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Student Mobility, Attendance, and Student Achievement: The Power of Implementing a Unique Student Identifier (USI)

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Conference Paper Contributors:
Roland Simons, Margo Bampton, Andrea Findlay and Alistair Dempster.
Supporting work conducted by Susan Daniel, Nicholas White and Penny Howland.

ABSTRACT

One of the major problems in unpacking the enduring relationship between Socio-Economic Position (SEP) and student achievement is the multi-dimensional nature of SEP. Student SEP is often considered to be an amalgam of parental socio-economic position, social class, and disadvantage. In this respect SEP is a very broad term and it becomes difficult to target education programs based on this information alone. In this paper we investigate the role of disruptions to schooling (mobility and attendance) in explaining the general relationship between SEP and achievement. Mobile and absent students represent a unique challenge for educational jurisdictions, not only because they are difficult to monitor but also because it is difficult to ensure they receive integrated support and teaching. Recent forays in Australia toward value-added measures have further accentuated the need for a careful consideration of mobile and non-attending students. This paper highlights the benefits of database integration and a unique student identifier (USI) based on initiatives implemented by the Department of Education, Training, and the Arts in Queensland. It was found that the use of the USI considerably enhanced the accuracy and efficiency of data usage. Furthermore, the enhanced student tracking capacity allows for considerable exploration of the mobility, attendance, and performance patterns of students. Results indicated that substantial proportions of the SEP – achievement relationship can be explained by school disruptions. These results demonstrate, empirically, that continuity of schooling is an important way in which SEP can influence a child's achievement potential. Implications for the use and interpretation of value-add measures as well as theoretical models of the relationship between SEP and student performance are also presented.

INTRODUCTION

Previous research (Simons, Bampton & Bode, 2006) investigated the relationship between socio-economic background and student achievement and concluded that, at least in Queensland, the relationship was identified regardless of the type of measure used (e.g., parental education, parental occupation, 5 year old census data) or level of analysis (student/family versus school). The paper noted, as have many other authors in the field, that although the relationship was identified as being extremely robust that the concept of socio-economic position (SEP) was extremely difficult to decompose into actionable interventions for education service providers (Roby, 2004; Entwisle, Alexander & Olson, 2004; Marks, McMillan, Jones, & Ainley, 2000). Socio-economic position is a generic indicator of advantage or disadvantage and as such reveals very little about the ways in which some students are differentially affected by advantage/disadvantage. It is those relationships that are necessary to identify if we are to be able to target suitable interventions.

In this paper we argue that previous research which has claimed that student mobility and attendance does not influence student achievement after socio-economic background is controlled for does not recognise that SEP and mobility/attendance are likely to be (in part) proxy measures for the similar underlying factors. Furthermore, we argue that SEP is a much more powerful measure than mobility/attendance due to its broader definition and greater natural variation across samples and therefore we are more likely to find greater associations between student achievement and SEP than between student achievement and mobility/attendance. However SEP is a multi-dimensional construct and this clouds the interpretation of any relationship involving it. Therefore we argue that it is imprudent to conclude that SEP and mobility or attendance measures are measuring different factors. Instead they are likely to be measuring the same underlying factors with varying degrees of specificity. We argue that the relationship between SEP and achievement can be progressively unpacked into a model of theoretically distinct and clear concepts. The greater clarity that is afforded by this model makes the development of intervention programs easier to design, promote and monitor.

To answer the research questions this study outlines the results of a large scale longitudinal analysis of student achievement on standardised tests of literacy and numeracy in Year 7 in 2006. The study utilised a unique student identifier (USI) to match student achievement data with enrolment and attendance patterns in government schools in Queensland, Australia. The study tracked over 35,000 primary school students across a six year period, from year 2 to year 7.

The context of longitudinal student databases in Australia

As the issue of quality research in Australian universities is being actively debated and implemented at the present time, increasing pressure is being brought to bear on education researchers, amongst others, to demonstrate relevance and worth in the face of high barriers to entry and limited opportunities to conduct empirical studies. There remains an emphasis on qualitative research in education which, for the large part, is highly appropriate given the complexity of the pedagogical experience. However, large scale evaluations of theoretical models, empirical relationships and the intervention programs that arise from qualitative research are rarely engaged in because of the difficulties and costs involved. This state of affairs has given rise to a literature replete with exploration and innovation but much less evaluation and large-scale intervention. Add to this the costly nature of longitudinal research programs and the nature of quantitative research in educational arena becomes even more problematic when compared to research in the fields of psychology, business, sociology, and health. It is not surprising therefore that studies into predictors of student test performance with sample sizes over 1000 students are comparatively rare in education literature.

The issue of student testing is in itself sensitive. Students in almost all OECD countries, and many non-OECD countries, are required to participate in regular achievement testing designed to estimate level of performance. This requirement makes it difficult for external researchers to gain approval to engage their own empirical tests of performance for fear of creating an additional burden for students or simply for cost and logistical considerations. It is therefore the schooling authorities in each state / county who are the gatekeepers of student achievement data that is so critical to studies of student performance. In Australia, the test data in primary schools are largely governed by state based authorities, both government and non-government, often working collaboratively to monitor and report on student performance within their jurisdictional boundaries.

As the primary role of state based authorities is to deliver and report on educational services, many databases are created and managed independently of each other, often in ways that are difficult to link. For example, student achievement data may be compiled in central databases whilst student attendance and disciplinary actions are located at the schools. This separation of different sources of data is often a major obstacle for research both for university and government researchers alike.

There is a growing trend toward formal departmental research strategies in Australia and the ability to link the data at an individual level is an essential component of empirical study into drivers of student achievement.

Whilst departmental research tends to focus on policy and practice related issues, this does not necessarily preclude it from academic relevance. If the student matching and data integration issues were to be suitably addressed, the quantity and quality of data available in departmental databases would be sufficient to support powerful investigations of relationships and questions that are relevant to some of the most fundamental issues in education. Provided that the public ethical considerations are maintained and that exploring relationships may result in public benefit there should be little reason not to publish findings.

In recent years, highlighted by the work conducted in Queensland, the emphasis on collating data files has been gaining momentum with discussions proceeding on two fronts. The primary emphasis appears to be the centralisation of data across schools and secondary emphasis is the implementation of USIs. The Queensland state schooling sector appears considerably more advanced than most with regard to these developments, having instituted centralised database management and unique student identifiers as early as 1999 for many types of data.

Based on the strength of the Queensland data, this research paper investigates the relationships between indicators of schooling disruption (i.e., student mobility and attendance) and student achievement with a large longitudinal database that tracks primary state school student achievement and enrolment patterns across a 6 year period. The aim of this paper is to build on previous research into socio-economic position and student achievement (Simons, Bampton & Bode, 2006) and to report empirical results that investigate differential predictors of student performance.

Student mobility

Student mobility has often been linked with student achievement in the literature (Offenberg, 2004; Osher & Bailey, 2003; Strand, 2002; Alexander, Entwisle & Dauber, 1996). The effect of student mobility on student achievement is commonly expressed as an indicator of the impact of disruptions such as curriculum inconsistency, home environment upheaval, and social network changes on student learning (Strand & Demie, 2006; Demie 2002; Strand, 2002; Mantzicopoulos, 2001). Direct relationships between mobility and achievement have established a consistent negative correlation that suggests higher mobility is associated with lower scholastic success (Sanderson, 2004; James & Lopez, 2003; Rumberger, 2003; Smrekar & Owens 2003; Skandera & Sousa, 2002; Heinlein & Shinn, 2000). Interestingly, the relationship appears to be contingent in that a range of studies have demonstrated the disappearance of the relationship when socio-economic and demographic characteristics have been controlled for (Titus, 2007; Strand & Demie, 2006; Strand, 2002; Wright, 1999).

Student mobility is typically referred to as the frequency of transitions between schools recorded as either number of moves or number of new schools attended. Whilst the reasons for student mobility are often vast there is a common expectation and belief that high mobility is linked to lower student achievement (Offenberg 2004; Strand, 2002).

Regardless of the trend in findings that suggest mobility and low achievement are co-occurring symptoms the argument that mobility has no impact on achievement seems counter intuitive, indeed many anecdotal and theoretical arguments suggest causation (Rumberger, 2003). Such is the allure of linking mobility and achievement that papers persist in the presentation of direct relationships independent of contextual factors such as socio-economic background often making causal inferences, such as:

> "Educators need to develop strategies that target their school population and to work with parents and inform them about the negative effects of changing schools." (Engec 2006, p 178).

So what are we to believe? Might there be methodological problems with emerging work controlling for socio-economic background or are the issues more indicative of the size of the effect of mobility on achievement? There is some evidence to suggest that number of moves should directly impact student achievement. For example, in a study of mobility and psychological effects Mantzicopoulos and Knutson (2000) demonstrated with 90 children that school level stability was associated with student performance concluding that even after prior performance and demographic characteristics were controlled for that a relationship endured. In a qualitative study in North Queensland Sorin and Iloste (2006) conducted case studies of 5 schools and concluded a number of negative consequences of mobility were suggested.

Obtaining reasonable sample sizes with regard to student mobility is often problematic because of the difficulty in tracking students (Kerbow, 1996). A brief review of the papers that take into account contextual variables revealed considerable variation in methodology.

For example, in a study of approximately 1580 Kansas primary school students, in grades 3 and 4, Wright found that mobility was confounded by ethnicity and family income and concluded that mobility, both in time and location, is of little merit as an explanatory variable" (1999, p.352). Wright looked at students moving within a 12 month period determined by checking enrolment consistency at three distinct points in time. Similarly, studying 6400 London primary school students during the period 1995 to 1997, Strand (2002) concluded that after prior performance and proxy measures for socio-economic and demographic characteristics were controlled for the relationship between mobility and achievement was low when contrasted with other background factors. In a follow-up study Strand and Demie (2006) tracked 2279 primary school students and after controlling for their prior attainment levels found no evidence of a mobility effect on educational progress. In both the Strand and Strand and Demie studies mobility was calculated as a dichotomous variable (stable versus mobile). Mantzicopoulos and Knutson (2000) conducted a study of the impact of mobility on child adaptation, with 90 students. Instead of controlling for socio-economic background they controlled for prior achievement and gender and found an enduring relationship. Based on these studies one might conclude that the results for mobility are highly variable and maybe symptomatic of other relationships.

H1 – It was hypothesized that student mobility would be significantly associated with socio economic background and demographic characteristics.

H2 – It was hypothesized that student mobility would predict achievement before socio-economic background is accounted for but not after it is accounted for.

One of the problems may very well be the base rate of student mobility. For example, in a rare study of over 225,000 students Engec (2006) identified only 2038 students with more than 1 school move. The limited movement range and the small number of students with large numbers of moves would suggest that the power of any relationship test using mobility would be considerably smaller than that for socio-economic characteristics. Although Engec only controlled for student ethnicity a relationship between mobility and achievement endured. Few studies have incorporated as many students into their designs.

The difficulty in measuring mobility appear to be based on two factors, (1) identifying a large enough sample to adequately and reliably detect the effects of mobility and (2) tracking students over sufficiently long periods of time to determine the longitudinal impacts of mobility. When attempting research in the Australian context, the problem is only compounded by the physical distances involved.

At a different level of analysis, Offenberg (2004) argued that mobile students were difficult to factor into school performance reports not only in areas associated with "value addedness" but also due to the differential performance and typically lower socio-economic characteristics of these students. Other research investigating mobility also sought to identify the effect of mobility on non-mobile students. Kerbow (1996) investigated the net effect of large numbers of mobile students on school performance and concluded that groups of mobile students could lead to incorrect conclusions regarding the effectiveness of a school. It is possible therefore that mobile students have a net effect on the continuity of the educational teaching program that impacts all in the classroom.

H3 – It was hypothesized that that schools with with higher proportions of student mobility will demonstrate lower average achievement suggesting cohort impacts of mobility.

Student mobility can be measured in a range of ways. For example, Wright (1999) used at least one change in a 12 month period, Offenberg (2004) also used a dichotomous measure but within a 3 year period, Mantzicopoulos and Knutson (2000) used the number of transfers within a 3 year period. Two commonly used measures are, first, the total number of school transitions made by a student and the, second, the amount of time since the last school move. The second measure is a measure of student stability rather than mobility. However it identifies an additional dimension of mobility that maybe relevant. Another less commonly used method is to count the number of unique schools the student attends as some students travel between a limited number of schools suggesting possibly less disruption than might be experienced when moving to a school for the first time.

H4 – It was hypothesized the type of mobility measure employed will have an impact on the strength of relationship identified.

The findings reported in the literature regarding methodology reveal some interesting patterns. Stronger findings are commonly noted with regard to student mobility as opposed to student stability. This orientation toward stronger mobility findings maybe an artefact of the distributional characteristics of the measures, or it may represent ongoing longitudinal impacts for high mobility regardless of when it has occurred. It has often been commented that disruptions early in education are likely to have greater impacts on student performance because of the fundamental nature of the learning that has been disrupted and the way in which later year mastery depends on mastery of earlier concepts.

Perhaps one of the reasons that student mobility is so poorly associated with student achievement after socio-economic background is accounted for is that the number of students moving a large number of times is actually quite low. This limited range for the majority of students makes the relationship a difficult one to detect, especially in studies where the sample sizes of students with higher mobility are quite small. Referring to the research, it is assumed by the authors that greater variation would be identified for low SEP groups and therefore stronger relationships are possible for these groups than for higher SEP groups.

H5 – It was hypothesized that stronger relationships between mobility and student achievement would be identified for students in low socio-economic groups after socio-economic variations were controlled for.

In Australia the issue of student mobility is also one of considerable interest given the degree of distance that can be travelled between any two schools. Physical distance is likely to be related to contextual changes, particularly in Queensland. Data from the ABS indicates that the majority of household movements are intrastate in Australia (see also 2035.0 - Census of Population and Housing: Population Growth and Distribution, Australia, 2001). The experiences of change not only from shifting schools but also from shifting schools in different

contexts may play a role in disrupting student achievement. For example, the experience of attending a school in a remote location is likely to be very different from attending a school in the state capital. Not only is the issue of curriculum disruption suggested by the physical relocation of a student but also by the amount of time it takes to reach the destination and entrée into the school.

It is likely that the timing of student mobilisation is critical to the impact on educational experiences. Changes made within a school year within a teaching program are more likely to be disruptive than changes at natural breaks in schooling (e.g., Christmas holidays, mid-year break; Malmgren & Gagnon, 2005). Naturally, mobility related disruptions should be viewed in the context of smaller perhaps more frequent disruptions suggested by attendance.

Student Attendance

We refer to student attendance here in its basest sense as an indicator of disruptions to schooling but note its potential value as an extreme indicator of student engagement. Student attendance is defined here as the rate of attendance. It is the total number of days a student attended school as a function of the total number of days the student could have attended school.

It is often argued that student scholastic success is a function of student engagement. There are a great many factors that are identified as contributing to student engagement (including standards, teacher support, relevant and interesting curriculum, and personalised learning environments; Rogers & Renard, 1999) and there are a great many ways of measuring engagement. Whilst numerous studies measure engagement via self-report techniques such as surveys (e.g., Handelsman, Briggs, Sullivan, and Towler, 2005) these are open to response bias' and less suitable for use by primary school students who maybe less able or inclined to openly express their engagement than more mature samples. Direct measures of student engagement can range from expert ratings of student task engagement, successful task completion, to observation of particular classroom behaviours (Dolezal, Welsh, Pressley, & Vincent, 2003). A more extreme indicator of student engagement commonly used in the literature is student attendance (Klem & Connell, 2004).

In general research has indicated that greater absenteeism is associated with lower achievement (Dolezal, Welsh, Pressley & Vincent, 2003; Klem & Connell, 2004). The relationship between student achievement and attendance has been argued to be a recursive one in which those students who are lower performing are more likely to reduce their attendance rate which in turn impacts their subsequent achievement and so on until finally they drop out (Jones, 1984; Knesting & Waldron, 2006).

Despite the primary emphasis on student engagement, it is worth noting that a wide range of possible reasons may explain student attendance patterns (e.g., SEP, Marsh, 2000; health, Taras & Potts-Datema, 2005). Some have argued that lower student attendance will result in lower achievement as a simple function of reduced opportunity for knowledge transfer.

There have been differing approaches with regard to examining the relationship between attendance and student achievement. Implicit in many studies is the assumption of linearity as noted by the use of correlation and regression analyses (e.g., Van Blerkom, 1992). Yet it has been demonstrated that assumptions of both normality and linearity are not typically appropriate for absenteeism data which are Poisson distributed suggesting that the effects maybe strongest in the first few days then the effect of each subsequent day of non-attendance having proportionally less effect (Karweit, 1976). At the very least, these assumptions should be checked.

H6 – it was hypothesized that the relationship between attendance and student achievement is linear

Although the relationship between student attendance and achievement has been repeatedly suggested in a number of studies (Roby, 2004), relatively little has been done with regard examining the shared variance between attendance and socio-economic background although a relationship maybe evident (Cobbold, 2006; Rothman, 2001).

H7– It was hypothesized that student attendance would predict achievement before socio-economic background is accounted for but not after it is accounted for.

As with student mobility, the effects of low student attendance on class achievement have been put forward with the argument that schools distinguished by lower overall attendance will demonstrate relationships for students who are characterised by high attendance. Peer effects are a notable feature of the research (Finn, 1989). It has

been argued that this is likely to be the function of the classroom disruptions caused by attending to students with gaps in their knowledge.

H8 – It was hypothesized that cohort level effects will be identified for attending students in classes containing lower proportions of attending students than for those with greater proportions of attending students.

Explaining the relationship between achievement and socio-economic position

In acknowledging that the concept of SEP is often defined as a multi-dimensional factor it becomes difficult to understand how to address this relationship in an educational setting. The complexity of the relationship was outlined by Marks, McMillan, Jones, and Ainley (2000) who summarised a matrix of common explanations as follows:

Level	Culture/Values	Material/Physical Resources
Student	Aspirations Feelings of self-worth Attitude to education	Ability Disability
Family	Aspirations for their children Parental attitudes to education Cultural capital Elaborated and restricted codes of speech	Parent's income/wealth A room for study A desk Atlas Encyclopaedia and other books in the home
School	Attitude of teachers Organisation of curriculum Discipline Student body	State of buildings Laboratories Library Computing Class sizes Quality of teaching
Community	Ethnic and class sub-cultural factors Social capital	Physical environment of community Area attracts good/bad students and/or teachers

In the face of such a myriad of explanations it becomes difficult to formulate a service delivery response. Can an investigation of student behaviours (e.g., mobility and attendance) shed more light on the general achievement and SEP relationship?

H9 – It was hypothesized that student characteristics, attendance behaviour and mobility patterns would help to explain the relationship between SEP and student achievement.

In this study we sought to investigate the relationship between specific indicators of student behaviour to further develop our understanding of the explanatory variables that might predict student achievement. We assert that with longitudinal student level data of sufficient size, length and accuracy that variables such as mobility and attendance can be used to decompose the SEP – achievement relationship to a level that suggests at least mutual dependence or at most a causal relationship (Donathan, 2003).

METHOD

Three major phases of analysis were undertaken – in the first, student mobility and its relationship with achievement was undertaken; in the second, student attendance and its relationship with achievement was undertaken; in the third, these factors were examined together.

Sample

All analyses were based on the cohort of students enrolled in Year 7 in a Queensland state school in August 2006, with the USI used to match students across a range of databases. Table 1 gives an outline of the number of students with data available for the different analysis phases. In this analysis, students have been counted as 'Indigenous' if they were identified as Indigenous in the August 2006 enrolment collection.

*Mobility***.** These analyses explored the students' enrolment history in Queensland state schools from February 2001 to August 2006. The enrolment data was sourced from the enrolment collections undertaken in February, August and November of each year.

The data records the school at which the student was enrolled at the collection dates, and cannot identify what movement, if any occurred between these collection dates. This means that for some students their mobility may be *under-reported*.

A small number of students were excluded from the matching of data from 2001 to 2006 because they were enrolled part-time, or were enrolled in Special Schools or Schools of Distance education, or were enrolled in non consecutive grades (e.g,. repeated a year level).

*Attendance***.** These analyses were based on the attendance data for students in semester 1 2006. These data are collected centrally, for the year, in November and so were available only for those students still enrolled at their August school in November.

*Matched Attendance and Mobility Sample***.** Of the 39,467 students from the attendance data 1086 were excluded because they were not enrolled in a state school in semester one, data was collected at a later date and not during the Nov collection, they had left the state school system at the time of the collection, or they had been enrolled at a new school after July. The analysis in this report on matched mobility and attendance is based on the remaining 38,381 students.

Table 1: Student numbers and percentages within the cohorts of data items available for examination of variables for analysis

Number of Year 7 students	Mobility	Attendance	Combined
Enrolled in a state school in August 2006		**41,261**	
Number of students in the 'Sample' after exclusions	**40,181**	**39,467**	**38,381**
Demographic			
Indigenous	3,026	2,900	2,733
Male	20,641	20,345	19,736
Female	19,539	19,122	18,645
Location			
Brisbane Metropolitan region	25,756	25,312	24,791
Provincial City	4,520	4,436	4,336
Rural Region	8,309	8,138	7,799
Remote Region	1,596	1,581	1,455
Disadvantaged School Index			
High	8,096	7,864	7,967
Mid-high	14,721	14,957	14,238
Mid-low	11,357	10,847	10,586
Low	5,930	5,765	5,560
Excluded		34	30
No full days absent		4,502	

% of Year 7 students	Mobility	Attendance	Combined
Demographic			
Indigenous	7.5%	7.3%	7.1%
Male	51.4%	51.5%	51.4%
Female	48.6%	48.5%	48.6%
Location			
Brisbane Metropolitan region	64.1%	64.1%	64.6%
Provincial City	11.2%	11.2%	11.3%
Rural Region	20.7%	20.6%	20.3%
Remote Region	4.0%	4.0%	3.8%
Disadvantaged School Index			
High	20.1%	19.9%	20.8%
Mid-high	36.6%	37.9%	37.1%
Mid-low	28.3%	27.5%	27.6%
Low	14.8%	14.6%	14.5%
Excluded		0.1%	0.1%
No full days absent		11.4%	

MEASURES

A number of measures of mobility and attendance were derived from the available data, and tested for their explanatory power with achievement. A number of measures of socio-economic position are available.

Mobility

Number of transitions: This was measured as the number of times a student's school location on any collection date was different to that of the previous collection. This includes instances of non-enrolment and returns to earlier schools (about 6% of students returned to their original school). The number of changes also includes a student's first entry into the state school system if they entered the system after February 2001.

Timing of transitions: Mobility was also examined as a function of (1) the number of transitions between the beginning of Year 2 and the beginning of Year 5, (2) the number of transitions between the beginning of Year 5

and mid-Year 7, (3) the number of transitions at 'natural breaks' in schooling [i.e. between November and February], and (4) the number of transitions that interrupt the school year [i.e. between February and August or between August and November].

Length of time in their current school (stability): Stability was measured as the length of time for which they had been *continuously* enrolled at the school of their August 2006 enrolment.

Number of schools enrolled in: Mobility was measured as the number of different Queensland state schools in which a student had been enrolled.

Kilometres travelled: Mobility was further analysed in terms of the distance of August 2006 Year 7 students' most recent move between schools. The distance between schools has been calculated for those students whose most recent change of school was from another Queensland state school.

Attendance

Full Days Absent: Full days absent was measured as a full day absent during semester one 2006. Retrospective data were centrally collected in November, and included the dates of absence. A student's complete Full Days Absent score is simply an accumulation of these individual days.

A Full Day Absent could be recorded based on a range of reasons including unexplained, illness, holiday, suspension, exclusion, cancellation, other, and unauthorised.

Episode: The episode measure indicates the number of distinct periods of absence a student took. For example, if a student was absent for two consecutive full days, this would count as one episode. If a student took five consecutive full days absent, this would also count as one episode. The Episode measure is then a count of these periods of absence not in duration but in the number of instances.

This was further broken down into Average Episode length and Maximum Episode length.

> *Average Episode Length:* The average number of days absented across the number of episodes.
>
> *Max Episode:* The greatest number of consecutive full days absent a student accumulated in a single episode.
>
> *Attendance Rate:* This score was obtained by dividing of the number of full days attended with the total possible full days the student could have attended. The resulting figure was expressed as a percentage. The possible full days attended is the length of semester one school days excluding weekends, public holidays etc. Full days attended is Possible full days minus full days absent. Consideration was given to students who enrolled within the semester, in which case the total number of possible full days was calculated from the enrolment date to the end of semester.

Achievement

Year 3, 5, and 7 student achievement tests: In Queensland student achievement is measured in primary school in Years 3, 5, and 7 on the curriculum areas of Reading, Writing, and Numeracy. These tests are administered in August of each year to the relevant cohorts. The tests are horizontally and vertically equated using Rasch modelling techniques by the Queensland Studies Authority who then provide standardised scale scores for each student. Results of the standardisation process are then provided to state and non-state education providers who then utilise the data for reporting purposes. Independent assessment of the test reliability suggested Cronbach alphas of 0.84, 0.75, and 0.78 for Reading, Writing, and Numeracy respectively in 2006.

Socio-Economic Position (SEP)

School IRSED: The average IRSED value was calculated based on the student residential postcodes for all students enrolled at each school. This is calculated on a 5 yearly basis, in the year following the release of the census IRSED values for collection districts. For the majority of analyses presented in this paper, the students were assigned the school average IRSED as an indicator of their SEP.

It should be noted that a range of other measures were investigated, as had been conducted in Simons, Bampton, and Bode (2006), in parallel with School IRSED that are not reported to any great extent here although some references are included. These included (1) the IRSED based on the school location postcode, (2) the student IRSED based on student postcode, (3) a student SEP category based on parent occupation, and (4) a student SEP

category based on parent education. Student SEP categories based on parent occupation and education are presented in Appendix B.

ATSI
For the purposes of this study Indigeneity is defined as being of Aboriginal and or Torres-Strait Islander (ATSI) decent. Whilst these two groups are distinct and not necessarily homogenous samples they are included in the study as a conservative indicator of disadvantage and its relationship to student achievement above and beyond SES and social class. The ATSI category was coded 0 for non-ATSI and 1 for ATSI based on self-report at the time of test completion in year 7, 2006.

RESULTS

Data integrity
The data matching engaged in for this exercise involved the tracking and matching of student data across a range of databases and a range of years. It is worthwhile commenting on the degree of accuracy in the matching exercise that was identified by cross validating the USI information with other student identifiers (e.g., name, date of birth, and gender).

Less than 1% of students are assigned more than one USI. Of the year 7 students whose USIs did not appear in the February year 8 collection, less than 1% could be matched using non- USI methods (i.e. one that attempts to match based on last name, first 4 characters of first name, gender and date of birth). This rate was found to be consistent across each of the 6 transition periods studied.

The following example is used to highlight the nature of the inconsistencies identified. With the transition between year 7 and year 8, which represents the single greatest period of transition, we found that more than 99% of students were correctly matched on USI, even when there is an incomplete match using a non-USI method. In the Nov 2006 - Feb 2007 transition, about 91.2% of students who matched on USIs also matched on all 4 non- USI criteria (i.e., last name, first 4 characters of first name, gender and date of birth). A visual inspection of the remaining 8.8% (2919 students) showed that 7.2% appeared to be correctly matched on USI, even though there was not a complete match using the non- USI method (e.g. Non- USI mismatches typically occurred because of different spellings, e.g., MacDonald and McDonald).

Table 2. Breakdown of the students with varying degrees of data match from Year 7 (2006) to Year 8, (2007).

No. of Criteria fulfilled when matching Year 7 students to Year 8 in the Feb collection of the following year ie 'kept' students					No of 'kept' year
Mismatch on all 4 criteria	Mismatch on 3 criteria	Mismatch on 2 criteria	Mismatch on 1 criteria	Complete Match on all 4 criteria	Total
2919 (8.8%)				30385 (91.2%)	33304 (100.0%)
5 (0.0%)	6 (0.0%)	111 (0.4%)	2797 (8.4%)		

About 91.2% of the year 7 students who matched on USI in year 8 (ie the 'kept') students had the same last name, first 4 characters of the first name, date of birth and gender. Data for about 8.8% of students did not match on all 4 criteria with only 5 students possessing data which did not match on any of the 4 criteria and 6 students which only matched on a single criteria.

A visual inspection of the data for these 8.8% of students (n=2919) revealed that 2655 (91.0%) students appear to be correctly matched despite inconsistencies in criteria matching. These problems appear to be related to transcription errors or data-entry inconsistencies in the non-USI data. For example, the first name is abbreviated in some instances (i.e., Bob compared to Robert) or transcription errors associated with handwriting (i.e., 1 June compared to 7 June). A further 210 (7.2%) students appear to be due to legitimate last name changes only. This investigation suggested that of the 2919 students identified as mismatching on non-USI criteria 2865 were appropriately matched using the USI.

The remaining students (n=54) were comprised of 40 for whom it was unclear whether a correct match had occurred and 14 for whom a correct match seemed unlikely (e.g., gender change). It is argued therefore that of the 33304 students originally matched only 14 of the matches were most likely to be incorrect resulting in an estimated 99.96% accuracy in data matching. When considering with the 91.2% accuracy of matching based on 4 common criteria (last name, first 4 characters of the first name, date of birth and gender) the accuracy of the USI appeared to be much greater.

At the student level the correlations with reading achievement were significant at p<.01: number of absence episodes (r=-0.18), mobility (=-0.13, and Indigeneity (r=-0.27). At the school level the correlations with reading achievement were significant at p<.01: number of absence episodes (r=-0.32), number of movers (=-0.22), and Indigeneity (r=-0.36).

Student Mobility

H1. It was hypothesized (H1) that student mobility would be significantly associated with socio economic position and demographic characteristics. This hypothesis was supported. Based on the full cohort of student (n=40,181), Table 3 shows the mobility of students according to the socio-economic position of the school in which they were enrolled in August 2006.

Results support the notion that student mobility is associated with the socio-economic position of their school. Only 70.6% of students in schools with a low socio-economic position had an enrolment history of 0 or 1 enrolment transitions. In contrast, 87.0% of students in schools with a high socio-economic position had the same enrolment history. Similarly, patterns demonstrate a decline from low to high SEP for those in the other (2 or 3 enrolment transitions and 4+ enrolment transitions) categories.

Table 3: Students enrolled in state schools in Year 7 in August 2006. Student mobility (number of enrolment transitions) by socio-economic position of the student's school

	Socio-economic position of students' school in Year 7 2006				All
	Low	Mid-Low	Mid-High	High	students
Low mobility - 0 or 1 enrolment transitions	70.6	77.2	82.5	87.0	80.1
Mobile - 2 or 3 enrolment transitions	21.3	17.3	14.7	11.3	15.8
Highly mobile – 4 or more enrolment transitions	8.1	5.5	2.8	1.6	4.1
Total	100.0	100.0	100.0	100.0	100.0

Figure 1 uses a broader mobility range of students according to the socio-economic position of the school in which they were enrolled in August 2006.

Student mobility was associated with the socio-economic position of the school in which they were enrolled. Only 43.2% of students in schools with a low socio-economic position had remained in the same school from February 2001 to August 2006, compared with 52.3% of students in schools with a high socio-economic position.

Figure 1: Students enrolled in state schools in Year 7 in August 2006. Student mobility (number of enrolment transitions) by socio-economic position of the student's August 2006 school.

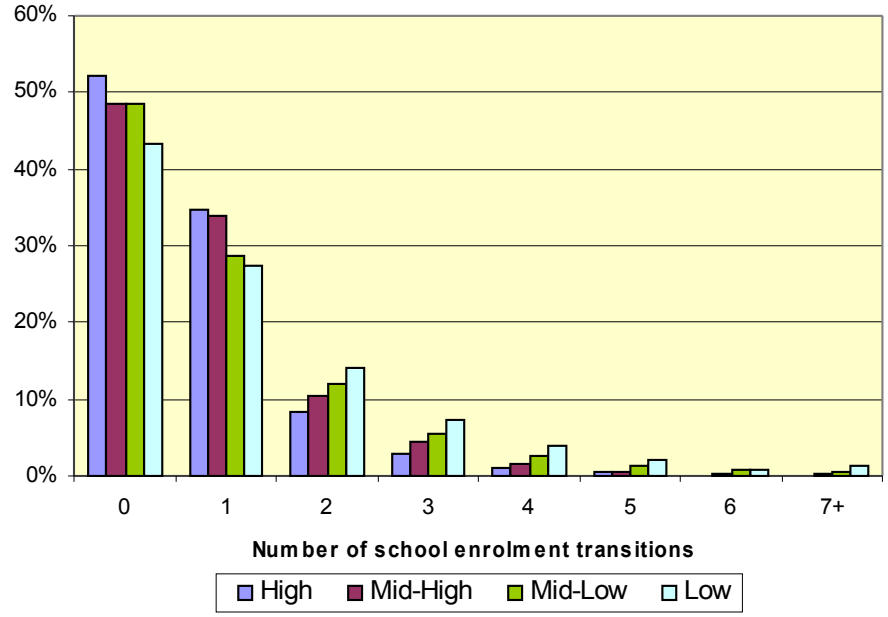


Table 4 shows that the mobility of Indigenous students is higher than the mobility of other students. For example, in the 2006 Year 7 cohort, 14.4% of Indigenous students had four or more enrolment transitions between February 2001 and August 2006. In contrast, only 4.1% of all students had this high level of mobility.

Also, 62.0% of Indigenous students and 80.1% of all students who were enrolled in a state school in Year 7 in August 2006 had a stable enrolment history since February 2001.

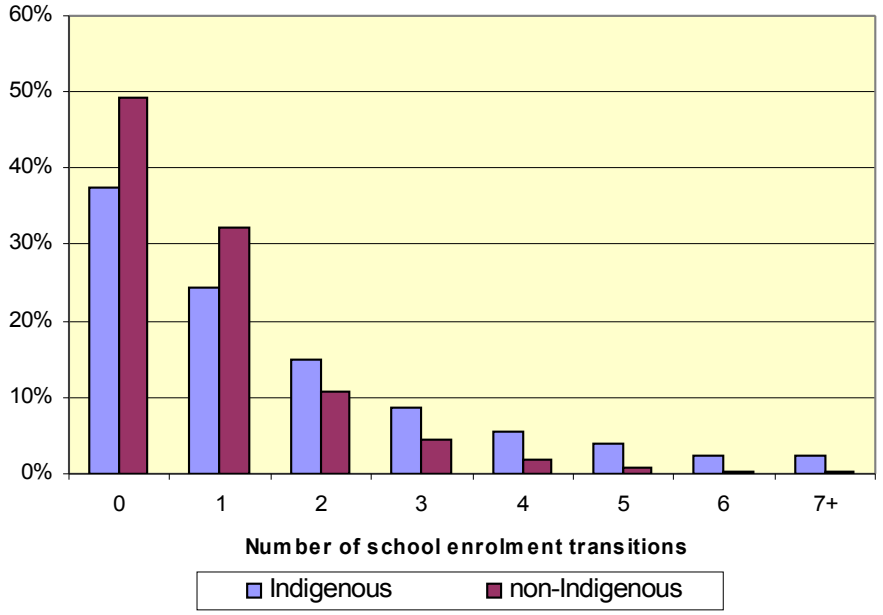
Table 4: Students enrolled in state schools in Year 7 in August 2006. Student mobility (number of enrolment transitions) by Indigenous background

	Indigenous students	All students
Stable - 0 or 1 enrolment transitions	62.0	80.1
Mobile - 2 or 3 enrolment transitions	23.6	15.8
Highly mobile – 4 or more enrolment transitions	14.4	4.1
Total	100.0	100.0

Figure 2 shows that the mobility of Indigenous students is higher than the mobility of other students. For example, in the 2006 Year 7 cohort, 14.4% of Indigenous students had four or more enrolment transitions between February 2001 and August 2006. In contrast, only 4.1% of all students had this high level of mobility.

Also, 37.5% of Indigenous students and 49.3% of non-Indigenous students who were enrolled in a state school in Year 7 in August 2006 had been enrolled in the same school since February 2001 (Year 2).

Figure 2: Students enrolled in state schools in Year 7 in August 2006. Student mobility (number of enrolment transitions) by Indigenous background



H2. It was hypothesized (H2) that student mobility would predict achievement before socio-economic background is accounted for but not after it is accounted for. This hypothesis was partially supported.

A series of linear regressions using achievement on the August 2006 Year 7 Test as the dependent variables were conducted. In the first series of regressions, the number of school enrolment transitions was the only explanatory variable included. The results found that this measure of student mobility has limited association with student achievement: reading achievement $F(1, 37896)=893.3$, $p<.001$, rsquare = 0.023; writing achievement $F(1, 37859)=932.5$, $p<.001$, rsquare = 0.024; numeracy achievement $F(1, 38154)=1127.8$, $p<.001$, rsquare = 0.029. The total percentage of variance in student achievement that was explained by the number of school transitions was between 2.3% and 2.9%.

In the second series of regressions, the number of school transitions was included in a block after the socio-economic position of the student's school. These results show that even after socio-economic position has been considered, the number of school transitions has a significant association with their achievement: reading achievement $F_{change}(1, 37838)=540.8$, $p<.001$, $rsquare_{change} = 0.013$; writing achievement $F_{change}(1, 37801)=595.3$, $p<.001$, $rsquare_{change} = 0.014$; numeracy achievement $F_{change}(1, 38096)=745.3$, $p<.001$, $rsquare_{change} = 0.018$.

The total percentage of variance in student achievement that was explained by the number of school transitions *and* the socio-economic position of the student's school was between 8.7% and 9.8%.

H3. It was hypothesized that schools with higher proportions of student mobility will demonstrate lower average achievement suggesting cohort impacts of mobility. This hypothesis was supported.

Table 5 shows the results of the series of stepwise regression models where the *school* mean scale score is the dependent variable. School mobility was entered among a range of variables including school average IRSED, school location (Metropolitan, Provincial city, Rural, and Remote), number of Year 7 students who sat the test at the student's school, and the percentage of Year 7 students who are Indigenous at the school.

The effect of three school-level measures of student mobility was examined:

1. The percentage of Year 7 students in the school who had enrolled in that school during Year 6 or Year 7. This is the percentage of 'new kids' among the Year 7 cohort.
2. The percentage of Year 7 students in the school who had enrolled in that school during Year 1 or Year 2. This is the percentage of long-term enrolments among the Year 7 cohort.

3. The percentage of Year 7 students in the school who had four or more school transitions between February 2001 and August 2006. This is the percentage of highly mobile students among the Year 7 cohort.

The total percentage of variance explained by the explanatory variables is much greater for school mean performance than for individual student performance. The total percentage of variance explained by the models of school mean achievement was between 36% and 45%.

In most cases the school-level mobility measure was the third variable entered into the model – after the school IRSED and the percentage of Year 7 students who are Indigenous. In some cases the mobility measure was the fourth variable entered into the model, after school IRSED, the percentage of Year 7 students who are Indigenous and the indicator variable for a rural location.

The additional variance explained by the school level mobility measure ranged between 0.5% and 1.5%. The mobility measure which accounted for the greatest additional variance was the percentage of Year 7 students who had enrolled in the school during Year 1 or Year 2. That is, the percentage of long-term enrolments among the Year 7 cohort has a small positive effect on the average achievement of that cohort.

Table 5: Linear stepwise regression results predicting school level achievement average on 2006 Reading, Writing, and Numeracy tests using student mobility (measured in three alternative ways) amongst a range of other variables.

School mobility measure		Correlation with Year 7 reading	Order of entry into stepwise regression model	Overall R-square of the final model	R-square change provided by school mobility measure
Dependent Variable: School Mean Score In Reading					
1	Percentage of Year 7 students who had enrolled in the school in Year 6 or Year 7	-0.116	-	-	-
2	Percentage of Year 7 students who had enrolled in the school in Year 1 or Year 2	0.183	4	0.452	0.006
3	Percentage of Year 7 students who had four or more transitions between Feb 2002 and Aug 2006	-0.228	4	0.451	0.005
Dependent Variable: School Mean Score In Writing					
1	Percentage of students who had enrolled in the school in Year 6 or Year 7	-0.176	3	0.408	0.010
2	Percentage of Year 7 students who had enrolled in the school in Year 1 or Year 2	0.230	3	0.413	0.015
3	Percentage of Year 7 students who had four or more transitions between Feb 2002 and Aug 2006	-0.261	3	0.408	0.010
Dependent Variable: School Mean Score In Numeracy					
1	Percentage of students who had enrolled in the school in Year 6 or Year 7	-0.145	4	0.368	0.006
2	Percentage of Year 7 students who had enrolled in the school in Year 1 or Year 2	0.222	3	0.378	0.015
3	Percentage of Year 7 students who had four or more transitions between Feb 2002 and Aug 2006	-0.198	4	0.365	0.006

Please note that "-" indicates non-significant prediction.

H4. It was hypothesized (H4) that the type of mobility measure employed will have an impact on the strength of relationship identified. This hypothesis was supported.

Table 6 displays the results of a series of stepwise regression models where student 2006 reading scale score was the dependent variable and mobility was included amongst a range of other variables. The other variables included IRSED, school location (Metropolitan, Provincial city, Rural, and Remote), student gender and student Indigeneity. Typically mobility was included in the prediction after IRSED and Indigeneity had been included. The results indicated that there was very little additional variance explained by the measure of mobility (regardless of measure employed) typically after IRSED and Indigeneity were included. In some conceptualisations of mobility the variables were included at a later stage suggesting a lower degree of relevance.

The findings suggested that, of the measures of mobility, the number of school transitions was the best predictor of student achievement after IRSED and Indigeneity had been included. In all circumstances the relationship between the indicators of mobility with student achievement was negative suggesting greater mobility was associated with lower performance.

Table 6: Linear stepwise regression results predicting student level achievement average on 2006 Reading test scores using a wide range of different measures of mobility.

	Student level mobility measure	Correlation with Year 7 reading	Order of entry into stepwise regression model	Overall R-square of the final model	R-square change provided by school mobility measure
Overall mobility					
1	Number of school transitions	-0.152	3	0.119	0.009
2	Number of Queensland state schools enrolled in	-0.143	3	0.119	0.009
Student stability					
3	Year started in Year 7 school	-0.118	3	0.118	0.008
Timing of transitions – student year level at school					
4	Number of school transitions between start of Year 2 and start of Year 5	-0.113	3	0.115	0.005
5	Number of school transitions between start of Year 5 and start of Year 7	-0.125	3	0.117	0.007
6	Whether or not a student changed schools between Feb 06 and Aug 06	-0.069	3	0.112	0.002
Timing of transitions – time of year					
7	Number of school transitions that interrupt the school year, ie between February and August or between August and November	-0.145	3	0.118	0.008
8	Number of transitions at 'natural breaks' in schooling, ie between November and February	-0.092	3	0.114	0.004
Distance of previous school transition					
9	Whether a student's previous move was less than 10 kilometres	-0.084	3	0.115	0.005
10	Whether a student's previous move was more than 100 kilometres	-0.043	7	0.110	0.000
11	Distance in kilometres of previous move (only includes those students with a distance measure – 11326 students)	0.021	4	0.089	0.003
Other characteristics of student mobility					
12	Whether or not a student had a 'break' from enrolment in state schools	-0.054	6	0.110	0.000
13	Whether or not a student had a 'return' to their original school	-0.082	4	0.111	0.001

H5. It was hypothesized (H5) that stronger relationships between mobility and student achievement would be identified for students in low socio-economic groups after socio-economic variations were controlled for. This hypothesis was not supported.

A regression analysis of the students identified in the lowest IRSED group (e.g., those with less than or equal to 930) indicated very similar profiles of relationships (see Table 7) to those seen overall. These findings do not suggest substantial differences in relationships within different bands of SEP.

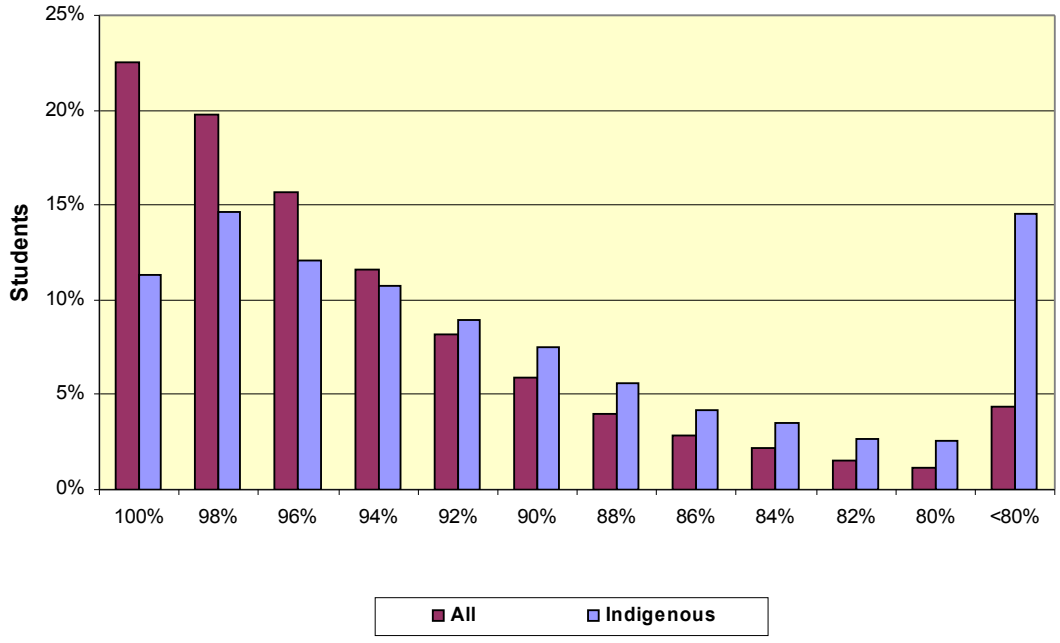
Table 7: Linear stepwise regression results predicting school level 2006 Reading test scores using low IRSED schools only.

		Model Statistics				Change Statistics			
Variable added	**Entry #**	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**R Square Change**	**F Change**	**df**	**Sig. F Change**
IRSED	1	.283(a)	.080	.080	64.152	.080	473.243	1, 5428	.000
Indigenous	2	.339(b)	.115	.115	62.930	.035	213.925	1, 5427	.000
Number of students tested	3	.348(c)	.121	.121	62.722	.006	36.919	1, 5426	.000
Number of moves	4	.356(d)	.127	.126	62.524	.006	35.415	1, 5425	.000
Remote location	5	.363(e)	.132	.131	62.339	.005	33.348	1, 5424	.000
Gender	6	.368(f)	.135	.135	62.222	.003	21.366	1, 5423	.000
Rural location	7	.369(g)	.136	.135	62.196	.001	5.631	1, 5422	.018
Provincial city location	8	.371(h)	.137	.136	62.167	.001	6.007	1, 5421	.014

Student Attendance

Investigation of the attendance rates in the data set suggested that there was a declining frequency of students as the attendance rates increased. However, a slightly different trend was identified for Indigenous students who were more likely to have a greater number of days absent than non-Indigenous students (see Figure 3).

Figure 3: Students enrolled in state schools in Year 7 in August 2006. Student attendance (percentage of semester one attended) by Indigenous background.



Investigating the actual number of days not attended in Semester 1 2006 by year 7 students revealed that the majority of students were absent from school for between 1 and 5 days. Figure 4 (and table 8) outlines the relationship by socio-economic position (school IRSED) and suggests that as socio-economic position increases

the proportion of students taking no days off increases and students taking more than 11 days off decreases. Specifically, the number taking no days off school in the highest SEP category are almost double that of students in the lowest category; the proportion of students taking more than 11 days off school in the highest category is less than half that in the lowest SEP category.

Figure 4: Students enrolled in state schools in Year 7 in August 2006. Full days absent by socio-economic position of the student's August 2006 school.

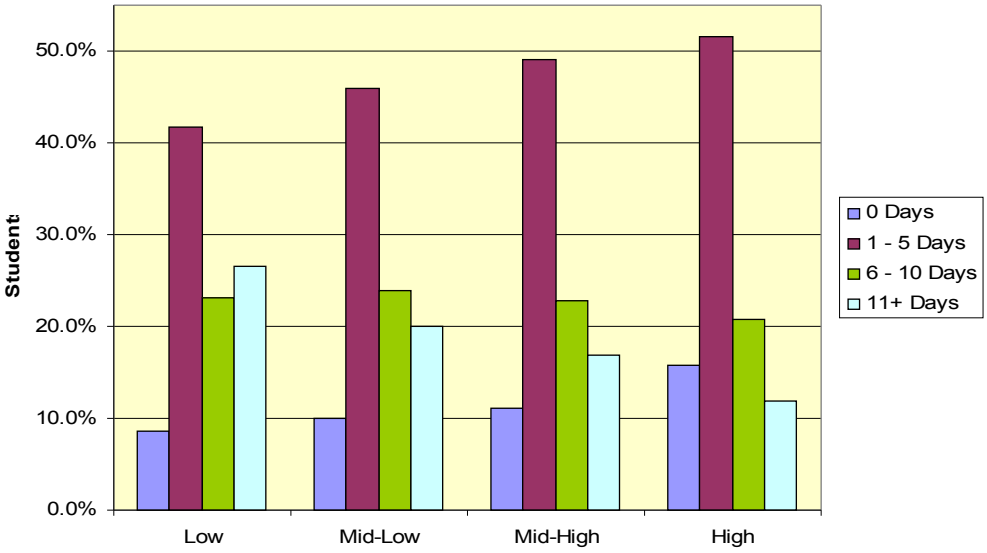
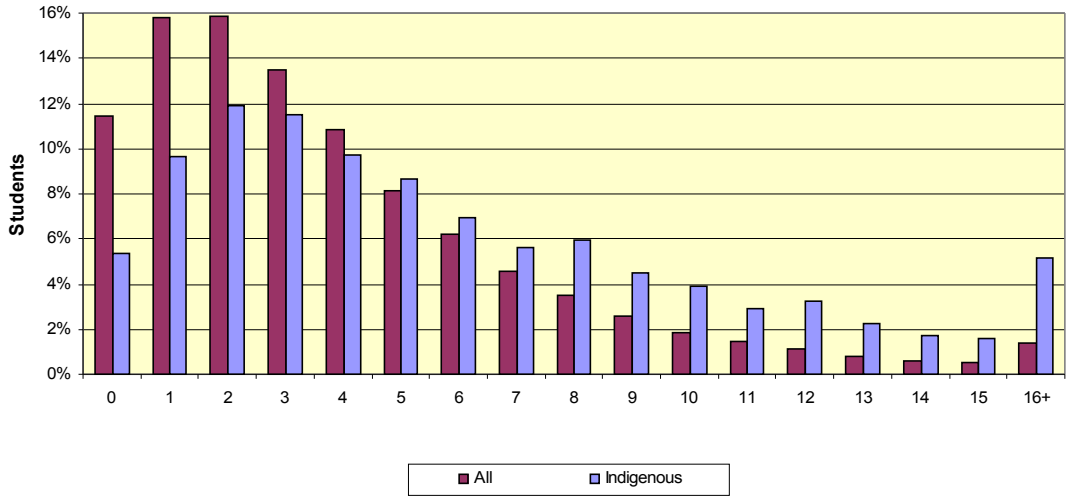


Table 8: Students enrolled in state schools in Year 7 in August 2006. Full days absent by socio-economic position of the student's August 2006 school.

	Socio-economic position of students school in Yr 7 2006				All Students
	Low	**Mid-Low**	**Mid-High**	**High**	
Nil days absent	8.6%	10.1%	11.2%	15.9%	11.4%
One to five days absent	41.7%	45.9%	49.0%	51.6%	47.6%
Six to ten days absent	23.2%	23.9%	22.9%	20.7%	22.8%
More than 11 days absent	26.5%	20.1%	17.0%	11.9%	18.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Graphing the actual number of episodes of absence (see figure 5) identified 1-2 days was the modal range for non-Indigenous students and 2-3 days for Indigenous students.

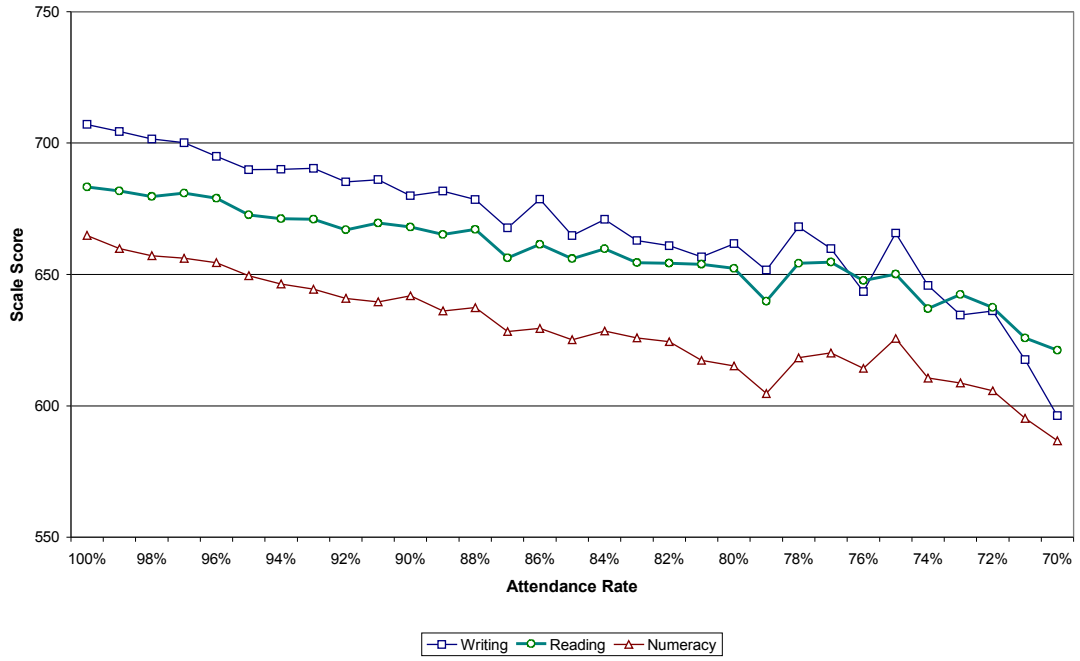
Figure 5: Students enrolled in state schools in Year 7 in August 2006. Number of episodes of absence by Indigenous background. The category "0" represents students with no absences.



H6 It was hypothesized (H6) that the relationship between attendance and student achievement is linear. This hypothesis was supported.

Figure 6 clearly indicates a negative correlation with a slightly flatter relationship for reading than writing and numeracy. It should be noted that smaller numbers of students in the lower attendance rate range are likely to influence the reliability observations at that extreme. These findings were supported by correlations which indicated attendance rates correlations with reading achievement ($r=0.17$, $p<.001$), writing achievement ($r=0.19$, $p<.001$), and numeracy achievement ($r=0.20$, $p<.001$).

Figure 6: Students enrolled in state schools in Year 7 in August 2006. Student attendance rate (percentage of semester one full days attended as a proportion of total number of days that could be attended) by scale score for Reading, Writing and Numeracy.



H7 It was hypothesized (H7) that student attendance would predict achievement before socio-economic background is accounted for but not after it is accounted for. This hypothesis was not supported.

Five multiple regressions were conducted using different student level measures of attendance ranging from total number of full days absent to average length of each absence episode. In all regressions except for one attendance was found to predict student achievement after SEP and Indigeneity were included (Table 9 outlines the results using student achievement on Reading tests). Comparing the results of the regressions indicated that number of distinct episodes of absence was the single best attendance indicator of achievement. Results indicated that if you have more episodes of absence, then you are more likely to have a lower achievement score.

Table 9: Comparative contribution of different attendance measures to the prediction of Year 7 reading test results based on student level multiple regression analyses.

Attendance measure		**Correlation with Year 7 reading**	**Order of entry into stepwise regression model**	**Overall R-square of the final model**	**Additional R-square provided by the attendance measure**
1	Total full days absent	-0.161	3	0.117	0.011
2	Attendance rate (days absent as a percentage of days enrolled)	0.166	3	0.117	0.012
3	Number of episodes of absence	-0.182	3	0.121	0.015
4	Maximum episode length for a student	-0.059	3	0.108	0.001
5	Average episode length	-0.010	-	-	-

Please note that "-" indicates non-significant prediction.

H8 It was hypothesized (H8) that cohort level effects will be identified for attending students in classes containing lower proportions of attending students than for those with greater proportions of attending students. This hypothesis was supported.

The average number of episodes per students was the best predictor across all measure types (Reading, Writing, and Numeracy) and was entered third for Reading and Numeracy (after SEP and Indigeneity) and fourth for Writing. Centre attendance rate performed similarly with the balance of the attendance measures performing less well.

Table 10: Comparative contribution of different attendance measures to the prediction of Year 7 reading test results based on school level multiple regression analyses.

Attendance measure		Correlation with DV	Order of entry into stepwise regression model	Overall R-square of the final model	Additional R-square provided by the attendance measure
Reading					
1	Centre attendance rate	0.208	3	0.109	0.003
2	Total number of episodes for all students	-0.038	3	0.108	0.002
3	Average number of episodes per student	-0.219	3	0.111	0.005
4	Average episode length for all students	-0.015	-	-	-
Writing					
5	Centre attendance rate	0.199	4	0.135	0.004
6	Total number of episodes for all students	-0.002	6	0.132	-
7	Average number of episodes per student	-0.199	4	.0133	0.004
8	Average episode length for all students	-0.032	-	-	-
Numeracy					
9	Centre attendance rate	0.221	4	0.112	0.006
10	Total number of episodes for all students	-0.036	4	0.108	0.002
11	Average number of episodes per student	-0.229	3	0.114	0.008
12	Average episode length for all students	-0.020	-	-	-

Please note that "-" indicates non-significant prediction.

Mobility Attendance and achievement

Investigating the predictive capacity of attendance in combination with mobility using stepwise regressions revealed that attendance (number of distinct episodes) was entered third into regression equations for Reading and Writing after SEP which was entered first and Indigeneity which were entered second. In the case of Numeracy the attendance indicator was entered second after SEP, with Indigeneity being entered third. Mobility (number of transitions) was entered into the regressions after attendance.

These results suggest that attendance has a stronger relationship with achievement than mobility regardless of the achievement type being considered. The results also suggest that the relationship between attendance and achievement is stronger with regards to numeracy than other types of achievement.

Table 11: Comparative contribution of different measures to the prediction of Year 7 test results based on multi-level analyses.

	Correlation with DV	Order of entry into stepwise regression model	Overall R-square of the final model	Additional R-square provided by the measure
Reading				
Student - Number of episodes of absence	-0.182	3	0.129	0.015
Student mobility - Number of transitions	-0.141	4	0.129	0.006
Centre average number of episodes per student	-0.218	5	0.129	0.001
Centre mobility - percentage of students starting in Year 1 or 2	0.115	7	0.129	0.001
Writing				
Student - Number of episodes of absence	-0.194	3	0.157	0.021
Student mobility - Number of transitions	-0.144	5	0.157	0.008
Centre mobility - percentage of students starting in Year 1 or 2	0.112	7	0.157	0.001
Centre average number of episodes per student	-0.199	9	0.157	-
Numeracy				
Student - Number of episodes of absence	-0.215	2	0.144	0.030
Student mobility - Number of transitions	-0.157	4	0.144	0.009
Centre mobility - percentage of students starting in Year 1 or 2	-0.132	6	0.144	0.002
Centre average number of episodes per student	0.229	8	0.144	0.001

Please note that "-" indicates non-significant prediction.

H9 It was hypothesized (H9) that student characteristics, attendance behaviour and mobility patterns would help to explain the relationship between SEP and student achievement.

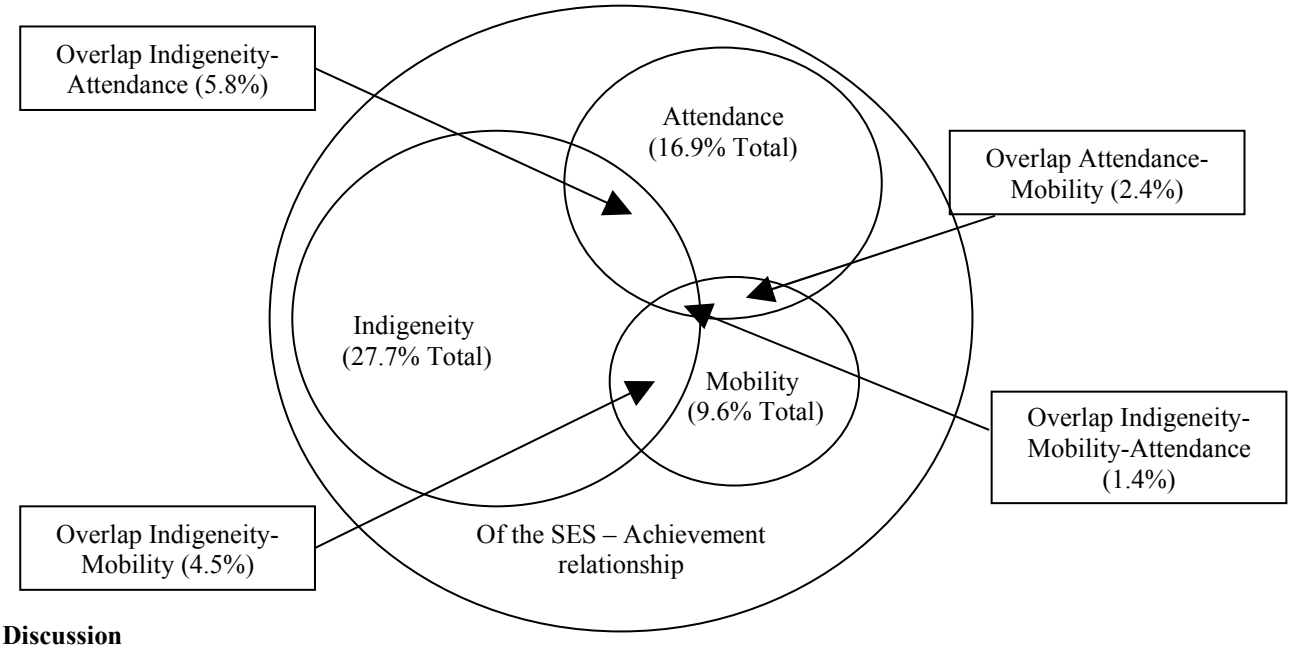
By sequentially loading variables on achievement prior to the SEP variable we can identify the degree of shared variance that may help us to explain why SEP is found to relate to achievement. In total, we can explain about 24% of the relationship using disruptions to schooling (both attendance and mobility) and achievement in Reading.

At the student level, the prediction of reading achievement using SEP was 8.3%. Of this relationship, 16.9% of variance was accounted for by attendance (number of absence episodes) alone, 9.6% was accounted for by mobility alone, and 27.7% was accounted for by Indigeneity alone. Combining variances resulted in 24.1% accounted for by attendance and mobility (with 2.4% shared variance) and 42.2% was accounted for by attendance, mobility, and Indigeneity combined (see also Figure 7).

At the school level, the prediction of average reading achievement using SEP average was 35.0%. Of this relationship, 22.6% of variance was accounted for by attendance (number of absence episodes) alone, 10.9% was accounted for by mobility (number of movers) alone, and 28.9% was accounted for by Indigeneity (number of Indigenous students) alone. Combining variances resulted in 28.3% accounted for by attendance and mobility (with 4.1% shared variance) and 42.6% was accounted for by attendance, mobility, and Indigeneity combined.

Results for analyses using parental occupation and education information and using student residential postcodes indicated a similar pattern of findings at the student and school levels. It is worth noting that Indigeneity was identified as a explanatory variable for the SEP achievement relationship largely distinct from the variables of school disruption used.

Figure 7: Venn diagram of variance explained within the SEP – reading achievement variance pool at the student level.



Discussion

This study outlined the results of a large scale longitudinal analysis of student achievement on standardised tests of literacy and numeracy in grade 7. The study utilised a USI to match student achievement data will enrolment and attendance patterns in government schools in Queensland, Australia. The study tracked over 35,000 primary school students across a six year period, from year 2 to year 7.

The analyses focus on the relationships between student mobility, attendance, and student achievement with a large longitudinal database that tracks primary state school student achievement and enrolment patterns across a 6 year period. The aim of this paper was to build on previous research into socio-economic position and student achievement (Simons, Bampton & Bode, 2006) and to indicate empirical results that investigate differential predictors of student achievement.

It was identified that the use of the USI was superior to a multi-criteria approach to matching student data. The USI approach was identified as noticeably more accurate (99.96%) than a 4 criteria method (91.2%). Whilst one could argue that more criteria could be added to match students this does not discount the fact that at least 8.8% of students failed to match on at least one criteria in the present study. The work required to validate non-matching students is substantial and highlights the efficiency of the USI approach. The level of accuracy afforded by the USI approach was sufficient to permit detailed statistical analyses (assuming that other data are sufficiently accurate). It should also be noted that the current study investigated USI accuracy across the Year 7 to Year 8 transition, a transition marked by considerably greater complexities for data matching than perhaps any other period in schooling. We concluded therefore that the USI accuracy provided a robust basis on which further detailed analyses could be conducted.

Investigations of student and school level data confirmed previous findings that SEP is a dominant predictors of student achievement and that the size of these relationships is greater than that for observed disruptions in schooling, measured in this case via attendance and mobility measures. For both attendance and mobility it was shown that the number of distinct episodes of absence and number of moves were the best predictors of performance, in a negative way. Not surprisingly greater absenteeism and mobility were associated with lower achievement.

The results further suggested that the effect for attendance was greater than the effect for mobility however this could be due to greater accuracy of measurement in the attendance data. Interestingly, attendance was found to be a greater predictor of numeracy performance than Indigeneity suggesting sequential (uninterrupted) learning experiences are more critical for the acquisition of numeracy skills than for literacy skills. The differences in overall relationship between attendance and achievement in numeracy and literacy were slight.

Whilst the results suggest that SEP remains the single greatest predictor of achievement we argue that greater specificity in the measures of attendance and mobility provide much needed information that can help unpack the SEP – achievement relationship. The results suggested that of the SEP – achievement relationship

approximately 24% can be explained by attendance and mobility variables at the student level and approximately 28% at a school level.

Although a very large sample was able to be tracked across a 6 year period which included collection and integration of data from different sources matched at a student level in a way that supports causal interpretation a number of limitations should be noted. The results presented in this paper are restricted to Queensland state primary school students that could be tracked from year 2 to 7 for the period 2001 to 2006. The measures of student mobility are based on checking student enrolment details at three distinct points in each year. Therefore, any movements of students within those enrolment periods will not be captured by the measure of mobility that was used. Student attendance was similarly restricted to tracking full day absences only and would not identify repeat instances of part-day absences. Finally, the measure of socio-economic position (IRSED) used for the majority of analyses was based on a school average of the IRSED values of student residences. To investigate likely differences, we also analysed IRSED of student residential locations as well as parental occupation and highest level of education. Although samples with parental occupation and education levels were substantially smaller all analyses indicated similarities in findings. The stability of findings in this research regardless of measures and sub-samples used is a notable feature of the results.

The results carry serious implications for the calculation and reporting of school value add. The results indicated significant prediction of student achievement using measures of student mobility and attendance. Clearly, students with higher mobility and absenteeism are at greater risk. Yet it is these students who are less likely to be accurately included in measures of value add. Mobile and absent students are also less likely to be tracked and included in time based comparisons of school performance. The results in this paper indicate that question of how best to apportion "value-add" based on these students is both difficult and important.

Student mobility and attendance represent unique challenges for state school reporting with regards to student achievement particularly in light of recent trends in the approximation of "value add" and school performance measurement. Whilst the departmental research was aimed at determining biases brought about by disproportionate levels of mobility and attendance this paper is oriented toward a confirmation and extension of the literature.

The findings clearly implicate school disruptions as a mechanism by which SES is likely to impact on student achievement. Moreover, attendance appears to have a greater impact than mobility in this regard although both have separate effects. The findings allow jurisdictions to argue that intervention programs targeted at minimising the effect of school disruptions are also measures to address inequities brought about, directly and indirectly, by socio-economic disadvantage. These results carry very important implications for the conceptualisation of SES, the relative importance of minimising school disruptions (particularly absenteeism), and understanding how disruptions directly affect student achievement.

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Additional interest

First, student mobility is associated with absence and exemption from the Year 7 Test. Students who are absent or exempt do not have a scale score result. In the literacy test, 6.2% of the highly mobile students were absent and 3.9% of the highly mobile group were exempt. These rates of absence and exemption were about twice as high as for students with a stable enrolment history. Among students with a stable enrolment history, the rates of absence and exemption were 2.8% and 1.5% respectively.

Table 3: Students enrolled in state schools in Year 7 in August 2006. Student mobility (number of enrolment transitions) by absence and exemption from the Year 7 Test.

Enrolment Transitions Category	Student Absence or Exemption from the Year 7 Test – Literacy			
	Neither absent nor exempt	Absent	Exempt	Total
Stable (0 or 1 changes)	95.7%	2.8%	1.5%	100.0%
Mobile (2 or 3 changes)	93.0%	4.3%	2.7%	100.0%
Highly mobile (4+ changes)	89.8%	6.2%	3.9%	100.0%
All students	95.0%	3.2%	1.8%	100.0%

Appendix A - Sources and coverage of data items used to form final variables for analysis

The cohort used as the basis of the analysis was that of all students enrolled in state schools in Year 7, August 2006. The data used were the corporate data available through DETA enrolment collections from state schools, and the QSA Year 7 Tests of literacy and numeracy. All students in the cohort were tracked back as far as possible through the DETA enrolment collection data bases to Feb 2002 (ie. when the cohort commenced Year 2). Not all students were retained in the analysis. The following table summarises the data items available and how indicators for analysis were derived.

Level of data	Data source	Variable	Scope	Availability	Indicator
Individual Student Level	Department of Education, Training & the Arts (DETA) Enrolment Collections	↘ *'Unique Student Identifier' (USI)*	Three collections per year in February, August & November from February 2001 to August 2006	Census	Used to link data to create other variables
		↘ *'Gender'*	Taken as at the August 2006 collection	Near census	↘ Student Gender
		↘ *'Indigenous Status'*			↘ Student Indigenous Status
		↘ *'Parental Education and Occupation'*	Taken as at the August 2006 collection	≈ 50% complete	↘ Student Socio-Economic Status (SES)
		↘ *'School of Enrolment'*	Three collections per year in February, August & November from February 2002 to August 2006 or since joining the state sector	Census	↘ Student Mobility
	Department of Education, Training & the Arts (DETA) Attendance Data	↘ *'Full Days Absent'*	Semester 1 2006, covers length of enrolment at August 2006 school	Near census	↘ Student Attendance
Aggregated School Level	Queensland Studies Authority (QSA) Literacy & Numeracy Testing Program	↘ Year 7 Test results: *'Reading', 'Writing'* & *'Numeracy'*	Tests for *'Reading', 'Writing'* & *'Numeracy'* in Year 3 (2002), Year 5 (2004) and Year 7 (2006)	Near census	↘ Student Achievement
	DETA Enrolment Collections	↘ *'% Indigenous'*	Three collections per year in February, August & November from February 2001 to August 2006		↘ School Indigenous
		↘ *'% Mobility'*			↘ School Attendance
		↘ *'% Attendance'*			↘ School Mobility
	Australian Bureau of Statistics (ABS) Index of Relative Socio-Economic Disadvantage (IRSED) aggregated by DETA	↘ *'Disadvantaged School Index (DSI)'*	Quadrennial Census collections 1996 and 2001	Census	↘ School SES
School Level	MCEETYA Geographic Location Classifications	↘ *'School Geo-location'*	As agreed by MCEETYA jurisdictions in 2005		↘ School location

Appendix B – Descriptions of Parental Occupation and Education Cateogories Used

Parental Occupation: Parental occupation level and status were categorized into five categories with an additional category for non-response. These categories are rank ordered according to social and economic position. Sample of 14202 (33.9% of full sample in this paper) students were identified with parental occupation information.

Parental occupation types:

- Category 1. Senior management in large business organisation, government administration and defense, and qualified professionals
- Category 2. Other business managers, arts/media/sportspersons and associate professionals
- Category 3. Tradesmen/women, clerks and skilled office, sales and service staff
- Category 4. Machine operators, hospitality staff, assistants, labourers and related workers
- Category 5. Not in paid work in last 12 months
- Not stated / unknown / missing

Parental Education: Parental education level was categorized into eight categories with an additional category for non-response. These categories are rank ordered according to level of education accomplishment. Sample of 13979 (34.4% of full sample in this paper) students were identified with parental occupation information.

Parental education types:

- Parental Education
- Category 1. Bachelor degree or above
- Category 2. Advanced diploma/Diploma
- Category 3. Certificate I to IV (including trade certificate)
- Category 4. No non-school qualification
- Category 5. Year 12 or equivalent
- Category 6. Year 11 or equivalent
- Category 7. Year 10 or equivalent
- Category 8. Year 9 or equivalent or below
- Not stated / unknown / missing