



Transitional pathways through middle school for First Nations students in the Northern Territory of Australia

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Abstract

The middle-school years (Year 7 to Year 9) is a particular challenge for socially disadvantaged populations, with high proportions of children either repeating school years or dropping out of school. In Australia, a group of particular concern is First Nations children for whom there is a collective effort by all governments to improve education outcomes, although there have been few studies of their transition through the middle-school years. This retrospective study, using individual-level linked data, followed a cohort of 7881 First Nations students for 2 years after enrolment in Year 7 (Y7) in any Northern Territory (NT) government school in the years from 2008 to 2014 to quantify the transitional pathways through middle school and identify the factors associated with faltering progress. We used multinomial multilevel logistic regression to identify the factors associated with school dropout and repeating Y7 or Y8 (Y7/8). Two years after Y7 enrolment, eight in ten First Nations students progressed to Y9 (78.8%), more than one in ten students had dropped out of school (13.3%) before reaching Y9, and one in 12 (7.9%) repeated Y7/8. The likelihood of either dropping out of school or repeating years was higher among students who were enrolled in Y7 when aged less than 11.5 years, had a low Y7 school attendance rate, moved to either interstate or non-government schools and who lived in a remote area. Students who were not born in the NT and those with a record of substantiated child maltreatment during Y7 were more likely to repeat Y7/8. Planning interventions to improve school retention through the middle-school years should consider these factors.

Keywords School dropout · Repeat · First Nations · Multinomial multilevel regression · Data linkage · Retention

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Background

Consistent progress through school is crucial to ensure children have a strong foundation for subsequent education (Chang & Romero, 2008). Across Australia, school attendance is compulsory for children and young people aged from 6 to 17 years (ACARA, 2023). Despite this requirement, there are groups of children with either low attendance or who drop out of school, during secondary school. Problematic secondary school pathways are associated with low school completion and graduation rates as well as participation in the economy, health and employment outcomes (Guenther, 2021; Hancock et al., 2013; Henderson et al., 2014; Hickman et al., 2008; Qilong, 2015; Smith & Skrbiš, 2017; Stone et al., 2017). Furthermore, dropping out of school or repeating secondary school years is associated with an increased risk of social problems including risky health behaviours (drug and alcohol abuse), frequent work absences, homelessness, welfare dependence and repeated involvement in the justice system (Balfanz & Byrnes, 2012; Chang & Jordan, 2011; Chang & Romero, 2008; Ginsburg et al., 2014; Gottfried, 2014; Henderson et al., 2014; Hickman et al., 2008).

First Nations young people are more likely to experience higher rates of adverse health and social outcomes as a consequence of a history of colonisation and discriminatory social policies across generations (Dudgeon et al., 2010; Paradies et al., 2008). They are also less likely to attend school regularly and more likely to leave school before completing Year 12. The system has been challenged to take responsibility for fulfilling the educational needs of First Nations children (Anderson et al., 2022). Australian governments have committed to addressing inequities experienced by First Nations peoples with progress publicly reported against 'Closing the Gap' outcome targets (Australian Department of the Prime Minister Cabinet, 2020). Improving educational outcomes have been an important focus for governments, and while there have been improvements in retention to Year 12, school attendance rates have trended lower and average academic results reported through standardised tests for First Nations students remain well below the results for the whole population.

The Northern Territory (NT) of Australia is a large, remote and sparsely populated jurisdiction covering parts of northern and central Australia. The NT has distinct demography compared to other states and territories in Australia, with the smallest total population (approximately 245,678) (ABS, 2022); a greater proportion of First Nations people (30.3%) compared with 4.8% for Australia as a whole, a greater proportion of children enrolling in remote or very remote schools (47.8% compared with 3.0%); and greater proportion of students with language background other than English (39.4% compared with 18.0%) at school entry (ABS, 2022). In the NT, two stages of secondary schooling, middle school (Y7 to 9) and senior school (Y10 to 12) were introduced in 2007. Although the precise rate of middle-school dropout and repeating years among NT First Nations students is unknown, the Australian Bureau of Statistics has estimated dropout to be approximately 15% based on the aggregated 2020 enrolment data, which were substantially higher than the corresponding rate for non-First Nations

students (~0.4%) (ACARA, 2020). Disparities in Year 10–12 school retention, between First Nations and non-First Nations students, declined between 2011 and 2018 but has increased more recently (ACARA, 2023). From the wider literature, the factors associated with children dropping out of school and repeating years largely relate to school environment, family context, and students' personal traits (Biddle & Cameron, 2012; Chang & Jordan, 2011; Chang & Romero, 2008; Ginsburg et al., 2014). Parker viewed low school attainment of First Nations children from an intergenerational perspective reporting few differences in the typical processes of educational mobility between First Nations and non-First Nations emerging adults (Walter & Andersen, 2016). Parker et al. suggest that educational inequality appears to result from lower school attainment in both First Nations parents and their children (Parker et al., 2021a, b).

No study has been conducted in NT to assess the transitional pathways of students through middle-school and the potential determinants of school pathways. This study aimed to quantify the middle-school transitional pathways from Y7 and investigate the factors associated with the outcomes of students' dropping out and repeating during the middle-school years. The findings of this study have the potential to inform education policy and practice to improve school retention among First Nations students.

Methods

Study setting, design, and cohort

The study cohort consisted of First Nations children who were enrolled in Y7 at NT government schools in the period from 2008 to 2014. The NT Government provides education services to approximately 34,004 students across all grades in 153 government schools (NT Department of Education N.D). About 71% of the NT Government schools are located in remote areas with the majority of First Nations students enrolled at these schools (NT Department of Education N.D). We excluded observations with incomplete, uncertain or unknown outcome data.

Data sources and linkage

The study used data held within a repository of de-identified, individual-level linked records from multiple administrative datasets. The repository was established by the Child and Youth Development Research Partnership, a collaboration between Menzies School of Health Research and the NT Government agencies and contained 14 datasets from the health, education, child protection and youth justice sectors. The first stage of data linkage was undertaken by SA NT DataLink which linked records for the same child in one or more datasets using probabilistic linkage with clerical review for uncertain matches (Christen, 2012). The data linkage process has been described elsewhere (Schneider et al., 2019). For the analysis we combined records from the government school enrolment dataset with the following datasets

containing covariates: NT Government school attendance, Y9 National Assessment Programme-Literacy and Numeracy (NAPLAN), child protection services (CP) and the NT perinatal data register. School-specific data items were extracted from the *My School* website.

Outcome variables and measurement

We measured educational outcomes for students 2 years after enrolment in Y7 using the school enrolment dataset. The enrolment data include a field that records where children go when leaving a school. Our preliminary analysis found the following outcome profiles:

- (i) a group of students found in NT government schools, with a fully ascertained retention outcome,
- (ii) a group of students who moved to non-government schools, assessed using Y9 NAPLAN, for whom the retention outcomes was unable to be ascertained,
- (iii) a group of students who moved interstate, for whom the retention outcome was unable to be ascertained using the NT Government enrolment.

The groups included children who moved, or intended to move, interstate or to other schools but were subsequently found to have returned to the NT with records in the NT education datasets.

From the preliminary analysis, after exclusion of those students who moved interstate or to non-government schools with an uncertain outcome, we classified the remaining students into the following categories:

- A. Retained—those students who progressed to Year 9,
- B. Dropout—those who no longer attended school,
- C. Repeated Y7/Y8—those students who repeated either Y7 or Y8 and
- D. Skipped Y9—those students enrolled in Year 10 or 11.

We merged Groups A and D and created three outcome categories: retained (categories A and D), repeated (category C) and dropout (category B). We defined Y9 retention rate as the proportion of full-time students enrolled in Y7 who after 2 years were enrolled in Y9 or higher.

Potential covariates

Potential covariates were identified from the literature and are presented in the conceptual framework (Fig. 1). The potential covariates hypothesised to be associated with the school transitional pathways of school dropout and repeating Y7/8 were conceptualised under four levels (clusters). The first cluster was community-level factors for which available measures included Socioeconomic Indicators for Areas (SEIFA) (ABS, 2011), housing overcrowding, level of geographic remoteness (urban, rural and remote as defined by the NT Department of Education), percentage

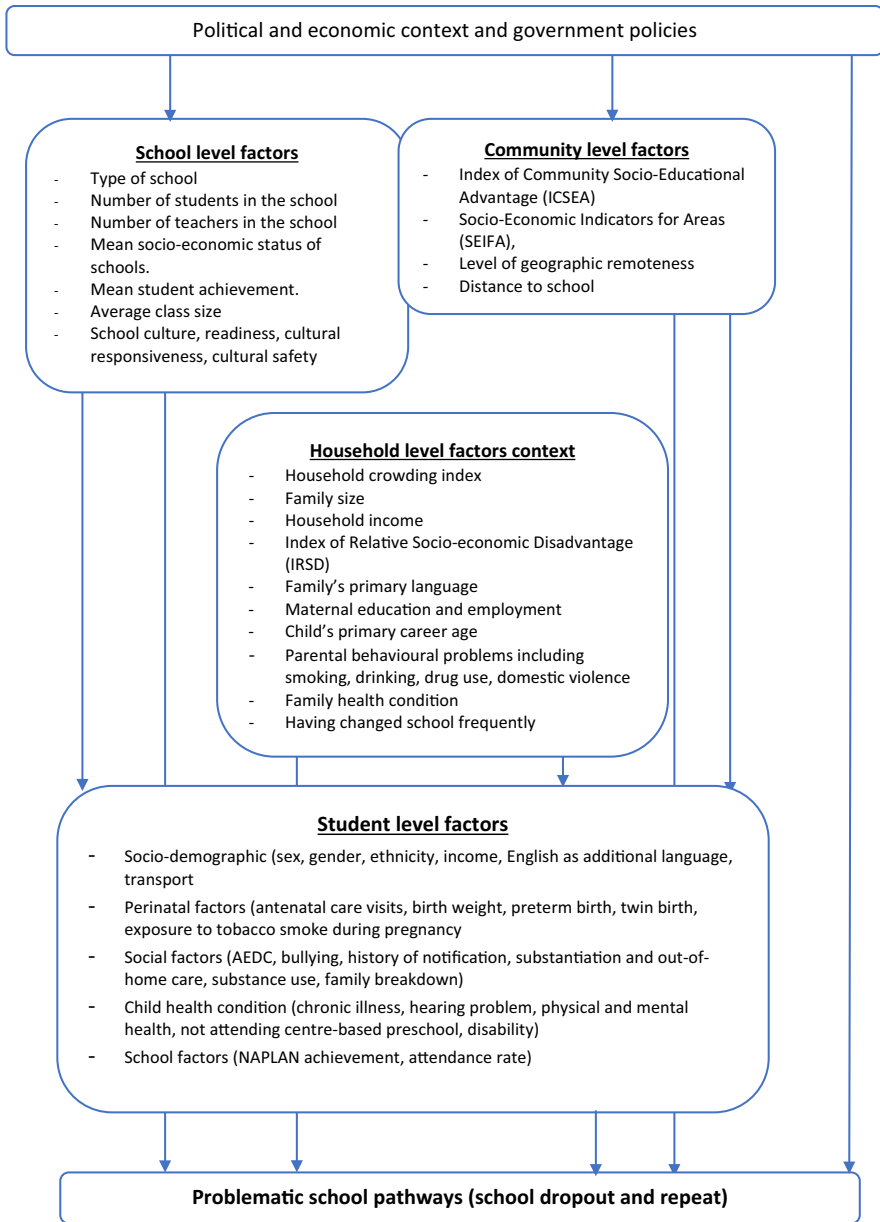


Fig. 1 A conceptual framework showing the multilevel nature of factors associated with school pathways

of individuals living in the community who have completed year 9 and are unemployed (ACARA, 2020). The second cluster was school-level factors and included number of students in the school, number of teachers in the school, mean socioeconomic status of school, total teaching and non-teaching staff, student–teacher and

non-teaching staff ratio and attendance rate (ACARA, 2020). The third cluster of covariates was related to household-level factors and included maternal education and occupation, and maternal use of tobacco and consumption of alcohol during pregnancy. The fourth cluster was related to the student-level factors and included age, sex, gender, low birth weight, preterm birth, twin birth, English as additional language and history of contact with the child protection system.

Data analysis

We created the research dataset by linking records from all datasets from which the outcome and potential covariates were accessed. The outcome is presented as three categories: retained, dropout and those who repeated in Y7/8. The research dataset was cleaned and checked for missing data, multicollinearity and distribution. We excluded perinatal covariates from the analysis for the following reasons: (i) data were missing for some variables, (ii) data were not found for non-NT born children and (iii) the proximity of the risk factors from the outcome variable. We did an exploratory data analysis using mean, median, standard deviation and frequency/percentage. We used correlation, chi-square and *t*-tests to test a crude relationship within and between the outcome and covariates. We checked for multicollinearity using variance inflation factor (vif) post-estimation and correlation analysis to decide which variables needed to be dropped.

In accordance with the conceptual framework (Fig. 1), it was appropriate to fit a multilevel model to account for clustering effect of school outcomes (Rabe-Hesketh & Skrondal, 2008). The assumption for nesting at community (SLA was used to cluster at community level), school and student levels were tested prior to fitting the model. For the purpose of this analysis, the student level combines the individual student and household-level factors. We checked for model fitness and superiority of random intercept model over fixed effect using the log-likelihood ratio test, AIC/BIC and intraclass correlation coefficient (ICC) (Kianoush & Masoomehni, 2015; Rabe-Hesketh et al., 2005). We fitted a three-level multinomial logistic regression model taking individual-level covariates as level-1, school as level-2 and community as level-3 (Statacorp, 2015). The model used multinomial distribution with a logit link function to compute the odds of dropout and repeat taking retention as a base category. The multivariate model was adjusted for all covariates that had a *p*-value ≤ 0.2 in the bivariable analysis. We assessed the model's explanatory ability using the McFadden's adjusted R^2 , for which any value between 1.0 and 2.0 indicates a good fit and greater than 2.0 indicates excellent fit (Veall & Zimmermann, 1996). We fitted a fixed effect multinomial logistic regression model to calculate community, school and individual-level variations.

Positionality statement

The authors have a diversity of backgrounds, with both ethnic diversity—First Nations (RO), Ethiopian (AD), Singaporean (VH), Taiwanese (JYS) and Caucasian (SG & JG)—and with five males (AD, VH, JYS, SG & JG) and one female (RO).

The authors have research skills and experience relevant to the analysis and interpretation of the results, across the fields of education, public health, social epidemiology and statistics. The authors have a shared value for the importance of continuity and completion of secondary education and have undertaken the study to provide accurate estimates of the extent and nature of disruption in formal education among the study population, with the intent of informing strategies to improve education outcomes for First Nations students in the NT.

Ethics statement

The authors acknowledge the sensitivities and risks of research involving First Nations people and are familiar with the recent guidance on working with First Nations people including the National Health and Medical Research Committee (NHMRC) and Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) guidelines (AIATSIS, 2020; NHMRC, 2018). The research is conducted with the approval of a Human Research Ethics Committee (HREC), which requires responses by researchers against the NHMRC guidelines. The HREC review includes review by a First Nations research committee who provide advice on projects and have the right of veto for projects. The project was also approved by the First Nations Advisory Group for the Child and Youth Development Research Partnership, which includes independent First Nations community members.

Results

A total of 7881 First Nations students were identified to have Y7 enrolment records during the period from 2008 to 2014. After excluding 516 students whose outcome status was uncertain, there were 7365 students remaining in the study cohort. Figure 2 shows the profile of students over the 2 years of follow-up period. Two years after enrolling in Y7, students in the study cohort were classified into the four distinct outcome groups: Group A—retained (5647; 76.7%), Group B—dropout (980; 13.3%), Group C—repeated (582; 7.9%) and Group D—containing students who skipped Y9 and were found in either Year 10 or 11 (157; 2.1%), and who were combined with Group A for analysis. There were 103 schools nested within 28 communities, and on average, there were 3.6 schools per community with a minimum of one and maximum of 15. The number of students per community (across all years) ranged from 1 to 1305 with a mean of 261.1, and number of students in a school ranged from 1 to 408 with a mean of 71.5 students.

Characteristics of study participants

The characteristics of the study cohort across three outcome categories are presented in Table 1. The mean age (\pm SD) of students at Y7 enrolment for Groups A (retained), B (dropout) and C (repeated) was 12.12 (0.42), 12.10 (0.55), and 11.49 (0.6), respectively. Most students in the retained and dropout groups were in the 11.5

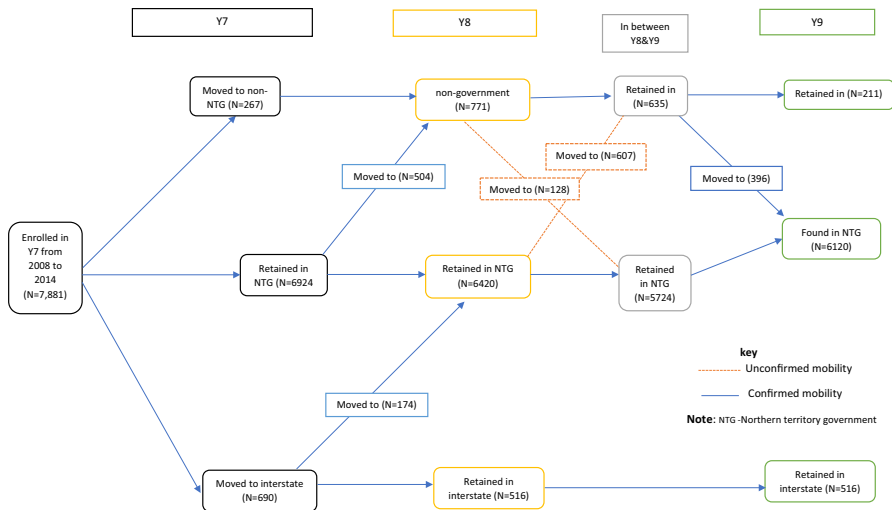


Fig. 2 Diagram showing students mobility across states, government, and non-government school system in the first 2 years after being enrolled in Y7

to 12.5 age group, while only half (49.6%) of the students in the repeat Y7/8 group were in this age group. Greater proportions of students enrolled in Y7 with under 11.5 years of age were in the dropout group (9.2%) or repeat group (46.6%) compared with the retained to Year 9 group (3.9%). The median (and interquartile range (IQR) of student annual attendance rate in Y7 was 68 days (IQR: 30) for retained, 74 days (IQR: 24) for dropout and 64 days (IQR: 17) for repeat groups. Low yearly attendance rate in Y7 (<80%) was correlated with dropout and repeat groups. Slightly less than half of students were male (47.2%), and English was an additional language for most of the students in all categories (around 81%). The proportion of students with a record of a notification to child protection services, 137 (14.0%), was higher in the dropout group while the proportion of students with a record of a substantiated notification, 34 (5.6%), was higher in repeat group.

A slightly higher proportion of students in the dropout and repeat groups had a history of interstate and non-government school mobility in Y7 compared to the retained group. The educational and occupational status of many of the mothers in all groups with complete information were a non-school qualification and unemployed, respectively. Around two-thirds, 4534 (61.6%), of students were from remote areas and these students were less likely to progress to the next level.

Retention outcomes and associated factors

The Y9 retention, dropout and Y7/8 repeat rates were 78.8% (95% CI 77.8, 79.7), 13.3% (95% CI 12.5, 14.1) and 7.9% (95% CI 7.3, 8.5), respectively. The variability in the three outcome categories is explained across levels of factors—individual, school and community. The intraclass correlation coefficient (ICC) result estimates that 16.6%, 34.5% and 31.0% of the total variation in dropout are accounted

Table 1 Characteristics of study participants included in the analysis ($N=7365$) of First Nations school dropout and repeat in the years 2008 to 2014, NT

Characteristics	Retained $N=5804$, (%)	Dropout $N=980$, (%)	Repeat Y7/8 $N=581$, (%)	Total, N (%) $N=7365$ (%)
Age of child at Y7 enrolment in years				
9 to 11.5	227 (3.9)	90 (9.20)	271 (46.6)	588 (8.0)
11.5 to 12.5	4619 (79.6)	695 (70.9)	288 (49.6)	5602 (76.1)
12.5 to 14.8	958 (16.5)	195 (19.9)	22 (3.8)	1175 (15.9)
Year of enrolment				
2008	789 (13.6)	175 (17.9)	109 (18.8)	1073(14.6)
2009	724 (12.5)	114 (11.6)	95 (16.3)	933 (12.7)
2010	809 (13.9)	133 (13.6)	79 (13.6)	1021 (13.9)
2011	837 (14.4)	128 (13.1)	86 (14.8)	1051 (14.3)
2012	829 (14.3)	129 (13.2)	63 (10.8)	1021 (13.9)
2013	941 (16.2)	125 (12.8)	78 (13.4)	1144 (15.5)
2014	875 (15.1)	176 (18.0)	71 (12.2)	1122 (15.2)
Y7 attendance rate (median, IQR)				
0 to 40%	1, 078 (18.6)	247 (25.2)	143 (24.6)	1,68 (19.9)
40 to 60%	1177 (20.3)	186 (20.0)	158 (27.2)	1521 (20.6)
60 to 80%	1660 (28.6)	239 (24.4)	173 (29.8)	2072 (28.1)
80 to 100%	1889 (32.5)	308 (31.4)	107 (18.4)	2304 (31.3)
Gender (male)	2, 737 (47.2)	479 (48.9)	278 (47.8)	3, 494 (47.4)
English as additional language (yes)	4, 716 (81.2)	798 (81.4)	520 (89.5)	6034 (81.9)
Level of contact with child protection (CP) Y7				
No contact	4913 (84.7)	801 (81.7)	473 (81.4)	6187 (84.0)
Unsubstantiated notification	685 (11.8)	137 (14.0)	74 (12.7)	896 (12.2)
Substantiated	206 (3.6)	42 (4.3)	34 (5.6)	282 (3.8)
Mobility history in Y7				
No change	4533 (78.1)	716 (73.1)	455 (78.3)	5, 704 (77.4)
Between NTG schools	889 (15.3)	110 (11.2)	60 (10.3)	1059 (14.4)
Interstate mobility	187 (3.2)	63 (6.4)	39 (6.7)	289 (3.9)
To non-NTG school	110 (1.9)	66 (6.7)	19 (3.3)	195 (2.6)
Mixed	85(1.5)	25 (2.6)	8 (1.4)	118 (1.6)
Place of birth (Not born in NT)	1, 072 (18.5%)	243 (24.8)	74 (12.7)	1389 (18.9)
Maternal education				
Non-school qualification	2222 (38.3)	282 (28.8)	212 (36.5)	2716 (36.9)
Certificate 1–4	813 (14.0)	93 (9.5)	29 (5.0)	935 (12.7)
Advanced diploma/diploma	164 (2.8)	20 (2.0)	3 (0.5)	187 (2.5)
Degree or above	108 (1.9)	19 (1.9)	5 (0.9)	132 (1.8)
Missing	2, 497 (43.0)	566 (57.8)	332 (57.1)	3395 (46.1)
Maternal occupation				
Grp 1	245 (4.2)	34 (3.5)	5 (0.9)	284 (3.9)
Grp 2	181 (3.1)	19 (1.9)	5 (0.9)	205 (2.8)
Grp 3	502 (8.7)	58 (5.9)	8 (1.4)	568 (7.7)
Grp 4	604 (10.4)	67 (6.8)	42 (7.2)	713 (9.7)

Table 1 (continued)

Characteristics	Retained <i>N</i> =5804, (%)	Dropout <i>N</i> =980, (%)	Repeat Y7/8 <i>N</i> =581, (%)	Total, <i>N</i> (%) <i>N</i> =7365 (%)
Unemployed	1947 (33.6)	278 (28.4)	214 (36.8)	2439 (33.1)
Missing	2325 (40.1)	524 (53.5)	307 (52.8)	3156 (42.8)
Remoteness				
Urban	1478 (25.5)	252 (25.7)	31 (5.3)	1761 (23.9)
Rural	925 (15.9)	115 (11.7)	30 (5.2)	1070 (14.5)
Remote	3401 (58.6)	613 (62.6)	520 (89.5)	4534 (61.6)

at community, school and observations within the same school and community. For the outcome category of repeating Y7/8—29.2%, 34.2% and 36.7% of the variations are accounted at community, school and observations within the same school and community. This means, a significant proportion of reasons for school dropout and repeating the same level are affected by community and school-level factors. Furthermore, a variance decomposition analysis illustrated in Table 2 showed that the variations explained at student, school and community level were higher for repeat than dropout. The age of the child at Y7 enrolment explained about 95% of the individual-level variations accounted by repeat in Y7/8. Y7 mobility accounted for more than half (53.6%) of the individual-level variability in the dropout group followed by age at Y7 enrolment (34.1%). The community and school-level factors equally contributed to explaining the variations in the dropout group while school characteristics account for more variation (10.3%) in the repeat group (Table 2).

Student age, year of enrolment, Y7 attendance rate, NT born, Y7 mobility history and place of residence were significant in the bivariable analysis of school dropout and were retained in the multivariable analysis model. Similarly, student age, enrolment year, Y7 attendance, English as additional language, level of child protection contacts at Y7, mobility history in Y7, maternal education, maternal occupation and residence were significant in the bivariable analysis of repeating Y7/8 and were retained in the multivariate model.

Table 2 Variance decomposition analysis for school retention outcomes separately for dropout and repeat of First Nations students enrolled in the year between 2008 and 2014, NT

Model	McFadden's adjusted R^2 (% variation explained)	
	Dropout	Repeat (%)
Individual-level factors (over all)	2.8	21.6
Age of at Y7 enrolment	0.9	20.5
Y7 attendance rate	0.3	1.3
Mobility history in Y7	1.5	0.5
School-level only	6.1	10.3
Community-level only	6.0	6.8
Remoteness	0.1	6.4

Table 3 Risk factors associated with dropping out of school and repeating years from a multilevel multinomial logistic regression model of First Nations children enrolled in Y7 between 2008 and 2014, NT

Individual-level factors	Dropout AOR (95% CI)	Repeat Y7/8 AOR (95% CI)
Age at Y7 enrolment (ref: 11.5 to 12.5 years)		
9 to 11.5 years	2.61 (1.94, 3.51)*	17.11 (13.38, 21.87)*
12.5 to 14.8 years	1.17 (0.96, 1.42)	0.36 (0.22, 0.57)*
Place of birth (ref: born in the NT)		
Not born in NT	1.70 (1.41, 2.05)*	0.78 (0.58, 1.05)
Y7 attendance rate (ref: 80 to 100%)		
0 to 40%	2.43 (1.93, 3.06)*	2.18 (1.56, 3.04)*
40 to 60%	1.38 (1.09, 1.73)*	1.76 (1.28, 2.41)*
60 to 80%	1.05 (0.85, 1.29)	1.54 (1.14, 2.08)*
Mobility history in Y7 (ref: no history)		
In NT government school mobility	0.82 (0.65, 1.04)	0.63 (0.46, 0.87)*
To private school in the NT	1.65 (1.18, 2.30)*	1.37 (0.89, 2.10)
Interstate mobility	3.52 (2.49, 4.99)*	2.24 (1.26, 3.98)*
Mixed mobility	1.36 (0.81, 2.27)	0.75 (0.32, 1.76)
Level of child CP involvement in Y7 (ref: no contact)		
Unsubstantiated notification	1.06 (0.85, 1.33)	1.29 (0.95, 1.76)
Substantiated	1.04 (0.72, 1.51)	1.74 (1.10, 2.74)*
Child year of enrolment (ref: 2008)		
2011	0.71 (0.53, 0.94)*	0.81 (0.57, 1.16)
2013	0.69 (0.52, 0.92)*	0.75 (0.52, 1.09)
Remoteness (ref: urban)		
Rural	0.94 (0.30, 2.93)	1.42 (0.59, 3.43)
Remote	2.57 (1.02, 6.46)*	6.82 (3.50, 13.29)*
McFadden's Adj R^2	0.175	

Retained category has been treated as a base category

*Significant at p -value < 0.05

The adjusted multinomial multilevel analysis identified six risk factors for student dropout and five risk factors for repeating years. The model had a good fit to the data with a McFadden's adjusted R^2 of 1.75. Table 3 shows a multivariate model presenting risk factors associated with students dropping out or repeating years. From the table, we can see that age at Y7 enrolment, place of birth, Y7 attendance rate, mobility in Y7, children's year of enrolment and remoteness had an association with students dropping out of middle school by Y9. The chance of dropping out of school was 2.61 [adjusted odds ratio (AOR) 2.61; 95% CI 1.94, 3.51] times higher for students enrolled by the age of 11.5 years. The students born outside NT had a 70% (AOR 1.70; 95% CI 1.41, 2.05) higher risk of dropping out of middle school than those born in the NT. The odds of dropping out of school among students with attendance rates of below 40% and 40–60% were 2.43 (AOR 2.43; 95% CI 1.93, 3.06) and 1.38 (AOR 1.38; 95% CI 1.09, 1.73) times higher, respectively, compared

to students with a minimum attendance rate of 80%. The students who had a non-NTG school and interstate mobility history in Y7 had a 1.65 (AOR 1.65; 95% CI 1.18, 2.30) and 3.52 (AOR 3.52; 95% CI 2.49, 4.99) times higher chance of dropping out of school, respectively, compared to those who did not move. The odds of dropping out of school was 29% (AOR 0.71; 95% CI 0.53, 0.94) and 31% (AOR 0.69; 95% CI 0.52, 0.92) lower for a cohort of students enrolled in Y7 in the year 2011 and 2013, respectively, compared to those enrolled in the year 2008. The risk of dropping out of school was 2.57 (AOR 2.57; 95% CI 1.02, 6.46) times higher for students living in remote areas compared to urban. Interstate mobility and age at Y7 enrolment, from the individual-level factors, contributed the most effect for dropping out of school (Table 2).

Similar factors were associated with students repeating Y7/8: the age at Y7 enrolment, Y7 child protection involvement, attendance rate, mobility and remoteness. The chance of repeating for students enrolled in Y7 with an age less than 11.5 years was 17.11 (AOR 17.11; 95% CI 13.38, 21.87) times higher and, by contrast, was 0.36 times lower (AOR 0.36; 95% CI 0.22, 0.57) for students enrolled with age more than 12.5 years. The likelihood of repeat was about 2.18 (95% CI 1.56, 3.04), 1.76 (95% CI 1.28, 2.41) and 1.54 (AOR 1.54; 95% CI 1.14, 2.08) times higher for students with attendance rate of below 40%, 40% to 60% and 60% to 80% as compared to students with more than 80%. The odds of repeat was 37% (AOR 0.63; 95% CI 0.46, 0.87) lower among students who changed government schools after being enrolled. Students with a record of substantiated maltreatment in Y7 had 1.74 times (AOR 1.74; 95% CI 1.10, 2.74) greater chance of repeating while those living in a remote area had a 6.82 (95% CI 3.50, 13.29) times higher risk of repeating years.

Discussion

A strong education system is an important indicator of socioeconomic development and productivity. Education inequalities for First Nations peoples across the globe are of concern to the United Nations (Short et al., 2020). Many Australian First Nations students struggle to engage with schooling, which has been reported to be a consequence of systemic failures related to engagement and racism (Lowe et al., 2019; Moodie et al., 2019). We assessed risks for students either dropping out or repeating years in middle school to support the early detection and intervention to address low rates of high school completion. This is the first NT and, to our knowledge, the first Australian study to report the progress of middle-school (from Y7 to Y9) First Nations students while also accounting for school and community variations. We found that about eight in ten students (78.8%) progressed to Y9 while more than one in ten students dropped out of school (13.3%) before reaching Y9 and 7.9% repeated in Y7/8. Interstate mobility, age at Y7 enrolment and living in remote areas were strongly associated with the odds of dropping out of school explaining around 85% of the variation in outcome. Age at Y7 enrolment explained about 95% of the individual-level variation in Y7/8 repeat.

The trend in the Y9 apparent retention rate estimated by the Australian Bureau of Statistics (ABS) was somewhat higher than yearly retention and the trend over

time found in our study (ABS, 2020). The ABS estimate does not adjust for interstate mobility, death of students, shifts in identification by individuals or school system and students who repeat school years. Furthermore, the risk of misclassification in our study is very low (<5%) compared to the ABS apparent retention rate. It is unclear how ABS estimates the rates for dropping out of school but the dropout and repeat rate that we found is higher.

We found mobility is the most important factor associated with transition through middle-school years, with the odds of progressing well in education system significantly affected by both interstate or non-government school mobility in Y7. This is an important finding considering the priority given by both the NT and Australian governments for access to boarding school as a solution to the lack of remote secondary delivery (Guenther & Osborne, 2020). Mobility accounts for 54% of the individual-level variations in school dropouts. Other studies have reported similarities in the characteristics of students who are not staying in school system and those who change schools (Rumberger & Larson, 1998; Rumberger & Thomas, 2000). Furthermore, students from remote areas are more than twice as likely to dropout of school system and six times more likely to repeat in Y7/8. This may be due to a lack of secondary schools and teachers, access to schools due to transport difficulties, climate conditions, inadequate housing, limited access to the Internet and health services in remote areas of the NT. The effect of mobility on negative educational paths would not only affect the student but also could have a detrimental effect on educational outcomes of other students in the same class, year or school explained by a peer effect supposition (Epple & Romano, 2011). Other studies have reported that students on the verge of changing schools or dropping out have been shown to display low levels of social and academic engagement and have discipline and performance problems (Engec, 2006; Gasper et al., 2012). We also found that the probability of students repeating Y7/8 was lower among those who changed government schools in Y7. This would be plausible if the reason for school change is justified and brought a positive change on the student school performance.

The second most important factor for the risk for students dropping out or repeating years is the age at Y7 enrolment, which accounts for 34% and 95% of the individual variability, respectively. Children enrolled in Y7 when younger than 11.5 years tended to leave school system or stay in the same level, with adjusted odds ratios of 17 and 2.6, respectively. This finding could be related to students' academic skills, experience of different school environments and emotional and psychological maturity (Gubbels et al., 2019). This explanation is supported by the related finding that older aged children (> 12.5 years) were 64% less likely to repeat.

International studies show that low school attendance is strongly associated with risk of dropout (Hancock et al., 2013; Kearney, 2008) and is also associated with economic, mental, social, occupational and marital problems during adulthood (Gubbels et al., 2019). A machine learning approach for predicting school dropout in Korea using big data with excellent prediction accuracy identified unauthorised absence and lateness as the most important predictors of school dropout, which means low attendance perfectly predicts sooner or later school dropout (Chung & Lee, 2019). While international comparisons with Australian First Nations attendance data might be problematic, our study found that the odds of leaving school

system and staying in the same level increased as the attendance rate of the student decreases below 60%. The odds ratio for leaving school system increased from 1.38 to 2.43 when school attendance rate reduced from 60 to less than 40%, and the odds of staying in the same level of education increased from 1.54 to 2.18 as attendance rate decreased from 80 to less than 40%. These results are consistent with observations from other studies which include: students who attend more frequently feeling more comfortable to engage in a western school environment—having a sense of ‘belonging’ (Bradley et al., 2021); are more confident with English literacy and the accompanying values of western education (Guenther et al., 2013); and, have parents who have had positive experiences of their own schooling (Guenther et al., 2014).

Non-NT born children had a 70% greater chance of not staying in school system than those born in the NT. Further analysis showed that a slightly greater number of students who were born outside the Territory returned interstate in Y7. This might be associated with parents’ employment or other issues that affect student engagement. This is a topic for further investigation. Related to this, a student with a record of substantiated child protection involvement had a 74% greater chance of repeating years. This is consistent with past studies that have reported child abuse and neglect as a predictor of below average educational outcomes including dropping out of school and repeating years, academic difficulties in reading and attention skills and graduating from high school (Maclean et al., 2016, 2018, 2020). Police arrest has also been associated with reduced school attendance, which is concerning given that young First Nations people are more likely to be involved with the law than their non-First Nations peers (Schwab, 2018). Furthermore, systemic barriers and racism and living in a household in which a family member has a criminal record have also been associated with higher chance of leaving school (Schwab, 2018).

Implications

In our study, academic-related individual-level factors (age at Y7 enrolment, Y7 attendance rate and mobility) and non-academic-related child protection involvement are majorly responsible for students not staying in the education system. Community and school-level variations were also important in explaining reasons that students leave school, which needs broader perspectives and intervention modalities to improve school environments, resources, and organisational aspects.

Changes in government policy such as the increased mandatory school leaving age and the provision of scholarships to high performing students to attend boarding schools in regional centres, which needs to be strengthened, have increased Y12 completion significantly over the last 10 years (Guenther & Osborne, 2020; Macdonald et al., 2018; Schellekens et al., 2020). ‘Off country’ boarding schools was planned to be the preferred ‘choice’ for remote First Nations students (Guenther & Osborne, 2020) with students encouraged to move interstate to continue their secondary education; however, most of the students are reported to have returned to the NT before then dropping out of school (O’Bryan & Fogarty, 2020). Lack of cultural safety was reported as a major barrier for First Nations student engagement and

attainment in offsite boarding schools (Lowe et al., 2019; O'Bryan, 2016). Addressing the challenges of boarding school and reasons for students to leave boarding schools would help to retain First Nations students in schools. More needs to also be done to achieve the national targets, and interventions during the middle-school years could further increase the number of children progressing to Y12 completion. Specific attention needs to be given for schools in remote areas.

Previous work suggested a perspective of positive education (PE) as a means of making school environments exert a positive effect on students' wellbeing and their school engagement irrespective of student-level variations (Echazarra & Radinger, 2019; Lombardi et al., 2019). Acknowledging the reasons for the lower level of school attainment identified in our study, the work by Parker and colleagues noted the failures in the western education model in fully explaining First Nations education inequality and suggested a need to reconsider the role of the unique knowledges and experiences of First Nations people (Parker et al., 2021a, b).

Limitations

We acknowledge the following limitations of the study. Interstate movement and transfers to non-government schools limited tracking of enrolment outcome for some students which may introduce minor misclassification bias. We were unable to control for covariates that play a role in student probability of leaving the education system or not progressing through years including behavioural, psychological and emotional conditions. Similarly, we were unable to control for teachers' characteristics including their teaching experience and engagement with students. Our study was also unable to include school-specific factors. The absence of routine collection of information on schools, including teachers, highlights the need for future studies to explore this area and make recommendations for more general collection of this information to inform education planning and student outcomes. Historical experiences of First Nations people, parental discomfort with schools and strong cultural notions of shame and fear of failure by school children might further contribute to unexplained reasons for students not progressing in the schooling system in this study. More research needs to be undertaken, which considers how best to cater for the learning needs of students we have identified as at risk of early dropout. Improving attendance and retention rates will require a system-wide approach, taking account of the complex array of interdependencies that cause educational inequities for First Nations students. While our study has highlighted factors that contribute to dropout, it cannot suggest what might work to make education more equitable.

Finally, we acknowledge that the quantitative nature of our study renders it unable to investigate the contextual factors associated with students' early departure from school. This is an area for future research, which can be built on the evidence produced by this study. The strength of the study is that it is the first to apply a longitudinal design to estimate the levels of problematic outcomes and the relative influence of school and community effects on the risks of dropping out of school or repeating years among First Nations middle-school students.

Conclusion

This study provides estimates for the rates of students dropping out or repeating years during middle school, both of which are high. The most important risk factors that explained most of the variations in school dropout and repeat are the student factors of age and attendance rate, the household factors of mobility and the community factor of remoteness. Potential interventions designed to reduce such problematic middle-school transitions should therefore account for these important influences within a broad sweep of responses that include policy and service components and recognise historical influences. Future studies also need to assess school or provider side reasons of such problematic middle-school transitions.

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Declarations

Conflict of interest The authors have declared that no competing interests exist.

Ethical approval The study was approved by the Human Research Ethics Committee of the NT Department of Health and the Menzies School of Health Research (HREC-2016-2708) and was supported by the First Nations Advisory Group for the Child and Youth Development Research Partnership which includes independent First Nations community members.

Informed consent Not applicable.

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