

# ICSEA 2017: Technical Report

*Research and Development*

February 2018

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## 1. Introduction

The Index of Community Socio-educational Advantage (ICSEA) identifies and quantifies many non-policy, malleable characteristics of a school and its student cohort and thus allows comparisons between schools that serve statistically similar students.

In addition to providing the ICSEA calculations, Australian Curriculum, Assessment and Reporting Authority (ACARA) reports the distribution of students in a school across four SEA (Socio-Educational Advantage) Quarters representing a scale of relative disadvantage ('bottom quarter') through to relative advantage ('top quarter'). The SEA Quarters distribution provides contextual information about the socio-educational composition of the students in a school.

ICSEA and SEA Quarters have been calculated and released annually by ACARA since 2008. During these years, the ICSEA model has been subject to a process of continuous refinement and enhancement. The current ICSEA and SEA Quarters model and calculation procedures are explained in full details in the ICSEA 2013 Technical Report<sup>1</sup>.

The purpose of this report is to provide an overview of procedures and outcomes of 2017 ICSEA and SEA Quarters calculation. Section 2 contains a description of the data sources used for the 2017 ICSEA and SEA Quarters calculation. Comparisons between the 2016 and 2017 ICSEA and SEA Quarters percentages are presented in Section 3. Section 4 provides parameters extracted and used in SEA estimation and ICSEA multi-level modelling process.

## 2. Data preparation and data sources

When enrolling a child in a school, all parents are asked to best indicate their occupation, school education and non-school education level attained. The possible answers to the parental occupation/education questions are described in the [Data Standards Manual: Student Background Characteristics](#). All states and territories, government education departments and Catholic system jurisdictional authorities provided ACARA with the parental background data for all students in their schools. This enrollment dataset used for the ICSEA and SEA calculations is referred as the Student Background Dataset (SBD).

### *Adjustment of school reading performance conditional variable*

The estimation of student SEA levels requires, as a conditional variable, the school average NAPLAN reading score (*schwler*), see ICSEA 2013 Technical Report. In 2015 ACARA investigated the impact that changes in the conditional variable has in the SEA and ICSEA estimations. It was observed that schools where the average reading score is based on results provided by only few students may show substantial changes in year-to-year *schwler* values.

Such a change could, in some cases, cause larger than expected year-to-year variability in SEA estimates. Such unexpected changes warrant additional treatment of the *schwler* conditioning variable for very small schools. The threshold for ICSEA reporting is set at no less than five records; thus, to maintain the consistency, it was decided that the same threshold should be applied to select schools that will receive

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<sup>1</sup> Australian Curriculum, Assessment and Reporting Authority (2014). ICSEA 2013 Technical Report.

additional treatment of *schwler* values.

### 3. Overview of 2017 ICSEA calculations and results

Figure 1 shows the comparison of the published 2016 and 2017 ICSEA. The black line represents a least-squares regression fit and, as it can be seen, it has slope of one and explained variance is 95%. The black cross shows the median in the horizontal and vertical axes. The box-plots at the top and left ends of the graph are a representation of each distribution, where the median, the interquartile range, whiskers at 1.5 interquartile range and the individual points considered as outliers (outside the whiskers) are represented for each dimension. These representations are used in all the following graphs.

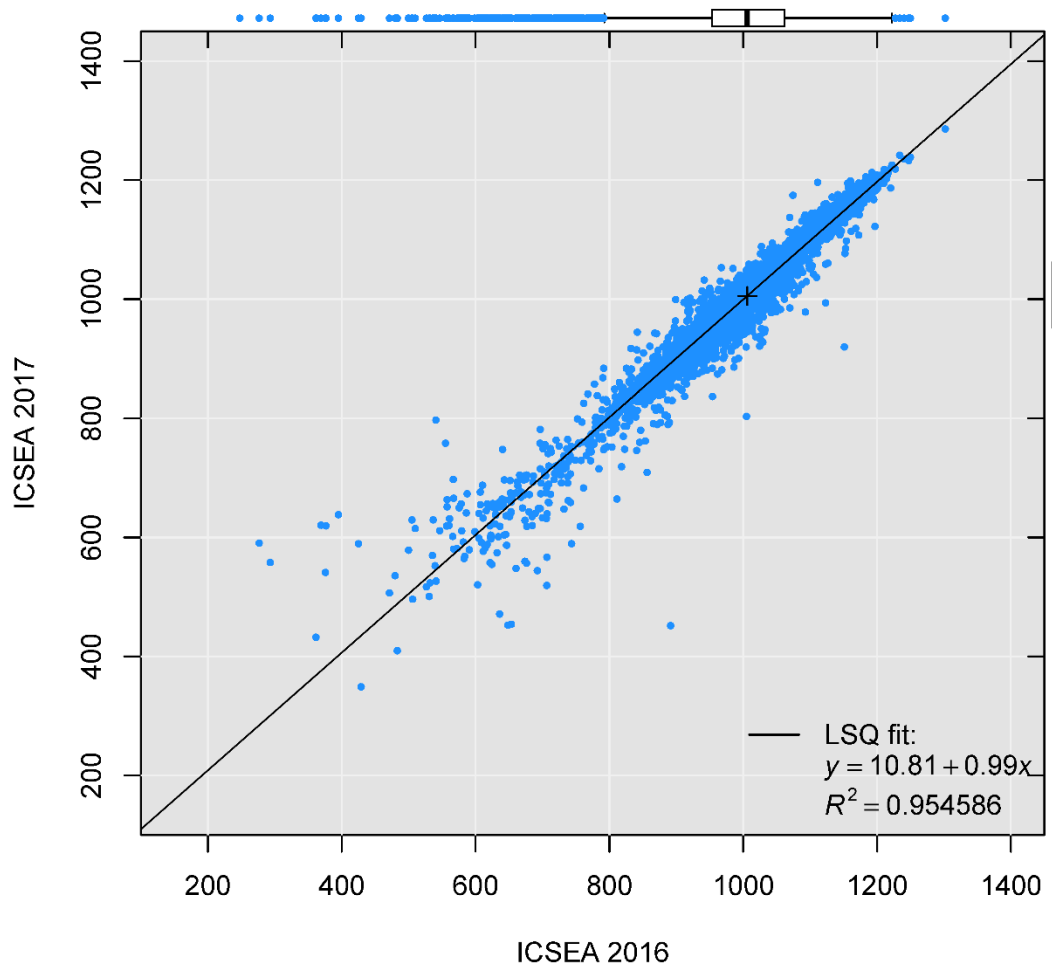
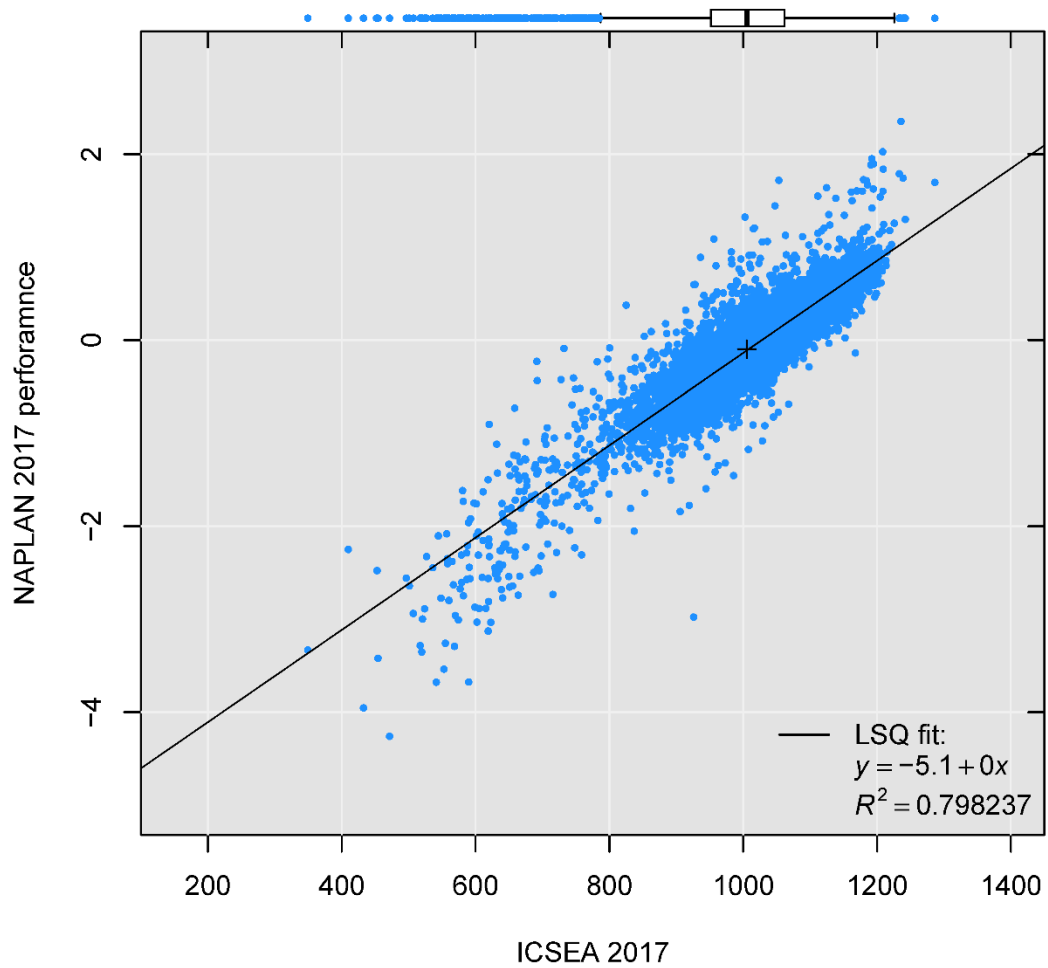


Figure 1: Correlation between 2016 ICSEA and 2017 ICSEA.

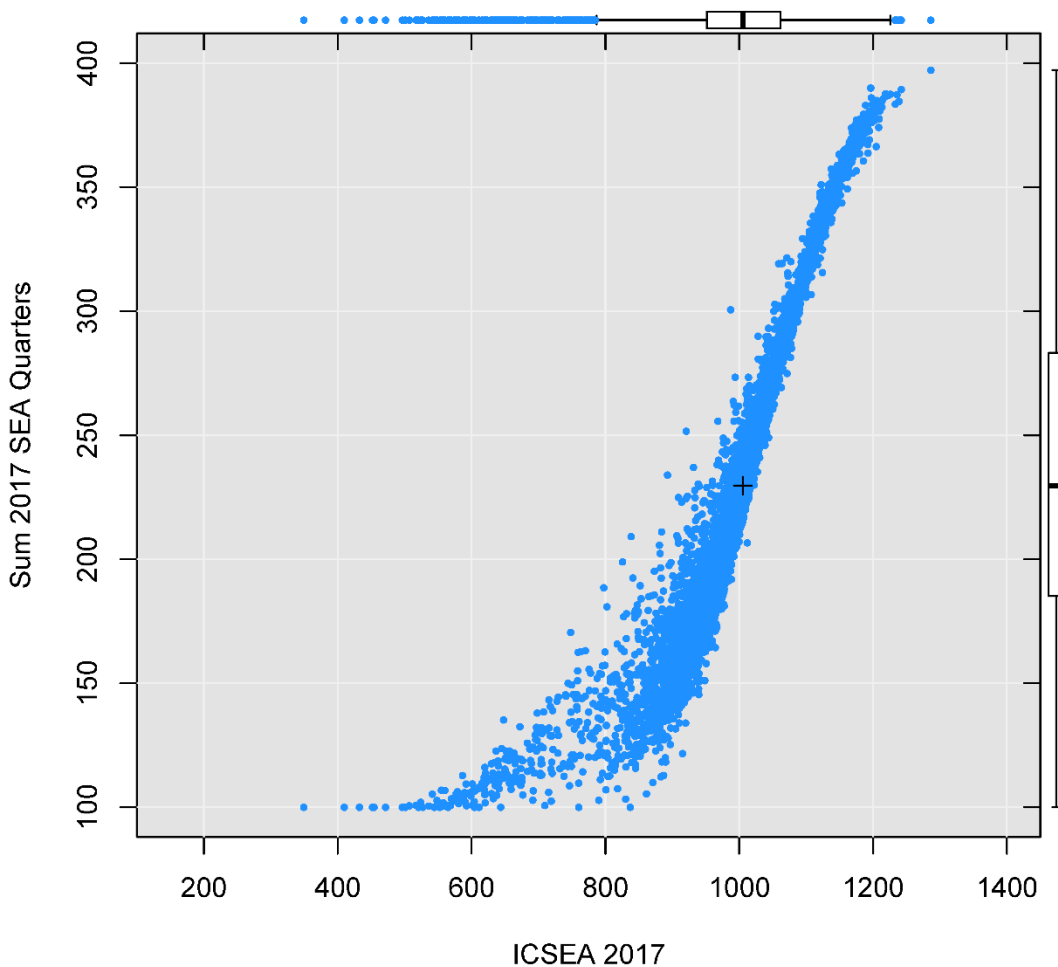
Figure 2 shows the correlation between published 2016 ICSEA and averaged school performance across all NAPLAN 2017 tests and all year levels available in a school. The regression analyses shows that 80% of variance in school performance is accounted for by ICSEA.



**Figure 2:** Correlation of 2017 ICSEA school 2017 NAPLAN performance

The SEA Quarters are a broad representation of a school's student distribution. From 2013, this distribution is based solely on each student's level of socio-educational advantage estimation. This means that the school effect is excluded from the Quarters distribution. Thus, the SEA Quarters provide contextual information of a school's socio-educational demographics. Figure 3 shows a correlation between the distribution of students in SEA quarters and ICSEA in 2017. The overall distribution of students in all for SEA quarters was calculated as follows:

$$\text{Sum SEA quarters} = \text{percentage Q1} \times 1 + \text{percentage Q2} \times 2 + \text{percentage Q3} \times 3 + \text{percentage Q4} \times 4$$



**Figure 3:** Correlation between of 2017 ICSEA and sum of SEA quarters percentages

## Appendix A: Generalised partial credit model parameters (GPCM)

Tables 2 to 9 contain the parameter scaling factors obtained from NAPPLAN 2017 data set using GPCM (see section 3.2 of the ICSEA 2013 Technical Report). The 'Response' column shows the responses available to the parental question; the 'Count' column shows the number of instances of a particular response the '%' column shows the percentage that the number of instances amounted; the 'Score' column provides the unweighted initial scores for each response category; while the '2017' and '2016' columns show the item weightings extracted from GPCM for corresponding ICSEA calculation cycle.

**Table 2:** Parent 1: school education

Response	Count	%	Score	2017	2016
Year 9 or equivalent	58465	5.42	0	0	0
Year 10 or equivalent	174904	16.2	1	1.04	1.03
Year 11 or equivalent	108872	10.08	2	2.08	2.07
Year 12 or equivalent	737323	68.3	3	3.11	3.1

**Table 3:** Parent 2: school education

Response	Count	%	Score	2017	2016
Year 9 or equivalent	57161	6.08	0	0	0
Year 10 or equivalent	189656	20.16	1	0.95	0.94
Year 11 or equivalent	95954	10.2	2	1.9	1.89
Year 12 or equivalent	597957	63.56	3	2.84	2.83

**Table 4:** Parent 1: non-school education

Response	Count	%	Score	2017	2016
No non-school education	232367	22.4	0	0	0
Certificate I–IV inc. trade certificate	279398	27.0	1	1.44	1.43
Advanced diploma / diploma	167984	16.2	2	2.88	2.86
Bachelor degree or above	354031	34.2	3	4.32	4.29

**Table 5:** Parent 2: non-school education

Response	Count	%	Score	2017	2016
No non-school education	173309	19.3	0	0	0
Certificate I–IV inc. trade certificate	315583	35.1	1	1.51	1.5
Advanced diploma / diploma	122582	13.6	2	3.02	3
Bachelor degree or above	286514	31.9	3	4.53	4.5

**Table 6:** Parent 1: occupation

Response	Count	%	Score	2017	2016
Machine operator	144638	19.1	0	0	0
Tradesperson/clerk/sales	223554	29.6	1	1.16	1.18
Professional/manager	192441	25.5	2	2.32	2.35
Senior manager	193005	25.6	3	3.48	3.53

**Table 7:** Parent 2: occupation

Response	Count	%	Score	2017	2016
Machine operator	180632	21.2	0	0	0
Tradesperson/clerk/sales	231964	27.2	1	1.27	1.26
Professional/manager	221790	26.0	2	2.55	2.51
Senior manager	217659	25.5	3	3.82	3.77

**Table 8:** Parent 1: non-paid occupation

Response	Count	%	Score	2017	2016
in non-paid occupation	278721	27	0	0	0
in paid occupation	753638	73	1	0.79	0.75

**Table 9:** Parent 2: non-paid occupation

Response	Count	%	Score	2017	2016
in non-paid occupation	67978	7.39	0	0	0
in paid occupation	852045	92.61	1	1.03	1.03

## Appendix B: Multi-level regression coefficients

Table 10 contains regression coefficients used to calculate ICSEA using multi-level regression model across each of the estimates in the set of five plausible SEA values. These coefficient very similar ( $R^2 = 0.99$ ) to those used in 2017 and 2016.

**Table 10:** ICSEA Multi-level regression coefficients for 2017

Variable	pv1	pv2	pv3	pv4	pv5
$\beta_0$ intercept	0.039	0.039	0.039	0.039	0.039
$\beta_1$ $SEA_{student}$	0.243	0.243	0.243	0.243	0.243
$\beta_2$ ATSI	-0.311	-0.307	-0.309	-0.308	-0.307
$\beta_3$ missing ATSI	-0.142	-0.139	-0.145	-0.147	-0.136
$\beta_4$ $SEA_{school}$	0.283	0.284	0.283	0.283	0.284
$\beta_5$ percentage ATSI	-0.006	-0.006	-0.006	-0.006	-0.006
$\beta_6$ ARIA	-0.007	-0.007	-0.006	-0.007	-0.007