

# THE RALES MODEL AND ACADEMIC OUTCOMES

Probing associations at the intersection  
of health and education

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**Rales**  
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and Education



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# THE RALES MODEL AND ACADEMIC OUTCOMES



## What did we do?

We sought to understand whether implementation of the Rales Model or its components was associated with measures of student academic achievement and engagement. We focused on attendance and performance on reading and math standardized assessments.

## Rationale

Increasingly, states and districts are being held accountable for student performance [1]. Academic performance reflects children's overall health and wellbeing. Healthier students are better learners [2]. Previous studies have noted that chronic conditions are associated with poorer academic achievement and engagement, and schools with safer and more positive school climates are associated with better health and academic achievement [3]. Historically, however, few studies of coordinated school-based health programs and school-based health centers (SBHCs) have focused on educational outcomes [4]. Among studies that have evaluated academic outcomes, the strongest evidence exists among students with chronic conditions, particularly asthma [5]. Some studies provide support for links between SBHCs and grades, attendance, college preparation, and suspensions; most such studies have focused on high school students [4]. Some emerging research provides support for indirect impacts of SBHCs on academic performance via increases in school connectedness and engagement [4]. To date, however, no comprehensive, fully integrated programs have been evaluated with respect to student academic performance and engagement

## Summary of Implementation and Results

We first reviewed trends in school readiness and academic performance and engagement metrics across the implementation period. We then examined relationships between health conditions and academic outcomes. Finally, we examined relationships between the Rales Model components and academic outcomes. For more details, please see the Evaluation Supplement.

**School Readiness**

During the Rales Model implementation period, an increasing fraction of KIPP Harmony students entered Kindergarten not yet demonstrating readiness to learn based on Kindergarten Readiness Assessment (KRA) (Figure 1). The proportion of students demonstrating “emerging” readiness increased nearly four-fold between Year 2 and Year 4. This suggests that the Rales Model was being implemented in the context of increasing academic demands on KIPP Baltimore over time.

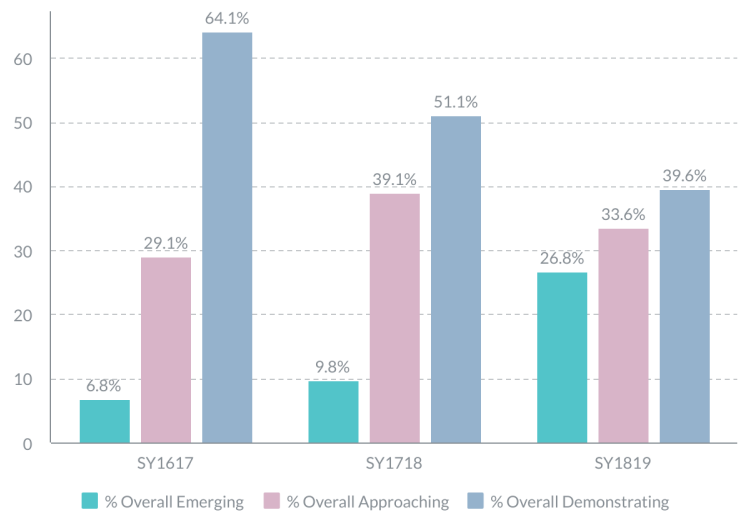


Figure 1: Kindergarten Readiness Assessment (KRA) trends Y2-Y4.

**PART I: SCHOOLWIDE ACADEMIC TRENDS ACROSS THE IMPLEMENTATION PERIOD**

**Schoolwide Trends in Attendance**

Average daily attendance improved modestly in the first three years of implementation before declining in Year 4 (Year 1: 92.7%, Year 2: 94.1%, Year 3: 93.3%, and Year 4: 92.3%). In Year 4, Baltimore City Schools began accounting for half-day absences to be consistent with other districts in Maryland; thus, decreases in attendance Year 4 are attributable, in large part, to reporting differences. Some decreases in attendance may also be related to extreme building temperatures caused by an antiquated heating and air conditioning system.

Chronic absenteeism, defined as missing 20 or more school days per year, declined 37.6% between years 1 and 3 (21.0% to 13.1%,  $p < 0.0001$ ) before increasing in Year 4 due to reporting of half-day absences (Year 4: 23.3%). An attendance coalition that included school leaders, student support staff, and Rales Health Center staff worked diligently to track and monitor students with chronic absenteeism and address barriers to attendance.

**CHRONIC ABSENTEEISM AT KIPP BALTIMORE DECLINED 38% BETWEEN YEAR 1 AND 3.**

### Trends in Standardized Assessments

#### PARCC Exam

As shown in Figure 2, in KIPP Harmony, there was a significant increase in the unadjusted proportion of students who demonstrated proficiency (i.e., a score of 4 or 5) on the Partnership for Assessment of Readiness for College and Careers (PARCC) math assessment over time compared to the pre-Rales Model baseline (2014-2015). The unadjusted proportion of students demonstrating proficiency on the PARCC ELA assessment was statistically unchanged over time. In Ujima, there were significant increases in ELA proficiency over time compared to the 2014-2015 baseline. PARCC math proficiency demonstrated strong gains in the first three years before falling in Year 4; nonetheless, the overall trend was still positive.

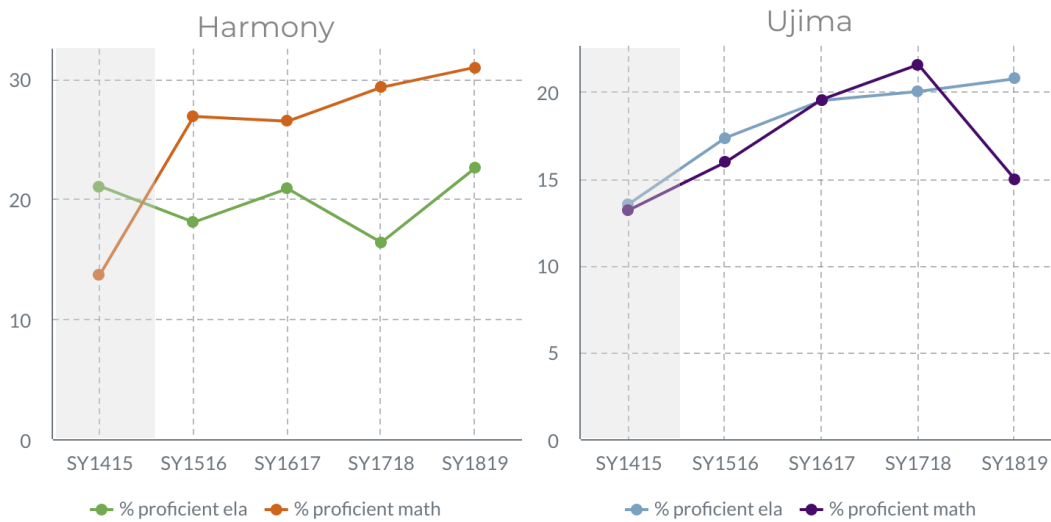
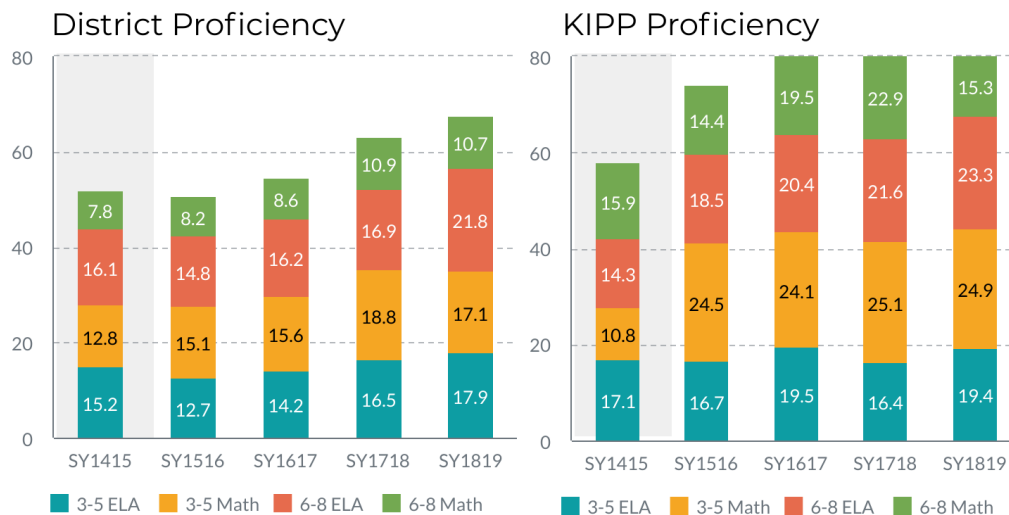


Figure 2: Trends in PARCC proficiency over time, KIPP Harmony (grades 3-4) and KIPP Ujima (grades 5-8).

As shown in Figures 3A and 3B, KIPP outperformed Baltimore City Schools overall with respect to proficiency on the PARCC assessment. District data are reported based on more common cutoffs for middle schools (grades 6-8) so below we compare KIPP to Baltimore City Schools in grades 3-5 and grades 6-8.



Figures 3A & 3B: Proficiency on the PARCC assessment English language arts (ELA) and math, grades 3-5 and 6-8, 2014-2015 to 2018-2019 in Baltimore City Schools overall vs. KIPP Baltimore



### MAP Assessment

Figure 4 shows unadjusted mean scores on the Measures of Academic Progress (MAP) assessment reading and math scores for Harmony and Ujima across the implementation period. In Harmony, reading and math scores were similar Year 1 to Year 4. In Ujima, both reading and math scores increased over time, but only the math score increase was statistically significant ( $p < 0.03$ ).

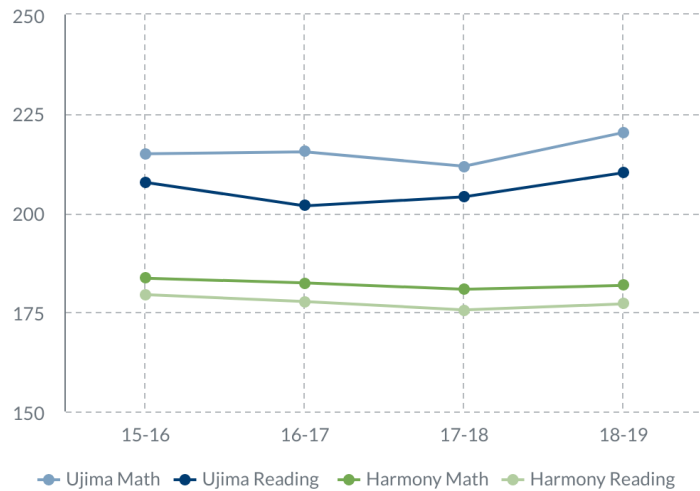


Figure 4 unadjusted MAP mean scores on reading and math scores for Harmony and Ujima

## PART 2: HEALTH CONDITIONS AND ACADEMIC OUTCOMES

We evaluated the relationship between prevalent health conditions and academic performance. Establishing the relationship between health conditions and academic performance and engagement is important to establishing a plausible mechanism by which fully-integrated school health programs like the Rales Model could impact academic outcomes.

### Asthma and Attendance

Asthma has previously been linked to student absenteeism. Studies of asthma and absenteeism have had several common limitations, however. Often, these studies rely on parent-reported asthma alone, which may be unreliable and prone to selection bias (i.e., parents whose children have asthma may be more likely to submit health forms), and many previous studies have not accounted for the potential impact of competing health and social risks that may drive absenteeism. Using the Rales Model's unique population-based asthma data (see Asthma Report), we quantified differences in absenteeism based on different sources of asthma data. We then estimated the proportion of all absenteeism at KIPP that was associated with asthma. In a paper published in the journal *Preventing Chronic Disease* [6], we looked at students who were enrolled at KIPP in both years 2 and 3. Asthma was assessed based on parent reports on health forms, student-reports of asthma-related emergency department visit/hospitalization or medication use, and Rales Health Center record of asthma. We estimated the relationship between asthma and number of days absent using Poisson random intercept regression, accounting for student's other health conditions and demographic characteristics estimated from their neighborhoods using Census data.

We found that parent-reported asthma (prevalence: 27%) was not associated with student absenteeism in adjusted models. Student-reported asthma healthcare or medication use (prevalence: 15%) and Rales Health Center record of asthma (prevalence: 23%) were each associated with more absenteeism (incidence rate ratio (IRR):1.16; 95% CI: 1.01-1.35 and IRR: 1.21; 95% CI:1.09-1.34, respectively). Student-reported asthma and RHC record of asthma were associated with 1.9 and 2.5 excess absences per year, respectively. In total, student-reported and health center record of asthma explained 14-18% of absenteeism, net other health and social risks. The results confirm the relationship between asthma and absenteeism after accounting for a wide variety of confounding factors; the results also highlight that there are many non-asthma related factors that drive attendance in students with asthma.

**The impact of poorly controlled asthma may be magnified over time. Students with significant asthma had 58% lower odds of proficiency on the PARCC math assessment over 3 school years.**

### *Asthma and Standardized Test Performance*

Asthma has previously been associated with poorer standardized test performance in a single school year [6]; however, this association may be magnified over time if students with asthma continue to fall behind. In a paper forthcoming in the journal *Academic Pediatrics* [7], we examined the relationship between asthma and standardized test performance during three school years (Years 1-3). We also explored whether standardized test performance was worse among those with more severe asthma (62% of students with asthma).



As above, asthma was defined based on the Rales Center's multi-modal asthma case definition that integrates parent-, self-, and RHC-reported asthma. Standardized test performance was assessed using PARCC math and ELA proficiency and MAP math and reading scores. Mixed effects linear and logistic regression models were used to evaluate the relationship between asthma and performance during three school years accounting for sex, school, absenteeism, and academic year.

We found that asthma, regardless of severity, was associated with worse MAP math and reading assessment scores but not PARCC proficiency across the three academic years. Students with the highest likelihood of significant or inadequately controlled asthma demonstrated worse performance on both MAP and PARCC. Aggregating across three school years, students scored 3.17 points worse on MAP reading (about 20% of a standard deviation) (95% CI: 0.7-5.63) and 3.56 points worse on MAP math (95% CI: 0.52-6.6); students with more significant asthma also had 48.8% (95% CI: 1.9%-73.2%) and 58.0% (95% CI: 21%-78%) lower odds of proficiency on PARCC ELA and math, respectively, compared to students without asthma. The relationship between asthma and poorer academic achievement in one school year appears to be magnified over multiple years, particularly among those with more significant or poorly controlled asthma.

### **BMI and Academic Outcomes**

We did not find consistent evidence that student weight was associated with attendance or test scores. Some previous studies in predominately African American samples of schoolchildren have found similar results [9].

### **ADHD and Academic Outcomes**

We found robust associations between ADHD and academic performance and engagement in adjusted models. RHC record of an ADHD diagnosis was associated with significantly lower attendance ( $B=-0.016$ , 95% CI: -0.025, -0.0073) and students with ADHD were 2.4 times more likely to be chronically absent than those without ADHD (odds ratio (OR): 2.44, 95% CI: 1.42,4.21), after accounting for gender, grade, and year. ADHD was also associated with 97% lower odds of proficiency on PARCC ELA (OR: 0.034, 95% CI: 0.0074, 0.15) and 96% lower odds of proficiency on the PARCC math (OR: 0.040, 95% CI: 0.011, 0.16). Similarly, ADHD was associated with 8.8-point lower MAP reading score ( $B=-8.84$ , 95% CI: -11.80, -5.88) and 10.8-point lower MAP math score ( $B=-10.83$ , 95% CI: -16.30, -5.35), accounting for gender, grade, year, and attendance.

### **Chronic Conditions and Academic Outcomes**

The majority of students at KIPP (65%) had one or more chronic conditions. Having any chronic condition was not associated with attendance or MAP assessment scores in adjusted models. However, students with any chronic condition were 57% less likely to be proficient on PARCC ELA (OR: 0.43, 95% CI: 0.27,0.68) and 52% less likely to be proficient on PARCC math (OR: 0.48, 95% CI: 0.29,0.78) compared to students without a chronic condition, after accounting for gender, grade, and attendance.

## PART 3: RELATIONSHIP BETWEEN RALES MODEL COMPONENTS AND ACADEMIC PERFORMANCE AND ENGAGEMENT

### *RHC Enrollment and Chronic Absenteeism*

Previously we noted a 50% decrease in chronic absenteeism among students with ADHD and a 49% decrease in chronic absenteeism among students with asthma who attended KIPP in Years 1 to 3. Building on these findings, we sought to understand the relationship between RHC enrollment and chronic absenteeism for all students. In Year 1, SBHC enrollees had less chronic absenteeism (24.5% vs 18.1%,  $p=0.004$ ) than non-enrollees. Over time, however, RHC staff were increasingly successful in proactive outreach to students with chronic attendance problems. Because the risk profile of the SHBC-enrolled student population changed over time, we looked at whether enrollment in the RHC was associated with students' likelihood of being chronically absent compared to themselves over time. We found that RHC enrollment was associated with greater likelihood of chronic absenteeism in Year 2 (OR: 2.78, 95% CI: 1.39, 5.60) and Year 3 (OR: 3.36, 95% CI: 1.42, 7.94) compared to Year 1. In Year 4, however, RHC-enrolled students were no more likely to be chronically absent (OR: 1.64, 95% CI: 0.68, 3.94). This suggests that program impacts may lag enrollment.

Among those not enrolled in the RHC, we observed modest improvement over time for math but no significant growth in reading. In contrast, among those enrolled in the RHC, we saw modest but significant growth in both math and reading.

### *RHC Enrollment and PARCC ELA and Math Proficiency*

We probed differences in the likelihood of PARCC proficiency over time by RHC SBHC enrollment using multivariable fixed effects regression models. We did not see meaningful differences by enrollment in the odds of PARCC math or ELA proficiency.

### *RHC Enrollment and MAP Reading and Math Score Growth*

The MAP assessment is designed to assess student growth in reading and math. Using fixed-effects multivariable linear regression, which compares individuals to themselves over time (thereby limiting threats from unmeasured differences between students), we evaluated the relationship between RHC SBHC enrollment and spring MAP score growth (Years 1-4), accounting for grade and absenteeism. Among those not enrolled in the RHC, we observed a modest but statistically significant improvement over time for math ( $B=0.11$ , 95% CI: 0.15, 0.21) but no significant growth in reading ( $B=0.008$ , 95% CI: -0.15, 0.17). In contrast, among those enrolled in the RHC, we saw modest but significant growth in both math ( $B=0.10$ , 95% CI: 0.056, 0.15) and reading scores ( $B=0.08$ , 95% CI: 0.0098-0.11). We saw a larger association between RHC enrollment and growth in math as compared to reading.



## Academic Impact of the Whole Child Kindergarten Intake Pilot

The Whole Child Kindergarten Intake Pilot was an enhanced kindergarten intake process implemented in the summer before students entered school in Year 4. The intake assessed: academic readiness, social and emotional functioning, vision, hearing, speech/language, unmet health and developmental needs, and family social needs. This intensive intake process provided detailed information to accelerate entry into needed services and identify unmet needs before they could undermine student success. A summary of the outcomes associated with the program is included in the Appendix.

Compared to the prior year, educational assessments (e.g., Kindergarten Readiness Assessment, KRA), were completed approximately three weeks earlier. This allowed targeted interventions and guided reading to be initiated sooner. In total, 17% of participants were flagged as at-risk on developmental screenings prior to school entry allowing for earlier implementation of responsive services, including speech/language interventions. In 2018-19 there were twice as many students receiving speech/language interventions by mid-September than in the prior year. Reading proficiency (as measured by STEP) increased by 2% compared to the prior year's baseline.

A whole-child kindergarten intake pilot was associated with earlier entry into educational support services and small but meaningful increases in reading ability compared to the prior year.

### **Dissemination**

- KIPP/Rales Whole-Child Intake Pilot. Presented at the Chan-Zuckerberg Initiative Health Integrated Schools Convening, Spring 2019, Palo Alto, CA.
- Johnson SB, Spin P, Connolly F, Stein M, Cheng TL, Connor K. Asthma and attendance in urban schools. *Prev Chronic Dis.* 2019;16:E148.
- Senter J, Smith B, Prichett L, Connor K, Johnson S. Pediatric asthma and academic achievement in urban elementary and middle school students. *Academic Pediatrics.* In press.
- Pediatric asthma and academic achievement in urban elementary school students. Presentation at the 2020 Academic Pediatrics Association Region IV Annual Meeting, Charlottesville, VA.

## Impact

- We demonstrated large and robust associations between health conditions and poorer attendance and standardized test performance, particularly among students with asthma and ADHD.
- Among students with ADHD and asthma who were enrolled at KIPP in Years 1-3, chronic absenteeism dropped by half.
- We observed modest but meaningful increases in student academic growth among students enrolled in the Rales Health Center; these associations were larger for math than for reading.
- Kindergarten intake activities that evaluated not just school readiness but a range of health and developmental threats to success resulted in earlier entry into services and modest improvements in reading assessment scores.

## LESSONS LEARNED

- *While students who enrolled in the RHC initially tended to be those at lower educational risk, over time those at high risk were successfully enrolled.*
- *We saw strong support for the role of chronic health conditions in academic performance and engagement over time.*
- *The relationship between asthma and academic achievement appears to be magnified over time, particularly among those with more significant asthma. This suggests that the impact of fully-integrated school health may also be amplified over time.*
- *While asthma was related to poorer student attendance, even after accounting for a variety of confounding factors, the condition explained only about 20% of absenteeism, underscoring the multifactorial nature of student attendance.*
- *The impact of health and educational integration, at least in the short term, may be more evident in academic growth over time rather than absolute proficiency.*
- *The impact of health and educational integration may be larger among individuals who are enrolled in the SBHC and therefore have more direct interaction with health services. This suggests that health and educational integration has the potential to have larger impacts when dose of the intervention is optimized for every child.*
- *Our results are consistent with a large portion of the prevention science literature that suggests that overall program effects are often modest, but subgroups of individuals may benefit differentially. Here we see the potential for students with some chronic conditions to benefit the most from these interventions.*

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We are grateful to all those who have joined us in our mission to create models of school health that help every child to achieve their full health and academic potential. Special thanks to the Norman and Ruth Rales Foundation and our partners at KIPP Baltimore; without them this work would not be possible.

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