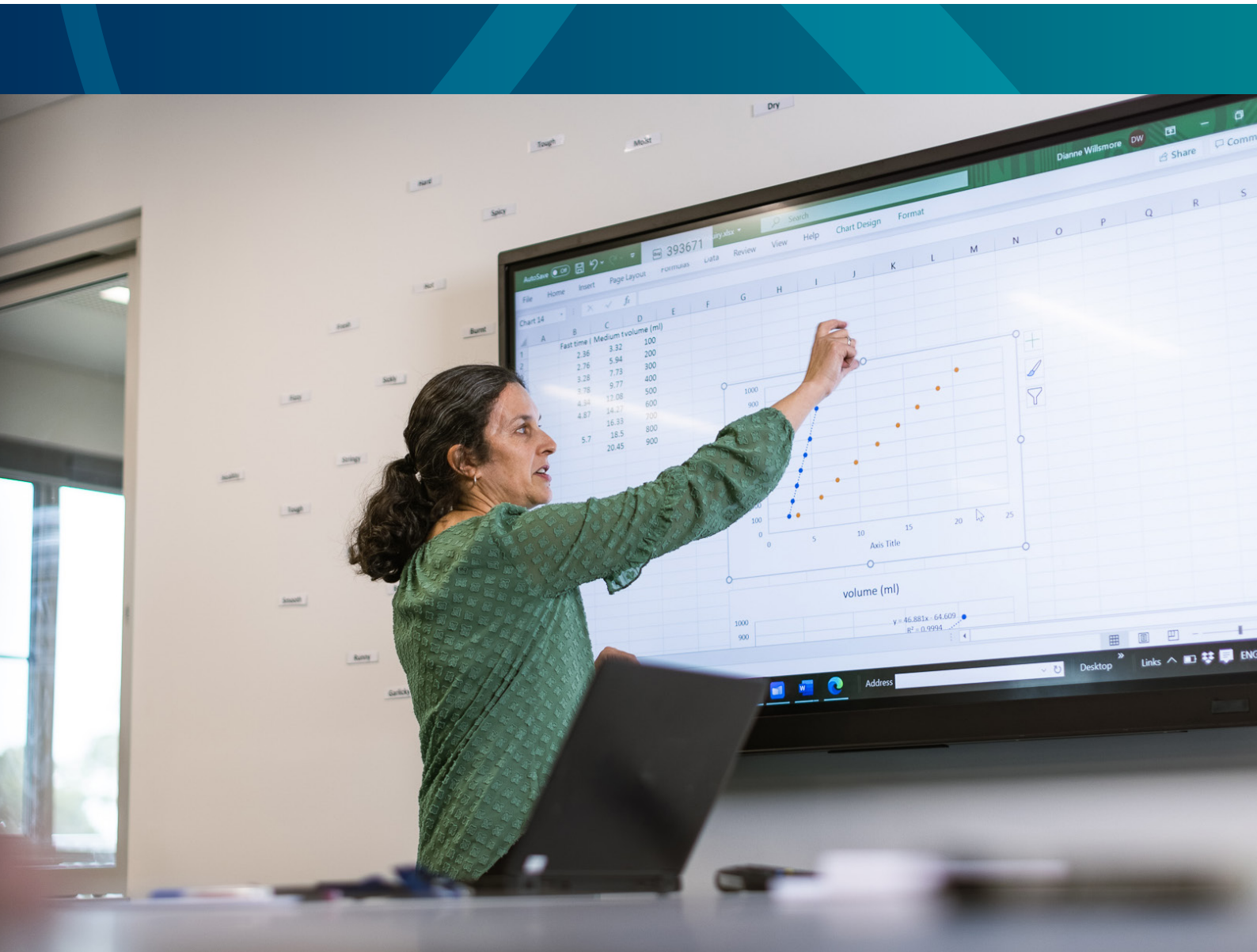


Analytical Insights Paper #2

# Learning outcomes of students with early low NAPLAN performance

August 2023



**The Australian Education Research Organisation (AERO) is Australia's national education evidence body, working to achieve excellence and equity in educational outcomes for all children and young people.**

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### Acknowledgement of Country

AERO acknowledges the Traditional Custodians of the lands, waterways, skies, islands and sea Country across Australia. We pay our deepest respects to First Nations cultures and Elders past and present. We endeavour to continually value and learn from First Nations knowledges and educational practices.

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The Australian Education Research Organisation (AERO)'s analytical insights papers provide accessible, up-to-date analysis of educational data.

This insights paper presents findings related to student progress in reading and numeracy. The findings were obtained from our new longitudinal literacy and numeracy in Australia (LLANIA) dataset that links individual student National Assessment Program – Literacy and Numeracy (NAPLAN) results from Year 3 through to Year 9 across Australia. This paper is the first in a series that uses the LLANIA dataset to explore educational questions.

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## Key points

- Year 3 students who perform below learning expectations are at a high risk of continuing to perform at that level throughout their schooling.<sup>1</sup> This shows the importance of early assessment of student progress against expected outcomes.
- Many students with early low performance did not catch up to their peers, highlighting that intervention is needed to boost the literacy and numeracy skills of those identified early.
- Of students with early low performance, the largest movement back onto a pathway of improved performance appears to happen between Year 3 and Year 5. This suggests that the best time to intervene to catch students up is as soon as they have been identified as not meeting learning expectations (early intervention).
- Catching up and staying caught up is not easy to achieve. When students with low Year 3 performance move to achieving expectations in Year 5, only around half of that group continue to perform this way until Year 9. The other half drop back down to below expectations in secondary school. This indicates that it is difficult for students to maintain improvements in learning gains as they move through school.
- Students from equity groups<sup>2</sup> are overrepresented among students who are consistently at/below National Minimum Standards (NMS) from Years 3 to 9 for both reading and numeracy.
- It is important that any student learning interventions that are adopted are monitored and assessed for their effectiveness. Longitudinal national datasets such as AERO's new LLANIA dataset (See [AERO's Longitudinal Literacy and Numeracy in Australia dataset](#)) offer opportunities to track student progress over time and assess the effectiveness of learning interventions so that equity and excellence can be achieved in Australia's education system.

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<sup>1</sup> In this paper, we use at/below the National Minimum Standards (NMS) as indicative of not meeting learning expectations. See [footnote 3](#) for further rationale for this choice.

<sup>2</sup> See [footnote 11](#) for definition of equity groups.

## Our analysis

Identifying and supporting students who fall behind expected learning standards is critical to achieving equity and excellence in Australia's education system. Educational systems invest resources in providing support to students to help them catch up if they fall behind. Understanding when and how those supports should be used is important for ensuring their effectiveness.

To inform efforts to support students who, for various reasons, do not achieve expected learning outcomes early on, we looked at what happened to those students who performed at or below the NMS in Year 3 as they progressed through school.<sup>3</sup>

Using our new linked NAPLAN dataset, we tracked the performance of approximately 190,000<sup>4</sup> Year 3 students who did not perform above NMS. We used Sankey diagrams<sup>5</sup> to describe the pathways of those students relative to their later NAPLAN performance. We did this for 2 domains: reading and numeracy.

### AERO's Longitudinal Literacy and Numeracy in Australia (LLANIA) dataset

The NAPLAN analysis presented in this paper is based on AERO's new LLANIA dataset. The dataset includes longitudinal, cross-sectoral data from all states and territories in Australia. The dataset links test results, participation and student and school demographics of over 6 million students between 2008 and 2021 from their first to their latest (or last) engagement with NAPLAN. Within this dataset, over 80% of Year 3 students (or 1.6 million, from 2008 to 2015, excluding 2014) who could be matched to Year 9, had a complete record linking their Year 3 test round through Year 5 and Year 7 to Year 9.

LLANIA is a new national linked dataset that can be used to generate substantial benefits for Australian education research. It provides an opportunity to understand the learning trajectories of Australian students from different backgrounds, across states and territories, and to evaluate policy impact with more precision and stronger validity.

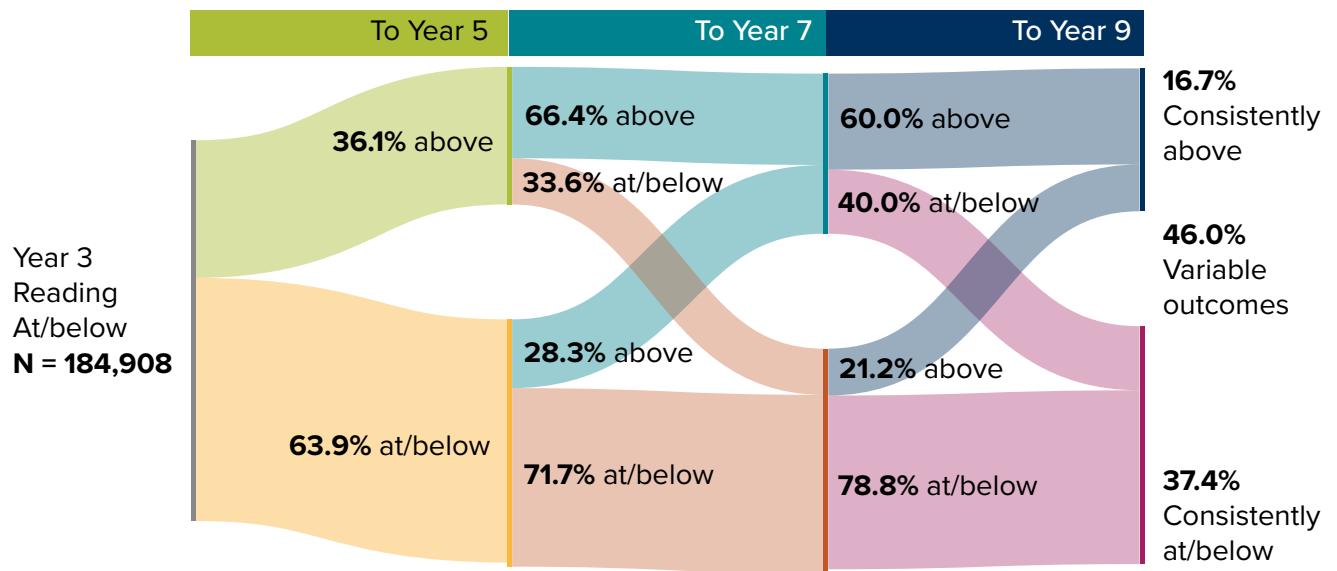
For more information about this dataset, see our [technical report](#).

- 3 Prior to 2023, the time period from which data for this analysis was drawn, student progress was reported in relation to NMS. There is wide agreement that the previous NMS were set too low (Goss & Sonnemann, 2016). Consequently, new proficiency benchmarks were established for 2023 NAPLAN and onwards. To more accurately capture students with low performance, this paper considers performance *at/below* NMS as a proxy for not achieving the expected standards.
- 4 The analysis uses the results of approximately 190,000 students who sat Year 3 NAPLAN between 2008 and 2015 (excluding 2014) and performed at/below NMS. These students had complete data in 4 NAPLAN measurement time points (i.e., Year 3, 5, 7 and 9 results). The 2014 Year 3 results could not be linked to Year 9 because of the cancellation of 2020 NAPLAN.
- 5 A Sankey diagram is a visualisation used to depict a flow from one set of values to another. They are useful to show multiple paths through a set of stages (Google Charts, 2023).

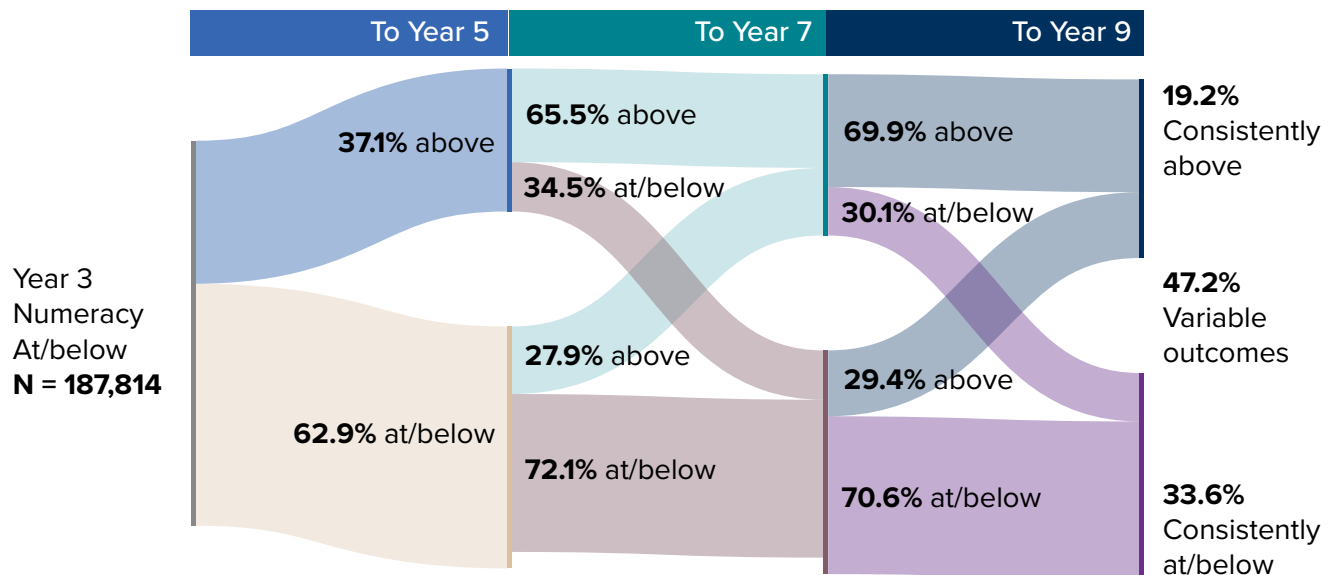
## Pathway analysis

The Sankey diagrams (Figure 1 and Figure 2) start with all the students in our linked dataset who performed at/below NMS in their Year 3 NAPLAN assessment. The diagrams map the pathways relative to performance at/below and above NMS through Years 5, 7 and 9.

**Figure 1:** Pathways for students who were at/below reading NMS in Year 3 (2008–2015, excluding 2014)



**Figure 2:** Pathways for students who were at/below numeracy NMS in Year 3 (2008–2015, excluding 2014)



## Insights

This section explores 5 key insights from the pathway analysis.

Our analysis shows that students who were at/below NMS in Year 3 can follow 8 pathways through to Year 9. We summarised these into 3 meaningful pathways:

1. *Consistently below*: students continue to perform at/below NMS in Years 5, 7 and 9.
2. *Variable outcomes*: students vary in their performance from year to year; sometimes they perform above NMS, and sometimes at/below.
3. *Consistently above*: students perform above NMS in Year 5 and continue to do so until Year 9.

### 1. Most students who do not meet Year 3 learning expectations continue to perform below expectations or inconsistently through school

Pathway 3, *consistently above*, represents the best of the 3 possible pathways. This group of students did not perform above NMS in Year 3, but demonstrated performance above NMS in Year 5 and after. Their initial weaknesses in reading and numeracy were overcome and they went on to perform at expected<sup>6</sup> levels. Unfortunately, the proportion of the group that was initially below expectations that went on to take this pathway was only 17% in reading and 19% in numeracy (see [Figure 3](#)).<sup>7</sup>

Approximately half of the Year 3 student group (46% in reading and 47% in numeracy) experienced pathway 2: *variable outcomes*. This group performed above NMS in one or 2 years out of Year 5, 7 or 9. Their pathway was inconsistent, sometimes performing well, and at other times, at/below expectations.<sup>8</sup>

Pathway 1, *consistently below*, was a group of students who remained at/below NMS through to Year 9. Concerningly, this pathway was taken by a little over a third of the Year 3 students who performed at/below NMS (37% for reading and 34% for numeracy).

When pathways 1 and 2 are considered in combination, most students who performed at/below NMS in Year 3 performed below expectations or inconsistently to Year 9.<sup>9</sup>

<sup>6</sup> See [footnote 3](#) about NMS having been set too low leading to our decision to consider students performing at/below NMS as the group whose performance is below expectations.

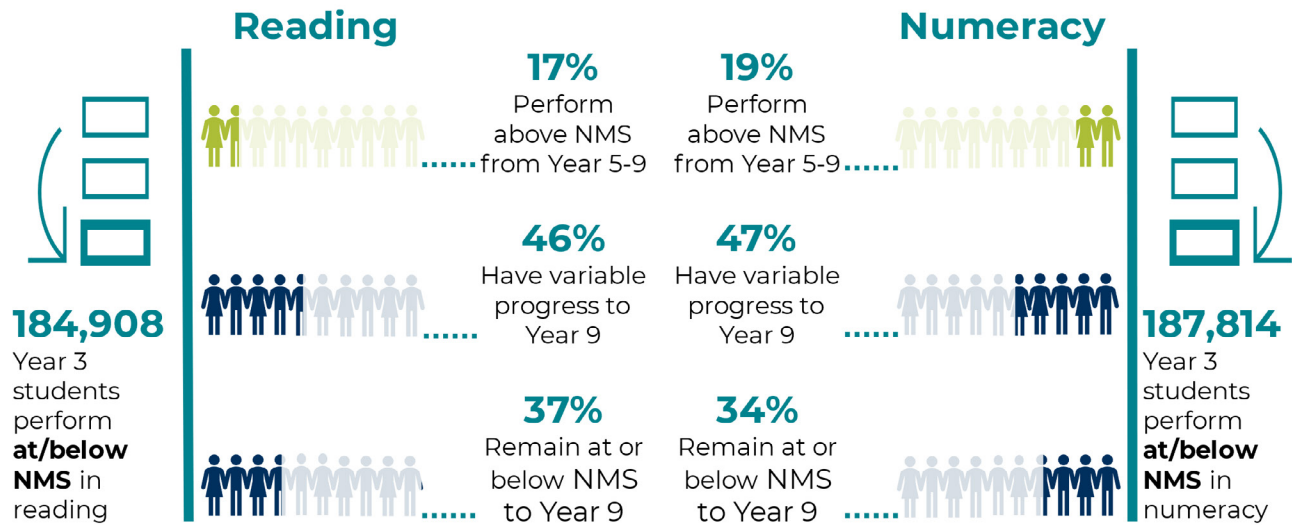
<sup>7</sup> The cohort of students used for the pathway analysis (i.e., Year 3 students who were tracked to Year 9) are slightly more socio-educationally advantaged than the broader Year 3 populations (see our [technical report](#)). This means the figures reported for the *consistently above* group are likely to be slightly overestimated, and those for *consistently below* are likely to be slightly underestimated.

<sup>8</sup> The large proportion of students in this cohort with variable outcomes demonstrates the difficulty of making a sustained change to a student's pathway towards performance that is consistently above standard. This observation was instrumental in the decision in this paper to view pathway 3, consistent performance above NMS from Year 5 to Year 9, as indicative of a student having caught up successfully, rather than using Year 9 performance above NMS in isolation.

<sup>9</sup> Additional analysis shows that, if we look at the Year 9 performance in isolation of the path students had taken up to that point, most of the students with early low performance (62.5% in reading and 53.6% in numeracy) performed at/below NMS in Year 9.



**Figure 3:** Proportion of students who catch up to their peers (indicated in light green) determined by performance against NMS



## 2. The greatest movement to performing above NMS appears to occur between Year 3 and Year 5

Among the students in Year 3 who performed at/below NMS, the largest movement of students back into the group performing above NMS happened between Year 3 and Year 5.<sup>10</sup> This can be seen in [Figure 1](#) where 36.1% of the initial group of students moved to performing above NMS in reading between Years 3 and 5. This is a much higher proportion than the 28.3% that made the same shift between Years 5 and 7, and the 21.2% that showed this improvement in performance between Years 7 and 9.

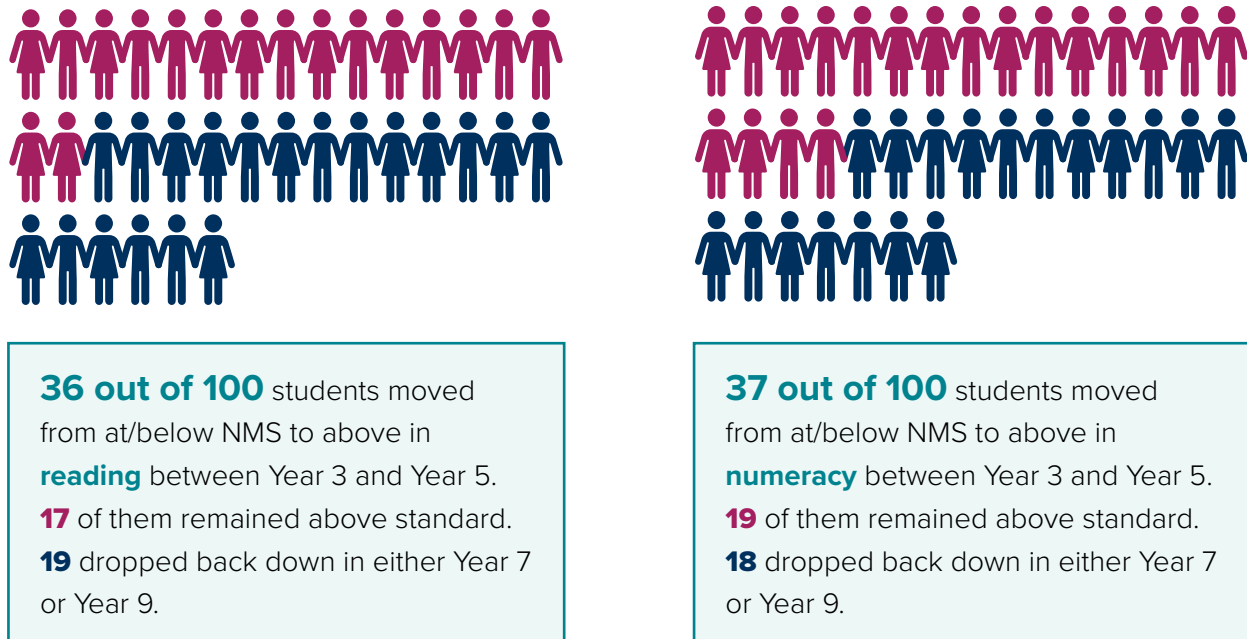
There is a similar pattern for numeracy, in which 37.1% of students moved to performing above NMS between Year 3 and Year 5, compared to 27.9% between Years 5 and 7, and 29.4% between Years 7 and 9.

## 3. Many of the students who moved into the group performing above NMS in Year 5 did not maintain this in secondary school

Many students did not maintain improvements in learning gains as they continued through schooling. While over a third of students moved from at/below NMS to above NMS in reading and numeracy between Year 3 and Year 5, a large proportion of them performed at/below NMS again in secondary school. Additional analysis suggests that, of the initial group of students moving from at/below NMS in Year 3 to above in Year 5, only around half maintained those gains through Year 7 and Year 9 (see [Figure 4](#)).

<sup>10</sup> Note that this pattern was observed in relation to the chosen comparison point of the NMS. Differently chosen comparison points, based on curriculum or other benchmarks, should be considered in future research to confirm and deepen understanding of results about future learning pathways of Year 3 students whose performance is identified as being low.

**Figure 4:** Proportion of students with early low performance who do not maintain learning gains in secondary school (indicated in dark blue)



#### 4. Equity groups are overrepresented among students who remain consistently at/below NMS

Equity groups<sup>11</sup> are overrepresented among students who are consistently at/below NMS from Years 3 to 9 (pathway 1) for both reading and numeracy. This analysis shows that students from remote and very remote locations, students of parents with education levels of Year 11 and below, and First Nations students are overrepresented in this group. Males were also slightly overrepresented in reading, and females in numeracy, but not to the extent of those priority equity groups.

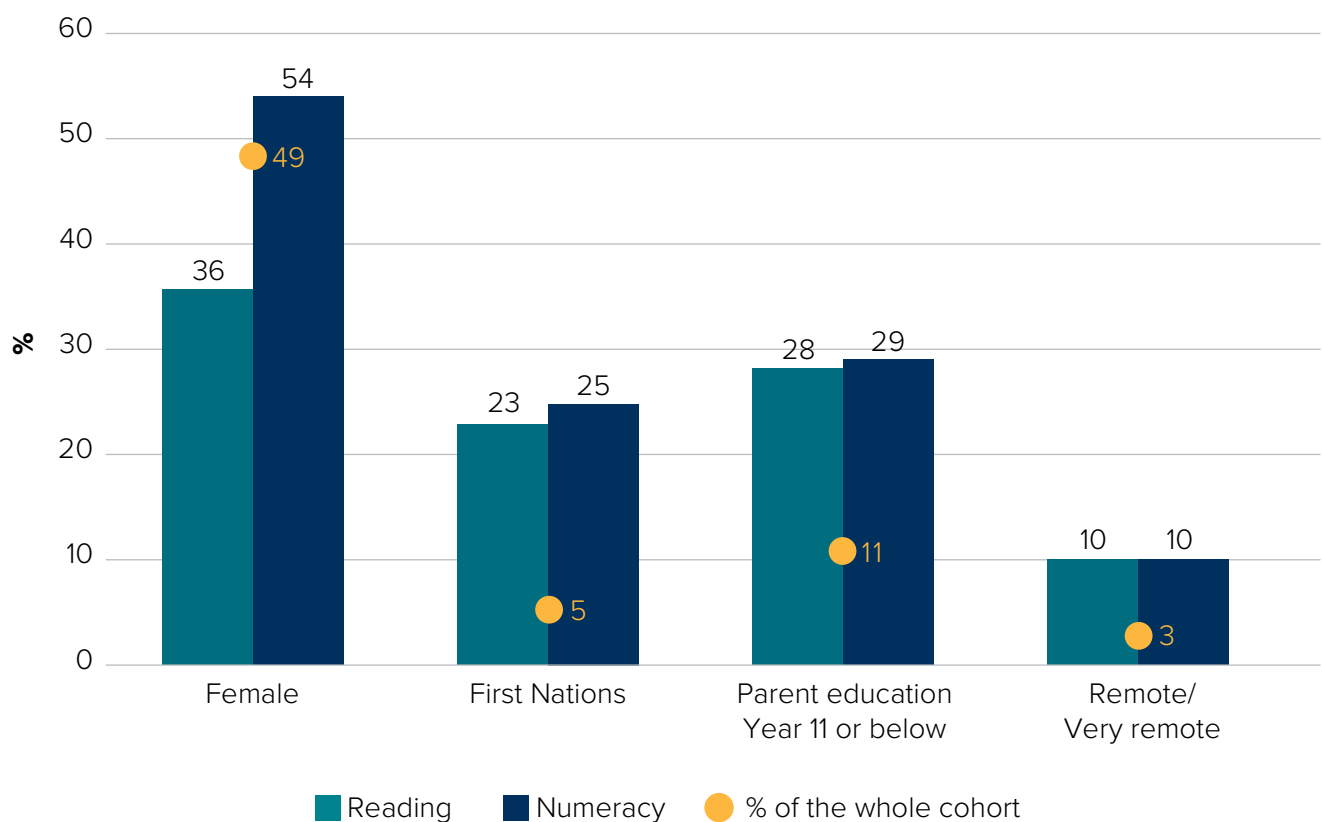
The column graph in [Figure 5](#) shows the proportions of students who experienced pathway 1 by demographic characteristic. A yellow dot indicates the rate at which each demographic characteristic appears in the whole cohort (Year 3 populations from 2008 to 2015 excluding 2014). If trajectories were equitable, we would expect the yellow dots to align with the columns. The greater the difference between these, the more over- or under-represented the groups are.

<sup>11</sup> Priority equity groups include First Nations students, students living in regional, rural and remote areas, students with disability and students from educationally disadvantaged backgrounds (Council of Australian Governments, 2021). Note: not all priority equity groups can be analysed through NAPLAN data. Additionally, we have analysed the performance of females for numeracy and males for reading. As a result, we use the term equity groups to refer to groups of students that research shows have inequitable educational outcomes.

From Figure 5, we can see that for students who performed consistently at/below NMS in reading and numeracy:

- almost 30% had *parents with education at Year 11 or below* – a much larger proportion than the 11% in the whole cohort
- 10% were from *remote or very remote areas* – far greater than the 3% in the whole cohort
- about 24% are *First Nations students* – much greater than the 5% in the whole cohort
- 54% were *female for numeracy* – slightly more than the 49% of females<sup>12</sup> in the whole cohort
- 64% were *male for reading* – more than the 51% of males in the whole cohort.

**Figure 5:** Demographic characteristics of students who remained consistently at/below NMS from Year 3 to Year 9



<sup>12</sup> While broader categories are now used to accurately describe gender, the historical data used here contained only 2 categories: female and male.

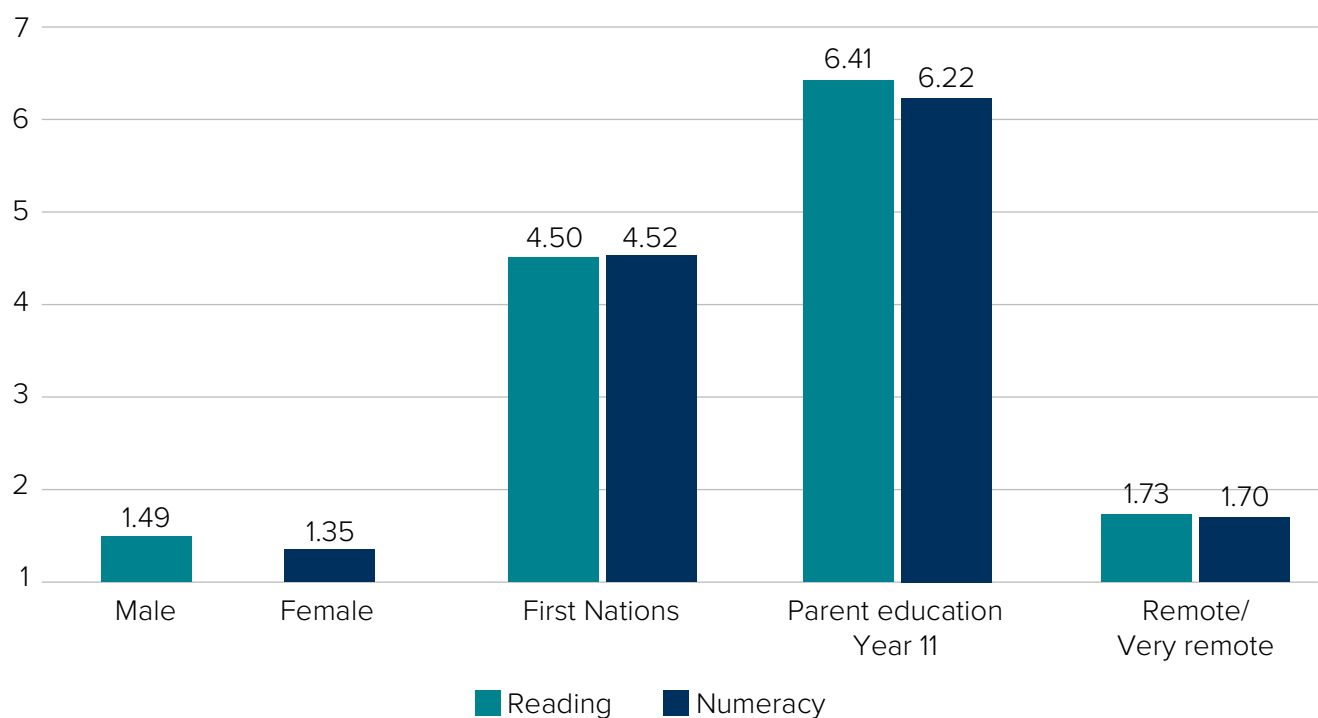
## 5. Students from equity groups are more likely to remain at/below the NMS

The previous analysis showed an overrepresentation of equity group characteristics in the students experiencing pathway 1. However, students can be in multiple equity groups, and the particular barriers they experience can have compounding effects on their performance. The analysis<sup>13</sup> presented in this section shows the unique relationship between a demographic factor and the chance of following a particular pathway, when holding everything else equal.

Figure 6 shows the likelihood of remaining consistently at/below NMS (pathway 1) compared to consistently above NMS (pathway 3) in reading and numeracy according to demographic background. For each demographic group, the figure shows the number of times more likely that group is to stay at/below the NMS (pathway 1) compared with those who went on to perform consistently above the NMS from Year 5 (pathway 3), while controlling for membership in other demographic groups in the analysis.

In both reading and numeracy, First Nations students are around 4.5 times more likely than non-First Nations students to perform consistently at/below NMS compared to consistently above NMS. Even more strikingly, those students whose parents had education levels of Year 11 or below are over 6 times more likely to consistently perform at/below NMS compared to those who had at least one parent with a bachelor's degree or above.

**Figure 6:** Number of times more likely to remain consistently at/below NMS from Year 3 to Year 9 by equity group



<sup>13</sup> Multinomial regressions were performed for reading and numeracy respectively. The dependent categorical variable is whether the students consistently remained at/below NMS, above NMS, or made inconsistent progress from Year 3 to Year 9. The variables included in the model are gender, First Nations status, parental education background and remoteness.

## What do these insights mean?

There has been some debate about whether students who begin with low performance levels in Year 3 in Australia are able to catch up to higher performing peers (Goss & Sonnemann, 2016; Larsen & Little, 2023). Our analysis using longitudinal student data clearly demonstrates that Year 3 students who perform at/below NMS – a proxy for not meeting learning expectations – are at a high risk of continuing to perform at that level for the remainder of their schooling. While it is true that some students can catch up, this feat is currently performed by fewer than 1 in 5 students (17% and 19% for reading and numeracy respectively) in the starting group of Year 3 students at/below NMS.

These insights show the value of early identification of at-risk students. Over one-third of students who were at/below NMS in Year 3 remained consistently at/below NMS throughout their schooling. Furthermore, approximately half of the Year 3 student group performed inconsistently in later NAPLAN tests, sometimes performing above, and at other times below expectations. Therefore, most students who performed at/below NMS in Year 3 NAPLAN could be classified as at risk of not meeting expected learning standards throughout their schooling. This underscores the importance of early assessment of student progress against expected outcomes.

This analysis also provides evidence that early intervention is key to lifting and sustaining student outcomes. The analysis did so through showing that for students in Year 3 (the earliest point growth can be tracked through NAPLAN) who did not meet expectations, the largest movement back onto a pathway of improvement in learning happened between Year 3 and Year 5. This result adds to existing evidence<sup>14</sup> that the best time to intervene to catch students up is as soon as students have been identified as not meeting learning expectations.

However, catching up and staying caught up is not easy to achieve, as insights from this paper suggest. When students moved from at/below to above NMS in Year 5, only around half of that group continued to perform above the NMS until Year 9. The other half dropped back down to at/below NMS in secondary school. This indicates that it is difficult for students to maintain improvements in learning gains as they move through schooling.

Equity remains an ongoing problem in the literacy and numeracy performance of Australia's students, as this paper shows. This challenge can be addressed through early identification of students who are falling behind (overrepresented by students from equity groups) and the provision of high-quality intervention tailored to specific needs to support their learning.

The most appropriate interventions to support at-risk students across a wide range of educational settings should continue to be researched. Small group tutoring (Sonnemann & Goss, 2020; Sonnemann & Hunter, 2023) within a multi-tiered system of support framework (de Bruin et al., 2023) is an effective approach to catching up students who have fallen behind.

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<sup>14</sup> Other studies (e.g., Lu & Rickard, 2014, p.31–32) provide corroborating evidence that from Year 3 to Year 9 student outcomes are less determined by prior performance and demographics in earlier years than in later years, indicating the best chance to intervene and change a student's learning trajectory is as soon as they are identified as needing support.

It is important that any student learning interventions that are adopted are monitored and assessed for their effectiveness. Going forward, with additional linkage, AERO's new LLANIA dataset offers an opportunity to investigate the impact of teaching and learning interventions on students' literacy and numeracy performance.

AERO is also undertaking further research on the pathways of students with different initial starting performance levels, given a significant number of students<sup>15</sup> who performed at/below NMS in Year 9 achieved above NMS in Year 3 (cohorts not examined in this research). The expanded research will enable us to get a fuller picture of all pathways students can take and the impact of each pathway on future schooling success.

Future research could also investigate why student gains are more easily made in earlier years, and what barriers prevent students from lifting their performance more when they are in Year 7, and more again when they are in Year 9.

Exploring these questions will enable more strategic interventions to put every child on a pathway to sustained learning.

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<sup>15</sup> Of the Year 9 students (2014 to 2021, excl. 2020) who were fully matched to Year 3 and who performed at/below NMS in Year 9 reading, 38.9% of them achieved at/below NMS in reading in Year 3. The equivalent figure is 43.2% for numeracy.

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