4-2003

The changing influence of socioeconomic status on student achievement: Recent evidence from Australia

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Introduction

The nature of the relationship between socioeconomic status (SES) and student achievement has been debated for decades, with the most influential arguments appearing in *Equality of Educational Opportunity* (Coleman, et al., 1968) and *Inequality* (Jencks, et al., 1973) in the United States of America, and a number of commissioned inquiries in Australia (Commission of Inquiry into Poverty, 1976; Karmel, 1973). How SES influences student achievement is not clear, and there have been many theories to explain the relationship. In one scenario, school students from low-SES homes are at a disadvantage in schools because they lack an academic home environment, which influences their academic success at school. Another scenario argues that school and neighbourhood environments influence academic success, so that low-SES schools are generally lower-performing, and that only extremely resilient young people can escape the 'fate' of low academic achievement. How governments interpret the SES–achievement debate influences education policies designed to ameliorate educational disadvantage, so it is important to examine the contribution SES makes to achievement at both student and school level.

State and Commonwealth government initiatives were introduced over the period, intended to ameliorate the disadvantage associated with low SES. In 1975, after the Commonwealth government inquiries into poverty in Australia, the Disadvantaged Schools Program was established, designed to reduce the negative effects of low SES on academic achievement. The program provided additional funds to schools in low-SES neighbourhoods for school-wide projects. During the mid-1990s, the program was changed to become more focussed on literacy and numeracy, and today its implementation varies between states.

This paper examines the influence of SES on student achievement using data from the Longitudinal Surveys of Australian Youth (LSAY), a national program of research on the transitions young people make from school. LSAY encompasses data from earlier Australian longitudinal studies—Youth in Transition (YIT; 1978-2002), the Australian Longitudinal Survey (ALS; 1984-1987), and the Australian Youth Surveys (AYS; 1989-1997)—and earlier studies of student achievement—Australian Studies in School Performance (1975 ASSP), the Australian Studies in Student Performance (1980 ASSP). At present, there are two active cohorts: those who were in Grade 9 in 1995 (1995 LSAY) and those who were in Grade 9 in 1998 (1998 LSAY). A new cohort will be added in 2003, based on participants in the OECD's Programme of International Student Assessment (PISA). All of the studies included in the LSAY program begin with extensive questionnaires that collect student background information, such as parents' occupations, home language spoken, and student's and parents' birthplaces, in addition to the achievement tests administered. Only 14-year-old students were included in the present analysis.

It is also important to recognise other changes in the educational and social landscape during the period in question. Between 1975 and 2002, the proportion of students attending non-government schools rose from less than 21.2 percent to 31.6 per cent, and the apparent

Paper presented at the annual meeting of the American Educational Research Association, Chicago, 21-25 April 2003.

retention rate increased from 34.1 to 75.1.[1] State governments expanded their provision of selective high schools, particularly New South Wales, the most populous state, and relaxed restrictions on local school zones. Immigration increased from countries where English is not the main language spoken, especially from Asian countries after 1975. The socioeconomic map of the major metropolitan areas also changed, with some suburbs becoming more exclusive because of housing affordability and others becoming less desirable.

Data and Methodology

The data used in this paper are from five studies. The first two studies, 1975 ASSP and 1980 ASSP, were major studies of the literacy and numeracy achievements of ten-year-olds and fourteen-year-olds attending Australian schools. There were 33 items on both the reading comprehension and mathematics tests in 1975, and 35 items on both tests in 1980. For the other studies—1989 YIT, 1995 LSAY and 1998 LSAY—the reading comprehension and mathematics tests each comprised 20 items, and were included to provide an indication of student achievement levels to be used as controls in studies of young people's transitions from school. Each test was developed by the Australian Council for Educational Research (ACER) and contained a number of items common to at least one other test, including the ASSP tests. The inclusion of these common items allowed scores on all tests to be equated to a single scale; for the present study, this scale has a mean of 50 and standard deviation of 10.

Previous Australian research on the relationship between SES and academic achievement has noted a decline in the influence of SES. Using the LSAY data, Marks and Ainley (1997) reported that differences in mean scores between students from high-SES families and students from low-SES families had declined between 1975 and 1995, in both reading comprehension and mathematics. Marks, et al. (2000) also reported that there was a decline between high-SES and low-SES students in the odds ratio for participation in higher education. These studies were limited in their analysis of SES by restricting the influence of SES to the student level, ignoring the possible effects of SES at the school or neighbourhood level.

For the present analysis, hierarchical linear modelling was employed to examine the influence of SES, as measured by family occupational status, at two levels: the student and the school. At the student level, SES was determined by one parent's occupation (generally the father's), coded to one of four ordered occupational groups based on the Australian Standard Classification of Occupations (ASCO). Three of the cohorts—1975, 1995 and 1998—collected information on student gender, language spoken at home, parent occupation and location. The 1980 cohort did not provide information on parent occupation but the 1989 cohort did, and the 1989 cohort did not provide information on language background. The four occupational groups are:

Group I	managers and administrators, professionals and associate professionals
Group II	clerical, sales and service workers
Group III	tradespersons and related workers
Group IV	intermediate production and transport workers, and labourers and related workers

School-level SES was determined by calculating the percentage of students in the school who were in each of two groups—group I, professional/managerial (representing socioeconomic

[1] The apparent retention rate is calculated using the number of full-time enrolments in Grade 12 in a given year as the numerator and the number of full-time enrolments in the cohort's first year of secondary school (Grade 7 or Grade 8) as the denominator.

advantage) and group IV, manual labourers (representing socioeconomic disadvantage). Thus school-level SES was based on the students attending the school (in each sample), and not generated from postal area or census area data.

Achievement in Reading Comprehension and Mathematics

Table 1 shows the means and standard errors by occupational group for the cohorts for which data were available. Figure 1 also shows means, demonstrating the decrease in the difference between groups I and IV, as noted by Marks and Ainley (1997). Between 1995 and 1998, however, differences between group I and group IV grew again, suggesting that what gains had been made to 1995 for low-SES students had disappeared.

Table 1 Means and standard errors of scaled scores on reading comprehension and mathematics tests, by parent's occupational group, 1975-1998

Reading Comprehension	**ASSP 1975**		**YIT 1989**		**LSAY 1995**		**LSAY 1998**	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
Group I	54.1	(0.35)	53.9	(0.38)	52.6	(0.25)	53.3	(0.28)
Group II	51.9	(0.49)	51.1	(0.45)	50.2	(0.35)	50.3	(0.36)
Group III	51.1	(0.47)	51.1	(0.44)	49.2	(0.33)	49.4	(0.28)
Group IV	48.6	(0.46)	48.7	(0.57)	48.8	(0.39)	48.3	(0.35)
All groups								

Mathematics	**ASSP 1975**		**YIT 1989**		**LSAY 1995**		**LSAY 1998**	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
Group I	53.9	(0.41)	52.9	(0.41)	53.0	(0.28)	52.9	(0.32)
Group II	51.0	(0.46)	49.6	(0.48)	50.3	(0.33)	50.1	(0.37)
Group III	50.8	(0.42)	49.4	(0.45)	49.5	(0.33)	49.6	(0.30)
Group IV	48.3	(0.47)	46.8	(0.50)	48.8	(0.40)	48.3	(0.29)
All groups								

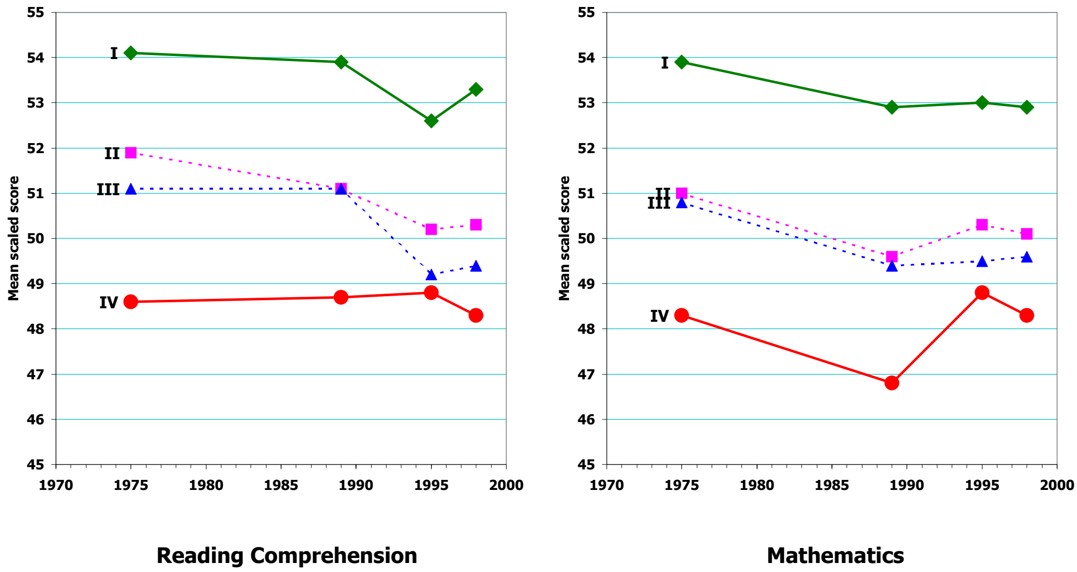

Figure 1 Mean scaled scores on reading comprehension and mathematics tests, by parent's occupational group, 1975-1998

Changes in Background Influences on Achievement in Reading Comprehension

Student-level Influences

The influence of each variable in the multivariate analyses for reading comprehension is shown in Table 2. The tests for each cohort were equated, so it is possible to compare the influence of each variable across the cohorts. For example, in 1975 the value of the estimate of gender's influence was 0.598, with a standard error of 0.332.[2] The associated *p*-value of .071 indicates that this estimate is not statistically significant ($\alpha = .05$), suggesting that when the other variables in the model are held constant, there was no significant difference between males and females on tests of reading comprehension in 1975. Similarly, in 1989, gender was not significant. In 1995 and 1998, however, the estimates for gender were 1.502 and 1.614, respectively, and they were significant ($p<.001$), indicating that females scored 1.5 points higher than males in 1995 and 1.6 points higher in 1998, holding all other variables constant.

Between 1975 and 1998, the magnitude of the estimate for language background decreased from –5.005 to –2.599, indicating a decrease by about one-half in the difference between students from homes where English is the main language spoken and students from homes where a language other than English is the main language spoken. During this period and within the ASSP and LSAY samples, the percentage of 14-year-olds from other-language backgrounds attending government schools more than doubled, from 4.4 per cent to 10.7 per cent. The stability of scores overall suggests that schools have been able to maintain standards in reading comprehension while enrolling increasing numbers of students from other language backgrounds.

For only the 1989 cohort was location significant, with students from metropolitan locations scoring lower than students from non-metropolitan locations. For all other cohorts, location was not significant, indicating that mean reading comprehension scores for students from non-metropolitan locations were equivalent to scores for students from metropolitan locations when all other variables in the model are held constant.

Table 2 Results of multivariate analyses for reading comprehension tests, 1975, 1989, 1995 and 1998

	1975		1989		1995		1998	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Student level								
Intercept	51.637		52.300		50.604		51.142	
Female	0.598	0.071	0.144	0.653	1.502	<0.001	1.614	<0.001
Metropolitan	0.251	0.653	-1.262	0.007	0.239	0.485	0.059	0.859
Other language	-5.005	<0.001			-3.462	<0.001	-2.599	<0.001
Occ group I	3.705	<0.001	3.048	<0.001	1.753	<0.001	2.605	<0.001
Occ group II	2.135	<0.001	1.758	<0.001	0.522	0.164	1.239	0.002
Occ group III	1.630	<0.001	2.131	<0.001	-0.067	0.848	0.583	0.084
School level								
% other lang.	-0.104	0.003			-0.043	0.004	-0.039	0.004
% occ. group I	0.015	0.367	0.070	<0.001	0.083	<0.001	0.102	<0.001
% occ.group IV	-0.118	<0.001	-0.048	0.013	-0.050	0.006	-0.023	0.243

Notes: 'Base' student is male, non-metropolitan, English-language background, from occupational group IV family.

[2] Standard errors are included in the tables in the appendix.

In their examination of these data and data from other, smaller studies in the LSAY series, Marks and Ainley (1997) noted that the influence of socioeconomic status had declined over the period from 1975 to 1995, because the difference between mean scores for students from occupational group I families and mean scores for students from occupational group IV families had declined. This is seen in Table 2, in the row for the variable for occupational group I. In 1975, it had an estimate of 3.705 and was highly significant (*p*<.001); in 1989, the estimate was 3.048 and highly significant; in 1995, the parameter estimate was 1.753, again highly significant (*p*<.001). During the same period, estimates for occupational group II, which measures the difference between group II and group IV, and estimates for occupational group III, which measures the difference between groups III and IV, also declined, becoming non-significant in 1995. In 1998, this had changed: the estimate for occupational group I increased to 2.605 (*p*<.001) and the estimate for occupational group II increased to 1.239 (*p*=.002), but the estimate (0.583) for occupational group III was still non-significant (*p*=.084), indicating that the differences were between the two highest occupational groups and the two lowest.

School-level Influences

Between 1975 and 1998, there were changes in the estimates for the percentage of students in the school whose parents were in occupational group I, the variable that was used to indicate a school's socioeconomic status. The estimate of 0.015 was not significant in 1975 (*p*=.367); in 1989, at 0.070, it was highly significant (*p*<.001); in 1995, at 0.083, it was also highly significant (*p*<.001); and in 1998, at 0.102, it was again highly significant (*p*<.001). It was noted in the section on student-level variables that the influence of a student's socioeconomic status, as measured by the difference between occupational group I and occupational group IV, declined between 1975 and 1995, although it did remain statistically significant. During the same period, however, the school-level measure of socioeconomic status *increased*, becoming statistically significant in 1989 and increasing in value for 1995 and 1998. During the same period, the estimates for the percentage of students in the school whose parents were in occupational group IV, the variable that measures a school's socioeconomic disadvantage, declined, having been statistically significant in 1975 but not in 1989, 1995 or 1998.

In all three cohorts with data on language background, the parameter estimate for the proportion of students in the school who came from homes where a language other than English was the main language spoken was statistically significant, although it decreased in magnitude from –0.104 to –0.039. With the finding that the parameter estimate for the corresponding student-level variable also decreased over the same period, this is a strong indication that as a group, 14-year-olds who live in homes where English is not the main language spoken have improved their achievement in reading comprehension.

Changes in Background Influences on Achievement in Mathematics

Student-level Influences

The influence of each variable on mathematics achievement is shown in Table 3. In 1975, gender had an estimate of -1.135 and a standard error of 0.367. This was significant at the .01 level (*p*=.002), suggesting that when the other variables in the model are held constant, there was a significant difference between males and females on tests of mathematics in 1975, with females scoring 1.135 points lower than males, on average. In 1989, 1995 and 1998, the estimates for females were –1.-1.720 and -2.060, respectively, and were statistically significant (*p*<.001), indicating that the difference between males and females in their performance on the mathematics tests increased over time.

Marks and Ainley (1997) noted that the difference between mean scores for occupational group I and for occupational group IV had declined between 1975 and 1995. This is seen in

Table 3, in the row for occupational group I. In 1975, this variable had a parameter estimate of 4.442, which was highly significant (p<.001); in 1989, the estimate was 3.464, also highly significant (p<.001); in 1995, the parameter estimate was 2.243, also highly significant (p<.001). During the same period, estimates for occupational group II, which measures the difference between group II and group IV, and for occupational group III, which measures the difference between group III and group IV, also declined, becoming non-significant in 1995. In 1998, these trends had changed: the estimate for occupational group I increased slightly to 2.376 (p<.001), the estimate for occupational group II increased to 1.294 (p=.001), and the estimate for occupational group III increased to 0.762 (p=.020). This result for parent occupational group shows that the decrease in the difference between occupational groups, seen between 1975 and 1995, did not continue in 1998 in mathematics.

Table 3 Results of multivariate analyses for mathematics tests, 1975, 1989, 1995 and 1998

	1975		1989		1995		1998	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Student level								
Intercept	50.861		50.981		50.806		50.864	
Female	-1.135	0.002	-1.847	<0.001	-1.720	<0.001	-2.060	<0.001
Metropolitan	0.818	0.164	-1.563	0.002	0.386	0.282	0.162	0.641
Other language	-2.978	<0.001			-1.071	0.012	-1.136	0.005
Occ group I	4.442	<0.001	3.464	<0.001	2.243	<0.001	2.376	<0.001
Occ group II	2.121	<0.001	1.902	<0.001	0.658	0.078	1.294	0.001
Occ group III	1.957	<0.001	2.207	<0.001	0.462	0.184	0.762	0.020
School level								
% other lang.	-0.095	0.009			-0.041	0.009	-0.015	0.324
% occ. group I	0.036	0.043	0.081	<0.001	0.096	<0.001	0.108	<0.001
% occ.group IV	-0.066	0.009	-0.062	0.002	-0.041	0.039	-0.004	0.858

Notes: 'Base' student is male, non-metropolitan, English-language background, from occupational group IV family.

Between 1975 and 1998, the magnitude of the parameter estimate for other language speakers decreased from -2.978 to -1.136, indicating a decrease of more than one-half in the difference between students from homes where English is the main language spoken and students from homes where a language other than English is the main language spoken. A similar decrease in the effects of language background was seen in reading comprehension. For the 1989 cohort, location was significant, as it was for reading comprehension, but for the other cohorts, location was not significant, indicating that mean mathematics scores for students from metropolitan locations were equivalent to scores for students from non-metropolitan locations when all other variables in the model are held constant.[3]

School-level Influences

During the period 1975-1998, estimates for mathematics for the percentage of students in the school whose parents were in occupational group I changed, as they did for reading comprehension. The parameter estimate of 0.036 was significant in 1975 (p=.043); in 1989, at 0.081, it was highly significant (p<.001); in 1995, at 0.096, it was highly significant (p<.001); and in 1998, at 0.108, it was highly significant (p<.001). It was noted above that the influence of an individual student's socioeconomic status, as measured by the difference between occupational group I and occupational group IV, declined between 1975 and 1995. Across the three cohorts, the school-level measure of socioeconomic status was statistically

[3] More recent LSAY analyses use a finer classification system for location based on the Accessibility/Remoteness Index of Australia (ARIA). Only the 1995 and 1998 cohorts can be assigned ARIA scores, limiting the classification in this paper to metropolitan or non-metropolitan locations.

significant and increased during the period. This result for mathematics is similar to the result for reading comprehension. The magnitude of the measure of socioeconomic disadvantage—the percentage of students in the school with parents in occupational group IV—declined over the period and was not significant in 1998.

In 1975 and 1995, the parameter estimate for the proportion of students in the school who came from homes where a language other than English was the main language spoken was statistically significant, although it decreased in magnitude from –0.095 (p=.009) to –0.041 (p=.009). In 1998, this school-level variable was not significant. With the finding that the parameter estimate for the corresponding student-level variable also decreased over the same period, this is a strong indication that as a group, students from homes where English is not the main language have improved their level of achievement in mathematics, as shown for their achievement in reading comprehension.

Overall Trends

There was little change in scores in reading comprehension between 1975 and 1998 among the subgroup of 14-year-old students, although there was a small, statistically significant decrease among the full cohorts. During the same period, there was a small increase in the mean score in mathematics among 14-year-olds, but this increase was not statistically significant, and no increase among the full cohorts. In the United States, findings from the National Assessment of Educational Progress (NAEP) noted that 13-year-olds showed a 'modest' increase in reading scores between 1975 and 1999, and a stronger increase in mathematics during the same period (NCES, 2000). In general, the findings reported here are consistent with findings for American students over the same period.

Female 14-year-olds scored 0.5 points higher in reading comprehension in 1998 than they did in 1975, and male 14-year-olds scored 0.6 lower. For both, these differences were statistically significant. As a result, the difference between males and females in reading comprehension scores increased from 0.9 in 1975 to 2.0 in 1998. In all cohorts, the difference between 14-year-old males and females in reading comprehension was statistically significant. In mathematics, 14-year-old male students increased their mean score by 0.6 points between 1975 and 1998, and female students increased theirs by 0.2. In both 1975 and 1998, the differences between males and females were statistically significant.

Similar gender differences were identified in trends in NAEP among 13-year-olds in the United States, with females scoring higher on tests of reading comprehension and males scoring higher on tests of mathematics (NCES, 2000). International studies of academic achievement, however, indicated no gender differences in mathematics among Australian 13-year-olds or 15-year-olds. The differences in reported results of literacy and numeracy achievement—between results in this report and results from TIMSS (Mullis, *et al*, 2000) and PISA (OECD, 2001)—may be the result of differences in the types of assessment used, with LSAY achievement tests requiring less reading than the TIMSS and PISA tests.

There were large increases in achievement among students for whom the main language spoken at home was a language other than English. In reading comprehension, 14-year-old students with language backgrounds other than English improved their mean by 3.0 scaled score points between 1975 and 1998, while English-language background students maintained their mean score. In mathematics, 14-year-olds from other language backgrounds improved their mean by 3.8 points, while English-language background students increased their mean by 0.4 points. For students from homes where English is not the main language spoken, the increases in scores were statistically significant. Although the differences in the mean scores decreased over the period, the differences between language groups (English and other language) were statistically significant in both 1975 and 1998. In the multivariate analyses, the negative effect of other-language background on achievement scores decreased over the period but remained statistically significant.

Language background also had a statistically significant effect at the school level. The multivariate analyses showed, in addition to the influence of language background at the student level, that as a school's percentage of students from other language backgrounds increased, its scores on tests of reading comprehension and mathematics decreased. Like the effect at student level, the effect at school level has decreased, even though it remains a significant factor.

Among 14-year-old students, those with parents in the production/labourers group (occupational group IV) had relatively stable mean scores in reading comprehension with a slight, non-significant decrease in 1998. In mathematics, mean scores for this group fluctuated over the period, but in 1998 they were the same as in 1975. This stability must be contrasted against the change for students from occupational group I, whose mean scores in both reading comprehension and mathematics declined significantly during the period. As a result, the differences between groups I and IV declined, although they remained significantly different. These differences were confirmed in the multivariate analyses.

In their report on reading and mathematics achievement using data up to 1995 from the same sources used here, Marks and Ainley (1997, p. 15) stated that there was 'a decline in differences in achievement according to occupational background'. The 'decline in differences' did not continue into 1998, and *increased* again for scores on tests of reading comprehension in the multivariate analyses. In their analyses, Marks and Ainley used no school-level measure of socioeconomic status. The analyses reported here included two such measures—the percentage of students in the school from occupational group I and the percentage from group IV.

For reading comprehension, the school-level effect of students from occupational group I increased from a non-significant influence in 1975 to a highly significant influence in 1995 and 1998. During the same period, the school-level effect of students from occupational group IV decreased, from highly significant in 1975 to non-significant in 1998. In 1975, a school with a higher concentration of students with professional and managerial group parents had no particular advantage over a school with a lower such concentration, while a school with a higher concentration of students with parents who were production workers and labourers was at a disadvantage when assessing influences on reading comprehension test scores. In 1998, this situation was reversed, with influence from higher group I concentrations and no influence from higher group IV concentrations. For scores in mathematics, there was a similar declining influence regarding the percentage of parents from group IV, but for parents from occupational group I, there has been a significant effect in all cohorts.

Small, non-significant differences were found in mean scores between students from non-metropolitan schools and students from metropolitan schools. There were also non-significant differences noted in the multivariate analyses.

Discussion and Implications

In 1975, when students in the first cohort in this report were tested, the war in Vietnam ended. In May of that year, post-war refugees began arriving from that and neighbouring countries in greater numbers than had arrived previously. Since then, immigration from South East Asia and other countries where English is not the main language spoken has increased dramatically. Between 1986, when data were first collected, and 2000, the last year for which data are available, the number of students from other language backgrounds enrolled in New South Wales government schools rose by 60 per cent (NSW Department of School Education, 1993a; NSW Department of Education and Training, 2000). In that time, the proportion of students from language backgrounds other than English rose from 15.2 per cent to 23.7 per cent of all enrolments. Between 1986 and 1992 alone, the number of students from Chinese-speaking backgrounds increased from 9,550 to 19,763; from Vietnamese-speaking backgrounds, from 6,830 to 10,921; and Arabic-speaking backgrounds, from 15,227 to 23,379 (NSW Department of School Education, 1993b).

With such dramatic changes in their clientele, schools found it necessary to ensure positive educational outcomes for a wider range of students from language backgrounds other than English. The data presented in this report show that Australian schools have been successful in providing educational opportunities and achieving positive outcomes for many of these students, reducing differences in scores between students from English-language backgrounds and students from other-language backgrounds, as measured at the student level and at the school level.

While achievement differences by language background have clearly decreased, changes in differences attributable to socioeconomic status are not as simple to describe. At the individual student level, there was a decrease in the impact of socioeconomic status, as measured by parent's occupational group, although between 1995 and 1998 that decrease did not continue. At the school level, however, there was an increase in the influence of socioeconomic status. During this same period there were a number of changes in the organisation of schooling in Australia, which may have had an influence on school and student achievement. The proportion of students attending non-government schools increased dramatically; rapidly increasing home prices in some suburbs of major cities created exclusive residential zones, which in turn have also become exclusive school zones; state education policies that eliminate or reduce school zoning practices have benefited only those with the resources to take advantage of attendance at non-local schools. Recent evidence from the United States suggests that school choice policies may have benefited only those who are able to exercise these options—wealthier, non-minority families (Goldhaber & Eide, 2002; Holme, 2002). The limited availability of school-choice options in Sydney was noted in a study on the education of primary school children identified as 'gifted', prior to the expansion of selective and specialist schools in New South Wales (Rothman, 1983).

As a result of the increase in 'de-zoning' and school-choice programs in Australia, there has been a greater socioeconomic segmentation of schooling, which is reflected in the transfer of the effects of socioeconomic status from the individual level to the school level. In the ASSP 1975 sample, only 18 per cent of schools enrolled more than half of its students from families in occupational group I; in the 1998 sample, that figure had grown to 41 per cent of schools, indicating a greater concentration of students from high-SES families. During the same period, there has not been a similar shift in the number of schools with more than half of its students coming from families in occupational group IV.

Educational programs that were designed to ameliorate the effects of socioeconomic disadvantage have been changed over the last decade, shifting in emphasis from whole-school approaches to individualised remedial approaches. With the growing segregation of schools along socioeconomic lines, the achievement trends reported here suggest that it may be more appropriate to re-evaluate which programs should target individual students and which should target schools, especially as it appears that school-level socioeconomic status—when viewed as the proportion of higher-SES parents in the school community—may have a greater influence than student-level socioeconomic status on student achievement. Further research is required to examine whether student achievement would be improved more through programs that target schools with high concentrations of students from lower socioeconomic groups than those that distribute resources to individual students regardless of the schools they attend.

Students from metropolitan areas do not appear to be disadvantaged by their location; neither do students from non-metropolitan areas. Metropolitan students achieved scores equivalent to their non-metropolitan counterparts, once other characteristics of the school are considered. It is important that educational policies that target non-metropolitan students continue to concentrate on issues of access. Programs for students from non-metropolitan areas should ensure that there are opportunities for students to undertake studies in a wide range of school subjects and to communicate with people with skills to enhance their knowledge. Jones (2002), analysing LSAY 1995 and 1998 data for outcomes by geographic location, used a six-category classification scheme for student location. He found that students from remote areas scored lowest on the reading comprehension and mathematics tests, but that students from other non-metropolitan areas (small and large provincial cities) scored above average. The higher achievement scores of students from non-remote non-metropolitan locations would account for the non-significant differences found in the present study between students from metropolitan locations and students from non-metropolitan locations.

Finally, while it is not possible to discuss changes in the performance of Indigenous Australian students over time, it is important to acknowledge that there were large differences between the mean scores for Indigenous students and mean scores for non-Indigenous students. In reading comprehension, the mean for Indigenous students was between 6 and 7 points lower than the mean for non-indigenous students; in mathematics, it was 5 to 6 points lower. These differences can not be translated into age or year levels, but they can be discussed in light of other reports using LSAY data. Marks, *et al* (2000) reported that students from the lowest achievement quartile had the lowest rates of participation in Grade 12 and higher education. Marks, *et al* (2001) reported that the greatest influence on tertiary entrance scores was prior academic achievement, as measured by the tests used here. Lamb and McKenzie (2001) found that lower-achieving students were more likely than others to experience unsuccessful transitions from school to employment. Lower achievement in reading comprehension and mathematics has been associated with lower engagement with school (Fullarton, 2002). Continued lower achievement levels for Indigenous Australian students will lead to continued lower participation and engagement in education beyond Grade 9 and continued lower activity in employment. It is important that school and community programs designed to increase literacy and numeracy levels among Indigenous Australians are successful, and that they are given all resources necessary to ensure successful outcomes.

REFERENCES

Coleman, J.S., Campbell, E.Q., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D., and York, R.L. (1966) *Equality of educational opportunity*. Washington, DC: US Government Printing Office.

Commission of Inquiry into Poverty (1976) *Poverty and education in Australia. Fifth main report.* (R.T. Fitzgerald, Commissioner). Canberra: AGPS.

Fullarton, S. (2002) *Student engagement with school: Individual and school-level influences*. LSAY Research Report No. 27. Melbourne: Australian Council for Educational Research.

Goldhaber, D.D., and Eide, E.R. (2002) What do we know (and need to know) about the impact of school choice reforms on disadvantaged students? *Harvard Educational Review 72*, 157-176.

Holme, J.J. (2002) Buying homes, buying schools: school choice and the social construction of school quality. *Harvard Educational Review 72*(2), 177-205.

Jencks, C., Smith, M., Acland, H., Bane, M.J., Cohen, D., Gintis, H., Heyns, B., and Michelson, S. (1972) *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books.

Jones, R.G. (2002) *Education participation and outcomes by geographic location*. LSAY Research Report No. 26. Melbourne: Australian Council for Educational Research.

Karmel, P. (chair) (1973) *Schools in Australia. Report of the Interim Committee*. Canberra: AGPS.

Karmel, P. (chair) (1985) *Quality of education in Australia. Report of the Review Committee*. Canberra: AGPS.

Lamb, S., and McKenzie, P. (2001) *Patterns of success and failure in the transition from school to work in Australia*. LSAY Research Report No. 18. Melbourne: Australian Council for Educational Research.

Marks, G.N., and Ainley, J. (1997) *Reading comprehension and numeracy among junior secondary school students in Australia*. LSAY Research Report No. 3. Melbourne: Australian Council for Educational Research.

Marks, G.N., Fleming, N., Long, M., and McMillan, J. (2000) *Patterns of participation in Year 12 and higher education in Australia: Trends and issues*. LSAY Research Report No. 17. Melbourne: Australian Council for Educational Research.

Marks, G.N., McMillan, J., and Hillman, K. (2001) *Tertiary entrance performance: The role of student background and school factors*. LSAY Research Report No. 22. Melbourne: Australian Council for Educational Research.

Marsh, H.W., Smith, I.D., Marsh, M., and Owens, L. (1988) The transition from single-sex to coeducational high schools: Effects on multiple dimensions of self-concept and academic achievement. *American Educational Research Journal 25*, 237-269.

Ministerial Council on Education, Employment, Training and Youth Affairs (1999) *The Adelaide declaration on national goals for schooling in the twenty-first century*. Melbourne: MCEETYA.

Mullis, I.V.S., Martin, M.O., Gonzales, E.J., Gregory, K.D., Garden, R.A., O'Connor, K.M., Chrostowski, S.J., and Smith, T.A. (2000) *TIMSS 1999 international mathematics report*. Boston: International Study Center, Boston College.

National Commission for Excellence in Education (1983) *A nation at risk: The imperative for educational reform*. Washington, DC: US Government Printing Office.

New South Wales Department of Education (1988) *Changing enrolment patterns in Australian schools*. Sydney: Department of Education, Management Information Services.

New South Wales Department of Education and Training (2000) *Students of non-English speaking background, 2000*. Sydney: Department of Education and Training, Strategic Information and Planning Directorate.

New South Wales Department of School Education (1993a) *Students of non-English speaking background: Mid-year census 1993*. Sydney: Department of School Education, Management Information Services Directorate.

New South Wales Department of School Education (1993b) *Students of non-English speaking background in NSW government schools 1986-1992*. Sydney: Department of School Education, Management Information Services Directorate.

Organisation for Economic Co-operation and Development (2001) *Knowledge and skills for life: First results from PISA 2000*. Paris: OECD.

Rothman, S. (1983) *The gifted child movement in New South Wales: public schools and the new class*. Unpublished MEd thesis, University of New England, Armidale, NSW.

APPENDIX 1. RESULTS OF MULTIVARIATE ANALYSES FOR ALL COHORTS

Table A 1 Results of multivariate analyses for reading comprehension tests, 1975-1998

	1975			1980			1989			1995			1998		
	Estimate	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**
Student level															
Intercept	51.637			49.265			52.300			50.604			51.142		
GENDER	0.598	0.332	0.071	1.434	0.320	<0.001	0.144	0.321	0.653	1.502	0.239	<0.001	1.614	0.240	<0.001
METRO	0.251	0.559	0.653	2.086	0.570	<0.001	-1.262	0.467	0.007	0.239	0.342	0.485	0.059	0.330	0.859
OTHLANG	-5.005	0.700	<0.001	-3.648	0.854	<0.001				-3.462	0.427	<0.001	-2.599	0.409	<0.001
OCCI	3.705	0.391	<0.001				3.048	0.400	<0.001	1.753	0.316	<0.001	2.605	0.310	<0.001
OCCII	2.135	0.424	<0.001				1.758	0.455	<0.001	0.522	0.375	0.164	1.239	0.401	0.002
OCCIII	1.630	0.419	<0.001				2.131	0.464	<0.001	-0.067	0.348	0.848	0.583	0.337	0.084
School level															
POTHLANG	-0.104	0.035	0.003	-0.179	0.020	<0.001				-0.043	0.014	0.004	-0.039	0.014	0.004
POCCI	0.015	0.017	0.367				0.070	0.014	<0.001	0.083	0.012	<0.001	0.102	0.012	<0.001
POCCIV	-0.118	0.024	<0.001				-0.048	0.019	0.013	-0.050	0.018	0.006	-0.023	0.020	0.243

Table A 2 Results of multivariate analyses for mathematics tests, 1975-1998

Maths	1975			1980			1989			1995			1998		
	Estimate	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**	**Estimate**	**s.e.**	**p-value**
Student level															
Intercept	50.861			49.744			50.981			50.806			50.864		
GENDER	-1.135	0.367	0.002	-0.943	0.339	0.006	-1.847	0.327	<0.001	-1.720	0.239	<0.001	-2.060	0.233	<0.001
METRO	0.818	0.587	0.164	2.105	0.600	0.001	-1.563	0.485	0.002	0.386	0.359	0.282	0.162	0.348	0.641
OTHLANG	-2.978	0.774	<0.001	-3.267	0.594	<0.001				-1.071	0.426	0.012	-1.136	0.397	0.005
OCCI	4.442	0.433	<0.001				3.464	0.408	<0.001	2.243	0.315	<0.001	2.376	0.301	<0.001
OCCII	2.121	0.468	<0.001				1.902	0.463	<0.001	0.658	0.374	0.078	1.294	0.390	0.001
OCCIII	1.957	0.463	<0.001				2.207	0.472	<0.001	0.462	0.347	0.184	0.762	0.328	0.020
School level															
POTHLANG	-0.095	0.036	0.009	-0.206	0.023	<0.001				-0.041	0.016	0.009	-0.015	0.015	0.324
POCCI	0.036	0.018	0.043				0.081	0.014	<0.001	0.096	0.013	<0.001	0.108	0.014	<0.001
POCCIV	-0.066	0.025	0.009				-0.062	0.020	0.002	-0.041	0.020	0.039	-0.004	0.022	0.858