

ICSEA 2014: Technical Report

Research and Development

January 2015

1. Introduction	3
2. Data preparation and data sources	3
2.1. Adjustment of conditional variable of school reading performance	3
3. Overview of 2014 ICSEA calculations and results	4
Appendix A: Generalised partial credit model parameters	8
Appendix B: Multi-level regression coefficients	10
References	11

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](#).

The purpose of this report is to provide an overview of procedures and outcomes of 2014 ICSEA and SEA Quarters calculation. Section 2 contains a description of the data sources used for the 2014 ICSEA and SEA Quarters calculation. Comparisons between the 2013 and 2014 ICSEA and SEA Quarters values 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).

Table 1 shows the number and type of records available to ACARA for the purposes of the 2014 ICSEA and Quarters calculations. In 2014 there were 1,130 (12.8 per cent) schools that did not provide SBD data. For these schools, parental background information was only available for students who participated in NAPLAN – collected and provided to ACARA by the Test Administration Authority in each state and territory (column 2). For these schools, their 2013 and 2014 NAPLAN datasets were merged (column 4) and used in with the SBD dataset to form the combined SBD dataset used for the ICSEA and Quarters calculations (column 5).

Table 1: Number of students and school in 2014 of NAPLAN and SBD datasets

Category	NAPLAN 2014	ISBD	NAPLAN 2013 + 2014 added to SBD	Final SBD (used in calculation)
# of records	1,111,708	3,005,079	401,262	3,406,341
# of schools	8,836	7,706	1,130	8,836

The estimation of student SEA levels requires, as a conditional variable, the school average NAPLAN reading score (*schwler*)¹. In 2014 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 additional treatment of *schwler* values.

For the 2014 calculation, a total of 304 schools met such a threshold. In order to create a more stable indicator of *schwler*, the rolling average based on 2013 and 2014 reading means was used as *schwler* condition variable for these very small schools.

3. Overview of 2014 ICSEA calculations and results

Figure 1 shows the comparison of the 2013 and 2014 ICSEA values. The black line represents a least-squares fit and, as it can be seen, it has slope of one. The explained variance between both years is 95 per cent. 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.

¹ See section 3.3 on page 6 of the [ICSEA 2013 Technical Report](#)

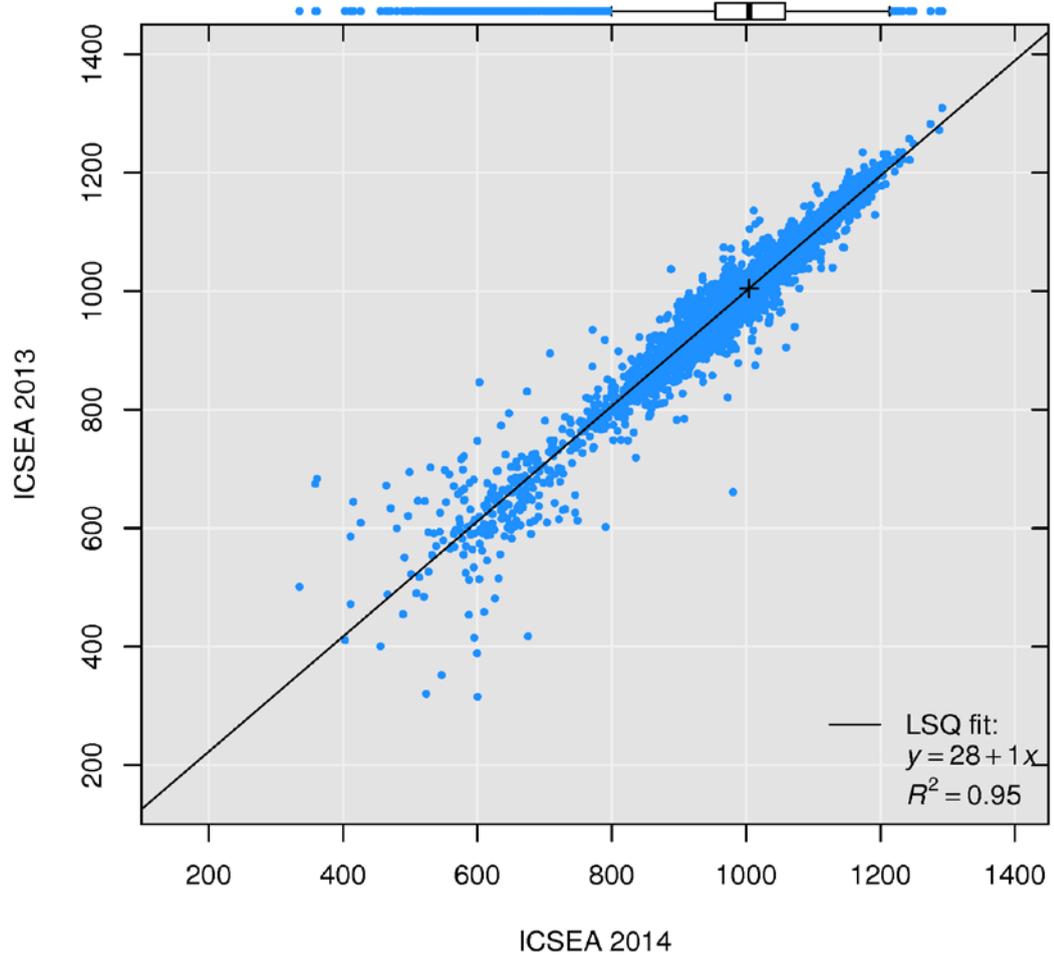


Figure 1: Comparison of published 2013 ICSEA values against the published 2014 ICSEA values

Figure 2 shows the schools' ICSEA values against their school-level NAPLAN performance for 2014. The explained variation (R^2) in NAPLAN performance for 2014 is 80 per cent, while for 2013 is 81 per cent.

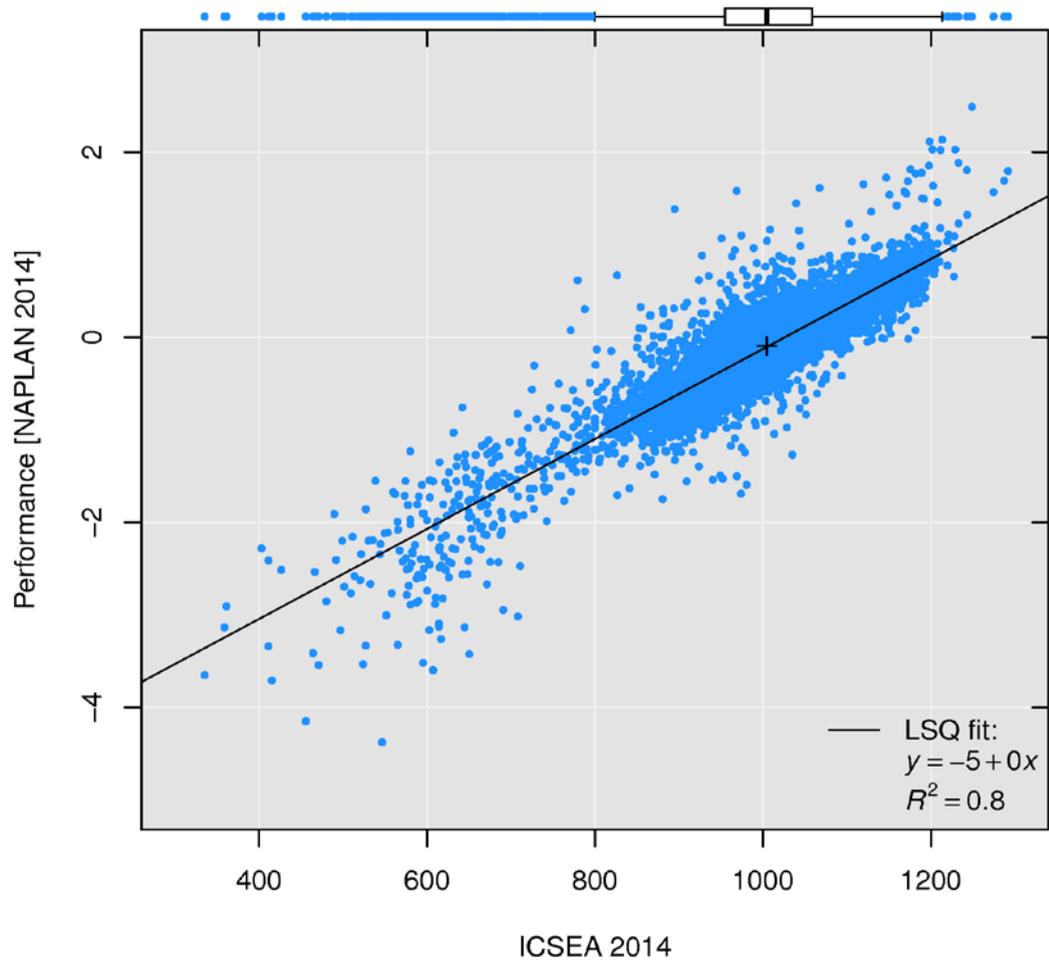


Figure 2: Published 2014 ICSEA against NAPLAN performance

The SEA Quarters are a broad representation of a school's student distribution. As of 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 comparison between the published Quarters versus ICSEA values. The vertical axis scores were calculated using the following formula:

$$\text{score} = \text{percentage Q1} * 1 + \text{percentage Q2} * 2 + \text{percentage Q3} * 3 + \text{percentage Q4} * 4$$

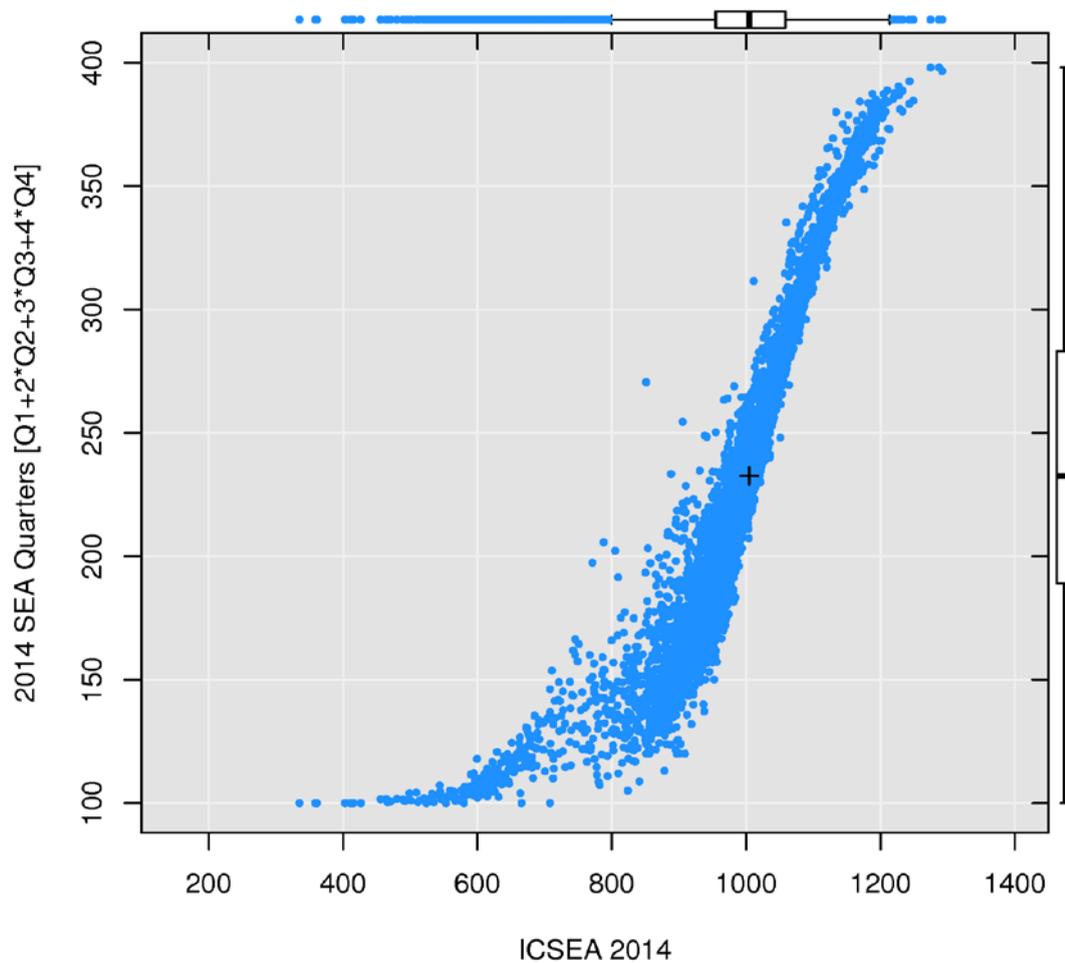


Figure 3: 2014 SEA Quarters against ICSEA

Appendix A: Generalised partial credit model parameters (GPCM)

Tables 2–9 contain the parameter scaling factors obtained by the GPCM for the 2014 ICSEA and SEA Quarters calculation (section 3.2). The 'Response' column shows the responses available to the parental question; the 'Count' column shows the number of instances of a particular response in 2014; the '%' column shows the percentage that the number of instances amounted to in 2014; the 'Score' column provides the unweighted scores for each response category; while the '2014' and '2013' columns show the item weightings using the GPCM approach for each year.

Table 2: Parent 1: school education

Response	Count	%	Score	2014	2013
Year 9 or equivalent	53,980	5.5	0	0	0
Year 10 or equivalent	183,328	18.8	1	1.31	1.24
Year 11 or equivalent	113,887	11.6	2	1.56	1.48
Year 12 or equivalent	623,336	63.9	3	3.15	3.06

Table 3: Parent 2: school education

Response	Count	%	Score	2014	2013
Year 9 or equivalent	53,189	6.26	0	0	0
Year 10 or equivalent	192,105	22.6	1	1.17	1.18
Year 11 or equivalent	97,718	11.5	2	1.43	1.46
Year 12 or equivalent	506,547	59.6	3	3.02	3.06

Table 4: Parent 1: non-school education

Response	Count	%	Score	2014	2013
No non-school education	230,433	25.4	0	0	0
Certificate I–IV inc. trade certificate	246,319	27.2	1	0.94	0.92
Advanced diploma / diploma	147,817	16.3	2	2.31	2.29
Bachelor degree or above	279,784	30.9	3	4.02	4.04

Table 5: Parent 2: non-school education

Response	Count	%	Score	2014	2013
No non-school education	164,628	20.7	0	0	0
Certificate I–IV inc. trade certificate	283,099	35.7	1	0.98	0.94
Advanced diploma / diploma	107,647	13.5	2	2.73	2.68
Bachelor degree or above	236,649	29.8	3	4.82	4.72

Table 6: Parent 1: occupation

Response	Count	%	Score	2014	2013
Machine operator	139,816	20.6	0	0	0
Tradesperson/clerk/sales	203,953	30.1	1	0.87	0.88
Professional/manager	173,192	25.6	2	1.98	1.99
Senior manager	159,291	23.5	3	3.44	3.53

Table 7: Parent 2: occupation

Response	Count	%	Score	2014	2013
Machine operator	166,731	21.5	0	0	0
Tradesperson/clerk/sales	208,064	26.8	1	0.84	0.85
Professional/manager	209,351	27.0	2	2	1.98
Senior manager	190,525	24.5	3	3.86	3.85

Table 8: Parent 1: non-paid occupation

Response	Count	%	Score	2014	2013
in non-paid occupation	249,042	26.9	0	0	0
in paid occupation	676,252	73.0	1	0.66	0.63

Table 9: Parent 2: non-paid occupation

Response	Count	%	Score	2014	2013
in non-paid occupation	54,928	6.62	0	0	0
in paid occupation	774,671	93.3	1	0.9	0.80

Appendix B: Multi-level regression coefficients

Figure 4 shows the comparison between the 2013 and 2014 multi-level regression coefficients. For every one of the seven regression coefficients, five plausible values were calculated (see table 10) and correlated across 2013 and 2014 ICSEA calculation.



Figure 4: 2014 versus 2013 ICSEA multi-level regression coefficients

Table 10: Multi-level regression coefficients for 2014

	Variable	pv1	pv2	pv3	pv4	pv5
β_0	intercept	-0.008	-0.009	-0.009	-0.009	-0.009
β_1	$SEA_{student}$	0.229	0.229	0.228	0.229	0.229
β_2	ATSI	-0.318	-0.319	-0.321	-0.320	-0.318
β_3	missing ATSI	-0.198	-0.204	-0.199	-0.209	-0.199
β_4	SEA_{school}	0.273	0.274	0.273	0.274	0.273
β_5	percentage ATSI	-0.007	-0.007	-0.007	-0.007	-0.007
β_6	ARIA	-0.002	-0.002	-0.002	-0.003	-0.002

References

Australian Curriculum, Assessment and Reporting Authority 2012, *Data Standards Manual: Student Background Characteristics*, 6th edn,
www.acara.edu.au/verve/_resources/DSM_1.pdf

Australian Curriculum, Assessment and Reporting Authority 2014, *ICSEA 2013 Technical Report*, www.acara.edu.au/verve/_resources/ICSEA_2013_Generation_Report.pdf
