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# ICSEA 2021: Technical Report

*Assessment and Reporting  
Measurement and Evaluation Unit*

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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 detail in the [ICSEA 2013 Technical Report](#).

The purpose of this report is to provide an overview of procedures and outcomes of the 2021 ICSEA and SEA Quarters calculation. Section 2 contains a description of the data sources used for the 2021 ICSEA and SEA Quarters calculation. Comparisons between the 2019 and 2021 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.

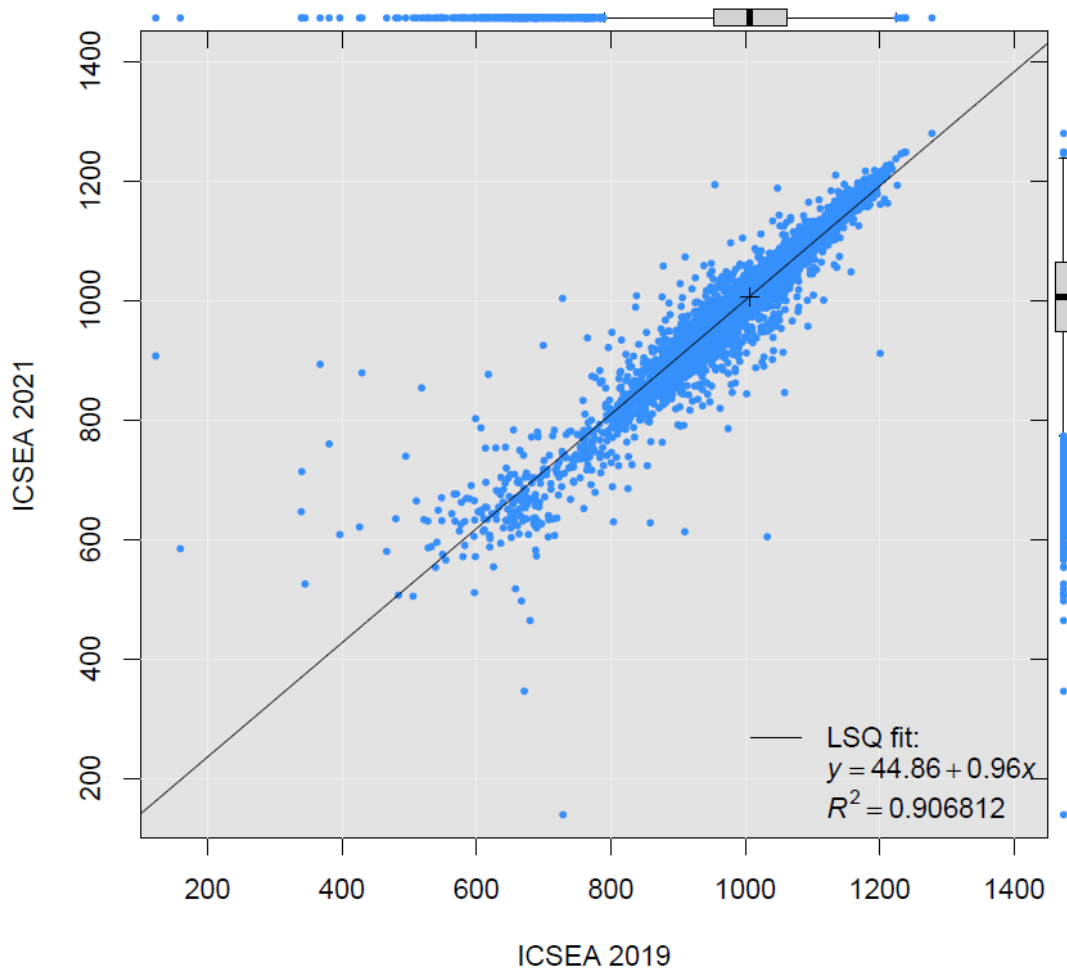
## 2. Data preparation and data sources

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 enrolment dataset used for the ICSEA and SEA calculations is referred as the Student Background Dataset (SBD).

## 3. Overview of 2021 ICSEA results

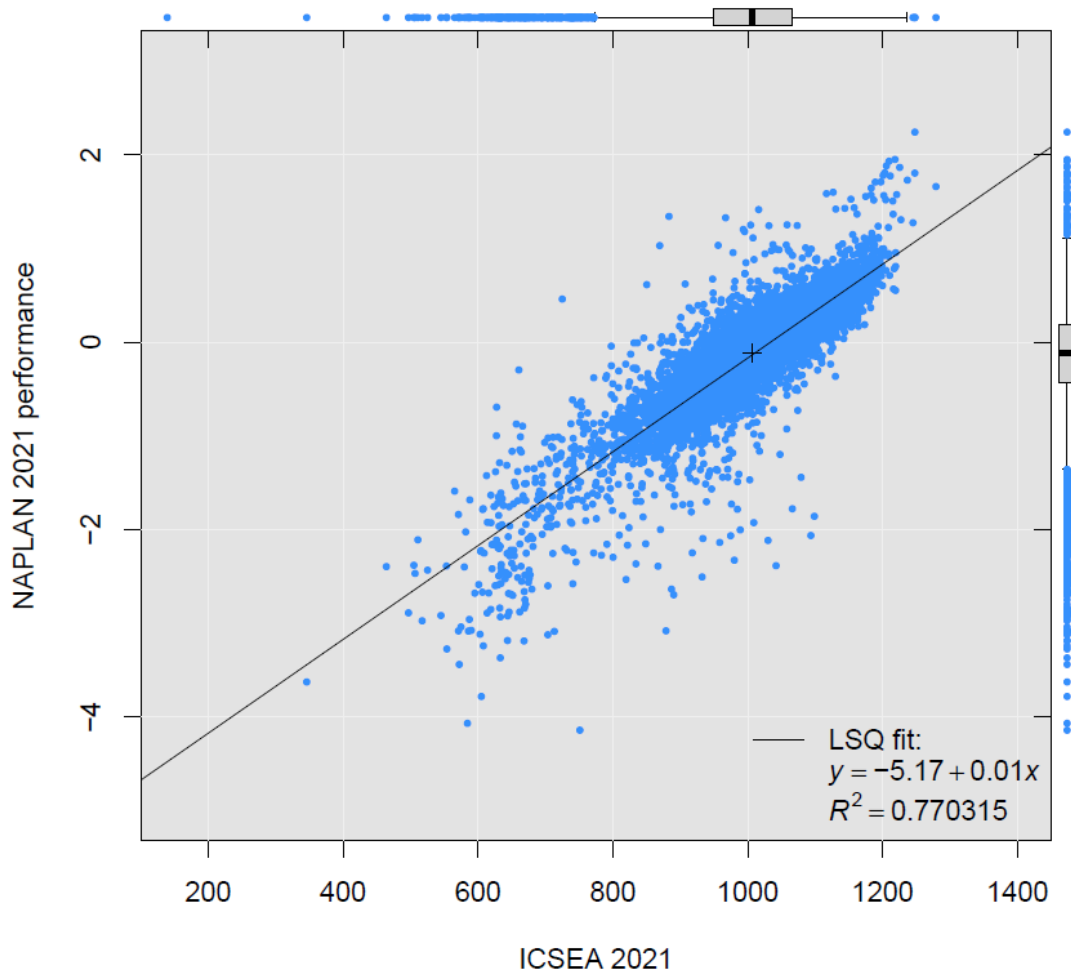
Figure 1 shows the comparison of the published 2019 and 2021 ICSEA. The black line represents a least-squares regression fit and, as it can be seen, it has slope of 0.96 and explained variance is 91%. The black cross shows the median in the horizontal and vertical axes. The box-plots at the top and right end 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.

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**Figure 1:** Scatterplot between 2019 ICSEA and 2021 ICSEA

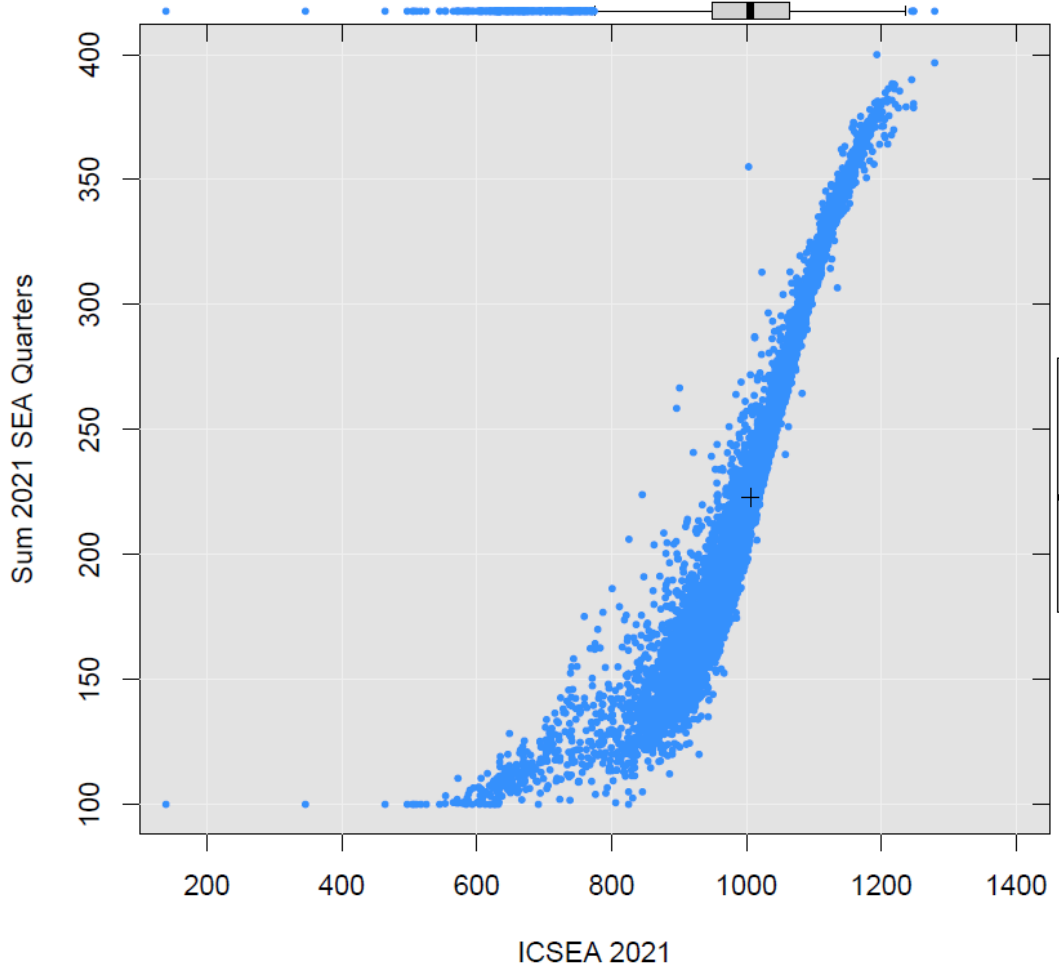
Figure 2 shows the scatterplot between published 2021 ICSEA and averaged school performance across all NAPLAN 2021 tests and all year levels available in a school. The regression analysis shows that 77% of variance in school performance is accounted for by ICSEA.



**Figure 2:** Scatterplot between 2021 ICSEA and 2021 NAPLAN school performance

The SEA Quarters are a broad representation of a school's student distribution. From 2013, this index is based solely on each student's level of socio-educational advantage as defined by the student's parental education and occupation. Figure 3 shows a scatterplot between the distribution of students in SEA quarters and ICSEA in 2021. The overall distribution of students in all four 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:** Scatterplot between 2021 ICSEA and sum of 2021 SEA quarters

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

Tables 2 to 9 contain SEA item statistics obtained from NAPLAN 2021 data set using the GPCM (see section 3.2 of the ICSEA 2013 Technical Report). The 'Response' column shows the response category 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 'Code' column provides the ordered coded response categories; the '2021' and '2019' columns show the estimated item scores extracted from GPCM for corresponding ICSEA calculation cycle.

**Table 2:** Parent 1: school education (p1se)

Response	Count	%	Code	2021	2019
Year 9 or equivalent	57196	5.16	0	0	0
Year 10 or equivalent	170060	15.3	1	1.11	1.20
Year 11 or equivalent	103610	9.35	2	2.22	2.39
Year 12 or equivalent	776804	70.1	3	3.33	3.59

**Table 3:** Parent 2: school education (p2se)

Response	Count	%	Code	2021	2019
Year 9 or equivalent	58340	5.67	0	0	0
Year 10 or equivalent	181971	17.6	1	0.98	1.02
Year 11 or equivalent	95802	9.31	2	1.97	2.05
Year 12 or equivalent	692632	67.3	3	2.95	3.07

**Table 4:** Parent 1: non-school education (p1nse)

Response	Count	%	Code	2021	2019
No non-school education	210545	19.6	0	0	0
Certificate I–IV inc. trade certificate	300485	28.0	1	1.53	1.23
Advanced diploma / diploma	169513	15.8	2	3.07	2.45
Bachelor degree or above	390177	36.4	3	4.6	3.68

**Table 5:** Parent 2: non-school education (p2nse)

Response	Count	%	Code	2021	2019
No non-school education	182664	18.4	0	0	0
Certificate I–IV inc. trade certificate	326016	32.9	1	1.5	1.75
Advanced diploma / diploma	140951	14.2	2	3.01	3.50
Bachelor degree or above	341302	34.4	3	4.51	5.26

**Table 6:** Parent 1: occupation (p1occ)

Response	Count	%	Code	2021	2019
Machine operator	157016	19.0	0	0	0
Tradesperson/clerk/sales	231545	28.0	1	1.13	1.00
Professional/manager	211159	25.5	2	2.27	2.00
Senior manager	226444	27.4	3	3.4	2.99

**Table 7:** Parent 2: occupation (p2occ)

Response	Count	%	Code	2021	2019
Machine operator	178146	20.1	0	0	0
Tradesperson/clerk/sales	249051	28.1	1	1.22	1.25
Professional/manager	225322	25.5	2	2.44	2.49
Senior manager	230801	26.1	3	3.66	3.74

**Table 8:** Parent 1: non-paid occupation (p1npo)

Response	Count	%	Code	2021	2019
in non-paid occupation	236689	22.2	0	0	0
in paid occupation	826573	77.7	1	0.92	0.91

**Table 9:** Parent 2: non-paid occupation (p2npo)

Response	Count	%	Code	2021	2019
in non-paid occupation	119140	11.8	0	0	0
in paid occupation	883791	88.1	1	0.87	1.09

The GPCM item parameter estimates for SEA questions are presented in Table 10.

**Table 10:** Item locations and scoring parameters

Item	Item location (xsi)	Scoring parameter (tau)
p1se	-1.616	1.111
p2se	-1.325	0.984
p1nse	-0.492	1.534
p2nse	-0.322	1.503
p1occ	-0.057	1.134
p2occ	-0.001	1.221
p1onp	-1.387	0.920
p2onp	-2.590	0.872

## Appendix B: Multi-level regression coefficients

Table 11 contains regression coefficients used to calculate ICSEA using a random intercept, fixed slopes multi-level regression model across each of the five plausible values for SEA. These coefficients were very similar ( $R^2 = 0.97$ ) to those estimated in 2018 and 2019.

**Table 11:** ICSEA Multi-level regression coefficients for 2021

Variable	pv1	pv2	pv3	pv4	pv5
$\gamma_{00}$ intercept	0.031	0.030	0.031	0.031	0.031
$\gamma_{10}$ SEA <sub>student</sub>	0.296	0.295	0.296	0.296	0.296
$\gamma_{20}$ ATSI	-0.300	-0.301	-0.300	-0.297	-0.298
$\gamma_{30}$ missing ATSI	-0.229	-0.228	-0.225	-0.225	-0.230
$\gamma_{01}$ SEA <sub>school</sub>	0.326	0.325	0.326	0.324	0.326
$\gamma_{02}$ percentage ATSI	-0.006	-0.006	-0.006	-0.006	-0.006
$\gamma_{03}$ ARIA	-0.007	-0.008	-0.007	-0.007	-0.007