***
Constant	197.3	63.2	164.2	39.0	214.1	41.0
Adjusted R-Squared	0.0841	0.1529	0.1188	0.1709	0.0747	0.1345
Sample size	1,046	12,603	1,046	12,603	1,046	12,603

Source: Customised calculations based on Wave 1 of the 2009 LSAY cohort.
Note: Variables for which the coefficient is statistically significant at the 1% level of significance are labelled ***; those statistically significant at the 5% level of significance only are labelled **, whereas those statistically significant at the 10% level of significance only are labelled *.

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