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Mobility of students in NSW government schools

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1. Introduction

Student mobility has been an ongoing concern to educators due to the perceived negative effects that changing schools can have on students' educational outcomes, on schools and on teaching. Mobility has been identified in studies in many countries including the United States, United Kingdom and Australia as being a contributing factor to student disadvantage, particularly in the areas of school engagement and lower achievement (Dobson, Henthorne & Lynas 2000; Navin, Hill & Doyle 2012; Reynolds, Chen & Herbers 2009).

In addition, significant student turnover may also impede teachers' and administrators' efforts to implement a reform agenda in schools thus hampering schools' efforts to turn around low performance. Therefore, the need to understand mobility and its effect on schools' ability to improve performance is critical, especially as greater emphasis is placed on school accountability.

Despite the widely held belief that mobility is damaging to student learning, little effort has been made to measure the extent and consequences of student mobility in the New South Wales school system. One major barrier has been a lack of access to high quality data bearing on student movements across schools and school systems. As a result, there has been insufficient evidence to comment on the nature, pattern and size of student mobility in NSW schools, let alone to discuss the policy significance of student transitions and mobility across different student groups, school structures and geographies.

Like a number of other Australian jurisdictions, the NSW Department of Education currently offers a small amount of funding for primary schools that believe they have high student turnover . However, this funding originated from a resourcing perspective, rather than an educational one, and is designed to compensate schools requiring additional resources such as textbooks and equipment. If mobility has as much impact on NSW student outcomes as demonstrated in other countries, there may be much greater need to support mobile students than has traditionally been provided.

The introduction of a unique Student Registration Number (SRN) in 2008 has provided the means to track students within the state government education system over time. Student mobility, approximated by student movements within the government sector, can now be calculated and its impact on student achievement can be estimated.

This report presents the results of a preliminary investigation into student mobility undertaken by the Centre for Education Statistics and Evaluation (CESE). The following section provides a brief overview of the international and national literature on student mobility, identifying ways in which mobility is defined and measured, and the effects that mobility has on educational outcomes. Section 3 presents the goals of the current study. Sections 4, 5 and 6 present the investigations and preliminary analyses undertaken by CESE to define and measure student and school mobility in NSW government schools and the effect mobility can have on students' educational outcomes. Section 7 concludes with an overview of the findings, and suggestions for future directions.

1 The turnover is measured as a combination of students who left (excluding Year 6) and new students (excluding Kindergarten), and the funding is managed under the 'Entitlement to Establishment Grants'. The annual budget for the mobility component funding is approximately $100,000 across the state (Schools Finance Directorate, NSW Department of Education). This funding allocation has been in place since 1989/90.

2. Literature review

It is clear from the literature that mobility is a single word used to describe a very complex phenomenon. Students move between schools for different reasons, ranging from negative reasons such as housing distress or domestic violence, to positive or strategic reasons such as school preference or job promotion. Mobility may therefore affect different students in different ways. Amongst published studies, mobility has been defined, measured and reported in different ways and at different hierarchical levels. The impact of mobility on educational outcomes has also been analysed in different ways and the relationship varies depending on the methodology employed. As the literature is dominated with studies focusing on mobility measures and the effects on either individual students or the schools they attend, we start this section with definitions of mobility used at the student- and at the school-level.

2.1 Definitions of student mobility

Within the literature, mobility is commonly defined as students moving between schools for reasons other than expected by the system structure (e.g. moves expected to occur when students advance from primary to secondary education). As students change schools under different circumstances, researchers emphasise the importance of differentiating the varied types of school moves, which can be broadly grouped into four main categories (National Research Council and Institute of Medicine 2010, pp. 4-5):

- school changes necessitated by residential moves, which may occur for positive or negative reasons (e.g. job loss, family dissolution, housing pressure, or relocating to be in the catchment of a better school)
- normative or structural moves — school moves that occur because of school system structural requirements, such as when children advance from primary to secondary schools
- strategic moves — school changes instigated by parents seeking better schools or a better fit for their children (e.g. specific academic programming). This may or may not involve residential moves
- school moves related to children's behaviour that resulted in change in placement (e.g. new enrolment as a result of expulsion), or related to special education placement to better manage students with particular needs.

While it is desirable to distinguish among different reasons for school changes (e.g. moves made under duress vs for positive reasons), research capacity is hampered by data availability, as information on reasons underlying school changes are not routinely and reliably collected by schools. While it would clearly be preferable to differentiate analyses according to the reasons for moving, a number of studies have shown that residential moves made for any reason have a negative effect on students' achievement, aptitude, and retention (Scherrer 2013; Voight, Nation & Shinn 2011, p. 4).

Almost universally, structural moves are excluded from student mobility definitions with most prior studies focussing on moves that are to some extent 'unexpected'. Unexpected moves can either be measured continuously or dichotomously. Continuous measures count moves over a period of time to gauge the extent of mobility. Dichotomous measures classify students as mobile or non-mobile based on predetermined thresholds, such as three or more moves in a given period (Mantzicopoulos & Knutson 2000; Strand 2002; Strand & Demie 2006).

The period of time over which mobility is measured varies across studies. Some studies have measured mobility per student that occurred over a school year (Eddy 2011; Wright 1999), while others have measured mobility over a longer time period to estimate the cumulative effects of repeated moves. For example, a longitudinal study by Lee, Burkam and Dwyer (2009) examined mobility patterns and their effects for USA students in the early years, using the number of non-structural school changes students made from Kindergarten to Grade 3.

Less prevalently, the length of time enrolled in a school has also been used to report student level mobility, as has the distance travelled between schools attended (Simons et al. 2007).

2.2 Definitions of school mobility

Two main types of school-based measures dominate the literature: measures of 'churn' and 'stability rates'. Churn measures aim to estimate the number of student movements in a given period divided by an average student enrolment such as a mid-year census or average daily membership (Dobson, Henthorne & Lynas 2000; Hill, Navin & Lynch 2009; Navin, Hill & Doyle 2012; O'Donnell & Gazos 2010; Taylor & Dunn 2010). Stability rates are defined as the number of students continuously enrolled in a school over a period divided by an enrolment population, such as the starting enrolment size (Webster & Almaguer n.d.).

One of the most commonly used mobility formulas is the Joiners Plus Leavers (JPL) measure (Dobson, Henthorne & Lynas 2000):

$$JPL = \frac{\textit{students joining the school} + \textit{students leaving the school}}{\textit{school total enrolment}}$$

This has been calculated using both point-in-time data (counting leavers and joiners by using the enrolment data collected at two points of time, see Simons et al. 2007) and cumulative enrolment data (counting the total movements into and out of a school by using every episode of movement, see Hill, Navin & Lynch 2009; Navin, Hill & Doyle 2012).

Differences in the calculation methods used can lead to significant differences in the mobility rates reported, which can affect any conclusions in relation to educational impact. For example, Navin, Hill & Doyle (2012) provided a comparison of two types of mobility measure using a sample of six low socio-economic status (SES) Queensland primary schools. They compared the number of students who were identified as leaving or joining using point-in-time enrolment data over two consecutive collection dates with the number of leavers and joiners identified by using continuous enrolment data and counting every episode of movement in and out of a school over the same one-year period. Mobility rates based on point-in-time data comparison captured fewer than three-quarters of the moves reported by measures based on continuous enrolment data. Point-in-time measures also underestimated the number of Indigenous students who joined the schools by as much as one-half. This undercounting of Indigenous student mobility was attributed to so-called 'circular movements', whereby a student is enrolled in one school, leaves for a period and then returns to the same school. This pattern was observed to occur several times over the school year. These circular movements were not picked up by point-in-time measures if the students left after the first collection date and came back before the next collection date.

Studies also vary in the types of student movements included in school level measures. Some studies have focused only on movements into, or out of, the school, while other studies have included both. Some include structural movements (e.g. students commencing Kindergarten or exiting Year 6) while others exclude these movements. Some exclude all movements made at the start or end of the year (e.g. new students enrolling in other grades at the beginning of the year) such that the focus is on movements that occur during the school year (Rumberger 2015; Taylor & Dunn 2010).

An issue in any measure of mobility at the school level is the selection of a proper enrolment base, or population at risk of moving, during the period of interest. If the interval of measurement is small, say a year, then the initial, final or mid-year total enrolment will all yield approximately the same rate for most schools. If a longer period is chosen, say a three year period, there could be sizeable differences in mobility rates based on different point-in-time enrolment counts.

2.3 Impact of mobility on students and schools

2.3.1 Effect of mobility on student outcomes

Over the past 20 years, numerous studies have sought to establish a relationship between educational outcomes and mobility. In general, studies find that frequent school moves can have a significant negative impact on student achievement and retention (Gasper, DeLuca & Estacion 2012; Reynolds, Chen & Herbers 2009) over and above other factors affecting outcomes such as an individual's socio-economic background. The reported magnitude of effect sizes however varies across studies (O'Donnell & Gazos 2010; Reynolds, Chen & Herbers 2009), depending on the research methodology, target cohort characteristics and mobility rates used.

To understand the degree to which mobility impacts on students' educational outcomes, Reynolds, Chen and Herbers (2009) performed a meta-analysis of research conducted in the USA over nearly two decades, from 1990 to 2008. The meta-analysis identified 16 well-controlled studies that measured non-structural moves across one or more grades between K-12, provided measures of attainment (i.e. reading and/or mathematics achievement, and/or school dropout), and importantly, all included a measure of pre-mobility achievement as a control variable. Many of the selected studies also included other control variables such as socio-economic status (SES) and family structure. Reynolds, Chen and Herbers' (2009) analysis concluded that mobility had a consistent and significant adverse impact on achievement, even after other risk factors and pre-mobility achievement measures were controlled for, and that the effects increased with the number of moves. The adjusted effect size associated with each additional move was approximately -0.07 to -0.08 of a standard deviation (SD) in reading and mathematics achievement, respectively. The impact on school dropout rates was even greater, with an average adjusted effect size of -0.10 SD for each additional move, corresponding to an average increase in the adjusted school dropout rate of 6.6 percentage points (Reynolds, Chen & Herbers 2009, p. 9)[2]. While less conclusive, the meta-analysis also found some evidence that mobility had a greater negative impact on numeracy achievement than on reading; and that moves occurring in the elementary and high school years were more detrimental than those that occurred in the middle years (Reynolds, Chen & Herbers 2009, p.10).

Researchers examining the causes of the impact of mobility on achievement have hypothesised that mobility causes disruptions to schooling and creates gaps in learning through higher absenteeism. Students with multiple moves may miss key educational material and experience difficulty in catching up with lessons. Frequent school changes can also lead to broken social connections. As a consequence, highly mobile students may lack social support and suffer from lowered self-esteem (Voight, Nation & Shinn 2011). Mobile students also face difficulty in building a strong and trusting relationship with their teachers in a short period of time. As a result, they do not feel as though they are members of the school and community, which can contribute to increased behavioural issues (Smither & Clarke 2007).

Movement between schools where curricula are not aligned can also hinder learning. In addition, when students change schools repeatedly, they simply do not attend any one school long enough for the school to have had a positive impact on their educational progress (O'Donnell & Gazos 2010). Mobile students may also be subjected to repeated evaluations and delayed intervention, especially if systems are slow to pass on information from one school to another when students move. This could cause frustration and further disruption to learning.

However, proving a causal relationship between mobility and achievement and providing a clear picture of causes and consequences of mobility is difficult as mobility is also found to interact with other known factors influencing educational outcomes. A consistent finding in the literature for example is that mobile students are more likely to live in low income households, come from single-parent families, and have parents with low levels of education attainment (Boon 2011; Heinlein & Shinn 2000; Hill, Navin & Lynch 2009; Long 1992; Smith, Fien & Paine 2008; Sorin & Iloste 2003). They are also more likely to belong to a disadvantaged minority group and have a greater tendency to be eligible for special support services (Columbus Foundation 2003; National Research Council and Institute of Medicine 2010, p. 17; Voight, Nation & Shinn 2011).

2 Results are based on the 5 well controlled studies included in the meta-analysis that included school dropout as an outcome measure. This effect size is based on the adjusted dropout rates that have all been adjusted for differences in pre-mobility achievement, family background and many other factors that vary across studies.

As students who frequently change schools are also likely to experience a variety of other problems in their family situations or in their personal situations (e.g. poverty, family dissolution, economic stress, housing pressure), it is difficult to estimate the cumulative (and unique) effects of mobility when they are confounded with a myriad of other factors. It is especially difficult when these other family and personal factors can also change over the same measurement period.

To compound the complexity of the issue, there is also evidence that mobility impacts negatively on student engagement, attendance and behaviour, all of which are critical to student learning and progress. Mobile students have been reported as having higher absenteeism than non-mobile students, higher rates of suspension and other behaviour problems, and exhibiting lower levels of engagement in classroom activities (Boon 2009; Columbus Foundation 2003; Fiel, Haskins & Lopez Turley 2013; Smither & Clarke 2007; Sorin 2005; Voight, Nation & Shinn 2011).

The complex relationship between mobility and other known risk factors necessitates careful interpretation of the varied results of mobility studies which can differ in many ways. The variations range from the student and family background factors controlled for in the analysis, the characteristics of students and schools investigated, to the methodologies used. The methodological variations include the measures of mobility used (e.g. dichotomous vs continuous), achievement measures of interest (attainment vs growth measures), the time period examined, and the statistical methods used to analyse impact (e.g. multilevel analysis or simple regression; inclusion of interaction effects or not).

Our review of the literature highlights the need for good study design, including the need to carefully consider how mobility should be defined and measured, what relevant contextual factors need to be taken into account to identify the independent contribution mobility has on student outcomes, and what appropriate statistical methods should be used.

2.3.2 Effect of mobility on school performance and reform

A number of studies have also found spillover effects of mobility. In other words, there is some evidence to suggest that mobility not only affects mobile students, but also their non-mobile peers who attend the same school.

Using data from 8,500 respondents to the first two waves of the US National Longitudinal Study of Adolescent Health, South, Haynie and Bose (2007, pp. 68-69) found "an increased risk of dropping out among both mobile and non-mobile students attending schools with high rates of student mobility, which appears partially attributable to lower levels of school attachment and weaker academic performance in high-mobility schools".

Non-mobile students in high mobility schools were also reported to have lower overall perception of school climate than their equivalents in low mobility schools (Voight, Nation & Shinn 2011). In general, schools with above average levels of student mobility have been reported as having more behavioural issues (Brown & Beckett 2006) and having lower attendance rates. When teaching resources are diverted to meet the increased behavioural issues and learning needs of mobile students, there is an inevitable impact on their non-mobile peers in the same classrooms.

Other studies have examined the collective achievement of schools in standardised tests, comparing high mobility with low mobility schools, while controlling for other school characteristics (such as concentration of low SES students in the schools). The predominant finding is that high overall performance in schools is significantly related to low mobility in the school student population (i.e. low enrolment churn), even when controlling for school demographics (Voight, Nation & Shinn 2011; Webster & Almaguer n.d.).

From the school's perspective, mobility potentially causes disruption at the classroom level. In addition to the impact of assessing and accommodating the needs of incoming students, which can detract from the needs of existing students, integrating new students into a class during the school term disrupts class curricula and instructional pace (O'Donnell & Gazos 2010, p. 2; Smither & Clarke 2007, p. 5). Additionally, schools experiencing significant student churn can face greater difficulties in implementing reforms to improve performance (Rhodes 2007). This highlights the need for equitable accountability regimes to consider school mobility when assessing school performance.

From a funding perspective, it has been argued that it costs more to educate mobile students and thus funding formulae should be adjusted to account for this (Sparks 2011).

The literature on student mobility also indicates that the impact of mobility can vary across different student groups, school structures and geographies. The next section focuses on the Australian literature on measures of mobility, the relationship with other aspects of disadvantage, and the impact on outcomes.

2.4 Australian context

Similar to studies in other countries, Australian studies have also found a negative association between mobility, achievement and attendance, plus overlap between mobility and other aspects of disadvantage which appear to mediate the mobility-achievement association (Boon 2011; Department of Education Science and Training 2002; Simons et al. 2007).

For example, researchers at the Queensland Department of Education, Training and the Arts (Simons et al. 2007) investigated the role of disruptions to schooling (mobility and attendance) in describing the association between socio-economic status and student achievement.

The cohort of all government students in Year 7 in 2006, and their school locations in the five years previous across the three annual enrolment collections (held in February, August and November), was used to obtain a sample of over 38,000 students. Different measures of mobility and attendance were calculated and tested for their explanatory power with Year 3, 5 and 7 student achievement tests.

Results reported by Simons et al. (2007) corroborated previous studies regarding the associations between mobility, SES, attendance and achievement. They found that student mobility had a small but significant effect on achievement in reading, numeracy and writing, over and above other socio-demographic factors. In addition, the investigators reported that both mobility and attendance 'explained' some of the association between SES and student achievement.

Simons et al.'s (2007) results also indicated that the type of mobility measure that best predicted student achievement was the number of transitions, compared with other measures such as length of time in the students' current school or distance from previous school. However, a limitation of Simon et al.'s (2007) investigation is that the mobility rates used in their analysis were constructed from students' enrolment status at three different points in time, not on continuous enrolment records. As a consequence, the extent and hence the impact of mobility is unlikely to have been accurately estimated in their study. Furthermore, their study did not control for other critical factors that are correlated with both mobility and achievement, in particular students' prior achievement which was a prerequisite variable in Reynolds, Chen and Herbers' (2009) meta-analysis.

Using longitudinal data from all public school students in Western Australia between 2008 and 2012, Hancock et al. (2013) also reported a negative association between student achievement and mobility, finding, for example, that the level of achievement of the most mobile students (those with 4 or more school changes) lagged that of non-mobile students by around two years. However, this study did not control for the influence of prior achievement, nor SES and other student contextual factors when analysing the relationship between mobility and student outcomes. It is therefore unclear whether this is an effect of mobility or other factors that are correlated with both mobility and student outcomes.

Hancock et al.'s (2013) results also point to a strong association between the number of school moves a student makes and reduced school attendance, finding that not only the number of school changes but also the timing of these moves has a strong relationship with attendance. Their results suggested that mid-term moves had a greater negative effect on attendance than end of year moves.

Other studies in Queensland, Western Australia and the Northern Territory have focussed on the mobility of Indigenous students, particularly in remote communities, and their consistently poorer schooling outcomes relative to non-Indigenous students. In Australia, Indigenous students are reported as having high mobility rates, and especially high within-term mobility rates (Navin, Hill & Doyle 2012; Sorin & Iloste 2003; Taylor & Dunn 2010). For example, Taylor and Dunn (2010) demonstrated the high turnover of Indigenous students within terms, especially in remote areas of the Northern Territory. Similarly, Prout and Yap (2012) reported on the high turnover of Indigenous students in schools in northern Western Australia which was not captured by administrative systems. They claimed that an unquantified proportion of Indigenous students in the area were highly mobile and disengaged from schooling.

A small number of Australian studies have also examined the mobility of students in out-of-home care, noting particularly that school mobility is often associated with students' first entry into care as well as changes in care placements (Navin 2012).

The necessity to regularly change schools has also been highlighted among Defence Force families in Australia. While seen as less than desirable, these moves can be better managed to some extent. For example, residential change associated with parental defence postings can coincide with the end of the school year to minimise disruption to schooling (Hotton, Monk & Pitman 2004).

At the federal level, with the renewed focus on 'needs based funding' in education in Australia, Hill, Navin & Lynch (2009) argue that action to support individual case management of mobile students is needed and call for commitment to reduce mobility in the low SES communities. There is also recognition in the broader research setting in Australia that the issue could be better understood (Nguyen & Anlezark 2009).

Recognising that mobility may be an issue for schools and students, other states and territories have made efforts to monitor and measure student mobility. Three states have attached sufficient importance to mobility for it to be included in resource allocation decisions. For example, South Australia (Department for Education and Child Development 2011) has included a measure of student mobility as one of four factors comprising schools' relative disadvantage; Queensland has provided targeted resources and additional teacher positions to support high mobility areas; while Victoria has recognised the administrative and resourcing costs involved in managing enrolment turnover.

Thus, three main areas seem to be the focus of policy and practice in responding to findings about the impact of mobility on students and schools in Australia:

- Global resource allocation decisions to help schools experiencing significant churn to better manage the needs of their students
- Administrative improvements – both for better data capture of transience and for enhanced support and co-ordination for mobile students within and between schools and services
- Classroom and teacher support strategies – to assist staff to be more responsive to student and school issues caused by high student turnover.

Before policy and resourcing responses can be considered or developed for NSW government schools, information is needed on the extent and impact of student and school mobility in NSW, which is the focus of the current study.

3. Goals of the study

As the first large scale mobility study in NSW, using longitudinal administrative data to analyse mobility, we aim to:

- construct measures of student and school mobility that are specific to the NSW context
- understand the size of our mobile student population, their demographic characteristics, any persistent movement patterns and the geographical distribution of the mobile population
- examine the impact of mobility on student and school performance, and how this impact is moderated by other known background factors.

The following section presents the definition of student mobility developed for the current study, along with descriptive analyses of the extent of mobility in the NSW government student population, patterns of mobility, and the characteristics of students who move.

4. Student mobility

4.1 Defining student mobility

The student mobility measure developed for this study was based on the most commonly used definition in the published literature, which is the number of non-structural moves each student makes in a given period. In the context of NSW schooling, the following school moves are expected as a result of system structural requirements, and were therefore excluded when measuring mobility:

- school changes as a result of students finishing primary education and starting secondary education in a secondary school (the Year 6 to 7 moves)
- school changes as a result of students finishing Year 2 at an infants school and moving to a primary school to continue primary education[3]
- school changes as a result of students being selected into a Year 5 opportunity class in another school[4]
- school changes as a result of students moving from a junior secondary school (catering to students up to Year 9 or Year 10) to other schools for their senior secondary education.

Under the NSW government school enrolment policy, students can only be officially enrolled in one school. This school is referred to in the system as the 'census school'. When students attend multiple educational settings simultaneously (e.g. a high school student enrolling in a course through a distance education school, or students placed in a support class in another school for a short period), the census school is the main school where the majority of the student learning is expected to be undertaken. For our project, any movements between schools that do not result in a change in the census school are not included in the measurement of mobility.

All other movements that do result in a change of census school are considered in-scope, including movements into or out of a School for Specific Purposes (SSP) or a support class at another school, movements into or out of full-time distance education, and movements of students from Intensive English Centres to other schools.[5]

School moves may coincide with a grade promotion (e.g. from Year 2 to Year 3), which are recorded in the enrolment system either as occurring at the end of the school year or at the beginning of the following year. In this report, these moves are referred to as 'between year moves' and they are reported in the move statistics against the new calendar year and the grade the students are progressed into, unless otherwise specified.

The time period over which mobility is measured for this study is dependent on data availability and the focus of each analysis, which is discussed in the relevant sections.

3 Infants schools in the NSW government sector only cater for students from Kindergarten to Year 2.
4 Opportunity Classes are special classes for gifted and talented Year 5 and 6 primary students. Students can sit state-wide aptitude exams in Year 4 for selection into these classes.
5 In sum, all these types of moves comprise approximately 15% of total moves each year.

4.1.1 Data sources

The NSW government system implemented a centralised system – the Enrolment Registration Number system (ERN) – in all schools in 2008. Under this system, every student enrolled in a NSW government school is associated with a unique student identifier – a Student Registration Number (SRN). This number travels with the student when he or she moves between NSW government schools, or returns to a NSW government school after a temporary exit from the system. Since details of every enrolment episode from 2008 are captured in ERN (e.g. the start and end date of an enrolment episode), it is possible to count the number of school changes a student makes in a given period, as well as the timing of those moves.[6] However, the system only allows for the tracking of students within the NSW government sector, so mobility (measured by the number of moves between government schools) estimated for a student over a period is a conservative estimate, as it does not include moves made from, to or between non-government schools or schools in other states prior to the student entering the NSW government system.

4.2 Descriptive analysis results – characteristics of movers and movement patterns

For this section, mobility has been considered over various time periods depending on the purpose of each analysis and data availability. We start by considering the level of annual mobility between 2012 and 2014. We then consider students moving in consecutive years, and conclude this section with an analysis of mobility over the entire primary, or secondary, years of schooling.

4.2.1 Student mobility in one year

In any given year, there are around 60,000 school moves system-wide that are not required by the schooling system structure. On average these moves involve approximately 54,000 students (approximately 7 per cent of all students) who make one or more moves in the year. Most of these students (almost 90 per cent) make only one school change in one calendar year (see Table 1). However, a sizeable number of them (around 4,700) make two school changes, meaning they may attend three government schools over a 12 month period[7]. About 800 students system-wide make at least three school moves in the one calendar year. These students can be considered as highly mobile students, since they stay in one school on average for only one term or less. The maximum number of school changes students make in one year is eight, although this level of extreme mobility only affects very few students (fewer than five in any year).

Table 1:

Number of mobile students by move frequency, 2012 to 2014

Calendar Year	Moved once		Moved twice		Moved three times		Moved four times or more		Total no. of mobile students
	No	%	No	%	No	%	No	%	
2012	47,374	88.8%	5,118	9.6%	709	1.3%	170	0.3%	53,371
2013	48,360	89.5%	4,852	9.0%	659	1.2%	172	0.3%	54,043
2014	49,308	90.0%	4,697	8.6%	629	1.1%	143	0.3%	54,777

6 The quality of enrolment transaction records in ERN and the continuity of student SRNs when students move schools has increased over time and is currently considered to be quite high. However, it is estimated that possibly up to half of one per cent of students currently enrolled may have previous enrolments recorded against a second SRN as a result of school staff being unable to identify a new student's previous records. Therefore, mobility for this small number of students will be under-reported.

7 Some student moves are circular, meaning that the student returns to a school in which they were previously enrolled. In this scenario, making two school changes means the student attends only two different schools, not three. See section 4.2.2.4 for more information about circular movements.

The following section examines the timing and grade levels of student moves as well as other movement patterns.

4.2.2 Movement patterns 2012 to 2014

To further our understanding of mobility in NSW government schools and to better inform policy discussion around strategies to manage risks arising from mobility, we analysed the patterns of movements, focusing on the following aspects of mobility:

- timing of school moves
- whether students in some grades are more mobile than others
- temporary versus persistent mobility
- circular mobility, and
- mobility and school SES.

4.2.2.1 Timing of School Moves

The literature suggests that the timing of school moves may differentially impact on students' learning progress, such that within-term moves are considered to be more disruptive and damaging than between-year moves. We classified all in-scope school changes that occurred between 2012 and 2014 into three categories:

- within term moves (school changes that occurred during a term)
- between term moves (school changes that occurred during a term holiday)
- between year moves (school changes that occurred at the start or end of a school year).[8]

Figure 1:

Timing of moves made over the three year period from 2012 to 2014

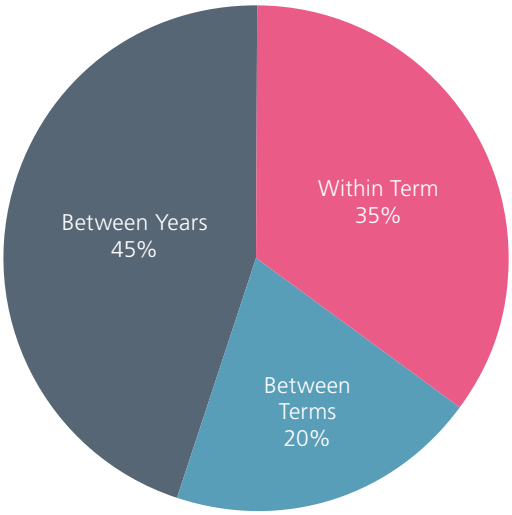


Figure 1 shows that, of over 180,000 moves made by students between 2012 and 2014, 45 per cent were made between school years and 20 per cent were made during term holidays. The type of move thought to cause greatest disruption to classroom teaching and affecting mobile and non-mobile students the most – moves that occurred during a school term – make up 35 per cent of total moves.

4.2.2.2 Are some cohorts more mobile than others?

Table 2 shows the number of moves made by students in each grade cohort in 2014 and the share of those moves as a proportion of the total moves incurred, as well as these moves expressed as a proportion of the grade enrolments. The findings reported below are consistent across other calendar years.

8 Between year moves include moves made in the last three weeks of one school year or the first three weeks of a new school year and are reported against the new calendar year and the grade into which the students have progressed.

Table 2:

Distribution of moves across grades (2014)

Grade	Total no. moves	% of total no. moves	No. of moves per 100 enrolments
Kindergarten	4,220	7%	6.1
Year 1	5,795	10%	8.4
Year 2	5,719	10%	8.5
Year 3	5,678	9%	8.8
Year 4	5,067	8%	8.3
Year 5	5,458	9%	9.1
Year 6	3,413	6%	5.8
Year 7	3,387	6%	6.9
Year 8	4,760	8%	9.4
Year 9	5,178	9%	10.1
Year 10	5,910	10%	11.2
Year 11	4,853	8%	10.0
Year 12	462	1%	1.1
Total Moves	**59,900**	**100%**	**8.1**

Note: consistent with our definition of mobility, moves made at the end of 2013 are included above and are counted against the student's grade in 2014. 'Moves per 100 enrolments' have been calculated from the enrolments in each grade as at August 2014 from the National School Statistics Collection.

Table 2 indicates that the number of school moves was fairly similar for Years 1-5 and Years 8, 9 and 11, with around 5,000 moves occurring in each of these grades in 2014, corresponding to 8-10 moves per 100 enrolments. In the primary years, the Year 3 and Year 5 cohorts were slightly more mobile than other primary cohorts with around 9 moves per 100 enrolments, while in secondary schools, the Year 10 cohort was the most mobile in 2014, with 11 moves per 100 students.

Year 12 students were the most stable of all students with only 1 move per 100 enrolments. It seems that once students reach Year 12 and start preparing for Higher School Certificate, they are unlikely to change schools. Similarly, Year 6 students in their last year of primary schooling were also more stable than average with just below 6 moves per 100 enrolments.

Kindergarten and Year 7, the first years of primary and secondary schooling, were the next most stable cohorts with 6-7 moves per 100 enrolments. The relative stability of Kindergarten and Year 7 cohorts is largely reflective of the schooling structure in NSW. As Kindergarten is the first year of schooling in NSW, there are no moves that could have occurred at the beginning of the year as a result of grade promotion. Similarly the low rate of total moves observed for Year 7 students is due to the fact that all school changes as a result of grade promotion from Year 6 to Year 7 are excluded from the mobility measures. Therefore, for both Kindergarten and Year 7, the total number of moves largely reflects moves made during the year and includes only a small number of between year moves made by students repeating that year of schooling at a different school.

4.2.2.3 Temporary vs. persistent mobility

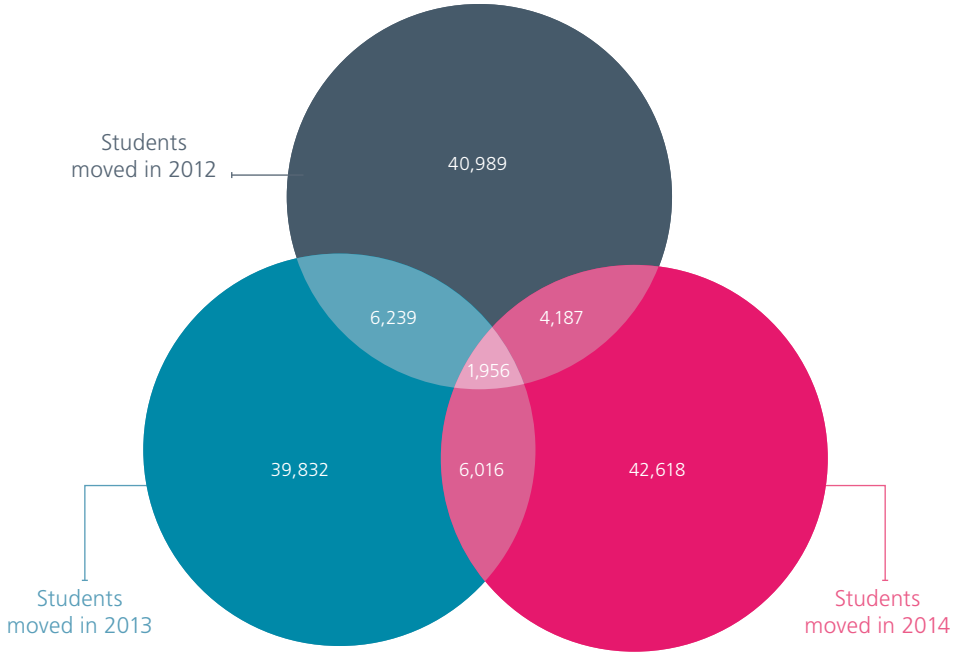
Students in NSW government schools change schools for various reasons including positive reasons such as residential moves necessitated by job promotions or strategic moves instigated by parents seeking better quality schools. These moves are hypothesised to be episodic and non-recurring, and less damaging than moves made under duress. Moves made due to negative reasons such as housing distress, domestic violence, or economic pressure are clearly related to students' disadvantaged family circumstances and, unless these circumstances change, mobility for the students affected is envisaged to be a recurring pattern.

While we don't have direct data on the reasons students change schools, we can examine mobility persistency for any student by linking moves incurred by the student in one year to moves made in subsequent years. We can then gauge to what extent students exhibit temporary versus persistent mobility patterns.

Our analysis using the 2012 to 2014 data indicates that the majority of mobility in NSW is temporary rather than persistent. On average, around 85 per cent of students who changed schools in one year did not change again in the following year; and three quarters of them did not switch school again in the next two years. Figure 2 shows the relatively small overlap of students moving in successive years over the last three years.

Figure 2:

Number of students moving schools in 2012, 2013 and/or 2014



However, when data are disaggregated further by the frequency of moves made within each year, a clear pattern emerges that students with higher levels of mobility in one year are more likely to change schools again in the following year. For example, of the 47,374 students who moved only once during 2012, 6,489 (or 14% of them) moved at least once again in the following year. However, of the 5,118 students who moved twice in 2012, 1,389 (or 27%) changed schools at least once again in the following year. This rate is even greater for students with higher prior year mobility. Of the 879 students who moved at least three times in 2012, 351 (or 40%) of them moved at least once again in the following year. Therefore, students' previous mobility pattern is predictive of future mobility.

In summary the majority of the mobility observed in one year seems to be temporary as most students do not move again in the next two years. One might assume that much of this 'one-off' mobility might be caused by strategic or neutral reasons such as relocations due to property purchase activities. Mobility fluctuates over time, as individual student, family and school community situations change over time. However, the degree of prior mobility in any given year is predictive of subsequent mobility. The greater the level of mobility that students experience in one year, the higher the likelihood for mobility to be a persistent issue for the student.

4.2.2.4 Circular moves

Circular mobility refers to a pattern of mobility whereby students return to a school at which they were previously enrolled. A number of studies have noted the existence of circular mobility in various student populations (Henderson 2004; O'Keefe, Olney & Angus 2012). Since potential strategies to help students experiencing circular movements might be different than those for students with other movement patterns, we sought to understand how many students generated circular movements, their demographic characteristics and their particular movement patterns.

A total of 26,801 students had the opportunity to incur a circular movement pattern (i.e. they had at least 2 moves) in the past three years, of which nearly one half (45% or 12,137) did incur such a movement pattern. This indicates that a considerable proportion of moderately and highly mobile students return to a previous school at some point in their schooling career. Further analysis shows that Aboriginal students are slightly more likely to incur circular movements than non-Aboriginal students, with Aboriginal students representing 30 per cent of all students who had circular moves compared to 25 per cent of the pool of students who could potentially generate circular moves.

The reasons for students making circular movements are not known and are likely to be varied. However, some circular moves may involve students being placed in a support class at another school for a period of time and then returning to their previous school at some future time. Analysis indicates however, that this is not a common source of circular movements with at most 5 per cent of circular movements being instigated by support class placement.

Of further interest is where the circular movements are occurring, since strategies to improve the educational outcomes for those students who move around in the same area or across areas might be different, and need area-based cross-agency approaches in tandem with individual-based support programs.

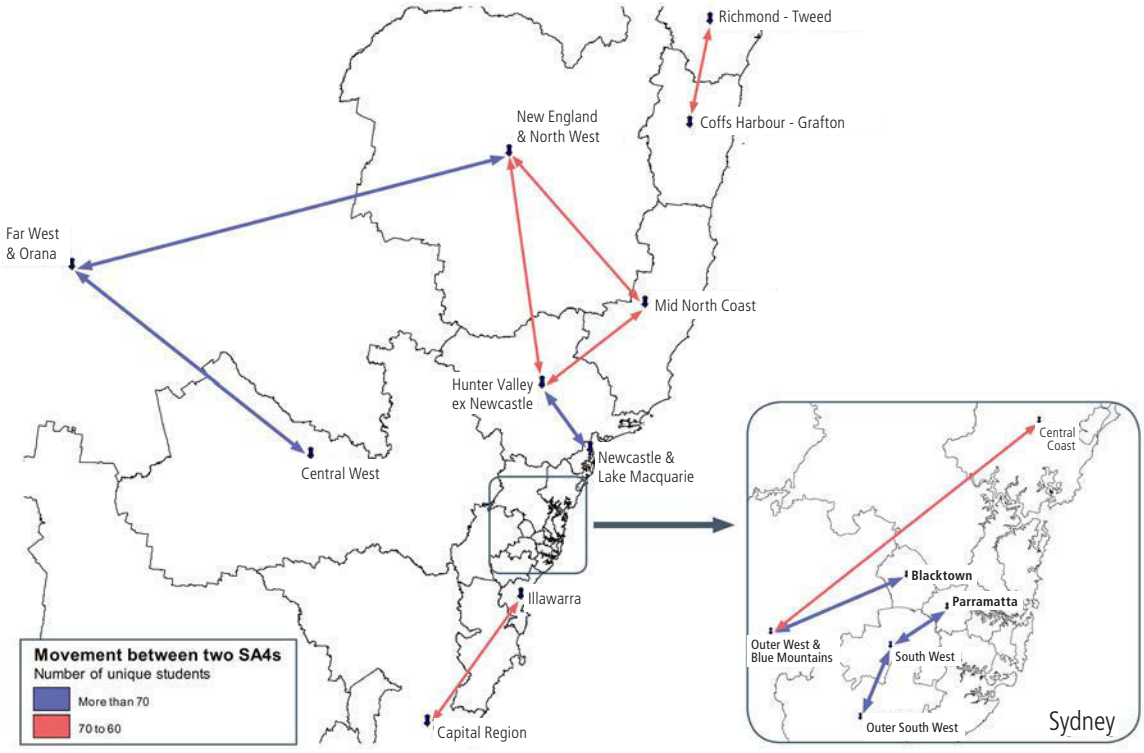
To examine the broad areas involved in circular movements, students' most recent circular move cycles were classified according to the ABS Statistical Area level 4 (SA4) of the school locations. Circular moves within the same SA4 accounted for 38 per cent of circular movements. As might be expected, circular moves that crossed SA4 boundaries largely involved schools in neighbouring SA4s.

The most common type of circular move involved only two schools (i.e. students moved from School A to School B and then returned to School A). Sixty-one per cent of students making circular moves had this type of movement pattern (the remainder have more complex movement patterns involving three or more schools).

The following map shows the most common patterns of circular movements which only involved two schools which were located in different geographical areas (i.e. different ABS Statistical Area level 4).

Figure 3:

Most common circular movement patterns involving schools in different SA4s, 2012 to 2014



In general, a similar number of circular movements originated in (and ultimately ended back in) each of the SA4s involved in each route. Exceptions included the New England/North West to Mid North Coast route, where the majority of circular movements originated in New England/North West, and also the Illawarra to Capital Region route, where the majority of circular movements originated in the Illawarra.

Analysis of circular moves involving 3 schools, or more than 3 schools (e.g. a movement pattern involving four schools with two "returns" such as: A -> B -> C -> B -> D -> A) is quite complex, and will be further investigated to understand the policy implications for these potentially educationally disadvantaged students.

4.2.2.5 Mobility and school SES

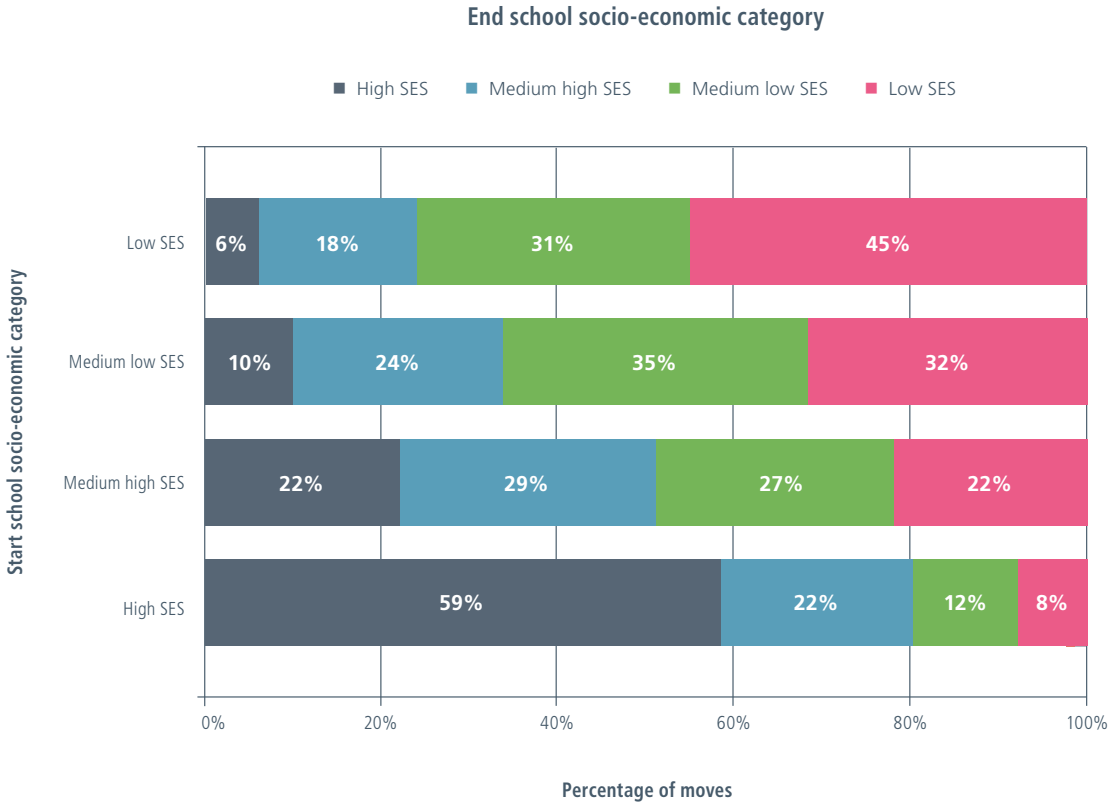
To better understand student mobility patterns, we also examined the socio-economic status (SES) categories of the schools that students moved from and to, that is, whether mobile students moved in a random fashion across schools at different SES levels, or if there were any systemic patterns.

Firstly, of all student movements that occurred in 2012-2014, the greatest proportion originated in schools in the lowest SES category (30 per cent). Student movements originating from schools in the highest SES category represented only 20 per cent of all moves.

Figure 4 shows, for every 'start school' SES category, the distribution of moves across the four 'end school' SES categories for all moves that occurred between 2012 and 2014. Students tend to move to schools of similar socio-economic status as the schools from where they came. For example, 59 per cent of the moves that originated from high SES schools between 2012 and 2014 ended in other high SES schools. Similarly, students are also more likely to move from low SES schools to other low SES schools, than to schools in any other SES categories.

Figure 4:

Mobility between school socio-economic status categories (2012 to 2014)



Note: school socio-economic category reflects the quarter that the school's 2014 Family Occupation and Education Index (FOEI) score falls in. FOEI is a measure of relative school disadvantage based on parental education and occupation information collected on student enrolment forms. Further information on FOEI is available in the following CESE Learning Curve publication: http://www.cese.nsw.gov.au/images/stories/PDF/CESE_Learning_Curve5_FINAL_FOEI.pdf

4.2.3 Mobility over the entire primary or secondary education

An important educational question is the degree of mobility students exhibit over their entire schooling career as this might further our understanding of the cumulative impact mobility has on students' outcomes.

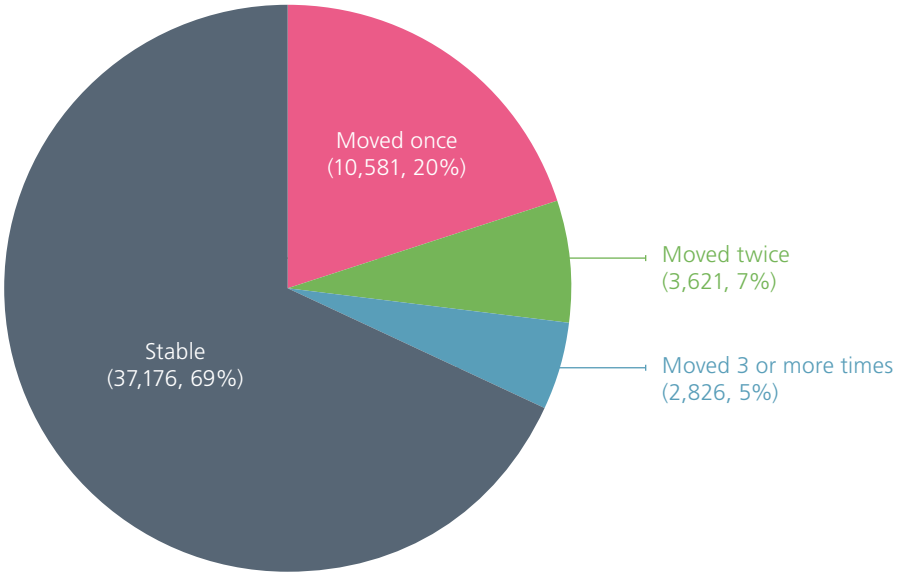
As our centralised enrolment system started in 2008, the first cohort for which we have been able to measure mobility over the entire seven years of primary education is the cohort of students who started school in 2008 (in Kindergarten) and who were still present in a government school in 2014[9]. The majority of these students finished Year 6 at the end of 2014, with the exception of students who repeated a grade during this period. Since repeating students also had seven years to incur mobility, for the sake of completeness, they have been included in this analysis of primary years' mobility. Their mobility is potentially underreported as they may experience further mobility in the year/s needed to complete their primary education. Students who temporarily exited the government system at some point between 2008 and 2014 but returned to the government system to finish primary education have also been included in this analysis. For these students, mobility is also underreported as data is not available for inter-sector or interstate mobility (i.e. moves incurred to, from or between non-government schools and in other states/territories). While these are issues worth noting, they are not expected to change the main patterns of mobility described in this section because the numbers in these categories are relatively small.

Figure 5 shows the degree of mobility experienced by NSW government students over the seven years of primary education.

Analysis shows that of the 66,849 students who started in Kindergarten in 2008, 54,204 (or 81%) were still enrolled in a government school in 2014. Of these, 69 per cent stayed in the same school for the entire period from the beginning of 2008 to the end of 2014, 20 per cent changed schools once, 7 per cent changed schools twice, and 5 per cent (or 2,826) changed schools three or more times. Of the students moving three or more times, 442 students appear to have a significant recurring mobility pattern as they moved school six or more times, averaging at least one school change per year; and of these, 55 moved 10 or more times over the same period, with four students moving 15 or more times over the seven years of primary education, averaging two or more moves every year.

Figure 5:

Level of mobility over students' entire primary schooling of the cohort commencing Kindergarten in 2008 through to Year 6 in 2014



9 Students who exited the government system and did not return to finish primary education in a government school have not been included in the analysis of mobility in the primary years. Since these students are of compulsory schooling age, they are expected to be enrolled in either a non-government school, a home school, or a school in other states/territories. As we cannot track these students' movements after they exited the government sector they have not been included in this analysis.

We also examined the degree of mobility over students' entire secondary education by tracking the total moves made by students who started Year 7 in 2008 through to the end of 2014[10]. An issue requiring consideration for this analysis is whether to include the estimated 30 per cent of students who leave the government school system before completing Year 12[11]. If these students are included, then they have had fewer years over which to accumulate mobility, and the estimates of overall mobility levels are likely to be underrepresented. On the other hand, we know that students leaving school before completing Year 12 are more likely to be low SES students, and as mobility is related to SES, omitting these students in the analysis of mobility is also likely to cause a non-negligible downward bias in the mobility estimates. To reduce these two negative effects as much as possible, we decided to include those students in Year 7 in 2008 who remained in a government school for their junior secondary years at least, and were therefore still enrolled in a government school in 2011 (i.e. four years later when the majority of students were in Year 10)[12]. Using this criterion, students have had sufficient years over which to accumulate mobility without inadvertently excluding those students who leave school between Year 10 and Year 12 and who may have experienced high levels of mobility.

Figure 6:

Level of mobility over students' entire secondary schooling of the cohort commencing Year 7 in 2008 through to 2014, for those students still enrolled in a government school in 2011

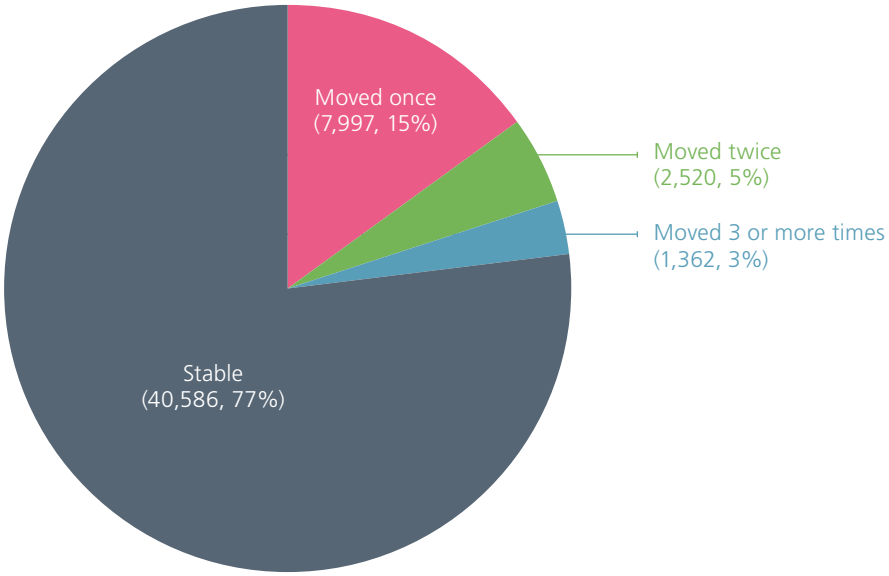


Figure 6 reports the degree of mobility experienced by NSW government students over their secondary years from 2008 to 2014. Of the 52,465 students who started secondary education in 2008 (and who stayed in the government system at least until 2011), 77 per cent stayed in the same school during the years they spent in secondary schooling, 15 per cent changed school once, 5 per cent changed school twice, and 3 per cent (1,362) changed schools three or more times, meaning they potentially attended at least four different schools. While only very few students have extreme patterns such as moving schools 10 times or more (7 students), the extent of mobility experienced by these students is very concerning.

Overall, the level of mobility among primary students over their seven years of primary schooling is slightly higher than that for secondary students over their six years of secondary schooling, with 31 per cent of primary students compared to 23 per cent of secondary students moving schools at least once. This may largely reflect the additional year of primary schooling plus some downward bias on secondary mobility rates due to an even shorter period over which to accumulate mobility for students who leave the government system prior to Year 12. However, it may also reflect that parents are somewhat less inclined to change their children's school during their secondary education.

10 For students who completed Year 12, most would have done so in 2013, however, a small number either repeated or undertook senior secondary studies on a part-time basis and were therefore still enrolled in 2014; therefore any moves made by these students were also included.

11 Students leaving the government school system prior to Year 12 do so for a variety of reasons. Some transfer to non-government schools or move interstate, while others leave to attend vocational training or gain employment.

12 Under the new school leaving age legislation which came into force in NSW in 2010, the cohort that commenced secondary school in 2008 (and were in Year 9 when the legislation commenced) were therefore required to complete Year 10 and either remain at school until age 17 or undertake other approved training or be in full-time paid employment. Those students leaving the government system prior to Year 10 are therefore expected to be enrolled in either a non-government school, a home school, or a school in other states/territories.

4.2.3.1 Characteristics of mobile students in NSW

To better understand our mobile student population, we examined the demographic background of movers compared to stable students, based on the same datasets used for the previous section – i.e., students who started in Kindergarten in 2008 and were still enrolled in 2014 as an example cohort of primary students; and students who started Year 7 in 2008 and were still enrolled as at 2011 as an example cohort of secondary students. For this analysis, students were reported in four groups based on the extent of mobility over the period between 2008 and 2014:

- stable students – those who stayed in the same school over the entire period
- infrequent movers – those who moved once in that period
- moderately mobile students – those who moved twice, and
- highly mobile students – those who moved three or more times.

For each mobility group, Table 3 reports the number and proportion of primary students in that mobility category that are of a particular background. For example, for the stable students group, 28.1 per cent were from a language background other than English (LBOTE), 5.3 per cent were from an Aboriginal background, and 22.4 per cent were from low SES backgrounds (those who are in the lowest SES quarter of all students). It is clear from the table that primary students who are from Aboriginal or low SES backgrounds are significantly over represented in the higher mobility groups. More than a quarter of the students in the highly mobile group are Aboriginal students, which is more than five times the rate of Aboriginal students in the stable group. Similarly, more than half of the students in the highly mobile group are low SES students, which is more than twice the rate of the low SES students in the stable group.

The likelihood of experiencing mobility for each demographic group is also reported in Table 3 as odds ratios. These ratios represent the odds of students in a particular demographic group (e.g. LBOTE) being in a particular mobility group, relative to the odds of students not in that demographic group (e.g. non-LBOTE) being in the same mobility group. Odds ratios close to 1 indicate similar odds for the two groups; odds ratios greater than 1 indicate higher odds for the demographic group being in a particular mobility group; whereas odds ratios less than 1 indicate that the demographic group has lower odds of being in a particular mobility group, than their peers.

Results indicate that male and female students have similar mobility patterns, with odds ratios for males in each mobility group generally close to 1.

Table 3:

Characteristics of primary students by level of mobility over their entire primary years (cohort commencing Kindergarten in 2008 through to Year 6 in 2014)

Primary students (2008 Kindergarten cohort)												
	Stable (no move)			Infrequent (1 move)			Moderately Mobile (2 moves)			Highly Mobile (3+ moves)		
	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio
LBOTE[i]	10,332	28.1%	0.98	3,273	31.8%	1.24	960	27.3%	0.95	462	17.1%	0.51
Aboriginal	1,982	5.3%	0.37	874	8.3%	1.08	557	15.4%	2.32	813	28.8%	5.67
Males	19,104	51.4%	0.97	5,602	52.9%	1.07	1,859	51.3%	0.99	1,425	50.4%	0.95
Low SES[ii]	8,194	22.4%	0.51	2,924	28.6%	1.13	1,415	40.7%	2.00	1,537	58.6%	4.26

Note: i. LBOTE stands for Language Background other than English, and includes students who themselves or whose parents are from a non English speaking background. ii. Low SES group includes those students whose SES scores are in the lowest SES quarter[13] of all government students, based on their parents' occupation and education status, as collected from enrolment forms. iii. Percentages are of all students in the designated mobility group, that have non-missing data for the designated background characteristic.

13 For details on how SES quarters are calculated for students in NSW government schools, please see the CESE technical report available from: http://www.cese.nsw.gov.au/images/stories/PDF/FOEI_Technical_Paper.pdf

Students from a non-English speaking background are slightly more likely to change schools once in their entire primary education than their English speaking peers, however, they are much less likely to change schools three or more times over the primary years than students from English speaking backgrounds.

Aboriginal students, and those from a low SES background, are more likely to be moderately mobile or highly mobile, when compared to their counterparts. For example, the odds of Aboriginal or low SES students being in the highly mobile group than in another mobility group are five and four times higher than the equivalent odds for their respective comparison groups.

Table 4 reports results for secondary students that are broadly comparable to those observed among the primary school cohort. However there were some differences. For example, Aboriginal students had even higher odds of being highly mobile (relative to their non-Aboriginal peers) when they are in the secondary years than in the primary years (odds ratio = 7.2 for secondary students, compared with 5.7 for primary students).

Table 4:

Characteristics of secondary students by level of mobility over their entire secondary years (cohort commencing Year 7 in 2008, through to 2014, for those still enrolled in a government school in 2011)

Secondary students (Year 7 2008 cohort)												
	Stable (no move)			Infrequent (1 move)			Moderately Mobile (2 moves)			Highly Mobile (3+ moves)		
	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio	No. of students	% of students in this group[iii]	Odds ratio
LBOTE[i]	11,356	28.0%	1.08	2,449	30.7%	1.19	508	20.2%	0.65	172	12.6%	0.37
Aboriginal	2,140	5.3%	0.34	765	9.6%	1.44	446	17.7%	2.98	456	33.5%	7.17
Males	21,355	52.6%	1.17	4,029	50.4%	0.94	1,131	44.9%	0.75	614	45.1%	0.76
Low SES[ii]	7,522	25.2%	0.69	1,450	29.6%	1.19	451	37.8%	1.71	273	50.1%	2.83

Note: i. LBOTE stands for Language Background other than English, and includes students who themselves or whose parents are from a non English speaking background. ii. Low SES group includes those students whose SES scores are in the lowest SES quarter of all government students, based on their parents' occupation and education status, as collected from enrolment forms. iii. Percentages are of all students in the designated mobility group, that have non-missing data for the designated background characteristic.

The high levels of mobility among Aboriginal and low SES students in both cohorts is further demonstrated by comparing the proportion of total moves that are incurred by these students relative to their share of total enrolments. Figures 7 and 8 show the moves generated by Aboriginal students, and low SES students respectively, as a proportion of all moves generated by all students between 2008 and 2014. Consistent with the above findings, Aboriginal students and low SES students generate a disproportionately higher share of total moves than their enrolment share.

Figures 7 and 8 also indicate the moves made by Aboriginal, and low SES, students as a proportion of all moves at each timing category. Both Aboriginal and low SES students are over-represented to an even greater degree in moves made during the school year, especially during term time; a move timing that has been suggested in prior research to have a greater negative impact on student outcomes than moves made between one school year and the next.

Figure 7:

Aboriginal students' share of moves, 2008-2014

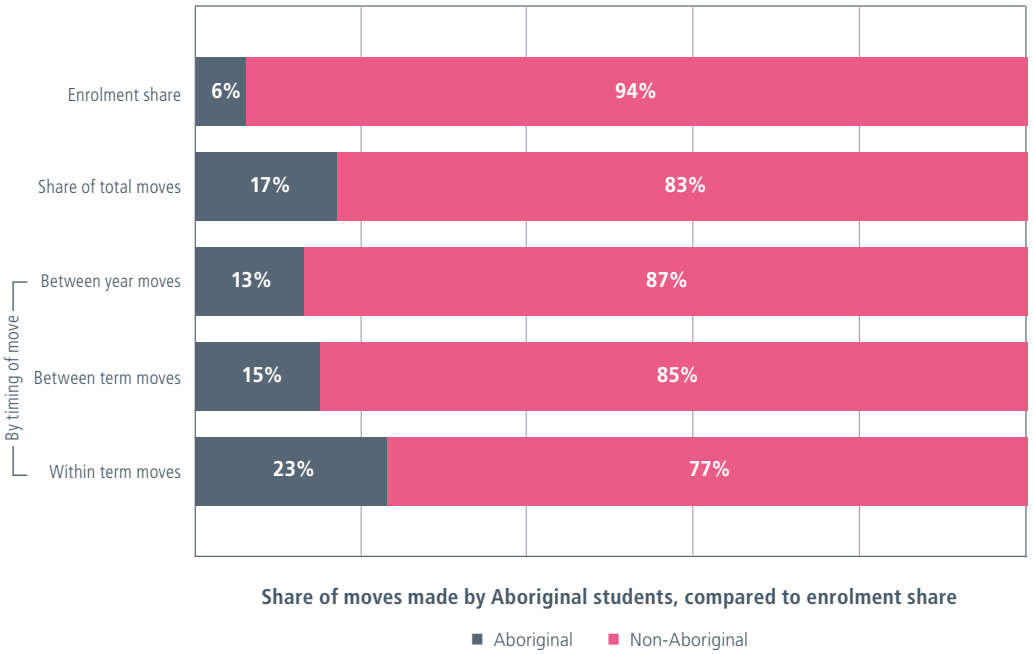
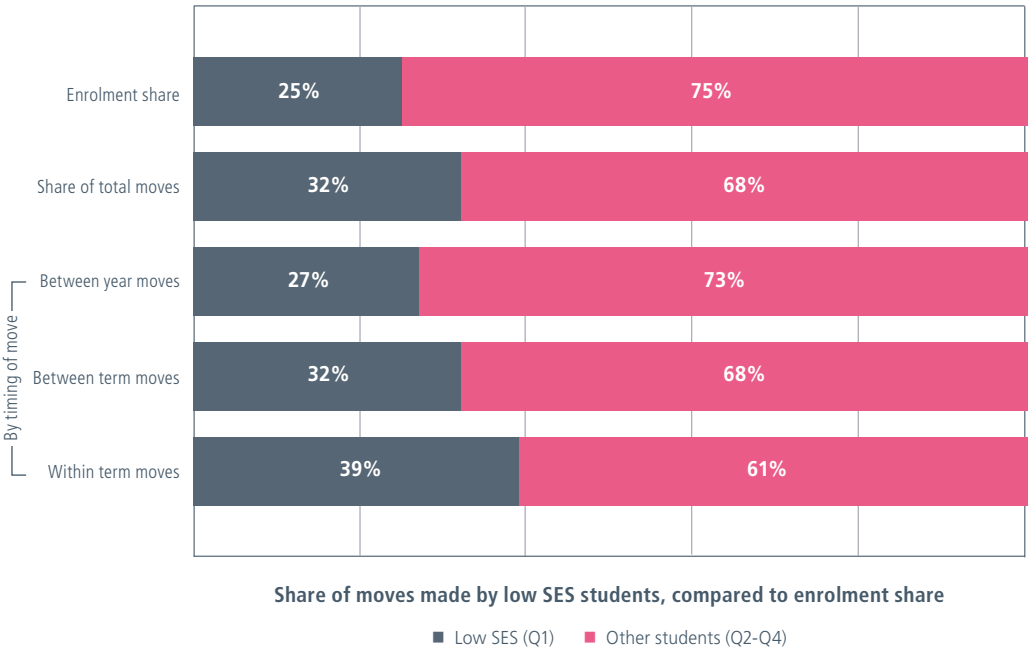


Figure 7 shows that Aboriginal students represented 6 per cent of total enrolments in NSW government schools on average over the period 2008-2014, but they generated 17 per cent of the total moves incurred over the seven year period. Across the move timing categories, Aboriginal students showed a higher propensity to change school at any time during the year than non-Aboriginal students, but particularly so during the term.

Low SES students follow a similar pattern. Moves made by these students as a proportion of all moves is 32 per cent, higher than the population share of low SES students which is at 25 per cent. Low SES students are also much more likely to make within term moves, with 39 per cent of the total within term moves incurred by these students.

Figure 8:

Low SES students share of moves, 2008-2014



Note: The low SES group includes those students whose SES scores are in the lowest SES quarter of all government students, based on their parents' occupation and education status, as collected from enrolment forms.

In summary, a significant number of students in NSW government schools are moderately to highly mobile during their schooling career. As these students are more likely to be Aboriginal or come from a low SES family background than students who do not make any non-structural moves, mobility and its consequent disruption to learning is an additional aspect of disadvantage facing these students[14].

The next section will explore the definition of mobility at the school level and the extent of mobility experienced across NSW government schools.

14 Additional analysis indicates that other groups of students experiencing high levels of mobility include students who are placed in out-of-home care, and students from defence force families.

5. School mobility

5.1 School mobility rate

This study considers two types of school mobility measures that are commonly used in the literature.

The first measure is a stability rate calculated from student enrolment data from the National Schools Statistics Collection (NSSC) which is conducted in August every year, where:-

1. $$\textit{School Stability Rate} = \frac{\textit{students enrolled in school x at time t and time t + 1}}{\textit{students enrolled in school x at time t with potential to be enrolled at time t + 1}}$$

Notionally for an annual rate in a primary school for the period 2013 to 2014 for example, the denominator would be the number of students enrolled in Kindergarten to Year 5 in 2013 from the 2013 census and the numerator would be the number of the same students still enrolled in the same school at the 2014 census. Most of these students are expected to be in grades from Year 1 to Year 6 in 2014. Those repeating a grade are included in the numerator and denominator.

This rate is easy to calculate from existing data collections and has the benefit of being conceptually simple. However it does not take account of moves made by new students who enrol after the census time in the base year, as well as the multiple moves a student may incur between the collection dates. Therefore, this measure underestimates school-level mobility. Based on our analysis of patterns of mobility amongst NSW government students, this could mean that most of the moves by highly mobile students are excluded.

An alternative measure, the school mobility rate, calculates gross movements into and out of a school divided by an average enrolment base. Since we can track students' movements within the government system, we can use continuous episodic data to calculate this rate (that is, the sum of individual movements divided by average enrolments).

2. $$\textit{School Mobility Rate} = \frac{\textit{moves into the school + moves out of the school in a given period}}{\textit{average enrolments over the same period}}$$

As with the measure of student mobility discussed above, the calculation of school mobility rates only includes non-structural moves. In addition, students moving from Intensive English Centres (IECs) to other high schools are not counted in the moves for the schools hosting the IECs. This is because students enrol at an IEC for a short-term period (approximately 20 weeks) with a planned exit to their chosen secondary school when they achieve a sufficient level of English proficiency. These moves can be considered a form of structural move and their inclusion would artificially inflate the mobility rates for the host schools. However, the moves of these students into other high schools are included in the mobility rates for those schools.

A further consideration in deriving mobility rates is the time interval that should be used in the definition of the mobility measure. As 15 per cent of our schools have enrolments typically below 50 and a quarter have enrolments typically fewer than 100, it is expected that school mobility measured over a single year would have an inherently high fluctuation for these schools from one year to the next. In order to get a reliable picture of mobility in NSW schools, it is therefore recommended that movements over a three year period be used to calculate average annual school mobility rates. For example, the 2014 school mobility rates should be based on the total of movements into and out of a school over the period 2012-2014, divided by 3, and then divided by the average enrolments over the same period to produce average annual school mobility rates. For ease of interpretation, these rates are multiplied by 100 and can be interpreted as the average annual number of moves per 100 enrolments experienced by a school.

However, as the source data for this calculation are movements occurring between government schools, the above calculation currently excludes students moving into a school that do not originate from another government school (e.g. students transferring in from non-government schools or interstate) and also excludes students who move out of a school and do not enrol in another government school. Hence, the current measure of school mobility underrepresents the true extent of the churn a school experiences. The associated implication is that analyses using the school mobility rates within this study are potentially biased[15]. Nevertheless, it is estimated that mobility rates calculated using this source data still capture a substantial proportion of movements into and out of a school.

School mobility rates have thus been generated for all mainstream primary, secondary and central/ combined schools. School mobility rates have not been calculated for schools for specific purposes due to their specialised nature and to the regulated Departmental processes for placing students in these schools.

5.2 Comparing school mobility rates to other measures

5.2.1 Comparison of school stability and mobility rates

In order to test the validity of the school mobility rates, analysis was carried out to examine the relationship between the mobility rates and the alternate measure – school stability rates, as well as to compare how well these two measures predict school performance. Since the mobility rates capture the enrolment churn in a more refined way than the stability rates, as discussed in the preceding section, it is hypothesised that they should predict school performance better than the stability rates. In order to perform this analysis, school stability rates were also calculated over a three year period from 2012 to 2014.

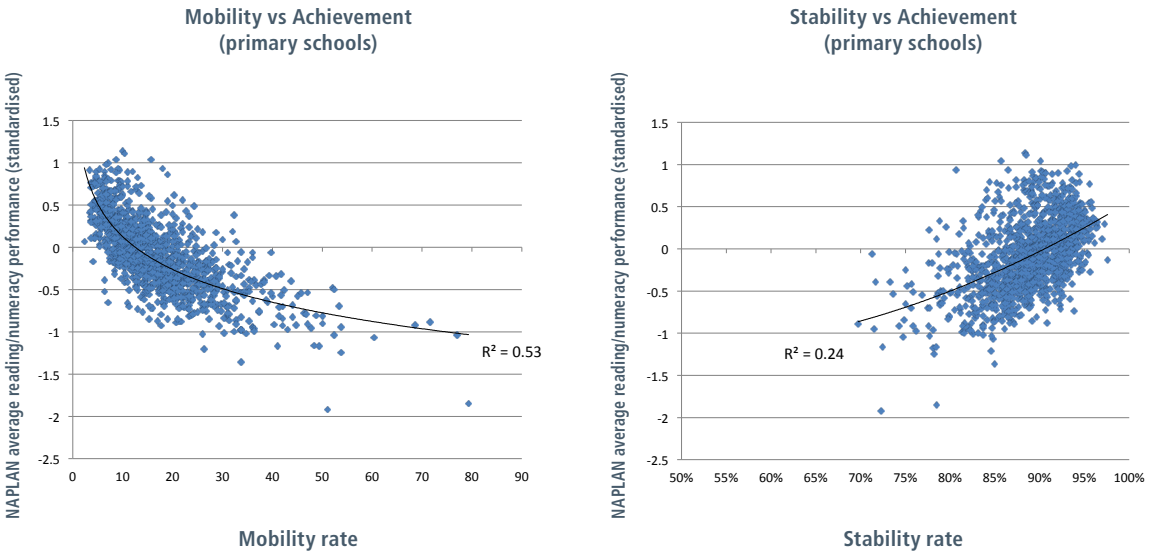
Results show that there is a high Pearson correlation (r=-0.71) between mobility and stability rates across all schools. This indicates that the two rates are measuring something similar but they are not identical.

However, in terms of predicting schooling outcomes such as average reading and numeracy achievement in the National Assessment Program on Literacy and Numeracy (NAPLAN) tests, school mobility rates explain a greater proportion of the variation in average school NAPLAN results for primary schools than do school stability rates, as indicated in Figure 9. Due to the volatility in average school NAPLAN achievement for small schools, schools with enrolments below 50 are excluded from this analysis.

15 Please refer to the 'Conclusions' section for plans to further improve and refine both school and student mobility measures.

Figure 9:

School mobility and stability rates (based on enrolment data for 2012-2014) as related to average NAPLAN achievement in primary schools (excluding small schools with fewer than 50 enrolments)



Note: The trend lines fitted in both graphs are the empirical best fit curves.

Figure 9 indicates that primary school mobility rates explain 53 per cent of the variation in average school NAPLAN achievement, compared to only 24 per cent for stability rates.

For secondary schools, mobility and stability rates are equally predictive of NAPLAN achievement, with both measures accounting for around 35 to 40 per cent of the variation in average school NAPLAN achievement.

5.2.2 Relationship between school mobility rates and other known school disadvantage/behavioural indicators

As an additional validation process, the relationship between school mobility and school socio-economic disadvantage, and that between mobility and school attendance rates were examined. Based on the review of relevant literature, our hypothesis was that higher rates of school mobility would be associated with greater school disadvantage and lower school attendance rates, another proxy for disruption to schooling. If these relationships are evident in the data, it provides a piece of predictive validity evidence for the school mobility measures we have constructed.

Analysis shows that the relationships between school mobility, school attendance rates and school disadvantage are as expected.[16] Results shows that school mobility is moderately correlated with school disadvantage (r=0.63), with more disadvantaged schools associated with greater enrolment churn. The correlation between the school mobility and school attendance rates is also statistically significant, at r=-0.71 for primary schools and r=-0.56 for secondary schools.[17] However, such a relationship is potentially influenced by the negative correlation observed between school disadvantage and attendance (r=-0.70 for primary schools and r=-0.65 for secondary schools). Figure 10 shows the scatter plots of school mobility, school disadvantage, and attendance rates for primary schools with enrolments of 50 or more students.[18]

In summary, as school mobility rates exhibit patterns as expected and better capture the enrolment churn experienced by schools, and are more predictive of average school achievement than school stability rates, they have been selected as the basis of further analysis in this study.

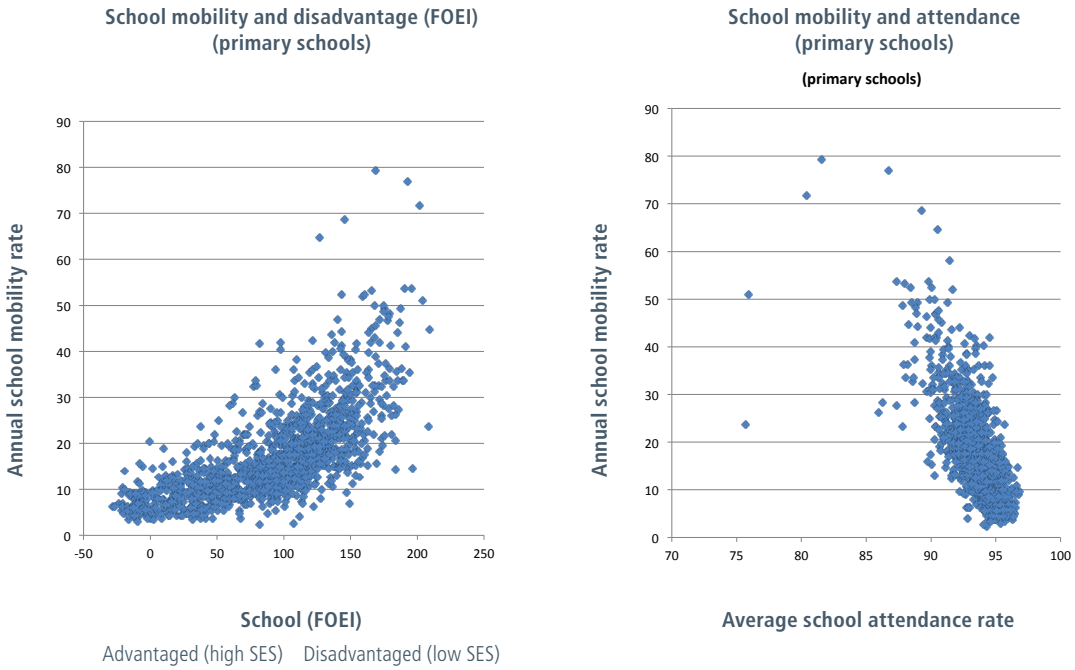
16 For this analysis, selective schools and schools with fewer than 50 enrolments are excluded. Selective schools have low rates of students moving out of the school; however, as some of them do have additional intakes into cohorts from Year 8 to Year 11, these new arrivals can inflate the mobility rates for these schools. To be consistent with the approach used for the analysis in the previous section, small schools with fewer than 50 enrolments are excluded due to the volatility in the relationships between mobility, FOEI and attendance that is inherent with small schools.

17 Analyses of attendance rates are reported separately for primary schools and secondary schools due to the differences in the distributions of attendance rates for primary vs secondary schools, and the potential differences in the relationship between mobility and attendance for these two levels of schooling.

18 Graphs depicting these relationships for secondary schools are included in Appendix A.

Figure 10:

Scatterplots of school mobility (based on all moves made in 2012-2014) with school disadvantage (Family Occupation and Education Index (FOEI)) and school average attendance rates for primary schools (excluding small schools with fewer than 50 enrolments)



Note: FOEI is a measure of relative school disadvantage based on parental education and occupation information collected on student enrolment forms.

5.3 Descriptive analysis of school mobility rates

Based on the above definition, school mobility rates for 2014 for government schools were calculated based on all non-structural movements from 2012-2014 divided by 3, then divided by the average NSSC enrolment across the three years, and multiplied by 100 for ease of interpretation. The median annual mobility rate across all primary, secondary and central/combined schools over this period was 16.3. This can be interpreted as 16.3 movements (both into and out of schools) per year per 100 students enrolled. As shown in Figure 11, the majority of schools have a mobility rate between 5 and 25; however, the distribution of mobility rates is skewed to the right with 13 per cent of schools having a mobility rate more than double the median rate for all schools. Benchmarked against international studies, these schools can be considered as having high mobility rates (Dobson, Henthorne & Lynas 2000; Navin, Hill & Doyle 2012). Around two-thirds of schools with high mobility rates are small schools with fewer than 100 students.

Figure 11:

Distribution of school mobility rates (based on all moves made in 2012-2014)

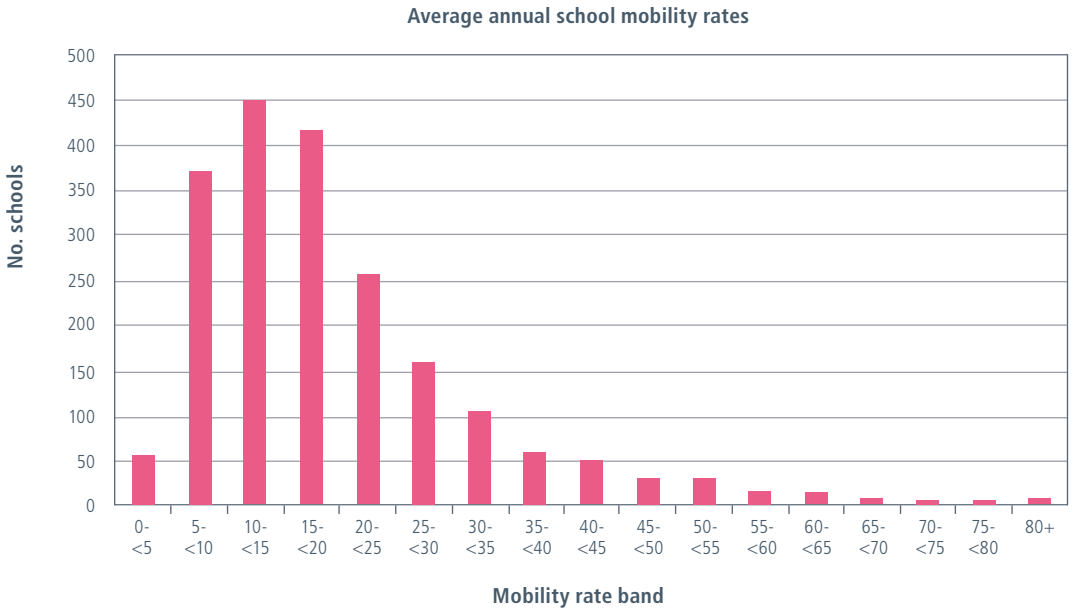
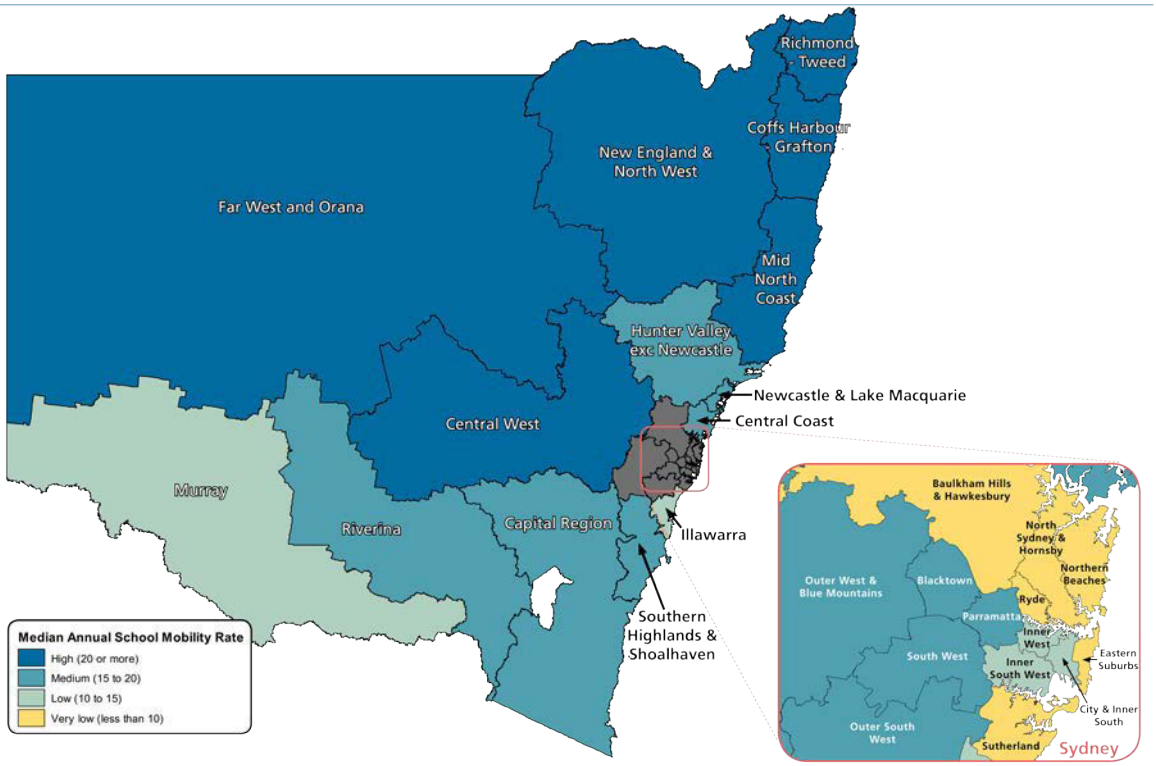


Figure 12:

Median annual school mobility rates (based on all moves made in 2012-2014) for schools in each ABS Statistical Area level 4 (SA4)



Note: Annual school mobility rates represent the number of moves (both into and out of schools) per 100 enrolments.

Figure 12 maps the median annual school mobility rates for schools in each ABS Statistical Area level 4 (SA4). Geographically, schools in areas such as Far West NSW, New England and North West, Mid North Coast, and Coffs Harbour-Grafton experience the greatest enrolment churn in the state with around 25 movements per 100 enrolments on average. The school mobility rates in these areas are 3-4 times higher than the rates for schools in affluent areas such as Northern Beaches, North Sydney/ Hornsby, Sutherland and Ryde, which experience 6-7 moves per 100 enrolments on average. See Appendix B for a table of median rates for each SA4.

6. Impact of mobility

This section examines the impact of mobility on student outcomes, and to what extent this impact is moderated by other known disadvantage indicators such as SES and Aboriginal background.

The analysis consists of three parts. The first part focuses on the impact of mobility on achievement for mobile students, the second part focuses on the impact of mobility on the likelihood of mobile students dropping out of school before completing senior secondary education, whilst the third part focuses on the impact of mobility on stable students (i.e. whether mobility has a spillover effect on the non-mobile students).

It is noted from the outset that the present study analyses the impact of mobility on outcomes by partialling out the effects associated with other known disadvantage factors. It does not, by design, investigate the causal mechanism via which mobility may affect outcomes (e.g., is the mobility effect a result of disruption to learning caused by curricular misalignment between schools, or is the effect simply a manifestation of other aspects of disadvantage that are not captured in the existing measures of disadvantage). Studies of different design are needed to understand any role that mobility might play in casual pathways leading to poor outcomes.

6.1 Impact of mobility on mobile students' achievement

6.1.1 Research questions

The student outcomes analysed in this section include students' reading and numeracy achievement. However, as the analysis of reading and numeracy achievement uses test scores from national tests, it is first necessary to examine whether mobility impacts on students' test participation, and hence the availability of test scores for use in the analysis. If mobile students are more likely to have missing test data then results of the analysis of achievement outcomes, especially those that rely on matched prior and later test data across a given period, are likely to be biased.

In summary, this section is concerned with the following two research questions:

1. Is there a relationship between mobility and student test participation? If so, is there evidence of this relationship remaining after other disadvantage factors such as SES and Aboriginal background, and prior achievement, have been controlled for?
2. What is the impact of mobility on students' educational achievement?
    a) Is there an association between mobility and educational achievement?
        i) Are there independent effects of mobility on educational attainment, after other disadvantage indicators are controlled for?
        ii) Are there independent effects of mobility on students' learning progress, after other disadvantage factors and prior achievement levels are controlled for?
    b) How does the impact vary by the degree of mobility and across levels of schooling (lower primary, upper primary and junior secondary)?
    c) Does the impact vary depending on the timing of moves (i.e. between year moves vs moves made during the year)?
    d) Does the impact vary for different test domains such as reading and numeracy?

When determining the questions to be explored, it is worthwhile noting that analysis of the impact of mobility on achievement in the senior secondary years was also considered. However, as around 30 per cent of students leave school prior to completing senior secondary education, and this may include a significant proportion of mobile students, we decided that such an analysis would significantly underreport the full impact of mobility on achievement. Instead, we have included an analysis of the impact of mobility on the likelihood of dropping out of school prior to completing senior secondary education in part 2 of this section.

6.1.2 Datasets

As the above research questions are concerned with the impact of mobility on test participation and outcomes across levels of schooling as well as across the extent of mobility, it would be ideal if sufficient longitudinal data were available to examine the cumulative effect of mobility throughout a student's education career. However, longitudinal data is only available from 2008 so total mobility is not available for students in Year 7 and beyond. Therefore, it was necessary to construct datasets that examined the impact of mobility for each schooling level separately with different cohorts of students.

A further requirement imposed for each dataset was the inclusion of only those students who were continuously enrolled in the NSW government system over the specified level of schooling. To do this, students that had an active enrolment record in each of calendar years over the relevant time period were classified as being continuously enrolled. The reason for including only those students continuously enrolled is that it reduces the bias associated with the underreporting of mobility for those students who, in the relevant period, left the government system and returned more than a year later. Since we cannot track school changes that occurred outside the government system, the inclusion of these students in the analysis might result in biased estimates of the effects of mobility.

Datasets were constructed to take the maximum advantage of the test performance data available for analysis. Unlike many of the states in the USA where annual test scores for students are often available, NSW government schools do not have system-wide standardised tests of students' achievement on an annual basis. Rather students are tested at two-year intervals, when they are in Years 3, 5, 7 and 9, through the national test program — National Assessment Program on Literacy and Numeracy (NAPLAN)[19]; and later when they are in Year 12 through the NSW Higher School Certificate (HSC) examinations in various subjects. In addition, for NSW government schools, all Kindergarten students are assessed by classroom teachers at the beginning of the year over multiple aspects of literacy and numeracy to enable teachers to gain a good understanding of the learning needs of every student upon entry to school.

Therefore, the following datasets were constructed for the analysis:

- A "lower primary" data file (dataset A) that contained all students who started Kindergarten in 2011 and who were continuously enrolled in a government school to the NAPLAN testing time in Year 3 in 2014, for analysis of the impact of mobility on students in the early learning years.
- An "upper primary" data file (dataset B) that contained all students who were enrolled at the NAPLAN test time in Year 3 in 2010 and who were continuously enrolled in a government school through to the NAPLAN test in Year 7 in 2014, for analysis of the cumulative effect over the upper primary years.
- A "junior secondary" data file (dataset C) that contained students who were enrolled at the NAPLAN test time in Year 7 in 2012 and who were continuously enrolled in a government school to Year 9 in 2014, for analysis of the effect over the junior secondary years.

19 NAPLAN is conducted early in a school year (in May) and tests skills in literacy and numeracy that are developed over time through the school curriculum. For further information on NAPLAN, refer to the website: http://www.nap.edu.au/naplan/naplan.html. In a nutshell, tests for the same learning domain (e.g. reading or numeracy) are vertically and horizontally equated so that they are comparable across test calendar years and across scholastic years. For example, Year 3 reading scaled scores in 2012 are comparable to Year 5 reading scores in 2014, as they are equated to the same scale.

While the choice of start and end scholastic years in datasets A and C is straightforward, the choice of Year 7 as the end scholastic year in dataset B requires an explanation. As test scores for students at the end of primary education (Year 6) are not available, the choice of test results for assessing the impact of mobility during the upper primary years is between the results at Year 5 or those at Year 7. As Year 5 results only represent outcomes midway through students' upper primary years, the Year 7 results are a better proxy for students' achievement at the end of primary years. This is because all NAPLAN tests are administered in early May, about 12 weeks into the new school year. So it can be reasonably argued that differences in NAPLAN results achieved at Year 7 (the first year of secondary education) reflect largely the differences in students' achievement to the end of primary years[20].

While in theory we can further break down the analysis of learning progress specified in dataset B to two pieces of analyses: analysis of progress from Year 3 to Year 5 and that from Year 5 to Year 7, we chose to analyse the mobility impact through one matched cohort, from Year 3 to the end of primary, as this would give us a more accurate estimate of the cumulative impact of mobility on students over the upper primary years.

A limitation of using Year 7 as a proxy for achievement in upper primary years is that a sizable number of government students leave the government system to enrol in non-government high schools, when they progress from Year 6 to Year 7. These students (referred to as Year 6 leavers) are not able to be included in the analysis of mobility impact for upper primary years. There is potential bias arising from omission of this group of students, as internal Departmental analysis has indicated that Year 6 leavers are somewhat higher performing on average than students who remain in the government system (as they tend to exit from higher SES schools that are generally also higher performing). However, the planned analyses take into account both background factors and prior achievement, which should reduce the potential bias to an extent.

For each of the three datasets described above, we included a student mobility group variable for each student for analysis of the impact of mobility. This variable classified students into four groups based on the total number of moves made by each student over the measurement period for each dataset. The four groups were: stable (stayed in the same school), moved once, moved twice, and moved three or more times over the specified period (e.g. for dataset B, the measurement period is the time period between the NAPLAN testing time in Year 3 and the NAPLAN testing time in Year 7). The reason for using a mobility grouping variable as described rather than using a direct numeric variable — the number of moves — in the analysis was that it allowed us to more accurately assess the impact for students who moved once or twice, which are the majority of the mobile student population. Very few students move four times or more over each reported period. By analysing the impact separately for each mobility group, we could test whether the impact of mobility was linearly related to the degree of mobility, i.e. whether the extent of the impact associated with each move was the same for students at different levels of mobility.

To assess whether the timing of school moves had any differential impact on achievement, two additional variables were included in the dataset: a count of school moves that occurred between school years (i.e. moves occurring either at the end of one school year or the beginning of the next school year) and a count of school moves that occurred during the school year (i.e. moves occurring more than three weeks after the commencement of the school year and before the last three weeks of the school year). These two broad categories of timing were constructed to maximise the reliability of the estimates due to the relatively small numbers of students in the more granular categories (i.e. within term vs between terms).

Other variables that were included in each dataset for each student were:

- Achievement measures, based on scaled test scores, and participation status, for both the start and end scholastic years in each dataset. The test scores for the start scholastic year are a proxy for prior achievement as at the beginning of the period across which mobility is measured. For example, dataset B contained each student's reading and numeracy scaled scores and associated participation codes for tests at Year 3, and four years later at Year 7, if available. For Kindergarten students in dataset A, the Kindergarten assessments across aspects of literacy and numeracy made by teachers at the beginning of the year are used as a proxy for prior achievement[21].

20 It is acknowledged that all students need to make a (structural) move when they exit a primary school and enrol in a secondary school for Year 7. However, this does not bias the results of the statistical analysis which aims to estimate the relative and not the absolute impact of moving schools.

21 For the purposes of analysis, the teacher ratings across several aspects of literacy and numeracy obtained from the Best Start assessment have been totalled, separately for literacy and numeracy, to provide proxy prior achievement scores.

- Student background variables including Aboriginal status, gender and student SES score based on parental education and occupation.

Appendix C provides summary descriptive statistics for each data item contained in each data file.

6.1.3 Analysis methods

For research question 1, descriptive analyses were first carried out to examine the raw relationship between mobility and test participation. In order to examine the extent to which mobility impacts test participation, over and above other possible explanatory factors, logistic regression analyses were then conducted to control for student background factors and prior achievement. These analyses were based on the matched datasets described previously: Kindergarten to Year 3 (dataset A), Year 3 to Year 7 (dataset B), and Year 7 to Year 9 (dataset C). The outcome variables in these analyses were students' participation in the NAPLAN reading tests, with each student either coded as 0 for being present or 1 for being absent from the tests. Students who were withdrawn or exempted from tests under special circumstances were excluded from the analyses[22].

For each dataset, logistic regression analysis was run with the following variables:

- a mobility group flag (stable, moved once, moved twice and moved three or more times) indicating the extent of the mobility incurred by each student over the respective time period
- a block of student background factors (student SES score, Aboriginal background, gender) that may impact both mobility and test participation[23]
- prior achievement scores in reading and numeracy, as low achieving students might be more inclined to not participate in the tests than their peers.

For research question 2, descriptive analysis examining the raw association between mobility and educational performance was first carried out. This was then followed by a series of ordinary least squares (OLS) regression analyses for each matched dataset for reading and numeracy separately, with the outcome variables being the standardised[24] test scores as at the later year. The sequential regression models were:

- The first model (Model 1) included just the mobility group variable, which classified students into four groups: stable, moved once, twice or three times or more, based on their total number of school changes between the start and end testing time for the relevant period.
- The second model (Model 2) added a block of student background factors including student Aboriginal status, student SES score (standardised), and gender into the regression equation. This enabled us to examine whether there was any mobility effect on attainment remaining after controlling for student background factors.
- The third model (Model 3) included a further block of prior achievement (student's standardised reading and numeracy scores at the start scholastic year). This allowed us to examine any independent effects mobility might have on the progress students made over the relevant period, after student background and the prior achievement (test scores over reading and numeracy measured at the start of the time period) have been accounted for[25].

22 Further details about NAPLAN participation and the exclusion of these students in the analysis are contained in the section 6.1.4 following.

23 Other potentially important background factors not included in the analysis include language background other than English, and English language proficiency. Language background has not been included as it is an extremely heterogeneous variable and in itself is not an indicator of educational disadvantage. Although low English language proficiency is an indicator of educational disadvantage, it has not been included due to the complexity of proficiency levels changing over time, and because, until 2013, teacher judgements were based on the old ESL phase framework which has known issues, particularly in relation to the assessment of students at an early learning stage.

24 Standardising a variable involves, for each value, subtracting the average value from it and then dividing it by the standard deviation of the values.

25 A measure of prior mobility (i.e. mobility incurred prior to the base year of each analysis) was also considered for inclusion in the analysis for upper primary and junior secondary cohorts. However, lack of sufficient longitudinal data as well as results from analysis indicating no residual impact of prior mobility on educational outcomes led to the decision not to include this measure in the models. Note that for the lower primary cohort, prior mobility is conceptually not applicable, as Kindergarten is the first year of formal schooling.

Models 1 and 2 are referred to in the literature as attainment models, whilst Model 3 is referred to as a growth or progress model, as it includes prior achievement. This means that the analysis examined the impact of mobility on learning progress (or adjusted growth) over the measurement period, rather than the absolute attainment at the end of the period.

As more variables were introduced to the models, missing data resulted in an increasing loss of cases for analysis. To ensure the comparability of the statistical results across the models, a common set of data records with complete data across all variables were used in each of the analyses. The summary statistics in Appendix C present the frequencies for each data item in the initial datasets compared to the final datasets with complete data that were used for the analysis.

6.1.4 Results and discussion

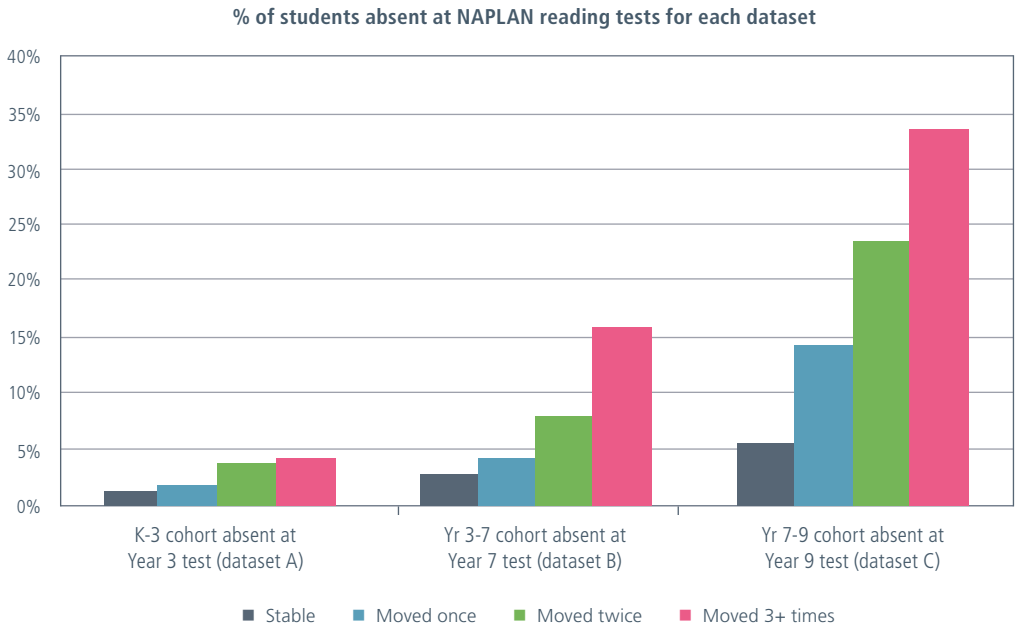
6.1.4.1. Mobility and test participation (research question 1)

There are three possible reasons for students' non-participation in NAPLAN tests: official exemption from the test, withdrawal by parents, or absent from school on the test day. Descriptive analysis indicates that the percentage of students exempted or withdrawn from the tests was similar for mobile and non-mobile students[26]. However, there is a clear pattern of mobile students being more likely to be absent from school on test days than stable students; and the higher the degree of mobility, the greater the propensity for students to be absent from the tests.

Figure 13 shows the proportion of students in each dataset that were absent at the NAPLAN (later year) reading tests, for each mobility category[27]. The proportion is calculated based on all students who had a valid test participation code for the relevant reading test. It is apparent from the graph that the extent of the negative association between mobility and test participation increases as students progress from early primary to secondary years and as the extent of mobility increases. For the matched Kindergarten to Year 3 cohort, the absence rate for students who moved three or more times is only slightly higher (around 2 percentage points) than the absence rate for students who did not change school (i.e. stable students) from the beginning of Kindergarten to the testing time in Year 3. However, this difference widens to 13 percentage points for the Year 7 cohort (matched from Year 3) and to 28 percentage points for the Year 9 cohort (matched from Year 7).

Figure 13:

Students absent from 2014 NAPLAN reading tests by level of mobility



26 If a student was actively enrolled in a school at a NAPLAN testing time, the student should have one of the four participation codes (exempt, withdrawn, absent, or present), for each of the NAPLAN tests. Across the three datasets, the proportion of students being exempted or withdrawn from tests varied from 0.3% to 3.6%, for students in each mobility category (stable, moved once, moved twice or moved at least three times, over the relevant reference period).

27 Analyses presented in this section relate to NAPLAN reading tests, however, results are very similar for NAPLAN numeracy tests.

Appendix D reports the descriptive statistics including the number of students of different demographic groups present or absent from tests for each dataset for students with complete data. It is clear from these statistics that low SES students, Aboriginal students and low performing students (students with low prior achievement scores) are also more likely to be absent from the tests than their respective peers. Given the overlap between mobility and other known disadvantage indicators, logistic regression analysis was carried out using these demographic indicators and prior achievement scores in addition to the mobility variable to predict the probability of a student being absent from a NAPLAN reading test.

Table 5 reports the coefficients from this analysis, which indicate the change in the log odds of the outcome associated with a unit change in the predictor variable, after other factors are held constant.

Table 5:

Logistic regression results for 2014 NAPLAN reading test participation

Dependent variable: Absent from the 2014 NAPLAN reading test	Absent from Year 3 test			Absent from Year 7 test			Absent from Year 9 test		
	Coef.	z	Odds ratio	Coef.	z	Odds ratio	Coef.	z	Odds ratio
Mobility group (ref: stable)									
Moved once	0.17	1.59	1.19	0.37***	4.08	1.44	0.79***	10.51	2.20
Moved twice	0.86***	5.68	2.37	0.76***	5.71	2.14	1.35***	10.33	3.86
Moved 3+ times	0.54*	2.22	1.72	1.06***	6.38	2.89	1.48***	6.64	4.40
Aboriginal	0.29*	2.24	1.33	0.76***	8.26	2.13	0.43***	5.18	1.53
Gender (ref: female)	0.15*	1.99	1.16	0.27***	3.98	1.31	0.04	0.7	1.04
Student SES score (std)	-0.24***	-5.67	0.79	-0.28***	-7.02	0.76	-0.27***	-8.54	0.76
Prior reading score (std)	-0.05	-0.87	0.96	-0.14**	-2.88	0.87	-0.02	-0.5	0.98
Prior numeracy score (std)	-0.13*	-2.59	0.88	-0.19***	-3.68	0.83	-0.58***	-11.62	0.56
N	43,055			30,800			31,331		
McFadden's R^2 [28]	0.021			0.058			0.083		

Note: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Descriptive summary statistics for each variable are provided at Appendix D.

For ease of interpretation, odds ratios are also provided. The table shows that the directions of all coefficients associated with key demographic factors and prior achievement scores are as expected: low SES students, Aboriginal students and low performing students (students with lower prior achievement scores) are more likely to be absent from the tests, than their respective peers, after other factors are held constant.

The table also confirms that mobility has an independent, negative effect on test participation, after controlling for student background factors and prior achievement. All coefficients associated with the three mobility groups (moved once, moved twice and three times or more) are positive, which means students in all three mobility groups have a greater likelihood of being absent from the tests, than non-mobile students (the reference group), after other factors are held constant. All coefficients associated with the mobility groups are statistically significant, except for that associated with the 2014 Year 3 students who moved only once since Kindergarten. This is consistent with the descriptive analysis results that Year 3 students who had moved once have a similar level of NAPLAN test absence as stable students.

Another finding is that, generally speaking, the negative effect of mobility on test participation increases as the level of mobility increases. The coefficients increase in unison from the least mobile group to the most mobile group for each dataset with only one exception: Year 3 students who moved three times or more. This exception could be due to random noise arising from a small sample size (there were only 19 students who moved three or more times who were absent from the Year 3 NAPLAN tests).

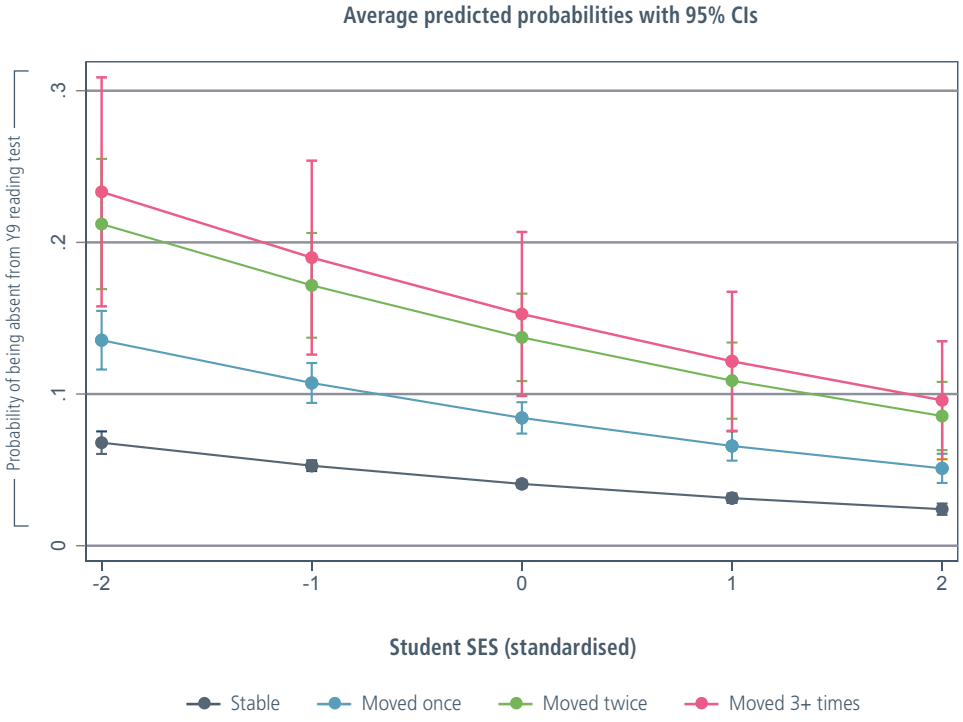
28 McFadden's R2 is the pseudo R2 produced by logistic regression analysis in Stata. It is calculated as the ratio of the log likelihood of the full model to the log likelihood of an intercept only model (i.e. with no predictors), subtracted from 1. Higher values of McFadden's R2 indicate that the full model is a better fit than the intercept only model. For further information, see: http://www.ats.ucla.edu/stat/mult_pkg/faq/general/Psuedo_RSquareds.htm

Adjusted odds ratios can be used to interpret the relative risks of test absence associated with each mobility group. For example, Table 5 shows that the odds of being absent from tests are four times higher for those who moved three times or more in the junior secondary years compared to those who didn't change schools, after all other covariates are taken into account. Even for those students who moved only once in the junior secondary years, the odds of being absent at the Year 9 reading test are twice as high as those who were non-mobile.

To further help understand the impact of mobility, the predicted probability of being absent from the reading test was calculated for all records in each of the matched cohorts. Figure 14 provides a visual representation of the average predicted probabilities across different mobility groups for students at different socio-economic levels for the matched Year 7 to Year 9 cohort. As indicated in Figure 14, low SES students have a greater probability of being absent than high SES students, and there appears to be an even greater increase in the probability of being absent for students with higher levels of mobility, particularly for low SES students. For example, a very low SES student experiencing three or more moves during the junior secondary years has a 24 per cent probability of being absent from the Year 9 reading test, whereas a very low SES student who does not change schools has only a 7 per cent probability of being absent[29].

Figure 14:

Predicted probability of being absent from the 2014 NAPLAN Year 9 reading test for students at each level of mobility across levels of student SES



29 Further analysis was carried out to check the significance of interaction effects between mobility and student SES for each dataset. This analysis confirmed that there were no statistically significant interaction effects across mobility groups and levels of schooling.

The size of the unique effect of mobility on test absence, after other disadvantage factors have been taken into account (i.e. the 'average marginal effect'[30]), reflects the change in the predicted probability of being absent relative to that for non-mobile students. On average, moving once in the junior secondary years increases the probability of being absent from the Year 9 test by 5 percentage points, while moving twice and three times or more increases the probability by 10 and 12 percentage points respectively, when compared to non-mobile students. For the lower and upper primary years, the average marginal effect of mobility on the probability of being absent from a test ranges from 1 to 5 percentage points. Results of the average marginal effects are provided in Appendix E.

The pattern indicated – that the more mobile a student is, the higher the likelihood the student would have missing test scores – means any mobility analysis involving the use of the test scores would most likely underestimate the extent of the mobility effects and the size of the bias could be significant. This pattern also has educational and policy implications as it suggests it is much harder to accurately track and monitor the progress of highly mobile students, resulting in increased risk of delayed intervention for this vulnerable and disadvantaged group of students[31].

6.1.4.2 Mobility and educational achievement (research question 2)

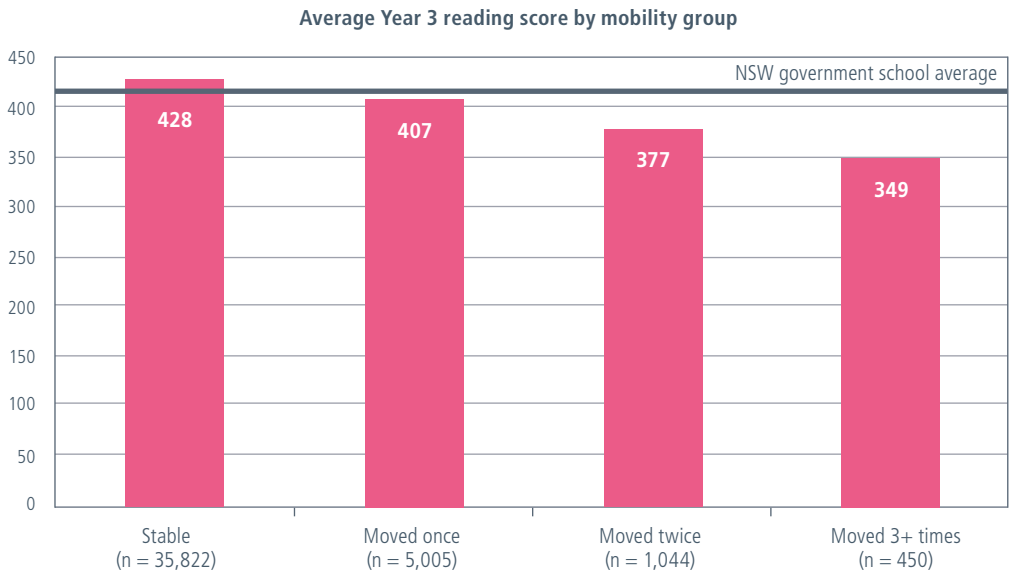
As discussed above, the observation that mobile student are more likely to be absent on test days poses challenges for any analysis of the impact of mobility on test scores. We nevertheless estimate these relationships with the cautionary note that the estimated effects reported below are likely to be conservative.

Impact of mobility over the lower primary years (K-3)

The average Year 3 reading scores for students in each mobility group are presented in Figure 15. As depicted, higher levels of mobility are associated with lower levels of reading achievement. For students who moved three or more times between Kindergarten and Year 3, average reading scores at Year 3 are almost 80 points (almost one standard deviation) below that for stable students. Results are similar for Year 3 numeracy achievement.

Figure 15:

Year 3 reading scores in 2014 NAPLAN by level of mobility



30 For logistic regression analysis, marginal effects measure the change in probability of an event (e.g. being absent from a test) associated with another variable (e.g. mobility category) compared to a reference group (e.g. stable students) after controlling for other factors. "Average marginal effects" are calculated as the average of the differences in the predicted probabilities of an event (e.g. absent from a test) for each possible level of the variable of interest (e.g. mobility category) based on the actual values of all other variables across all records in the dataset. For this reason, "average marginal effects" are considered by some researchers as superior to the previously widely used "marginal effects at means" where the effect size represents just that for the "average individual" (where all other variables in the model are held at their mean values). An easy to understand description and comparison of different forms of marginal effects for logistic regression can be found at: www.stata.com/meeting/chicago11/materials/chi11_williams.pptx.

31 The finding that mobile students have higher rates of absence from tests also suggests that the average daily attendance of mobile students in NSW is likely to be lower than for non-mobile students, as has been reported in previous studies (e.g. Hancock et al. 2013). Although a test day is not a typical day in the year, and may affect mobile students more than non-mobile students, the estimated marginal effects effectively hold constant the impact of testing across mobility groups because they have controlled for the influences of prior achievement and background factors. Therefore, the daily attendance of an average junior secondary student who is highly mobile may be up to 12 percentage points lower than that for a similar student who does not change schools.

However, it is likely that these differences in achievement are moderated to some extent through other aspects of educational disadvantage. To investigate the independent effect of mobility on achievement and learning progress over and above other disadvantage factors, a series of regression analyses (as described in 6.1.3) were carried out for the matched dataset from 2011 Kindergarten to 2014 Year 3. Results are reported in Table 6.

Table 6:

Impact of mobility on attainment and progress for the lower primary years (2014 NAPLAN Year 3 tests)

Dependent variable: Year 3 test scores (std)	Reading			Numeracy		
	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)
Mobility group (ref: stable)						
Moved once	-0.23 [0.01]***	-0.11 [0.01]***	-0.04 [0.01]**	-0.23 [0.01]***	-0.12 [0.01]***	-0.04 [0.01]**
Moved twice	-0.55 [0.03]***	-0.21 [0.03]***	-0.10 [0.02]***	-0.53 [0.03]***	-0.21 [0.03]***	-0.08 [0.02]**
Moved 3+ times	-0.86 [0.05]***	-0.30 [0.04]***	-0.17 [0.04]***	-0.86 [0.05]***	-0.31 [0.04]***	-0.16 [0.04]***
Aboriginal		-0.32 [0.02]***	-0.25 [0.02]***		-0.33 [0.02]***	-0.25 [0.02]***
Gender (ref: female)		-0.11 [0.01]***	-0.10 [0.01]***		0.07 [0.01]***	0.07 [0.01]***
Student SES (std)		0.42 [0.00]***	0.26 [0.00]***		0.41 [0.00]***	0.24 [0.00]***
Kindergarten literacy level (std)			0.21 [0.00]***			0.14 [0.00]***
Kindergarten numeracy level (std)			0.28 [0.00]***			0.38 [0.00]***
N	42,321	42,321	42,321	42,238	42,238	42,238
Adj R-squared	0.0192	0.2101	0.3756	0.0190	0.1998	0.3942

Note: Reported results include coefficients, [standard errors], and significance level: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables have been standardised prior to use.

These results confirm that school changes made over the lower primary years from Kindergarten to Year 3 have a statistically negative impact on students' educational attainment at the Year 3 reading and numeracy tests. As model 2 results indicate, this effect remains significant after differences in student background are accounted for[32]. When students' prior achievement levels are also taken into account (model 3), the impact of mobility on learning progress is also significant, even for students who moved only once. Furthermore, the results indicate that the greater the number of school moves made over that period, the more detrimental mobility is to both achievement at Year 3 as well as the learning progress over the early years.

In general, the effects of mobility are similar across reading and numeracy. When all the background and prior achievement levels are held constant, students who changed school once in the lower primary years are expected to underperform the stable students by 0.04 standard deviations on both reading and numeracy tests. The effect size increases to 0.17 (for reading) and 0.16 (for numeracy) standard deviations for students who moved three times or more during that period[33].

32 The model results presented in this section provide additional information on the relative impact of student background factors on achievement and learning progress. While of substantive interest, this is not the focus of the present report. Interested readers are referred to the Department's report titled Value added models for NSW government schools which explores this in more detail.

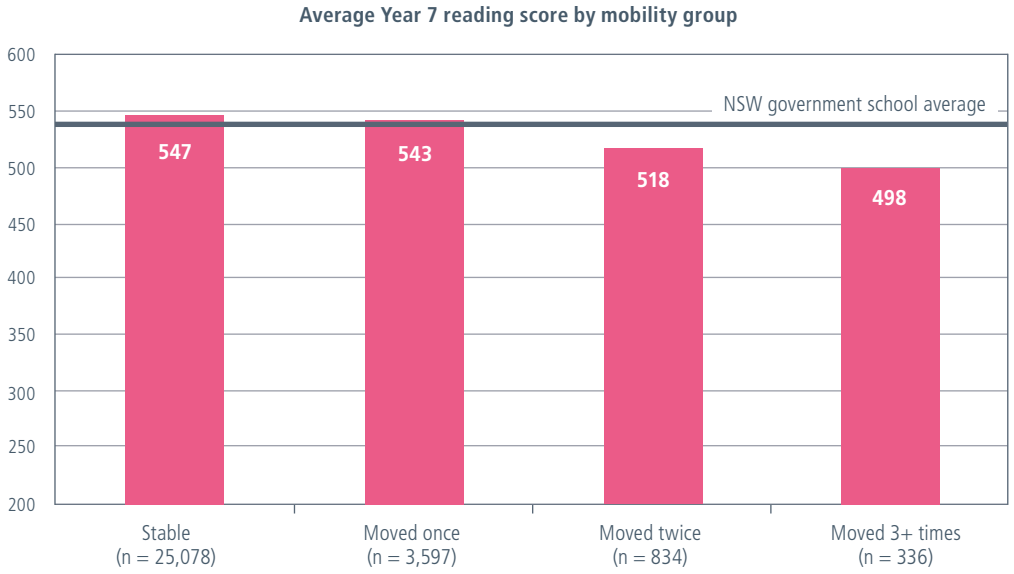
33 Whilst not reported here, this study also examined any interaction effects between mobility and other indicators (e.g. prior achievement measures and student background factors) for each data file using the most comprehensive model. With few exceptions, most of the interaction effects were found to be not statistically significant, and where significant effects were found, the magnitude of the effects in most cases was of no practical significance and they were only present for one mobility group, not across all mobility groups. Results of the interaction effects are available on request.

Impact of mobility over the upper primary years (Year 3 to Year 7)

Similar to Year 3 students, average reading achievement for Year 7 students is also markedly lower for those who are highly mobile, as shown in Figure 16, with students moving three or more times scoring 49 points (0.6 standard deviations) below that for stable students.

Figure 16:

Year 7 reading scores in 2014 NAPLAN by level of mobility



As for the lower primary analysis, a series of regression analyses were conducted with the matched Year 3 to Year 7 data file, to examine any unique effect of mobility for upper primary students.

The results reported in Table 7 show that, after accounting for student background factors, mobility during the upper primary years has a significant negative effect on reading and numeracy attainment (model 2), even for students moving only once. After taking account of students' prior achievement, the impact on learning progress from Year 3 to Year 7 (model 3) is less pronounced, as expected. For students moving once or twice, there is a significant negative effect on numeracy progress but not on reading progress. However, for students moving three or more times in this period, learning progress in both reading and numeracy is significantly lower than for stable students, with effect sizes of -0.10 standard deviations for reading and -0.14 standard deviations for numeracy, slightly less than the effect sizes reported for the lower primary years for the same mobility category.

Table 7:

Impact of mobility on attainment and progress for the upper primary years (2014 NAPLAN Year 7 tests)

Dependent variable: Year 7 test scores (std)	Reading			Numeracy		
	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)
Mobility group (ref: stable)						
Moved once	-0.21 [0.02]***	-0.12 [0.02]***	-0.01 [0.01]	-0.25 [0.02]***	-0.15 [0.02]***	-0.03 [0.01]**
Moved twice	-0.45 [0.03]***	-0.20 [0.03]***	-0.03 [0.02]	-0.54 [0.04]***	-0.29 [0.03]***	-0.12 [0.02]***
Moved 3+ times	-0.67 [0.05]***	-0.25 [0.05]***	-0.10 [0.03]**	-0.75 [0.06]***	-0.33 [0.05]***	-0.14 [0.03]***
Aboriginal		-0.31 [0.02]***	-0.10 [0.01]***		-0.34 [0.02]***	-0.12 [0.01]***
Gender (ref: female)		-0.13 [0.01]***	-0.06 [0.01]***		0.11 [0.01]***	0.09 [0.01]***
Student SES (std)		0.44 [0.01]***	0.13 [0.00]***		0.45 [0.01]***	0.15 [0.00]***
Year 3 reading score (std)			0.50 [0.01]***			0.13 [0.01]***
Year 3 numeracy score (std)			0.28 [0.01]***			0.63 [0.01]***
N	29,845	29,845	29,845	29,698	29,698	29,698
Adj R-squared	0.0139	0.2199	0.6421	0.0190	0.2323	0.6506

Note: Reported results include coefficients, [standard errors], and significance level: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables have been standardised prior to use.

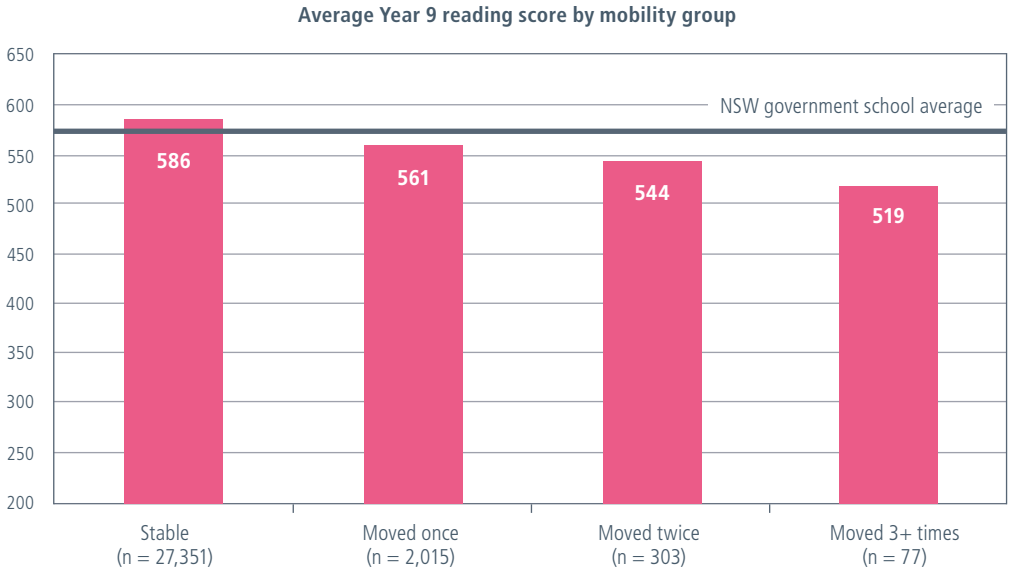
Results also seem to suggest that mobility has a differential impact on reading and numeracy for the upper primary years, which is contrary to the pattern observed for the lower primary years where mobility seemed to affect the two domains in a similar way. On the whole, mobility seems to have a greater negative impact on numeracy than on reading, based on the coefficients reported both from the attainment and progress models (differences ranging from -0.02 SD to -0.09 SD). This is worthy of follow up investigation as it might be substantively driven. For example, missing key concepts as a result of moving between schools may cause more educational harm for student's progress on numeracy than on reading because, at certain stages of learning, the later years' mastery may be more dependent on mastery of earlier concepts for numeracy than for reading. For example, the ability to understand and work with fractions, decimals and percentages (a significant component of Mathematics in Years 5-8) requires mastery of the concept that multiplication and division are reciprocal operations and represent repeated addition and subtraction (during Years 3-4). If this concept is not mastered by Year 5 or 6, students will struggle with Mathematics from then on. In addition, the resulting loss of confidence in their ability in this area further impacts their outcomes into the future.

Impact of mobility over the junior secondary years

Consistent with analyses for the primary years, mobile students in the junior secondary years also achieve lower results on average in the Year 9 NAPLAN reading and numeracy tests than do stable students, as shown in Figure 17. Students who moved three or more times between Year 7 and Year 9 scored 67 points lower (0.9 standard deviations) on average in the reading test than stable students.

Figure 17:

Year 9 reading scores in 2014 NAPLAN by level of mobility



Once again, a series of regression analyses were conducted to examine the effects of mobility on achievement after other known disadvantage factors have been taken into account. The results are summarised in Table 8.

Similar to the analyses for the primary cohorts, mobility still has a significant and large negative impact on both reading and numeracy attainment at Year 9 after student background factors have been taken into account (model 2).

However, the impact of mobility on students' learning progress from Year 7 to Year 9 (model 3) is less clear-cut. After accounting for prior achievement as well as student background factors, the effect size of moving three or more times is -0.13 standard deviations and marginally significant for reading, but only -0.07 standard deviations and non-significant for numeracy. In contrast, moving twice had a significant impact on numeracy (effect size -0.09) but not on reading (effectively nil effect size), while moving once had small but significant negative effects on both reading and numeracy progress.

There are a number of reasons which could explain the mixed results of the effect of mobility on learning progress over a two year period in junior secondary schooling. First, due to the small number of students with complete NAPLAN results and background data who moved twice (n=303) or three or more times (n=77) between Year 7 and Year 9, it is difficult to adequately and reliably detect mobility effects when the level of uncertainty around the mobility effect estimates is relatively large[34].

Table 8:

Impact of mobility on attainment and progress for the junior secondary years (2014 NAPLAN Year 9 tests)

Dependent variable: Year 9 test scores (std)	Reading			Numeracy		
	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)	Model 1 (attainment)	Model 2 (attainment)	Model 3 (progress)
Mobility group (ref: stable)						
Moved once	-0.33 [0.02]***	-0.24 [0.02]***	-0.05 [0.01]***	-0.34 [0.02]***	-0.22 [0.02]***	-0.02 [0.01]*
Moved twice	-0.55 [0.06]***	-0.29 [0.05]***	-0.01 [0.03]	-0.71 [0.06]***	-0.40 [0.05]***	-0.09 [0.02]***
Moved 3+ times	-0.88 [0.11]***	-0.45 [0.10]***	-0.13 [0.06]*	-0.92 [0.12]***	-0.47 [0.11]***	-0.07 [0.05]
Aboriginal		-0.37 [0.02]***	-0.09 [0.01]***		-0.41 [0.02]***	-0.06 [0.01]***
Gender (ref: female)		-0.21 [0.01]***	-0.14 [0.01]***		0.11 [0.01]***	0.03 [0.00]***
Student SES (std)		0.43 [0.01]***	0.06 [0.00]***		0.43 [0.01]***	0.05 [0.00]***
Year 7 reading score (std)			0.57 [0.00]***			0.05 [0.00]***
Year 7 numeracy score (std)			0.30 [0.00]***			0.84 [0.00]***
N	29,746	29,746	29,746	29,432	29,432	29,432
Adj R-squared	0.0119	0.2263	0.7366	0.0136	0.2156	0.8283

Note: Reported results include coefficients, [standard errors], and significance level: * p < 0.05, ** p < 0.01, *** p < 0.001. All continuous variables have been standardised prior to use.

34 As the number of students moving three times or more between Years 7 and 9 is small, an additional piece of analysis was performed with the two categories 'moving twice' and 'moving three times or more' first being combined to create a new category called 'moving twice or more' (N= 380). The most comprehensive model (model 3) was then run for reading and numeracy respectively with the new mobility groups. Results indicated mixed results for reading (ß = -0.05 SD, P<.001 for moving once; ß = -0.03 SD, p=.22 for moving twice or more) and consistently significant effects for numeracy (ß = -0.02 SD, p=.02 for moving once; ß = -0.09 SD, p<.001 for moving twice or more).

Furthermore, the time interval used in the analysis for junior secondary schooling was smaller (only two years between Year 7 and Year 9), as compared to that used for lower and upper primary schooling analyses. This contributed to a much larger impact of prior achievement (adding prior achievement to the junior secondary model increases the variance explained from around 20 per cent to 74 per cent for reading and over 80 percent for numeracy), which adds to the difficulty of detecting any significant effects on outcomes over and above the prior achievement measures.

When interpreting these results, it is important to note that they are likely to be conservative as the analysis does not include all highly mobile students. As discussed in the analysis of test participation, for students who moved two or three or more times during this period, the odds of them being absent from tests (therefore omitted from this analysis) are 3-4 times higher than non-mobile students, and if they had participated, the analysis suggests that they are more likely to be among the lowest in terms of both level of achievement and learning progress. As mobility has a larger negative effect on test participation for junior secondary students than for primary students, the bias in the reported effect sizes is likely to be larger from the junior secondary analysis than from the lower and upper primary analyses. This may also help explain the mixed results reported in this subsection relative to the clearer picture of the negative impact of mobility on attainment and progress reported in earlier subsections.

Impact of the timing of mobility

To investigate whether moves made during the school year impact on learning progress to a greater extent than moves made between years, the full model that controls for both student background and prior achievement (model 3) from the previous analyses was run using the two mobility timing variables (i.e. number of moves during the year, and the number of moves made between years) instead of the total mobility group variable. In contrast to the mobility group variable, the two timing variables are continuous variables. Any effects associated with these variables are assumed to be linear, and the effect size needs to be interpreted as the effect for one move. The total effect for two or more moves therefore requires multiplying the size of the effect by the number of moves.

Table 9 presents the coefficients for the two mobility timing variables, after controlling for student background and prior achievement (coefficients for these variables are very similar to those reported in Tables 6 to 8), for reading and numeracy for each cohort.

Table 9:

Impact of timing of mobility on reading and numeracy learning progress (2014 NAPLAN tests)

Dependent variable: Later year test result (std)	Lower primary (K-3)		Upper primary (3-7)		Junior secondary (7-9)	
	Reading	Numeracy	Reading	Numeracy	Reading	Numeracy
During year moves (per move)	-0.05 [0.01]***	-0.05 [0.01]***	-0.01 [0.01]	-0.05 [0.01]***	-0.05 [0.01]***	-0.05 [0.01]***
Between year moves (per move)	-0.04 [0.01]**	-0.03 [0.01]**	-0.01 [0.01]	-0.03 [0.01]*	0.00 [0.01]	0.00 [0.01]
N	42,321	42,238	29,845	29,698	29,746	29,432
Adj R-squared	0.3756	0.3943	0.6420	0.6505	0.7366	0.8283

Note: Reported results include coefficients, [standard errors], and significance level: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All continuous variables have been standardised prior to use.

As indicated in Table 9, moves made during the year, on the whole, have a greater detrimental effect on achievement than moves made between years. Further, during year moves have a consistent negative impact on reading and numeracy progress across all cohorts with the exception of reading in the upper primary years. For all other cohorts, the impact of moving school during the year was -0.05 SD for each move made. In contrast, the impact of between year moves decreases across the levels of schooling, from a significant negative effect in the lower primary years (-0.04 SD and -0.03 SD for reading and numeracy respectively) to nil effect in the junior secondary years.

Further, as the size of these effects represents one move, there is a compounding effect for moving more than once. For example, a student who makes four mid-year moves between Kindergarten and Year 3 is predicted to score 0.2 SD (i.e. 0.05 times 4) below a similar student who didn't change schools, in both reading and numeracy by Year 3.

6.2 Impact of mobility on dropping out of school

This section explores the following research question (research question 3):

> *Is there any association between student mobility incurred in junior years and the probability of the student later dropping out of school before completing senior secondary education?*

6.2.1 Dataset and analysis method

A high proportion of young persons completing Year 12 or equivalent is an important educational goal for the state and is included in the Department's *5 Year Strategic Plan (2012-2017)* as a key priority. Students who drop out of school prior to completing senior secondary education or equivalent are at greater risk of future unemployment, lower earnings and poorer quality life outcomes (OECD 2012).

Under the raised school leaving age legislation implemented in NSW in 2010, all students must complete Year 10 and, until age 17, either remain at school, undertake other approved training, or be in fulltime paid work or a combination of education/training and employment. We therefore decided to choose the cohort of Year 10 students who were enrolled in a government school in 2011 as our target cohort and track them to 2014 to see how many of them completed Year 12. Of those students in the target cohort staying on to Year 12, most would have completed Year 12 in 2013, although some would still be studying Year 12 in 2014, if they chose a different pathway than average Year 12 students to complete their secondary studies.

Based on the normal progression pattern, most of these students should also have started the first year of secondary education (Year 7) in 2008, which is the year when our centralised enrolment system was implemented and when mobility information started to become centrally available. By design, we could then match this cohort of Year 10 students to our Departmental enrolment records and restrict our target cohort to include just those who were identified as continuously enrolled in Departmental schools between 2008 and 2011 for this analysis. This approach allowed us to calculate all the school moves these students made from the start of Year 7 to the end of Year 10, which could then be used to analyse the cumulative effect of mobility incurred over the first four years of secondary education on these students' chances of completing Year 12[35]. As in the previous analyses, student mobility over students' years of secondary schooling was classified into four levels: stable (no moves), moved once, moved twice and moved 3 times or more.

To assess as accurately as possible whether students remained until Year 12, data from the Board of Studies, Teaching and Educational Standards (BoSTES) was used to determine the highest schooling level recorded for the 2011 Year 10 cohort. This ensured that students who transferred from the government sector to a non-government school were correctly recorded as either staying on to Year 12 or not. Students were defined as dropping out of school if there was no record of them completing the Higher School Certificate (HSC) by 2014 or still undertaking a Year 12 program of study in 2014; or identified by the school as an official school leaver in the BoSTES file.

While some students who drop out may have enrolled in other approved training that is equivalent to completing secondary schooling, this information is not available to inform the analysis. However, as these students have in fact left school to pursue other options, it is still appropriate to consider them as early "school" leavers.

A range of factors other than mobility also affect the likelihood of students leaving school before completing Year 12. For example, the research literature indicates that students from disadvantaged backgrounds are also more likely to leave school early (e.g. Davis-Kean 2005; Kalmijn 1994; Tansel 1997). Many of these factors are also related to higher levels of mobility, and may account for any link between mobility and dropping out. Therefore, to examine the association between mobility and dropping out of school, these factors also need to be taken into account in the analysis.

35 The reason we didn't include moves incurred in senior secondary years (Year 11 and Year 12) in the analysis of cumulative effect of mobility is because this information is not complete/available for all students, in particular for the many students who left government schools after completing Year 10 to continue senior secondary education in non-government schools. In order to have a consistent base for calculating mobility across all students included in the analysis, the research question focused on the mobility over the junior secondary years which we could calculate for all students who were continuously enrolled in the government schools over that period.

A dataset was therefore constructed that included students who completed Year 10 in 2011 according to BoSTES records, who were continuously enrolled in a government school between Year 7 2008 and Year 10 2011 according to Departmental enrolment records, and who had complete background information and prior achievement scores at the start of secondary education — Year 7. One problem in constructing this dataset was the loss of student records due to matching difficulties across differently sourced datasets and the levels of missing data for some variables. Table 10 shows the decrease in the number of students in the dataset at each step of its construction, and the resulting decrease in the proportion of students who drop out of school for each subset of the data. This indicates that students dropping out of school are more likely to have missing data and/or not be continuously enrolled in a government school between 2008 and 2011 relative to students who stayed to Year 12. As with the analyses of mobility and student achievement reported above, the estimated relationship between mobility and school drop-out is likely to be conservative.

Table 10:

2011 Year 10 cohort dataset construction steps and statistics

Dataset step	Description	N	% students in the dataset who dropped out of school
A (starting file)	All Year 10 students enrolled in government schools in 2011 (according to BoSTES records)	55,655	31.6%
B	Students in A who were able to be matched to Departmental enrolment records and who were considered to be continuously enrolled in the junior secondary years (i.e. between 2008 and 2011)	46,154	29.3%
C	Students in B with complete background information (i.e. Aboriginal status, gender, student SES score)	28,703	24.4%
D (analysis file)	Students in C with prior achievement scores (i.e. Year 7 reading and numeracy scores)	27,486	23.7%

Note: Descriptive statistics for the final dataset are provided in Appendix F

A logistic regression model was used to analyse the impact of mobility on the probability of dropping out before completing Year 12, using the final dataset D. An initial model was run with just the mobility group variable to examine the raw odds ratios of dropping out of school for each level of mobility. To assess the moderating influence of other factors that impact the likelihood of dropping out, a second model was run that included student background characteristics (gender, Aboriginal status, student SES) as well as student prior achievement (students' NAPLAN reading and numeracy achievement when they were in Year 7).

6.2.2 Results and discussion

Table 11 displays the results of the two logistic regression analyses, which indicate that the level of student mobility had a considerable effect on the likelihood of students dropping out of school relative to that for stable students. Even after accounting for student background factors and prior achievement, making only one non-structural school move during their junior secondary years was associated with a twofold increase in the odds of students dropping out of school before completing Year 12. For students who moved school twice or three times or more, the odds of them leaving school early were 3 times and 5 times higher, respectively, than the odds for stable students.

Table 11:

Logistic regression results for dropping out of school prior to completing Year 12 (2011 Year 10 cohort)

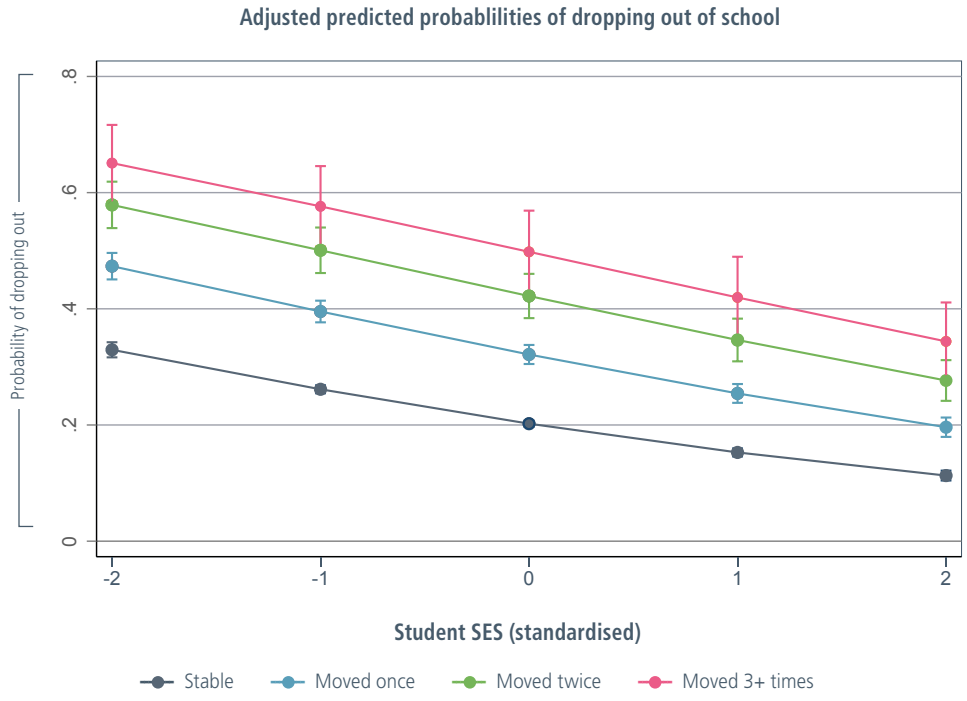
Dependent variable: dropped out of school prior to completing Year 12	Model 1 (mobility only)			Model 2 (with background and prior achievement)		
	Coefficient	z*	Odds ratio	Coefficient	z*	Odds ratio
Mobility group (ref: stable)						
Moved once	0.80	18.6	2.24	0.72	15.0	2.05
Moved twice	1.40	15.9	4.05	1.23	12.8	3.42
Moved 3+ times	1.86	11.7	6.40	1.60	9.2	4.93
Aboriginal				0.41	5.4	1.50
Gender (ref: female)				0.75	23.2	2.13
Student SES (std)				-0.38	-21.0	0.68
Year 7 reading score (std)				-0.23	-9.2	0.80
Year 7 numeracy score (std)				-0.73	-26.7	0.48
N	27,486			27,486		
McFadden's R^2	.022			.168		

Note: * all significant at p<.001

To further understand the effects of mobility, the predicted probability of dropping out, after adjusting for background factors and prior achievement, was calculated using all the data records. Figure 18 plots the average predicted probability of dropping out for students in each mobility group across different socio-economic levels. As indicated in Figure 18, low SES students had a greater probability of dropping out than high SES students, and there was a substantial increase in the predicted probability of dropping out for students with higher levels of mobility. For example, a very low SES student experiencing three or more moves during their first four years of secondary schooling has a 65 per cent probability of not completing secondary schooling – around twice that for a very low SES student who does not change schools.

Figure 18:

Predicted probability of dropping out of school for students at each level of mobility across levels of student SES (2011 Year 10 cohort)



The size of the unique effect of mobility on dropping out, after other disadvantage factors have been taken into account (i.e. the 'average marginal effect'), was calculated for each mobility level (see Appendix G for details). On average, changing school once during Years 7-10 increases the probability of leaving school early by 12 percentage points. This effect increases to 21 percentage points for moving twice and nearly 30 percentage points (28.5) if a student moved three times or more.

6.3 Impact of mobility on non-mobile students

This section explores the following research question (research question 4):

In NSW government schools, is there evidence of a spillover effect of mobility on stable students?

6.3.1 Dataset and analysis method

To examine the above question, we compared the learning progress of stable (non-mobile) students in schools with high rates of student mobility to the progress of similar stable students in schools experiencing low rates of mobility. The method allowed for the examination of any unique effects mobility might have on the non-mobile students' learning progress by controlling for a suite of other school and student-level factors that are known to influence students' growth.

The analysis was separately performed for each of the following two cohorts, to examine the spillover effects for primary and secondary students respectively:

1. Primary students who were continuously enrolled in the same school between Year 3 in 2012 and Year 5 in 2014 and were present for the NAPLAN tests in both years.
2. Secondary students who were continuously enrolled in the same school between Year 7 in 2012 and Year 9 in 2014 and were present for the NAPLAN tests in both years.

For the purpose of this analysis, these two cohorts represent the non-mobile students who did not change school over a two year period. To test any unique effect of school mobility on these students' progress, the following contextual factors, which have been shown to be significant contributors to students' progress through the Department's value-added work, were controlled for in the analysis[36]:

- student Aboriginal status
- student SES score, as derived from parents' educational and occupation information provided on student enrolment forms
- student's prior achievement score, calculated by averaging the (standardised) reading and numeracy scores from 2012 NAPLAN tests
- a polynomial function of the student's prior achievement score that improves the statistical fit of the model[37]
- school disadvantage measure (Family Occupation and Education Index)
- school co-ed status – boys' school, girls' school or co-educational school (for secondary schools only)
- school selectivity – a dichotomous flag indicating whether the school is a fully selective school or not (for secondary schools only).

The last two variables were used only in the analysis for the secondary cohort as they were not applicable for primary students in the NSW context.

36 Descriptions of these variables can be found on page 36 of the Department's report titled: Value added models for NSW government schools.

37 Previous Departmental analysis on student growth using NAPLAN test scores has consistently demonstrated that students with high and low prior achievement levels have different trajectories than students who score near the middle of the distribution. The differential trajectories can be modelled using a quadratic polynomial function, details of which are provided in Department's report titled: Value added models for NSW government schools.

The mobility variable used in the analysis for both the primary and secondary analyses was the school mobility rate developed for this study (see description in section 5). These rates are proxy measures of the enrolment churn schools experienced over the period between 2012 and 2014. The dependent variable used was the student's later achievement score, which was calculated by averaging the (standardised) reading and numeracy scores from the respective 2014 NAPLAN tests.

To account for the nesting structure of the data (i.e. students are nested within schools), a multilevel modelling technique was used to acquire reliable and accurate estimates of the coefficients. All multilevel analyses were performed in STATA13, with no constant terms and with all continuous variables standardised prior to the analyses[38].

6.3.2 Results and discussion

The results of the statistical analysis are included in Table 12.

Table 12:

Modelling results from the multilevel analysis of spillover effects (reading and numeracy progress from 2012 to 2014 NAPLAN tests)

Later year test scores (std)	Primary (3-5)		Secondary (7-9)	
Fixed effects	**Coefficient**	***p***	**Coefficient**	***p***
Student characteristics				
Prior achievement score (std)	0.88	<0.001	0.98	<0.001
Adjustment for non-linear relationship between prior and later achievement score (std)	-0.09	<0.001	-0.16	<0.001
Aboriginal status (vs non-Aboriginal as reference category)	-0.09	<0.001	-0.06	<0.001
Student SES score (std)	0.09	<0.001	0.04	<0.001
School characteristics				
School disadvantage score (std)	-0.05	<0.001	-0.03	<0.001
Fully selective school (vs comprehensive school as reference category)			0.20	<0.001
Boys-only school (vs co-educational school)			0.09	<0.001
Girls-only school (vs co-educational school)			0.07	<0.001
School mobility (std)	**0.00**	**0.44**	**-0.02**	**0.003**
R-squared using Snijders/Bosker (1994, 1999):				
Proportion of variance explained at Level 1 (student)	74%		84%	
Proportion of variance explained at Level 2 (school)	84%		96%	
Number of students	40,610		37,851	
Number of schools	1,529		443	

Table 12 shows that, consistent with findings from other educational studies, prior achievement continued to be the most significant predictor of students' later achievement. Directions and sizes of the impact of other known contextual factors (e.g. student and school SES) were also broadly consistent with previous studies of a similar nature conducted by the Department[39].

The table also shows that, having controlled for the influence of other known factors, the coefficient associated with the target variable — school mobility — is not statistically significant for explaining the differences in the matched primary Year 5 students' NAPLAN results (ß= 0.00, p=0.44); but is statistically significant for explaining the differences in the matched secondary Year 9 students' NAPLAN results (ß =-0.02, p=0.003).

These results indicate that, after taking into account the differences in students' prior achievement and differences in other student and school characteristics, there is no evidence that school enrolment churn rates have a discernible effect on the progress of those primary students who stayed in the same school between Year 3 NAPLAN and Year 5 NAPLAN.

38 The prior and later test scores are derived from first standardising each student's test score within the relevant government student cohort for that test, and then averaging the standardised scores over reading and numeracy. The aggregate scores are then re-standardised to ensure the mean and standard deviation of the outcome variable used in each model are 0 and 1 respectively.

39 For example, see the Department's report titled: Value added models for NSW government schools.

However, there is a spillover effect for junior secondary students, albeit small in magnitude. When prior achievement at Year 7 and other student and school contextual factors are adjusted for, a student who stayed in the same school between Year 7 NAPLAN and Year 9 NAPLAN testing time is expected to underperform by 0.02 standard deviations in Year 9 NAPLAN tests if the school's enrolment churn rate is 1 standard deviation above the system average.

It is difficult to comment on possible explanations for the differences in the results observed for primary and secondary cohorts, as a key piece of information in understanding mobility and its impact — reasons for student mobility — is not systematically collected.

It is also noted that the school mobility rates developed for this study currently underreport the extent of the enrolment churn schools experience as they do not include students moving into a government school who do not originate from another government school (e.g. students transferring in from non-government schools or interstate) nor do they include students who move out of a school and do not enrol in another government school. Results may change when school mobility rates are refined to include all movements into and out of a school, therefore capturing the full extent of churn a school experiences.

It is important to evaluate whether school mobility should be considered in value-added models which attempt to measure schools' contribution to students' progress. As mobility may be incurred largely due to changes in the circumstances of families and individuals which are likely to be outside the control of schools and staff, any impact it might have on student learning progression should be removed before fair judgements of school performance can be made.

The current suite of value-added models developed by the Department to quantify the contributions schools make to students' learning progress already take into account a number of known external factors that are considered to be outside the school staff and the principals' control[40]. The results from this analysis indicate that further work needs to be carried out to investigate the merit of the inclusion of a school mobility measure in the Department's value-added models, particularly those for secondary schools.

6.4 Section Summary

Overall, analyses in this section indicated that mobility is associated with lower student achievement in reading and numeracy domains and across levels of schooling, and that the higher the degree of mobility, the stronger the relationship between mobility and lower academic achievement. Consistent with findings from many other studies, the negative effects endure after student background factors are controlled for, and were generally still significant after prior achievement measures were also taken into account.

When mobility alone was analysed with achievement, we found, on average, students who moved once during a reference period (i.e., from K to Year 3, Year 3 to Year 7 or Year 7 to Year 9) underperformed stable students (those who did not move) consistently by about -0.2 SD to -0.3 SD on the later year's reading or numeracy NAPLAN test. The performance gap increased as the degree of mobility increased, with students who moved twice underperforming by about -0.5 SD to -0.6 SD and students who moved three times or more underperforming by about -0.7 SD to -0.9 SD, when compared to stable students.

When other aspects of disadvantage (e.g. Aboriginal status, low SES) were controlled for, analysis showed that the negative association between mobility and performance remained statistically significant across reading and numeracy and across levels of schooling examined, and the effect increased with the degree of mobility. However, as expected and consistent with other studies, the strength of the relationship was substantially reduced, by about one third to one half. For highly mobile students who moved three times or more, the remaining effect of mobility ranged from -0.3 SD to -0.5 SD across reading and numeracy and across levels of schooling.

In the most comprehensive models where prior achievement and student background factors were adjusted for, generally speaking, mobility still had a significant effect on reading and numeracy progress. For lower primary years, the effect on Year 3 results was similar across reading and numeracy, and ranged from -0.04 SD for moving once to about -0.16 SD for highly mobile students.

40 The contextual factors considered in the value-added Year 3 to Year 5 and Year 7 to Year 9 models are the same as those included in this analysis.

For upper primary years, the impact seemed to be larger on numeracy than on reading. For students who moved twice, the effect on Year 7 results ranged from -0.03 SD for reading to -0.12 SD for numeracy. For highly mobile students, the respective effects were greater, ranging from -0.10 SD for reading and -0.14 SD for numeracy.

For junior secondary years, the effect of mobility on Year 9 results was less apparent, because of the smaller number of students moving twice or more during the two year period between Year 7 and 9. However, all point estimates were negative, and for highly mobile students the effect was statistically significant for reading (-0.13 SD). The effect for numeracy (-0.07 SD) was still substantial even though not statistically significant due to the higher level of uncertainty associated with the small number of students with this level of mobility.

The study also provided some evidence that reading achievement is negatively impacted to a greater extent in the lower primary years than in the upper primary years. However, for numeracy, the effects are similar for moves that occurred in lower primary years as moves that occurred in the upper primary years.

Further, the results suggested that moves made during the school year are more detrimental than moves made between school years, especially in the junior secondary years where there was no evidence that between year moves had a negative impact on learning progress over and above other student background factors and prior achievement.

Another insight from the study is that the mobility effect size is not always linearly related to the degree of mobility (i.e. the effect size for one additional move is not always the same across the degree of mobility). For example, the most comprehensive model used for analysing numeracy progress from Year 3 to Year 7 showed that the effect size associated with changing from no moves to one move was -0.03 SD, however, the effect size associated with changing from one move to two moves was -0.09 SD. Caution is therefore needed when interpreting studies that used the number of moves as a continuous variable in a linear regression model, since they relied on an assumption of linearity.

It's important to note that all the effects reported in this study are conservative for various reasons. First, as previously discussed, student mobility is underreported as between sector movements and movements incurred in the non-government schools after students leave the government system are not included in school or student mobility measures. In addition, there is strong evidence that test participation is negatively associated with mobility and that this link exacerbates as the degree of mobility increases and as students progress from primary to secondary. For highly mobile students, the marginal effect on the probability of being absent from a NAPLAN reading test ranged from 1 percentage point at a Year 3 test to 12 percentage points at the Year 9 test, after controlling for prior achievement and student background factors. The non-random missingness in the test data available for analysis of the impact of mobility indicates that any effects reported by using the test data are likely to be biased.

The study also provided evidence of the marginal effect of mobility on school dropout rates. In the most comprehensive model where prior achievement and student background factors were controlled for, changing school once during Years 7-10 increased the probability of leaving school early by 12 percentage points. This effect increased to 21 percentage points for moving twice and nearly 30 percentage points if a student moved three times or more.

7. Conclusions

Student mobility is a significant issue for NSW government schools, with more than 30 per cent of students making at least one school move that is not required by the system structure during their years of schooling, and at least 5 per cent of all students, or 1 in 20 students, experiencing three or more non-structural school moves in their primary or secondary schooling career. In addition, 13 per cent of NSW government schools experience high levels of enrolment churn as benchmarked against international studies (Dobson, Henthorne & Lynas 2000). These estimates are conservative, as there is still insufficient system data to measure student mobility over the full 13 years of schooling, or to factor in student movements between government and non-government schools, or those that involve interstate or overseas schools.

Consistent with the literature, our analysis confirms that student mobility overlaps with other indicators of educational disadvantage, with mobile students more likely to be of Aboriginal descent or from low socio-economic family backgrounds. In fact, the lower achievement of these student groups may be partly explained by higher levels of disruption to schooling as a result of more frequent school changes, and higher rates of absence from school as suggested by the analysis of test participation.

The analysis also supports previous findings that mobility has a detrimental impact on student outcomes, even after other disadvantage background factors and prior achievement have been taken into account. Not only are mobile students more likely to be absent from school on national testing days, those that do attend achieve lower reading and numeracy results than stable students with similar backgrounds and prior achievement, especially in the early primary years. Further, the greater the number of moves, the greater the impact on outcomes, with test results for highly mobile students (those who move three or more times over a measured period for a given level of schooling) around 0.10 to 0.15 standard deviations below those for stable students with similar backgrounds and prior achievement.

In addition to the impact on achievement, mobility is also associated with a higher likelihood of leaving school prior to completing Year 12. Compared to stable students with similar backgrounds and prior achievement at the start of secondary education, changing school once during the junior secondary school years is associated with a 12 percentage point increase in the probability of students leaving school before completing Year 12. This effect increases to 21 percentage points for students who move twice and nearly 30 percentage points for those who move at least three times.

Mobility not only impacts on the educational outcomes of mobile student population, it also potentially causes disruption at the classroom level and interrupts the learning of stable students enrolled in schools with high enrolment churn. While our analysis of spillover effects did not detect an effect on stable students in the primary years and only found a small negative effect for students in the junior secondary years, it is worth noting that the school mobility rates as currently constructed and as previously noted underrepresent the true extent of the enrolment churn schools experience. The effects might be more notable if these measures are further improved.

Nonetheless, even based on the conservative estimates of school mobility using the current measures, 13 per cent of government schools are experiencing high rates of enrolment churn. For these schools, mobility could be a significant barrier to educators' ability to provide coherent learning and support and has the potential to negatively impact on mobile students' learning progress. As fewer students stay in the same school over a sustained period of time, it can be difficult for schools to implement an effective reform agenda to lift student and school performance.

Overall, the findings from this study indicate that student and school mobility is an additional indicator of educational disadvantage that the NSW government school system should monitor and for which specific policy responses may need to be developed. However, before policies and strategies can be developed, we need a deeper understanding of the causes of mobility, and the mechanisms by which mobility impacts on student achievement. In this regard, qualitative case studies of highly mobile students and schools would be useful to shed light on these other important aspects of student mobility.

It is noted that policies and strategies to reduce the impact of mobility on students' educational outcomes have been suggested and/or examined in a number of the studies reviewed for this report. While beyond the scope of the current report, a review of the literature and evidence for such policies and strategies would also be useful to identify 'what works' to improve educational outcomes for mobile students.

Finally, before the Department starts monitoring mobility on a regular basis, further development and refinement of the measures of student and school mobility is required. For example, the types of school moves to be included in the measures (such as planned moves to or from a specialist support setting) need to be clarified and agreed with relevant Departmental stakeholders. Further, the limitations with the current methodology, that result in levels of student and school mobility being underrepresented, need to be overcome to ensure that the measures of mobility are as accurate and robust as possible.

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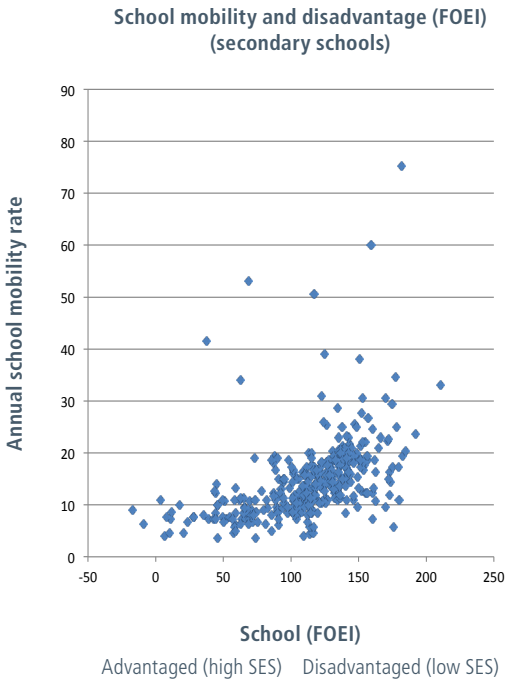
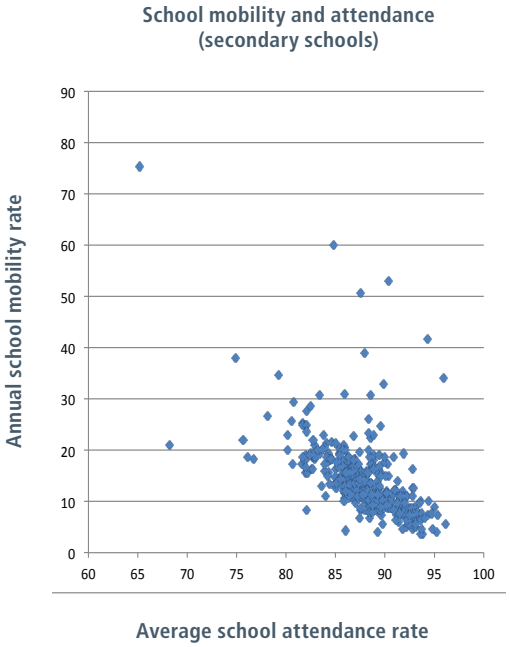
Appendices

Appendix A: Secondary schools: scatterplots of mobility with school disadvantage and attendance

Figure A1: Scatterplots of school mobility with school disadvantage (Family Occupation and Education Index (FOEI)) and school average attendance rates for secondary schools (excluding selective schools)





Appendix B: Median school mobility rates by SA4

Table B1: Median annual school mobility rates 2014 by ABS Statistical Area level 4 (SA4)

ABS Statistical Area level 4 (SA4)	Median Annual School Mobility Rate
Far West and Orana	26.3
New England and North West	24.5
Mid North Coast	22.7
Coffs Harbour - Grafton	21.3
Central West	20.3
Richmond - Tweed	20.0
Sydney - Blacktown	19.7
Hunter Valley exc Newcastle	18.7
Capital Region	18.0
Newcastle and Lake Macquarie	18.0
Riverina	17.0
Sydney - Outer South West	17.0
Sydney - Outer West and Blue Mountains	16.3
Sydney - Parramatta	16.0
Southern Highlands and Shoalhaven	15.7
Sydney - South West	15.7
Central Coast	15.2
Sydney - City and Inner South	13.0
Illawarra	12.5
Sydney - Inner South West	12.0
Murray	11.3
Sydney - Inner West	10.2
Sydney - Baulkham Hills and Hawkesbury	9.7
Sydney - Eastern Suburbs	8.0
Sydney - Ryde	7.3
Sydney - Sutherland	7.2
Sydney - North Sydney and Hornsby	6.8
Sydney - Northern Beaches	6.2

Note: 2014 school mobility rates are calculated as total non-structural moves (between government schools) over the period from 2012 to 2014 divided by 3, then divided by average school enrolments over the same period, and multiplied by 100 for ease of interpretation. Selective schools are not included in this analysis.

Appendix C: Descriptive statistics for datasets used in the analysis of mobility on students' reading achievement

Table C1: Descriptive statistics for dataset A ("lower primary" data file), Year K in 2011 to Year 3 in 2014

Dataset A: Year K - Year 3		Initial dataset		Dataset for final model	
Variable	**Category**	**No**	**%**	**No**	**%**
Total students		58,398		42,321	
Later year achievement	Students with a Y3 reading score	56,076	96.0%	42,321	100.0%
	Absent/exempt/withdrawn from test	2,322	4.0%	-	-
Prior achievement	Students with YK lit & num score	55,759	95.5%	42,321	100.0%
	Missing lit and/or num score/s	2,639	4.5%	-	-
Continuous enrolment	Yes	58,078	99.5%	42,321	100.0%
	No	320	0.5%	-	-
Aboriginal	Aboriginal	4,036	6.9%	2,327	5.5%
	Non-Aboriginal	54,346	93.1%	39,994	94.5%
	Missing	16	0.0%	-	-
Gender	Male	30,204	51.7%	21,628	51.1%
	Female	28,194	48.3%	20,693	48.9%
	Missing	-	0.0%	-	-
Student SES	Students with an SES score	45,780	78.4%	42,321	100.0%
	Missing	12,618	21.6%	-	-
Mobility frequency	No moves	48,161	82.5%	35,822	84.6%
	Moved once	7,704	13.2%	5,005	11.8%
	Moved twice	1,701	2.9%	1,044	2.5%
	Moved 3+ times	832	1.4%	450	1.1%
Mobility timing	1 or more in term moves	3,860	6.6%	2,259	5.3%
	1 or more between term moves	2,750	4.7%	1,729	4.1%
	1 or more between year moves	5,685	9.7%	3,691	8.7%

Note: The initial dataset contained all students enrolled in Year 3 as at the 2014 NAPLAN test dates and who were enrolled in Year K in 2011. Not all students had prior achievement data for both literacy and numeracy (as assessed at entry to school through the Best Start assessment). Students with a continuous enrolment are classified as those with an enrolment record in each calendar year from 2011 to 2014. Student SES is based on parents' occupation and education status, as collected from enrolment forms. The final dataset includes only those students with complete data for all variables.

Table C2: Descriptive statistics for dataset B ("upper primary" data file), Year 3 in 2010 to Year 7 in 2014

Dataset B: Year 3 - Year 7		Initial dataset		Dataset for final model	
Variable	**Category**	**No**	**%**	**No**	**%**
Total students		43,992		29,845	
Later year achievement	Students with Y7 reading score	41,402	94.1%	29,845	100.0%
	Absent/exempt/withdrawn from test	2,590	5.9%	-	-
Prior achievement	Students with Y3 read & num score	43,022	97.8%	29,845	100.0%
	Missing read and/or num score/s	970	2.2%	-	-
Continuous enrolment	Yes	43,375	98.6%	29,845	100.0%
	No	617	1.4%	-	-
Aboriginal	Aboriginal	3,555	8.1%	1,849	6.2%
	Non-Aboriginal	40,435	91.9%	27,996	93.8%
	Missing	2	0.0%	-	-
Gender	Male	22,668	51.5%	15,028	50.4%
	Female	21,324	48.5%	14,817	49.6%
	Missing	-	0.0%	-	-
Student SES	Students with an SES score	33,667	76.5%	29,845	100%
	Missing	10,325	23.5%	-	-
Mobility frequency	No moves	36,091	82.0%	25,078	84.0%
	Moved once	5,688	12.9%	3,597	12.1%
	Moved twice	1,512	3.4%	834	2.8%
	Moved 3+ times	701	1.6%	336	1.1%
Mobility timing	1 or more in term moves	3,514	8.0%	1,965	6.6%
	1 or more between term moves	2,253	5.1%	1,305	4.4%
	1 or more between year moves	3,949	9.0%	2,439	8.2%

Note: The initial dataset contained all students enrolled in Year 7 as at the 2014 NAPLAN test dates and who were enrolled in Year 3 in 2010. Not all students had prior achievement data for both reading and numeracy (as assessed through the 2010 Year 3 NAPLAN tests). Students with a continuous enrolment are classified as those with an enrolment record in each calendar year from 2010 to 2014. Student SES is based on parents' occupation and education status, as collected from enrolment forms. The final dataset includes only those students with complete data for all variables.

Table C3: Descriptive statistics for dataset C ("junior secondary" data file), Year 7 in 2012 to Year 9 in 2014

Dataset C: Year 7 - Year 9		Initial dataset		Dataset for final model	
Variable	**Category**	**No**	**%**	**No**	**%**
Total students		49,749		29,746	
Later year achievement	Students with Y9 reading score	45,080	90.6%	29,746	100.0%
	Absent/exempt/withdrawn from test	4,669	9.4%	-	-
Prior achievement	Students with Y7 read & num score	45,694	91.8%	29,746	100.0%
	Missing read and/or num score/s	4,055	8.2%	-	-
Continuous enrolment	Yes	49,672	99.8%	29,746	100.0%
	No	77	0.2%	-	-
Aboriginal	Aboriginal	3,702	7.4%	1,535	5.2%
	Non-Aboriginal	46,040	92.5%	28,211	94.8%
	Missing	7	0.0%	-	-
Gender	Male	25,614	51.5%	14,964	50.3%
	Female	24,135	48.5%	14,782	49.7%
	Missing	-	0.0%	-	-
Student SES	Students with an SES score	34,586	69.5%	29,746	100.0%
	Missing	15,163	30.5%	-	-
Mobility frequency	No moves	44,445	89.3%	27,351	91.9%
	Moved once	4,175	8.4%	2,015	6.8%
	Moved twice	857	1.7%	303	1.0%
	Moved 3+ times	272	0.5%	77	0.3%
Mobility timing	1 or more in term moves	2,446	4.9%	958	3.2%
	1 or more between term moves	1,270	2.6%	512	1.7%
	1 or more between year moves	2,432	4.9%	1,208	4.1%

Note: The initial dataset contained all students enrolled in Year 9 as at the 2014 NAPLAN test dates who were enrolled in Year 7 in 2012. Not all students had prior achievement data for both reading and numeracy (as assessed through the 2012 Year 7 NAPLAN tests). Students with a continuous enrolment are classified as those with an enrolment record in each calendar year from 2012 to 2014. Student SES is based on parents' occupation and education status, as collected from enrolment forms. The final dataset includes only those students with complete data for all variables.

Appendix D: Test participation descriptive statistics

Table D1: Descriptive statistics for absence vs participation in the 2014 Year 3 reading test

Year K to Year 3 cohort		Participated		Absent	
Total students		42,321		734	
Discrete variables		**No**	**%**	**No**	**%**
Mobility Frequency	No moves	35,822	84.6%	558	76.0%
	Moved once	5,005	11.8%	105	14.3%
	Moved twice	1,044	2.5%	52	7.1%
	Moved 3+ times	450	1.1%	19	2.6%
Aboriginal	Aboriginal	2,327	5.5%	78	10.6%
	Non-Aboriginal	39,994	94.5%	656	89.4%
Gender	Male	21,628	51.1%	403	54.9%
	Female	20,693	48.9%	331	45.1%
Continuous variables		**Mean**	**SD**	**Mean**	**SD**
Student SES (std)		0.018	0.992	-0.337	1.033
Prior literacy score (std)		0.070	1.013	-0.168	0.939
Prior numeracy score (std)		0.079	0.990	-0.188	0.980

Note: Counts and statistics are for students with complete data for all variables.

Table D2: Descriptive statistics for absence vs participation in the 2014 Year 7 reading test

Year 3 to Year 7 cohort		Participated		Absent	
Total students		29,845		955	
Discrete variables		**No**	**%**	**No**	**%**
Mobility Frequency	No moves	25,078	84.0%	671	70.3%
	Moved once	3,597	12.1%	165	17.3%
	Moved twice	834	2.8%	71	7.4%
	Moved 3+ times	336	1.1%	48	5.0%
Aboriginal	Aboriginal	1,849	6.2%	186	19.5%
	Non-Aboriginal	27,996	93.8%	769	80.5%
Gender	Male	15,028	50.4%	552	57.8%
	Female	14,817	49.6%	403	42.2%
Continuous variables		**Mean**	**SD**	**Mean**	**SD**
Student SES (std)		0.036	0.989	-0.450	0.980
Prior reading score (std)		0.086	0.992	-0.373	1.011
Prior numeracy score (std)		0.081	0.998	-0.371	0.939

Note: Counts and statistics are for students with complete data for all variables.

Table D3: Descriptive statistics for absence vs participation in the 2014 Year 9 reading test

Year 7 to Year 9 cohort		Participated		Absent	
Total students		29,746		1,585	
Discrete variables		**No**	**%**	**No**	**%**
Mobility Frequency	No moves	27,351	91.9%	1,216	76.7%
	Moved once	2,015	6.8%	253	16.0%
	Moved twice	303	1.0%	85	5.4%
	Moved 3+ times	77	0.3%	31	2.0%
Aboriginal	Aboriginal	1,535	5.2%	226	14.3%
	Non-Aboriginal	28,211	94.8%	1,359	85.7%
Gender	Male	14,964	50.3%	787	49.7%
	Female	14,782	49.7%	798	50.3%
Continuous variables		**Mean**	**SD**	**Mean**	**SD**
Student SES (std)		0.069	0.985	-0.454	0.952
Prior reading score (std)		0.121	0.988	-0.414	0.962
Prior numeracy score (std)		0.120	1.008	-0.504	0.748

Note: Counts and statistics are for students with complete data for all variables.

Appendix E: Average marginal effects of mobility on test participation

Table E1: Average marginal effects of mobility during the lower primary years on absence from Year 3 reading test

Reference group: stable students	Student SES (standardised)					Overall Effect
	-2	-1	0	1	2	
Moved once	2.0%	1.7%	1.4%	1.2%	1.0%	1.5%
Moved twice	2.6%	2.2%	1.8%	1.5%	1.3%	1.9%
Moved 3+ times	1.3%	1.1%	0.9%	0.8%	0.6%	1.0%

Table E2: Average marginal effects of mobility during the upper primary years on absence from Year 7 reading test

Reference group: stable students	Student SES (standardised)					Overall Effect
	-2	-1	0	1	2	
Moved once	2.1%	1.7%	1.3%	1.0%	0.8%	1.4%
Moved twice	4.9%	3.9%	3.1%	2.5%	1.9%	3.3%
Moved 3+ times	7.1%	5.7%	4.6%	3.7%	2.9%	4.9%

Table E3: Average marginal effects of mobility during the junior secondary years on absence from Year 9 reading test

Reference group: stable students	Student SES (standardised)					Overall Effect
	-2	-1	0	1	2	
Moved once	6.5%	5.4%	4.5%	3.6%	2.9%	4.7%
Moved twice	13.8%	11.7%	9.8%	8.1%	6.6%	10.1%
Moved 3+ times	16.3%	13.9%	11.6%	9.7%	7.9%	12.0%

Appendix F: Descriptive statistics for analysis of dropout rates

Table F1: Descriptive statistics for Year 10 students in 2011 completing school by 2014 vs those who dropped out

		Completed/Still completing		Dropped out	
Total students		20,969		6,517	
Discrete variables		**No**	**%**	**No**	**%**
Mobility Frequency	0 moves	19,018	90.7%	5,142	78.9%
	1 move	1,634	7.8%	988	15.2%
	2 moves	254	1.2%	278	4.3%
	Moved 3+ times	63	0.3%	109	1.7%
Aboriginal	Aboriginal	490	2.3%	422	6.5%
	Non-Aboriginal	20,479	97.7%	6,095	93.5%
Gender	Male	9,924	47.3%	3,936	60.4%
	Female	11,045	52.7%	2,581	39.6%
Continuous variables		**Mean**	**SD**	**Mean**	**SD**
Student SES (std)		0.095	0.997	-0.469	0.843
Prior reading score (std)		0.347	0.989	-0.366	0.816
Prior numeracy score (std)		0.355	1.040	-0.412	0.694

Note: Counts and statistics are for students with complete data for all variables.

Appendix G: Average marginal effects of mobility on dropping out of school

Table G1: Average marginal effects of mobility during Years 7-10 on dropping out of school

Reference group: stable students	Student SES (standardised)					Overall Effect
	-2	-1	0	1	2	
Moved once	14.4%	13.4%	11.9%	10.2%	8.3%	11.7%
Moved twice	24.9%	23.9%	22.0%	19.4%	16.4%	21.3%
Moved 3+ times	32.1%	31.5%	29.6%	26.7%	23.1%	28.5%

Glossary

BoSTES
Board of Studies, Teaching and Educational Standards.

CESE
Centre for Education Statistics and Evaluation.

ERN
Enrolment Registration Number.
ERN is a centralised, student administration system that captures all student enrolments in NSW government schools.

FOEI
Family Occupation and Education Index.
FOEI is derived from the parental education and occupation information provided by the parents on student enrolment forms. It is a relative measure of the average socio-economic disadvantage of students at a school.

LBOTE
Language background other than English.

NAPLAN
National Assessment Program – Literacy and Numeracy.
NAPLAN tests are administered every year to students in Australia enrolled in grades 3, 5, 7 and 9.

NSSC
National Schools Statistics Collection.
The NSSC is conducted annually in August in each state and territory.

SES
Socio-economic status.

SRN
Student Registration Number.
The SRN is a unique identifier for each student. It is generated by the ERN system when a new student is entered into the system.

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