IES Institute of Education Sciences

Factors Associated with Grade 3 Reading Outcomes of Students in the Commonwealth of the Northern Mariana Islands Public School System

Regional Educational Laboratory Pacific

At McREL International

REL 2021–116
U.S. DEPARTMENT OF EDUCATION

A Publication of the National Center for Education Evaluation and Regional Assistance at IES

Factors Associated with Grade 3 Reading Outcomes of Students in the Commonwealth of the Northern Mariana Islands Public School System

Todd Grindal, Stephanie Nunn, Erin D'Amelio, and Mary McCracken **September 2021**

Few elementary students on the Commonwealth of the Northern Mariana Islands (CNMI) are scoring at grade level or higher on the ACT Aspire reading assessment. To better understand factors associated with the reading proficiency of CNMI grade 3 students, stakeholders there asked the Regional Educational Laboratory Pacific to examine the demographic characteristics and education experiences of students who demonstrated reading proficiency by grade 3. The study focused on grade 3 students who were enrolled in CNMI public schools from 2014/15 to 2018/19. It found that female students, students who did not receive free or reduced-priced lunch, students who were older at the time of kindergarten entry, Filipino students, and students who did not change schools were more likely to demonstrate reading proficiency in grade 3 than other students. There was no difference in grade 3 reading proficiency between students who had enrolled in Head Start and students who had not.

Why this study?

Few elementary students in the Commonwealth of the Northern Mariana Islands (CNMI) are reading at grade level or higher, according to standardized assessments. In 2015, 17 percent of grade 3 students in the CNMI Public School System scored at or above proficiency on the ACT Aspire Reading assessment (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2015). Concerned by this low percentage, CNMI Public School System leadership prioritized reading achievement across its elementary schools by investing in teacher professional development on instruction for foundational reading skills and by hiring literacy coaches to provide continuous supports for teachers' reading instruction (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2015). Although the percentage of students meeting reading proficiency benchmarks rose to 24 percent in 2019, school proficiency rates varied widely—from 10 percent to 46 percent (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2019a).

Prior research indicates that students who meet reading benchmarks in grade 3 are likely to meet benchmarks across middle and high school (Hein et al., 2013; Singh, 2013). Meeting reading benchmarks is also positively correlated with other key academic skills (such as math skills development; see Gersten et al., 2005) and social skills (Miles & Stipek, 2006) in later elementary grades. Moreover, research suggests that reading proficiency positively influences postsecondary enrollment. Students who meet grade 3 reading proficiency benchmarks are more likely to graduate from high school and enroll in college than those who do not meet those benchmarks in grade 3 (Lesnick et al., 2010).

Though evidence points to skills such as oral reading fluency and vocabulary as strong predictors of grade 3 reading proficiency (Lonigan et al., 2018; Quinn et al., 2015), studies also suggest associations between students' demographic characteristics and education experiences and their reading proficiency (Canto & Proctor, 2013; Mulligan et al., 2018; Scammacca et al., 2020). For example, mobility (the number of times a student changes schools) can negatively impact reading and other academic outcomes (Ashby, 2010). Growing evidence suggests

For additional information, including background on the study, technical methods, supporting analyses, and supplementary analyses, access the report appendixes at https://go.usa.gov/xMxVf.

a positive relationship between enrollment in a high-quality early childhood education program, such as Head Start, and the development of skills and abilities that support students' short- and long-term success, including reading outcomes (Meloy et al., 2019; Wechsler et al., 2016; Yoshikawa et al., 2016). For instance, the federally funded Head Start Impact Study, a randomized controlled trial using a nationally representative sample of students, found that Head Start enrollment had significant positive effects on the development of children's literacy skills in kindergarten (Puma et al., 2010).

Families in the CNMI have access to early childhood education services, but data suggest that enrollment rates are low. Families can choose early childhood education services provided by the CNMI Public School System, which operates the Head Start program, or services provided through 25 licensed facilities and nine license-exempt home care providers (Commonwealth of the Northern Mariana Islands Preschool Development Grant Birth through Five, 2020). Head Start is the largest provider of early childhood education in the CNMI, with nine Head Start centers across the islands of Saipan, Tinian, and Rota, as of 2019 (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2019b). About 44 percent of families with young children in the CNMI have a household income below the federal poverty level, suggesting that their children are eligible to enroll in Head Start (Commonwealth of the Northern Mariana Islands Department of Commerce, 2018). In 2018, however, the total Head Start enrollment count was 393 students, which is less than half of CNMI's eligible three- and four-year-old children (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2019b). Although this is slightly lower than the 2021 funded enrollment of 396 students, the total number of students enrolled in Head Start has declined since 2015, when funded enrollment was 462 students (Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation, 2019b). CNMI stakeholders have suggested that enrollment in an early childhood education program like Head Start could be associated with grade 3 reading proficiency. Therefore, these low enrollment rates are a cause for concern.

The CNMI Public School System supports students not only in meeting academic achievement standards but also in acquiring "essential skills for lifelong learning, and ha[ving] the ability to transition into higher education and/or the workforce" (Commonwealth of the Northern Mariana Islands Public School System, 2021, para. 3). Therefore, understanding the relationships between its grade 3 students' demographic characteristics and education experiences and their reading performance is of critical interest. CNMI Public School System stakeholders sought support from the Regional Educational Laboratory Pacific to investigate these relationships in order to inform their efforts to improve literacy and better prepare students for academic and life success.

Research question

The study focused on students who enrolled in grade 3 in a CNMI public school from 2014/15 to 2018/19. It examined the association between those students' demographic characteristics and education experiences and their grade 3 reading proficiency. The demographic characteristics included gender, free or reduced-price lunch receipt (a proxy for family income), age at kindergarten entry, and ethnicity. The education experiences included Head Start enrollment and mobility.

The following research question guided the study:

- Which student demographic characteristics and education experiences were associated with grade 3 reading proficiency?

Key terms are defined in box 1. Data sources, the study sample, and analytic methods are summarized in box 2 and detailed in appendix B.

Box 1. Key terms

Age at kindergarten entry. A student's age at kindergarten entry, ranging from 56 months to 72 months. According to CNMI Public School System policy, a child must be 5 years old on or before September 30 of the school year to enter kindergarten (Commonwealth Law Revision Commission, 2019).[1]

Commonwealth of the Northern Mariana Islands (CNMI) Public School System. The public school system of CNMI that oversees all public K–12 schools on the islands of CNMI: Saipan, Tinian, and Rota. Since 1984 the CNMI Public School System has served as the agency operating the CNMI Head Start program.

Education experience. Formal and informal instruction, interactions, programs, and other experiences that students could undergo during their schooling. Education experiences in this study included Head Start enrollment and mobility.

Ethnicity. The reported ethnicity of a student. Three ethnicity categories were reported: Chamorro or Carolinian,[2] Filipino, and other (which combines all remaining ethnic categories).

Free or reduced-price lunch receipt. Whether a student received free or reduced-price lunch at kindergarten entry (a proxy for family income). The National School Lunch Program provides free or reduced-cost meals to eligible students during the school day. Students are eligible if their household income is at or below 185 percent of the federal income poverty level and their parents or other caregivers enroll them in the program.[3]

Gender. The reported gender of a student. Two gender categories were reported: female or male.

Grade 3 reading proficiency. Whether a student scored at the Ready or Exceeding benchmark on the ACT Aspire reading assessment at the end of grade 3, demonstrating reading proficiency. The ACT Aspire reading assessment is a computer-based, standardized benchmark assessment of reading skills administered in the spring to all CNMI grade 3 students. It covers informational and literacy text skills related to identifying key ideas and details in text, analyzing text structure and purpose, and integrating knowledge and ideas from text. Data were provided as a categorical variable indicating whether a student scored significantly below (Needs Support), below (Close), at (Ready), or above (Exceeding) grade-level benchmarks for proficiency. The study team then converted that categorical variable to a binary variable indicating whether the student was proficient (received a benchmark score of Ready or Exceeding) or not proficient (received a benchmark score of Close or Needs Support) in reading in grade 3.

Head Start enrollment. Whether a student had enrolled in Head Start for at least one year.

Mobility. In this study the number of schools a student attended between kindergarten and grade 3. Two mobility categories were used: attended one school and attended more than one school. An insufficient number of students attended three or four schools to examine any of those groups of students separately.

Predicted probability. The predicted probability (in percent) of an outcome occurring for a given value of a predictor, with all other predictors held constant at their mean. This study reports the probability of a student demonstrating proficiency (receiving a benchmark score of Ready or Exceeding) rather than not demonstrating proficiency (receiving a benchmark score of Close or Needs Support) on the grade 3 reading assessment. The probability was estimated using hierarchical logistic regression models with a binary outcome (demonstrating versus not demonstrating proficiency). The analysis controlled for the influences of student demographic characteristics and education experiences on reading proficiency.

Quartile. A group representing 25 percent of the observed data. Quartiles are used to calculate predicted probabilities for continuous variables. The zeroth quartile represents the sample's minimum value, the first quartile represents the observed midpoint between the minimum value and the median (or the middle value in the dataset), the second quartile represents the median, the third quartile represents the observed midpoint between the median and the maximum value, and the fourth quartile represents the sample's maximum value.

Notes

1. The sample used in this study showed that, contrary to policy, a small number of students were very young at kindergarten entry (between four years, two months old and four years, five months old). The study team conducted a sensitivity analysis that removed extreme age values and the results did not change substantially (see appendix D).

2. This report uses *Chamorro* and *Carolinian* to align with the terms used by the CNMI Public School System. Some community members in CNMI, however, may prefer *CHamoru* and *Refaluwasch* respectively.

3. Only families that completed an application for free or reduced-price lunch benefits and received the benefit are marked as such in the data. There might be families that were eligible but that did not complete the application and therefore did not receive the benefit.

Box 2. Data sources, sample, and methods

Data sources. The Commonwealth of the Northern Mariana Islands (CNMI) Public School System provided the study team with administrative records for each of the 2011/12–2018/19 school years. These records included longitudinal data from five cohorts of students who enrolled in grade 3 in a CNMI public school from 2014/15 to 2018/19. Student data included gender, free or reduced-price lunch receipt, birthdate, ethnicity, mobility, school attended, and performance on the ACT Aspire grade 3 reading assessment. Head Start, which is under the auspices of the CNMI Public School System, provided administrative records on Head Start enrollment for the 2009/10–2015/16 school years.

Sample. The final analytic sample for the study included 2,095 students for whom the study team received information on performance on the ACT Aspire grade 3 reading assessment. The sample reflects 99.1 percent of the target population of 2,115 students who enrolled in kindergarten in a CNMI public school from 2011/12 to 2015/16 and who enrolled in grade 3 in a CNMI public school from 2014/15 to 2018/19.

Methodology. The study team used hierarchical logistic regression models to estimate the associations between the outcomes of interest and student demographic characteristics and education experiences. The outcome of interest was whether the student demonstrated proficiency (received a benchmark score of Ready or Exceeding) on the grade 3 reading assessment. Predicted probabilities were then calculated from the results of the hierarchical logistic regression models for demographic characteristics and education experiences that had statistically significant associations with the outcome variable. Associations for which the *p*-value associated with the coefficient was less than .05 were considered significant. Differences in predicted probabilities between categories that were less than 10 percentage points were classified as minor, and differences that were 10 percentage points or greater were classified as major.

More information on the data sources, sample, and methodology is in appendix B. Full results of the analyses are in appendix C, and supplemental analyses are in appendix D.

Findings

This section describes the findings related to the research question.

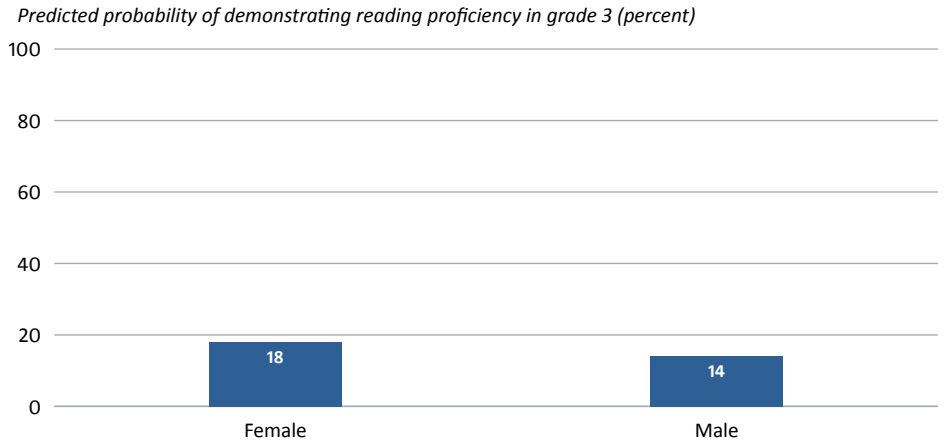
Female students had a higher probability of demonstrating reading proficiency in grade 3 than male students

Female students were statistically significantly more likely than male students to score at the Ready or Exceeding reading proficiency benchmark in grade 3, after other student demographic characteristics and education experiences were controlled for (figure 1; see also tables C2 and C3 in appendix C). The predicted probability of demonstrating reading proficiency in grade 3 was 18 percent for female students compared with 14 percent for male students. The difference between those probabilities was minor.

Students who received free or reduced-price lunch had a lower probability of demonstrating reading proficiency in grade 3 than students who did not receive this benefit

Students who received free or reduced-price lunch were less likely to demonstrate reading proficiency in grade 3 than students who did not receive this benefit, after other student demographic characteristics and education experiences were controlled for (see table C2 in appendix C). The probability of demonstrating reading proficiency in grade 3 was 13 percent for students who received free or reduced-price lunch compared with 19 percent for students who did not receive free or reduced-price lunch (see table C3). The difference between those probabilities was minor.

Figure 1. Female students had a higher probability of demonstrating reading proficiency in grade 3 than male students



Note: n = 2,095. Results are predicted probabilities derived from hierarchical logistic regression analyses and using multiple imputation of missing data. Gender was a statistically significant predictor ($p < .01$) of grade 3 reading proficiency (see table C2 in appendix C). Post-hoc comparisons indicated that female students had a statistically significantly higher predicted probability of demonstrating reading proficiency in grade 3 than male students ($p < .01$; see table C3).

Source: Authors' analysis based on 2011–19 administrative data files provided by the Commonwealth of the Northern Mariana Islands Public School System.

Older students had a higher probability of demonstrating reading proficiency in grade 3 than younger students

Students who were older at kindergarten entry were more likely to demonstrate reading proficiency in grade 3 than students who were younger at kindergarten entry, after other student demographic characteristics and education experiences were controlled for (see table C2 in appendix C). The predicted probability of demonstrating reading proficiency in grade 3 was 10 percent for the youngest students at kindergarten entry (4 years, 2 months, or 50 months old) compared with 14 percent for students who entered kindergarten at age 5 years, 1 month (61 months, 25th percentile); 16 percent for students who entered at age 5 years, 5 months (65 months; median); 18 percent for students who entered at age 5 years, 8 months (68 months; 75th percentile); and 20 percent for the oldest students at kindergarten entry (6 years, or 72 months old; figure 2; see also table C3). The differences in probability between each age at kindergarten entry quartile were minor, except the difference between the youngest and oldest students at kindergarten entry.

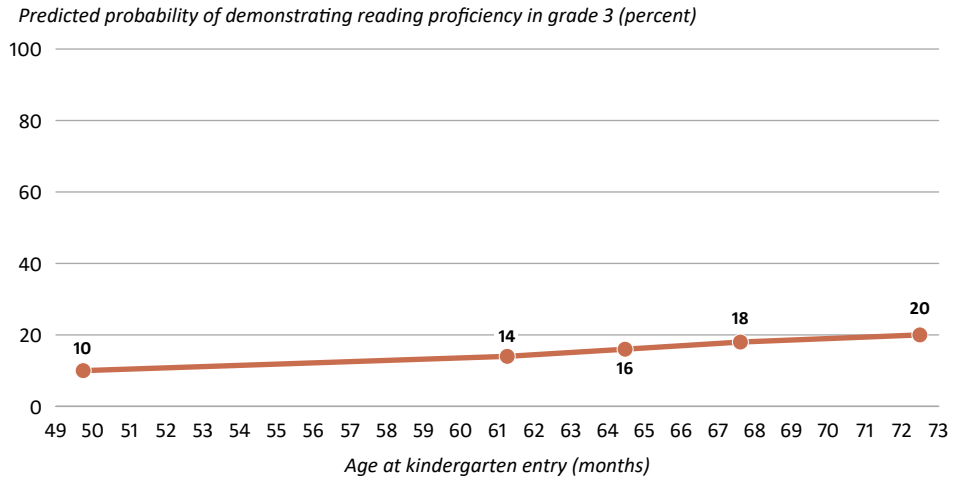
Filipino students had a higher probability of demonstrating reading proficiency in grade 3 than students of other ethnicities

The predicted probability of demonstrating reading proficiency in grade 3 was 23 percent for Filipino students compared with 12 percent for Chamorro or Carolinian students and 14 percent for students who reported another ethnicity, after other student demographic characteristics and education experiences were controlled for (figure 3; see also tables C2 and C3 in appendix C). The difference in probability between Filipino students and Chamorro or Carolinian students was major.

Head Start enrollment was not associated with grade 3 reading proficiency

There was no statistically significant difference in grade 3 reading proficiency between students who had enrolled in Head Start and students who had not, after other student demographic characteristics and education experiences were controlled for (see table C2 in appendix C).

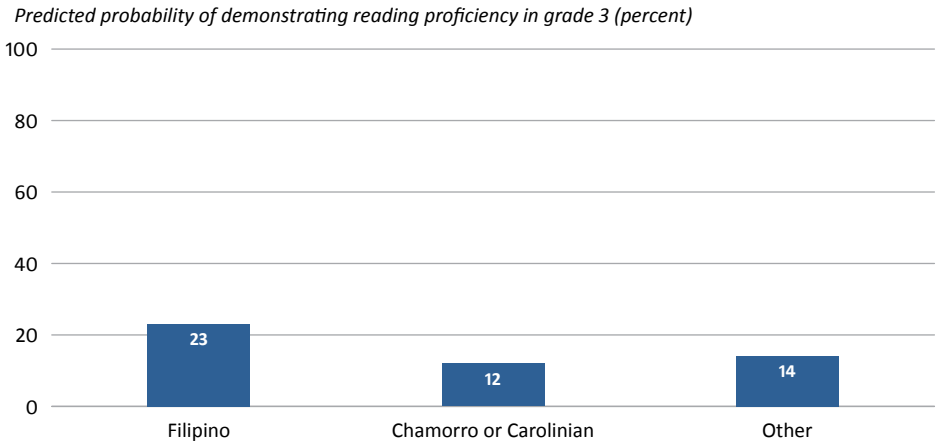
Figure 2. Students who were older at kindergarten entry had a higher probability of demonstrating reading proficiency in grade 3 than students who were younger at kindergarten entry



Note: *n* = 2,095. Results are predicted probabilities derived from hierarchical logistic regression analyses and using multiple imputation of missing data. Age at kindergarten entry was a statistically significant ($p < .05$) predictor of grade 3 reading proficiency (see tables C2 and C3 in appendix C). The age values selected correspond to quartiles for the sample (see box 1 for additional details on quartiles).

Source: Authors' analysis based on 2011–19 administrative data files provided by the Commonwealth of the Northern Mariana Islands Public School System.

Figure 3. Filipino students had a higher probability of demonstrating reading proficiency in grade 3 than students of other ethnicities



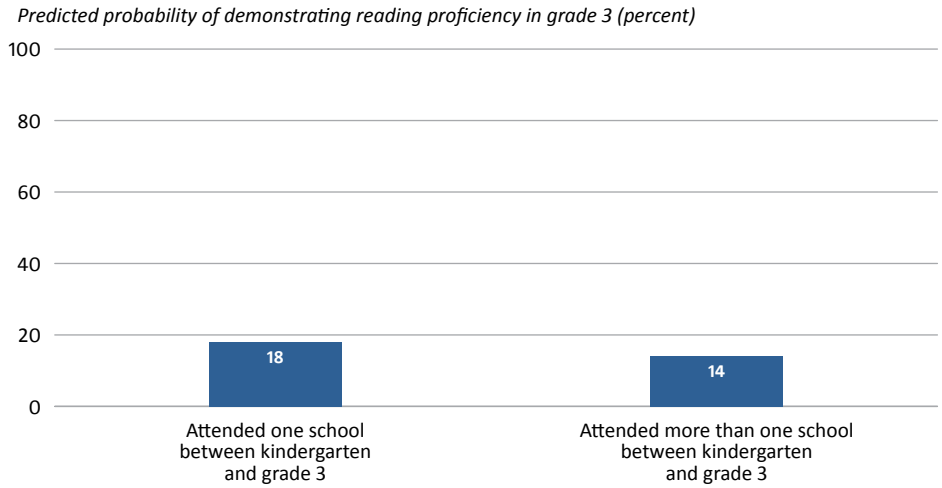
Note: *n* = 2,095. Results are predicted probabilities derived from hierarchical logistic regression analyses and using multiple imputation of missing data. Filipino ethnicity was a statistically significant predictor ($p < .001$) of grade 3 reading proficiency (see table C2 in appendix C). Post-hoc comparisons indicated that Filipino students had a statistically significantly higher predicted probability of demonstrating reading proficiency in grade 3 than Chamorro or Carolinian students or students of other ethnicities ($p < .001$; see table C3). There was no statistically significant difference between Chamorro or Carolinian students and students of other ethnicities.

Source: Authors' analysis based on 2011–19 administrative data files provided by the Commonwealth of the Northern Mariana Islands Public School System.

Students who attended the same school from kindergarten to grade 3 had a higher probability of demonstrating reading proficiency in grade 3 than students who changed schools

The probability of demonstrating reading proficiency in grade 3 was 18 percent for students who attended the same school from kindergarten to grade 3 compared with 14 percent for students who changed schools during this period, after other student demographic characteristics and education experiences were controlled for (figure 4; see also tables C2 and C3 in appendix C). The difference between those probabilities was minor. About

Figure 4. Students who attended the same school from kindergarten to grade 3 had a higher probability of demonstrating reading proficiency in grade 3 than students who changed schools



Note: n = 2,095. Results are predicted probabilities derived from hierarchical logistic regression analyses and using multiple imputation of missing data. Mobility was a statistically significant predictor ($p < .05$) of grade 3 reading proficiency (see table C2 in appendix C). Post-hoc comparisons indicated that students who attended one school between kindergarten and grade 3 had a statistically significantly higher predicted probability of demonstrating reading proficiency in grade 3 than students who attended two or more schools from kindergarten to grade 3 ($p < .05$; see table C3).

Source: Authors' analysis based on 2011–19 administrative data files provided by the Commonwealth of the Northern Mariana Islands Public School System.

67 percent of students in the sample attended the same school from kindergarten to grade 3 (see table C1), which is somewhat higher than the national average (almost 56 percent; see Burkam et al., 2009).

Limitations

Several issues limit the interpretation of findings from this study.

First, as with other analyses using observational data and nonexperimental analytic methods, the results cannot be interpreted as causal. That is, it cannot be said that the study predictors lead to the observed reading outcomes. Other explanations could exist.

Second, limited data prevented the study team from analyzing other factors that could influence grade 3 reading proficiency. Complete data were not available on teacher education and credentials, instructional quality, or student absenteeism, which the study team hypothesized, based on a literature review, might be associated with students' grade 3 reading performance. Because data were not available, the study team could not include those measures in the analyses. Although some information was available on the quality of classroom instruction, it was not possible to directly link student records to classroom teacher records. Doing so might have provided useful insight into student reading performance. It was also impossible to explore the wide range of differences in proficiency rates across schools, which might have provided further insight into the needs of specific schools and the strategies that could address them. Similarly, the Head Start measure provided information only on student enrollment and not on participation in the program or use of Head Start services, so it was not possible to explore these effects on grade 3 reading proficiency. Additionally, data were unavailable on other early childhood experiences available to CNMI children.

Limited data also meant that the study team did not explore many other factors that research has suggested could be associated with grade 3 reading proficiency. These include student health records, indicators of adverse childhood experiences, students' participation in out-of-school activities, parents' employment and education

status, school curricula, and other measures of cognitive, emotional, or social development. The extent to which the CNMI Public School System systematically collects these data is unclear. It is possible that these factors, rather than the factors examined, have a larger influence on differences in reading proficiency. Understanding these factors would require a separate study.

Third, few of the examined factors predicted meaningful or large differences in reading performance among students. Given the minor differences found among the factors analyzed in this study, it is difficult to derive specific policy implications without further analysis. Although the study found a major difference in reading proficiency between Filipino students and their peers, identifying policy changes or practices from this finding will require further study of the underlying behaviors or supports to which these students have access. This is discussed further in the implications section.

Implications

This study found that some student demographic characteristics and education experiences had a positive, if small, association with reading outcomes among CNMI grade 3 students but that those factors do not fully explain students' reading proficiency. The study findings have three main implications.

Examine additional education environment factors that might influence student reading proficiency

CNMI Public School System stakeholders might consider seeking to better understand how other education environment factors are related to student reading proficiency. Though the study was unable to explain the variance in grade 3 reading performance across schools, exploring relationships between other education environment factors and student performance might help explain that variance and might provide CNMI Public School System greater insight into the school characteristics or experiences that are stronger drivers of student reading proficiency. These other factors include teacher education, teacher academic skills, and teacher years of experience. Prior research suggests that exposure to high-quality teaching can lead to better student performance (Atlay et al., 2019; Desimone & Long, 2010; Hanushek & Rivkin, 2006). One study that examined the association between teaching experience and teaching effectiveness found that students of teachers with more experience (those teaching for seven or more years) had higher performance on standardized assessments (Kini & Podolsky, 2016). Other characteristics of the education environment in elementary schools, such as low turnover and positive school climate, have been found to maintain student gains, especially for students who attend preschool (Ansari & Pianta, 2018; Unterman & Weiland, 2019). The CNMI Public School System is building a longitudinal data system that will better link teacher and student data and can facilitate future research on these questions.

Collect additional information to better understand the academic performance of different student groups

CNMI Public School System stakeholders might benefit from conducting additional research that focuses on understanding the differences in academic outcomes among their students. The largest difference in grade 3 reading performance that the study found was between Filipino students and their non-Filipino peers, while other differences, such as those between students who changed schools and students who did not change schools, were minor, though statistically significant. Supplemental analyses showed that Filipino students had a higher probability of having enrolled in Head Start than their peers. However, having enrolled in Head Start did not explain Filipino students' higher probability of demonstrating reading proficiency in grade 3 (see table D5 in appendix D). The explanation behind this finding warrants future study. Research suggests that, rather than focusing on uncontrollable categories such as ethnicity or free or reduced-price lunch receipt, future studies could observe potential behaviors or processes that schools might have more influence over, such as providing parent education programs on the importance of supporting reading skills at home (Raag et al., 2011). More detailed qualitative data (collected via surveys, interviews, or focus groups) might help elucidate the underlying behaviors

or supports that Filipino students and their families have that could explain their performance. This information could then be used to target other students with additional resources to raise their overall reading achievement.

Track the academic outcomes of Head Start enrollees and their peers with other or no early childhood education experiences at additional time points, including kindergarten entry, middle school, and high school

The CNMI Public School System might consider studying the effects of Head Start enrollment at additional points during students' education. One possible reason for the lack of observable grade 3 differences in this study is that students who had not enrolled in Head Start caught up with their peers during the years from kindergarten to grade 3. Another possible reason is that Head Start attendance or active participation—rather than enrollment, the factor examined in this study—drives differences in academic outcomes. These possibilities, or other unobserved student demographic characteristics or education experiences, require further exploration (Meloy et al., 2019). Other studies have found that Head Start enrollment might not correlate with standardized reading scores but might correlate with other later academic outcomes, such as middle school math test scores (Phillips et al., 2016) and high school graduation (Deming, 2009). CNMI stakeholders could track the performance of Head Start enrollees and students with other or no early childhood education opportunities to determine whether early childhood effects are found in kindergarten, middle school, and high school. This would enable future studies to examine both short- and long-term measures of academic outcomes (in other subjects besides reading and in other grades besides grade 3) and nonacademic outcomes. Prior research indicates that Head Start and other center-based early childhood education programs have similar impacts on student outcomes (Feller et al., 2013; Meloy et al., 2019). Collecting information on the other types of early childhood education programs in which children enrolled prior to kindergarten might allow for a more robust understanding of the reasons behind the varying performances between student groups. It might also provide insights into both academic outcome trends across these experiences and into how stakeholders could support students more effectively.

References

Ansari, A., & Pianta, R. C. (2018). The role of elementary school quality in the persistence of preschool effects. *Children and Youth Services Review, 86*(1), 120–127. https://doi.org/10.1016/j.childyouth.2018.01.025.

Ashby, C. M. (2010). *K–12 education: Many challenges arise in educating students who change schools frequently.* Report to congressional requesters (GAO-11–40). U.S Government Accountability Office. https://eric.ed.gov/?id=ED514099.

Atlay, C., Tieben, N., Hillmert, S., & Fauth, B. (2019). Instructional quality and achievement inequality: How effective is teaching in closing the social achievement gap? *Learning and Instruction*, *63*(1), 101–211. https://doi.org/10.1016/j.learninstruc.2019.05.008.

Burkam, D. T., Lee, V. E., & Dwyer, J. (2009). *School mobility in the early elementary grades: Frequency and impact from nationally-representative data.* Paper commissioned by the Committee on Impact of Mobility and Change on the Lives of Young Children, Schools, and Neighborhoods. Retrieved February 20, 2021, from https://www.fcd-us.org/school-mobility-in-the-early-elementary-grades-frequency-and-impact-from-nationally-representative-data/.

Canto, A. I., & Proctor, B. E. (2013). Beyond ORF: Student-level predictors of reading achievement. *Journal of Research in Education, 23*(2), 17–34. https://eric.ed.gov/?id=EJ1098420.

Commonwealth Law Revision Commission. (2019). *Public school system rules and regulations § 60–20–412, entrance age.* https://www.cnmilaw.org/pdf/admincode/T60/T60–20.pdf.

Commonwealth of the Northern Mariana Islands Department of Commerce. (2018). *CNMI economic census 2017.* Retrieved September 18, 2020, from http://ver1.cnmicommerce.com/sy-2017-table-5–12–15-poverty-level/.

Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation. (2015). *Annual report SY 2014–2015.* Commonwealth of the Northern Mariana Islands Public School System. https://www.cnmipssoare.org/application/files/1915/8031/7757/SY_2014-2015_CNMIPSS_Annual_Report.pdf.

Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation. (2019a). *PSS ACT Aspire targets & annual growth*. Commonwealth of the Northern Mariana Islands Public School System. https://indd.adobe.com/view/ec77fc41-c472-45a1-919f-a6641b1ca544.

Commonwealth of the Northern Mariana Islands Office of Accountability, Research, and Evaluation. (2019b). *Academic achievement report SY 2018–2019.* Commonwealth of the Northern Mariana Islands Public School System. https://www.cnmipssoare.org/application/files/8815/8031/8258/SY_2018-2019_CNMIPSS_Annual_Report_1.24b_ForPrinters.pdf.

Commonwealth of the Northern Mariana Islands Preschool Development Grant Birth through Five. (2020). *CNMI PDG B–5: Safe, healthy, and thriving children.* http://www.cnmicclp.gov.mp/wp-content/uploads/2020/06/PDG-B-5-APPLICATION.pdf.

Commonwealth of the Northern Mariana Islands Public School System. (2021). *Office of Curriculum and Instruction executive summary.* Retrieved September 18, 2020, from https://cnmipss.org/office-curriculum-and-instruction.

Deming, D. (2009). Early childhood intervention and life-cycle skill development: Evidence from Head Start. *American Economic Journal: Applied Economics*, *1*(3), 111–134. https://doi.org/10.1257/app.1.3.111.

Desimone, L. M., & Long, D. (2010). Teacher effects and the achievement gap: Do teacher and teaching quality influence the achievement gap between Black and White and high-and low-SES students in the early grades? *Teachers College Record*, *112*(12), 3024–3073.

Feller, A., Grindal, T., Miratrix, L., & Page, L. C. (2016). Compared to what? Variation in the impacts of early childhood education by alternative care type. *Annals of Applied Statistics*, *10*(3), 1245–1285. https://doi.org/10.1214/16-AOAS910.

Gersten, R., Jordan, N. C., & Flojo, J. R. (2005). Early identification and interventions for students with mathematics difficulties. *Journal of Learning Disability, 38*(4), 293–304. https://doi.org/10.1177/00222194050380040301.

Hanushek, E. A., & Rivkin, S. G. (2006). *School quality and the Black-White achievement gap* (NBER No. w12651). National Bureau of Economic Research. https://www.nber.org/papers/w12651.

Hein, V., Smerdon, B., & Sambolt, M. (2013). *Predictors of postsecondary success*. American Institutes for Research College and Career Readiness and Success Center. https://eric.ed.gov/?id=ED555671.

Kini, T., & Podolsky, A. (2016). *Does teaching experience increase teacher effectiveness? A review of the research*. Learning Policy Institute. https://learningpolicyinstitute.org/product/does-teaching-experience-increase-teacher-effectiveness-review-research.

Lesnick, J., Goerge, R., Smithgall, C., & Gwynne J. (2010). *Reading on grade level in third grade: How is it related to high school performance and college enrollment?* Chapin Hall at the University of Chicago.

Lonigan, C., Burgess, S., & Schatschneider, C. (2018). Examining the simple view of reading with elementary school children: Still simple after all these years. *Remedial and Special Education, 39*(5), 260–273. http://dx.doi.org/10.1177/0741932518764833.

Meloy, B., Gardner, M., & Darling-Hammond, L. (2019). *Untangling the evidence on preschool effectiveness: Insights for policymakers.* Learning Policy Institute. Retrieved September 7, 2021, from https://learningpolicyinstitute.org/product/untangling-evidence-preschool-effectiveness-report.

Miles, S. B., & Stipek, D. (2006). Contemporaneous and longitudinal associations between social behavior and literacy achievement in a sample of low-income elementary school children. *Child Development, 77*(1), 103–117. https://eric.ed.gov/?id=EJ732832.

Mulligan, G. M., McCarroll, J. C., Flanagan, K. D., & Potter, D. (2018). *Findings from the fourth-grade round of the Early Childhood Longitudinal Study, kindergarten class of 2010–11* (ECLS-K:2011) (NCES No. 2018–094). U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. https://eric.ed.gov/?id=ED581674.

Phillips, D., Gormley, W., & Anderson, S. (2016). The effects of Tulsa's CAP Head Start program on middle school academic outcomes and progress. *Developmental Psychology, 52*(8), 1247–1261. https://doi.org/10.1037/dev0000151.

Puma, M., Bell, S., Cook, R., Heid, C., Shapiro, G., Broene, P., Jenkins, F., Fletcher, P., Quinn, L., Friedman, J., & Ciarico, J. (2010). *Head Start impact study: Final report*. U.S. Department of Health and Human Services, Administration for Children & Families. http://eric.ed.gov/?id=ED507845.

Quinn, J. M., Wagner, R. K., Petscher, Y., & Lopez, D. (2015). Developmental relations between vocabulary knowledge and reading comprehension: A latent change score modeling study. *Child Development, 86*(1), 159–175. https://doi.org/10.1111/cdev.12292.

Raag, T., Kusiak, K., Tumilty, M., Kelemen, A., Bernheimer, H., & Bond, J. (2011). Reconsidering SES and gender divides in literacy achievement: Are the gaps across social class and gender necessary? *Educational Psychology, 31*(6), 691–705. https://doi.org/10.1080/01443410.2011.599835.

Scammacca, N., Fall, A., Capi, P., Roberts, G., & Swanson, E. (2020). Examining factors affecting reading and math growth and achievement gaps in grade 1–5: A cohort-sequential longitudinal approach. *Journal of Educational Psychology, 112*(4), 718–734. https://eric.ed.gov/?id=EJ1249849.

Singh, S. (2013). A longitudinal study of a state-wide reading assessment: the importance of early achievement and socio-demographic factors. *Educational Research and Evaluation, 19*(1), 4–18. https://eric.ed.gov/?id=EJ995365.

Unterman, R., & Weiland, C. (2019). *Quantifying and predicting variation in the medium-term effects of oversubscribed pre-kindergarten programs.* MDRC. https://eric.ed.gov/?id=ED601065.

Wechsler, M., Melnick, H., Maier, A., & Bishop, J. (2016). *The building blocks of high-quality early childhood education programs*. Learning Policy Institute. Retrieved August 27, 2020, from https://learningpolicyinstitute.org/product/building-blocks-high-quality-early-childhood-education-programs.

Yoshikawa, H., Weiland, C., & Brooks-Gunn, J. (2016). When does preschool matter? *Future of Children, 26*(2), 21–35. https://eric.ed.gov/?id=EJ1118535.

REL 2021–116

September 2021

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-17-C-0010 by the Regional Educational Laboratory Pacific administered by McREL International. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Grindal, T., Nunn, S., D'Amelio, E., & McCracken, M. (2021). *Factors associated with grade 3 reading outcomes of students in the Commonwealth of the Northern Mariana Islands Public School System* (REL 2021–116). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Pacific. http://ies.ed.gov/ncee/edlabs.

This report is available on the Regional Educational Laboratory website at http://ies.ed.gov/ncee/edlabs.