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WORKING PAPER

Looking Back:

How Prior-Year Attendance Impacts Starting Achievement

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Abstract

Much of the current chronic absenteeism research has demonstrated the impact of chronic absences on end-of-year achievement; however, few studies have focused on how the impact of absences carry from one year to the next. Using data from a large, urban district, this research uses interim assessment test results to measure the impact of prior year attendance on starting achievement the following year. Our results the impact prior-year absences have are significant and persistent. Students with moderate to chronic absenteeism start the following year significantly behind their peers academically. These results suggest absences become "chronic" before students reach commonly accepted definitions of chronic absenteeism, stressing the need for sustained and early interventions for students with emerging or consistent attendance problems.

Keywords: Chronic absenteeism, Attendance, Achievement, Instructional Time

Looking Back: How Prior-Year Attendance Impacts Starting Achievement

School attendance campaigns often feature motivating slogans such as “attend today, achieve tomorrow.” This is backed by an extensive body of research showing a robust link between absenteeism and later achievement (Aucejo & Romano, 2016; Chang & Romero, 2008; Gershenson, Jacknowitz, & Brannegan, 2017; Gottfried, 2010; Gottfried, 2014; Gottfried, 2015; Gottfried & Kirksey, 2017; Lamdin, 1996). The research focuses on the corollary: can we leverage information about yesterday’s attendance to better understand starting achievement. Much of the research demonstrating the relationship between chronic absenteeism and student achievement relies on data from end-of-year summative assessments, which are generally administered to students in the spring of each year starting in third grade continuing through high school. While this study provides insight into the cumulative effects of absences on student achievement at the conclusion of a school year, little is known about the persistent effects of chronic absenteeism in a previous year on achievement at the start of the next year.

In this study, we build upon the foundation of previous chronic absenteeism research to examine if the effects of prior-year chronic absenteeism are related to significantly lower achievement at the start of the subsequent school year. This research allows us to evaluate if chronically absent students start the next school year at a significant academic disadvantage compared to their peers with similar prior achievement. If so, policies focused on reducing rates of absenteeism should also include targeted academic interventions for students with a prior history of chronical absenteeism, to help these students make up for lost classroom time and “catch up” to students with minimal to no prior attendance issues. Given the critical role of early intervention this may be a high leverage way to support struggling students (Kemple, Sergeritz, & Stephenson, 2013).

The association between within-year absences and the decline in end-of-year achievement is well documented (e.g. Gershenson et al, 2017; Gottfried, 2010). However, there is an important bidirectional relationship that occurs between absences on academic achievement. This bidirectionality means that students with higher absences have lower levels of academic achievement (Gershenson et al, 2017; Gottfried, 2010), but importantly, there is also evidence that students who struggle academically are more likely to be absent (Kearney, 2016; Nichols, 2003). If chronic absenteeism in a previous school year is related to significantly lower achievement at the start of the next school year, then student absences in the subsequent year may be a function, at least in part, of these students starting the school year at a significant academic disadvantage compared to their peers with minimal to no absenteeism issues. Thus, if chronically absent students start the following school year significantly behind their peers academically, then failing to provide additional academic support to help close this achievement gap may result in these students falling further behind and disengaging further from school.

The situation where students with more absences have lower levels of achievement and students who struggle academically are more likely to be absent presents a bit of a chicken and egg problem. This research provides an opportunity to examine the impact of past absences on starting achievement and the threshold at which absences begin to show significant impacts on starting achievement, in an effort to identify when interventions might be best placed to break cyclical patterns of attendance.

While there is no single definition in policy or practice of how many absences are needed for absenteeism to be considered "chronic," the most commonly used and recommended definition is when students miss 10% of school days or more (Balfanz & Byrnes, 2012; Bauer, Liu, Schanzenbach, & Shambaugh, 2018; Ginsburg, Jordan, & Chang, 2014; Kostyo et al., 2018). No empirical justification for the establishment of the 10% threshold could be found in research, yet this definition is widely used in schools and states across the country as the standard for identifying when absenteeism becomes "chronic." An examination of the persistent effects of prior-year absenteeism on following-year achievement allows for the evaluation of whether the pernicious effects of absenteeism are evident at a less extreme threshold than 10% of days missed. This examination is important to ensure that students with problematic patterns of attendance are not missing out on additional interventions and supports meant to change student attendance trajectories because they fall below an arbitrarily established attendance threshold.

Background on the Effects of Chronic Absenteeism on Student Achievement

Chronic absenteeism is an area of growing focus in schools across the country. Under the Every Student Succeeds Act (ESSA), states are required to include a valid, reliable, and comparable indicator of school quality or student success in their accountability system, and many states are now placing a greater emphasis on measuring, reporting, and reducing rates of chronic absenteeism to meet these requirements. For example, as of 2017-18, 37 states and the District of Columbia used some indicator of chronic absenteeism as a component of their state report cards or school accountability systems (Kostyo, Cardichon, & Darling Hammond, 2018).

This increased focus on chronic absenteeism is warranted based on the proportion of students across the U.S. who miss school to this degree, and because of the significant negative relationship that has been demonstrated between days of school missed and student achievement. Estimates of the prevalence of chronic absenteeism range from approximately 10% to 16% of all U.S. students (Balfanz & Byrnes, 2012; Chang & Romero, 2008; Ginsburg et al., 2014), with 7.3 million students chronically absent during the 2015-16 school year (Bauer et al., 2018). The effects of this persistent absence pattern on student achievement is well-documented, as extensive research has shown that students who are chronically absent from school have significantly lower end-of-year achievement levels when compared to students with no absences or less severe absence rates (Aucejo & Romano, 2016; Chang & Romero, 2008; Gershenson, Jacknowitz, & Brannegan, 2017; Gottfried, 2010; Gottfried, 2014; Gottfried, 2015; Gottfried & Kirksey, 2017; Lamdin, 1996).

In an examination of absenteeism in kindergarten and first-grade achievement, Romero and Lee (2007) found that those students with the highest absenteeism rates in kindergarten subsequently had the lowest achievement levels across multiple subject areas at the conclusion of first grade. Chang and Romero (2008) elaborated on these analyses, and identified that among low socio-economic students, students who were chronically absent in kindergarten also had the lowest achievement levels at the conclusion of fifth grade. These trends are also consistent with within-year results found by Roby (2004). Roby (2004) identified strong correlations across grade levels between mean end-of-year achievement and attendance at the grade-within-school level. Roby (2004) also found significant differences in achievement between the students ranked in the top and bottom 10% of attendance at a particular grade level.

Additional research has controlled for student, classroom, and school effects to estimate the causal impact of absences on achievement. For example, using panel data from North Carolina, Aucejo and Romano (2016) estimated the relative effects of extending the school calendar compared to decreasing student absences, both of which aim to increase student instructional time. The authors found disparate effects for these two approaches, noting that decreasing absences by ten days resulted in an increase of 5.5% and 2.9% of a standard deviation in mathematics and reading respectively, a much larger effect than simply extended the school calendar by an additional ten days. Gershenson, Jacknowitz, and Brannegan (2017) included absences as a covariate in value-added models and found that math and reading achievement decreased by 0.02-0.04 standard deviations when absences increased by one standard deviation. Each additional absence was associated with a reduction in math and reading achievement of 0.007 and 0.004 standard deviations respectively.

Potentially due to differences in sample size and characteristics, Gottfried (2010) found larger effect sizes associated with the causal impact of attendance on academic performance. Using an instrumental variables approach (distance from school), the author identified that a one standard deviation increase in days of school attended was associated with a 0.28 to 0.45 standard deviation increase in student grade point average (GPA). Further, focusing specifically on kindergarten students using a national dataset, Gottfried (2014) identified that students identified by their teachers as showing strong chronic absenteeism (i.e. absent 20 or more days) achieved at a level -0.17 to -0.20 standard deviations lower than students with 10 or fewer absences in reading and math respectively. Gottfried (2014) also examined the relationship between moderate chronic absenteeism (i.e. absent 11 to 19 days) and students with 10 or fewer absences, and while the effect sizes were notably lower than those identified for strong chronic absenteeism, the difference between students with moderate chronic absenteeism and students with 10 or fewer absences was still statistically significant.

The timing of absences and the subsequent effects on student achievement has also been examined to determine if absences closer to when testing occurs at the end of the school year are more impactful compared to absences at the beginning of the year (Gottfried & Kirksey, 2017). Focusing on elementary students, the authors found that spring absences were more impactful than fall absences. In math and English/language arts, the cumulative effects of each spring absence on spring achievement was -0.07 and -0.03 standard deviations respectively. Thus, across all of these studies, the clear finding is that as the extent of absenteeism increases, so too does the subsequent negative effect on student achievement, with the strongest effects observed for students who miss the greatest number of days of school.

Central to the question of how absenteeism relates to achievement is what factors are associated with or contribute to increased numbers of school absences. For example, chronic absenteeism tends to be highest in the earlier and later grades (i.e. kindergarten and high school), with attendance improving later in elementary school and then decreasing as students get older (Balfanz & Byrnes, 2012; Bauer et al., 2018). Chronic absenteeism is also cyclical – students who were chronically absent in previous years are more likely to be chronically absent in subsequent years (Connolloy & Olsen, 2012; Hancock, Shepherd, Lawrence, & Zubrick, 2013).

There are a number of potential reasons, many of which are interrelated, for why a student may be absent from school, including idiosyncratic reasons such as student illness, a lack of transportation or family resources, high student mobility, and many others. More broadly, chronic absenteeism is highly related to student socio-economic status, as students eligible for free and reduced-price lunch are more likely to be chronically absent than higher-income students (Kearney, 2016; Morrisey, Hutchinson, & Winsler, 2014; Ready, 2010; Romero & Lee, 2007). In addition to socio-economic status, research has also shown that ethnicity and eligibility for special education services are also strong predictors of chronic absenteeism (Balfanz & Byrnes, 2012; Ready, 2010).

In sum, research examining the relationship between student absenteeism and school performance consistently demonstrates that increased absences are related to or result in decreased school performance. The current study fills a gap in existing literature by examining to what extent the effects of absences persist into the fall of the subsequent school year. Connecting prior absences to achievement has only been conducted using end-of-year achievement scores due to data constraints and lack of accessibility for most researchers to student level fall starting test scores. This focus on start-of-the-year achievement allows us to determine if chronically absent students start the following school year at a significant academic disadvantage compared to students with minimal to no attendance issues. Further, in this research, we are able to identify the impact of a single absence on starting achievement the following year to determine if similar significant and persistent effects are observed for students with a high number of absences but who do not yet meet the most commonly recognized definition of when absenteeism becomes chronic (10% of days missed). Specifically, we tested the following two research questions:

A. How are absences in prior years, especially for those students who meet the existing definition of chronic absenteeism (10% of days absent), related to lower student achievement at the start of the following school year?

B. How do individual absences in the prior year relate to decreases in student achievement from the fall of the prior year to the fall of the following academic year?

Data

The data used in this study come from a large, urban, predominately Hispanic school district in southern California. The dataset used spans the 2015-16 and 2016-17 school years and includes student-level attendance information (number of days enrolled and number of days absent) and demographic data such as gender, ethnicity, free and reduced-price lunch status (FRL), special education status, and English language learner (ELL) status.

The dataset also includes mathematics and reading achievement data from NWEA's MAP Growth assessments. These assessments are computer-adaptive, aligned to a state's curricular standards, and employ an unconstrained, cross-grade scale. They assess student achievement and growth in four subject areas – mathematics, reading, language usage, and science – and generally take 40 to 60 minutes to complete. This research focuses on mathematics and reading outcomes only, as these were the two subject areas most commonly assessed across the district. The MAP Growth assessments were administered at schools across the district three times per year – in the fall, winter, and spring – allowing for multiple observations of student achievement over time, and for student achievement growth to be measured within and across school years. NWEA generates nationally representative achievement and growth norms to provide context in the interpretation of scores (referred to as RIT scores) on these assessments (Thum & Hauser, 2015). The assessments can be administered to students in grades K-12, though given the paucity of MAP Growth data in this district in the 11^{th} and 12^{th} grade, this research focuses only on students in grades K-10. The district requires MAP for mathematics in grades K-10 and MAP for reading in grades 3-10. Most existing research examining the relationship between chronic absenteeism and student achievement focuses on students in a small subset of grades (e.g. – kindergarten to first grade), but by relying on assessment results that span grades K-10, we can examine the effects of absenteeism on student achievement across a much broader range of students and school environments.

In total, the dataset includes testing and demographic information for more than 40,000 students from the 2015-16 school year and over 39,000 students from the 2016-17 year. Table 1 provides descriptive information on the overall student sample in 2015-16 and 2016-17.

<Insert Table 1 approximately here>

The table shows the district population is predominately Hispanic, ELL, and FRL-eligible, with little change in demographics and achievement between the two years. Overall student achievement in the district was below-average relative to NWEA's national norming sample (Thum & Hauser, 2015), with the median student achieving at the 36th percentile in Spring 2016 and 35th percentile in Spring 2017 in mathematics and 35th percentile for Spring 2016 and Spring 2017 in reading.

Methods

Measuring Student Attendance

This analysis follows the two student cohorts over the course of two academic years. Students starting in the fall of 2014 are followed through the spring of 2016, and students starting in the fall of 2015 are followed through the spring of 2017. Data from the two years are pooled, and all students with fall and spring test scores over the two-year periods of pooled data are included in the analysis, conditional upon students have absenteeism and testing data in the prior and following year. Inclusion of testing data in the prior and current year ensures that starting achievement in the fall has prior year achievement as a control variable. Students were excluded from analyses if they switched grades mid-year or did not have attendance data. Further, we divided students by grade to study the differential impacts at grade-level. For instance, disaggregating at the grade level allows us to examine how absences in first grade impact starting achievement at the beginning of second grade, and so on for second grade into third grade, etc. This also allows us to estimate the effects of absences on starting year achievement across grades during which students often transition to a new school setting, such as 5th grade to 6th grade, when students move from elementary to middle school. These data provide information for students starting in kindergarten through students who started in 9th grade. The data follows students into the subsequent year, meaning the data span from kindergarten to 10th grade. This analytic technique yields over 79,000 total students with testing and absenteeism information from the prior year. Broken out by grade-level, the analytic technique provides a sample of approximately 6,000 records for each grade-level. Absences are counted for each student from fall to spring, and a cumulative number of days missed is calculated for each student and compared to the total number of days in which a student was enrolled to compute individual student attendance rates. Students missing 10% or more days of school are considered chronically absent in the district. The district does not differentiate between excused or unexcused absences when computing student attendance rates.

Depending on the analysis, absences are treated as either a continuous or categorical variable, by binning the cumulative number of absences in the prior year. Treating absences as categorical allows the research to address how achievement varies by bins of students classified by their absences. While treating absences as continuous allows this research to estimate the impact a single absence may have on next year's starting achievement. Students were categorized as being Chronically Absent (CA - absent 10% or more days), Highly Absent (HA - absent 5%-9.9% of days), Moderately Absent (MA - absent 0.1%-4.9% of days), or No Absences (NA). For context, there are 180 instructional days of school within this district, so CA students were who enrolled in the district the entire school year were absent 18 or more days of school, HA students were absent 9-17 days, and MA students were absent 1-8 days. Table 2 shows the number and proportion of students included in the analytic sample who have 180 or greater membership days within the district in each of the attendance bins during 2015-16 or 2016-17 school year, as well as the average attendance rates and number of days these students were absent from school.

<Insert Table 2 approximately here>

These summary data show that only 2.25% of students within this district were chronically absent, which is notably lower than estimates of 10% to 16% of students nationwide (Balfanz & Byrnes, 2012; Chang & Romero, 2008; Ginsburg, Jordan, & Chang, 2014). Consistent with prior research (Balfanz & Byrnes, 2012; Romero & Lee, 2007), chronic absenteeism in this district is higher in kindergarten, and then decreases throughout elementary school, before increasing throughout middle and high school (see Table 3).

<Insert Table 3 approximately here>

Taken together the data, as shown in Figure 1 demonstrate that as students progress, CA and HA students fall further behind each subsequent year.

<Insert Figure 1 approximately here>

Analytic Strategy for Estimating Effects of Prior Absences on Starting-Year Achievement

As previously stated, in this research we seek to answer two questions:

A. How are absences in prior years, especially for those students who meet the existing definition of chronic absenteeism (10% of days absent), related to lower student achievement at the start of the following school year?

B. How do absences in the prior year relate to decreases in student achievement from the fall of the prior year to the fall of the following academic year?

To address the first research question, we estimate the effects of prior year absences on student achievement in subsequent school years across multiple years of data, which helps control for potential endogeneity bias (Aucejo & Romano, 2016). Simply, students may have unobserved characteristics which influence student achievement estimates, and those estimates will be correlated with each other over time. For this research, the models we employed use student level fixed effects to control for time invariant characteristics which are constant over time and also include a student's prior fall test score. Inclusion of a student's prior fall test score is important to control for historical influences that are unobserved in the data and is consistent with prior research on this topic (Gershenson et al., 2017; Gottfried, 2014). Prior scores consist of standardized, relative to NWEA's national norming sample, RIT scores at the grade and year level, which allows for the current score to show an increase or decrease from the centered prior score. Using a centered score allows for ease in interpretation of the unstandardized coefficient. That is, the results of the models show the change in standardized RIT scale points students from their prior score, all else being equal. In these models, we do not distinguish between unexcused and excused absences.

The first equation is modeled to empirically address how absences in a prior school year impact students' starting achievement in the fall of the following school year:

Equation 1

$$\gamma_{ijt} = \beta_0 + \beta_1 Chronic_{i,t-1} + \beta_2 High_{i,t-1} + \beta_3 Moderate_{i,t-1} + \beta_4 \gamma_{i,t-1} \beta_5 Xit + \delta_t + \varepsilon_{ijt}$$

In this model, γ_{ijt} is the fall RIT score for student i at time t in school j. β_1, β_2 and β_3 are the coefficients associated with dummy variables that classify a student's prior year absences (t-1) as CA, HA, or MA, respectively. Students in the NA group in the prior year serve as the reference group for these analyses. $\gamma_{i,t-1}$ is a student's lagged fall RIT score from the prior year. X_{it} represents the vector of student-level covariates which may or may not vary over time, including gender, free and reduced lunch recipient, has an Individualized Learning Plan (IEP), and has ever been classified as an English Language Learner. δ_t represents the time level fixed effects as we follow two different cohorts of students. Including a year fixed effect controls for variations which may occur as a function of year-to-year differences that are unobserved in the model

(Angrist & Pischke, 2009). ε_{ijt} represents the error term, which includes all unobserved covariates related to achievement.

The key coefficients of interest (β_1, β_2 and β_3) are those associated with the dummy variables for a student's prior absences controlling for both time fixed effects and a student's prior starting score, as these coefficients indicate the extent to which these categories of absences correspond to decreased achievement in the fall of the following year relative to students with no absences in the prior year. We estimated the effects of absences on achievement in two ways - once with all students included and then individually by each grade for each subject (math and reading). Running each model by grade provides an additional grade level fixed effect.

The benefit of the fixed effects model is that all estimates provide within-school variations of scores at each grade level where the model is run. Results are robust to the presence of serial correlation present in panel data and to heteroskedasticity as standard errors are clustered at the school level. We do not measure the effect an individual school may have on the overall average starting achievement for each attendance group. The estimates are the average of all students in the group at the district level.

Our second model (Equation 2) measures the impact of a single absence on students' student fall-to-fall achievement growth. This model seeks to measure the cumulative effect of absences and can help demonstrate the point at which absences from the prior year start to have a significant and chronic effect on student achievement at the start of the following school year.

Equation 2

$$\gamma_{ijt} = \beta_0 + \beta_1 Absences_{i,t-1} + \beta_2 \gamma_{i,t-1} + \beta_3 Xit + \delta_t + \varepsilon_{ijt}$$

In this model, γ_{ijt} is the growth in achievement a student experiences between the prior-year fall test and the following-year fall test. The $Absences_{i,t-1}$ are lagged student absences treated as a continuous variable in this model, compared to the prior model, where absences are binned into categories by the number of absences. The remaining variables in this second model are the same as the previous model. Again, we run this second model overall and by grade and test subject (math and reading) to provide estimates at the grade level for students with robust standard errors clustered at the school level.

Limitations

This study utilizes data from one large urban district that consists of predominately low-income and Hispanic students. This is significant because absence rates are higher among socioeconomically disadvantaged students (Ready, 2010; Morrisey, Hutchinson, & Winsler, 2014), despite what we observe in this particular district. Absences for this group of students may be more impactful given that such households may be less able to compensate for lost instructional time than more affluent households (Chang & Romero, 2008). Estimating the impacts of chronic absenteeism across a largely homogenous district consisting of low-income and Hispanic student populations may limit the generalizability of these results to other school settings with more heterogeneous groups of students.

The composition of the sample may further bias some estimates in the research given the relationship demonstrated between attendance, poverty, and prior student achievement on future student achievement in subsequent years. Another limitation of the sample is that this study only includes data for students where attendance and achievement data are both available. Therefore, student estimates may be biased because this sample does not include highly mobile students or students who missed at least one testing session.

Results

Preliminary Descriptive Results

Before presenting results from our regression model, the relationship between prior year absences and starting fall achievement can be highlighted descriptively. In Figure 2, this relationship is shown by attendance category bin, which demonstrates how the mean achievement for students at the start of the following year declines consistently by prior-year attendance patterns.

<Insert Figure 2 approximately here>

The boxplots, standardized across grade, subject, and year demonstrate that students who were chronically absent achieved at over half a standard deviation below their peers (prior to controlling for any other variables or separating by subject). Figures 3 highlights declining achievement as absences increase over the time period studied.

<Insert Figure 3 approximately here>

Simply put, the more absences a student had in the prior year, the lower the student's starting achievement in the fall of the following year. These results are consistent with prior research on achievement and attendance (Balfanz, & Byrnes, 2012; Gottfried, 2014; Goodman, 2014).

Primary Results

Results from our fixed-effects regression models are consistent with the descriptive results presented in Table 4 & Table 5. These analyses show that the relationship between chronic absenteeism and starting fall achievement are significant and persistent in mathematics across grades. Related to the first research question, Table 4. highlights unstandardized achievement differences and effect sizes, as determined using Cohen's d (1977), of those differences for students in the CA, HA, and MA prior year attendance bins compared to students with no absences in the prior year.

<Insert Table 4 approximately here>

Students who were CA in the prior year (10%+ absences), when controlling for prior fall starting achievement, year, and a vector of individual covariates (including FRL, ELL, SPED) start the following year achieving at a level 0.22 to 0.47 SDs lower than students with no absences in the prior year in math. The magnitude of this effect varies by grade, and the difference was significant in all grade areas except for 5th grade. The effects of chronic absenteeism in reading are much smaller in magnitude and non-significant in most grade levels. However, there is some evidence the lack of significance for chronically absent students in reading may be an issue of power in the sample of chronically absent students taking the reading assessment, as the effect size of highly and chronically absent students in reading are similar to those seen in math.

The results also indicate that students in the HA group (5-9.9% absences), who did not meet the definition of chronically absent, also experienced significant and persistent differences in starting achievement when compared to students with no absences. HA students started the subsequent school year at an achievement level between .14 and .22 SDs lower than NA students in math. These effects are all negative and significant across grade levels. The effects in reading are smaller in magnitude than the mathematics results. Interestingly, MA students (0.1-5.0% absences) also started the following school year at a significantly lower achievement level in mathematics than their NA peers (effects ranging from .07 to .15 SDs).

As a robustness check, we also re-estimated these effects using a different set of absence categories and reference group. For these purposes, students with four or fewer absences served as the reference group, which is consistent with the district's current policy about which students do not require absence monitoring. This also allows for more students to be included in the reference group, as students with one or two absences may not be substantively different than students with no absences (especially since this research does not differentiate between excused and unexcused absences). Chronic absence is still defined as 18 or more days absent (10%), while the HA and MA are adjusted to include students who were absent 11-17 days and 5-10 days respectively. This robustness check produced similar results across all grade and subject areas. Results show that CA students achieved between .21 and .39 SDs lower than their peers with four or fewer absences at the start of the following school year in mathematics, with minimal differences observed in reading. Achievement for HA students at the start of the following school year lagged by .12 to .19 SDs.

Results from Model 2 address the second research question. Though the relationship between prior absences and starting achievement vary to some extent across grades and subject areas, the effect of a single absence in a previous year on starting achievement the following year further highlights the significant cumulative impact absences may have on starting achievement. In mathematics, a single absence was associated with a decrease in starting achievement of between .010 to .016 SDs (see Table 5).

<Insert Table 5 approximately here>

These effect sizes are aligned with previous findings on the relationship between current year absences and spring achievement (Gottfried, 2014; Gottfried, 2015). Results in reading are smaller in magnitude than mathematics results. Given the linear relationship, in this case, between absences and achievement at the start of the following year, a 4th grade who is meets the definition of CA by being absent 18 days would see a decline of .27 SD in mathematics on the fall assessment. For reference, by some educational studies a .20 SD change can be considered demonstrating a medium to large impact on student achievement (Cohen, 1988), while a .05 SD is a meaningful yet small impact (Kraft, 2019). Under Kraft's (2019) guidance on effect sizes, the cumulative impact of absences begins to have an outsized correlational connection to lower starting achievements in both math and reading far earlier than current recommendations suggest. These compounding impact of absences on student starting achievement highlights the influence of prior year absences on starting achievement in the subsequent school year for those students who have not yet met accepted chronic absenteeism definitions.

Discussion

This research extends previous work around the impact attendance has on student achievement (Balfanz, & Byrnes, 2012; Gottfried, 2014; Goodman, 2014). The findings highlight that absences not only impact end of year achievement, but that the effects of these absences persist to the start of the subsequent school year. While the effects of prior absences on starting achievement is apparent in both subjects, cumulative absences have a much larger negative effect on mathematics achievement than reading achievement. This may be because mathematics achievement tends to be differentially impacted by missed in-class instruction time, whereas reading achievement can more easily be supported outside of the classroom (Gottfried, 2017).

In this study we find that students who were chronically absent or highly absent in one year start the subsequent school year at a mathematics achievement level .22 to .47 SDs (depending on the grade) behind their peers who had no absences in the prior year. We also found that even students with a moderate number of absences in the prior academic year started the following school year at a significantly lower achievement level than their no-absence peers, ranging in magnitude from -0.07 to -0.15 SDs in mathematics.

Policy Implications

There are several implications of these findings. First, the effects of prior year absences on starting achievement the following year are significant for not only students who were chronically absent, but also students that did not meet the "chronic" threshold but still had moderate to high absences. Students who do not yet meet the commonly accepted definition of chronic absenteeism (i.e. 10% of days of school missed), but still miss a significant number of days of school (5-17 days of a 180-day school year), are falling academically behind their no-absence peers. School systems should consider redefining the threshold to deem absenteeism as "chronic" in policy and practice, especially if resources and interventions aimed at reducing the frequency of absences are targeted specifically to those students who are chronically absent. Maintaining the current chronic absenteeism definition in practice ensures that a sizable proportion of students with significant absenteeism issues – but who have not yet met the chronic absenteeism definition – do not benefit from these additional services and supports aimed at positively impacting student attendance trajectories. Beyond defining a new threshold by which to measure absenteeism as "chronic", schools should monitor each bin of students with a focus on preventing students from falling into subsequent bins where effects are increasingly detrimental to student success.

For example, Attendance Works (n.d.) recommends interventions strategies such as emphasizing the impact of absences on student achievement, monitoring attendance patterns closely, and recognizing positive or improved attendance. As attendance decreases, the organization advocates for personalized outreach, identification of mentors for students, coordinated school and community engagement, and if necessary, legal intervention. Broadening the definition of at risk students may allow for more intervention earlier and reduce the gap in starting achievement.

Second, policies aimed at reducing absenteeism should consider the longer-term attendance trajectories of students, with potential services for students continuing into subsequent school years until students demonstrate changes in their attendance patterns. This is especially true when students with moderate to chronic absenteeism issues transition to new schools, where minimal information is known about the needs of students. Insight into a student's prior-year attendance patterns could provide actionable information to current-year schools about which students may need additional targeted supports and interventions to ensure that absenteeism issues do not persist.

Finally, it is clear that students with even moderate absenteeism issues in a prior year start the following year at a significantly lower achievement level than their peers without absences. Additional supports should also be prioritized for these students to help them "catch up" academically. Of all the interventions identified in the literature, one area of focus that does not feature prominently is providing targeted academic interventions and supports to students in subsequent years to help them catch up academically with their peers. If student achievement is significantly negatively affected by chronic absenteeism, and that deficit persists into the start of the following year, then targeted academic resources aimed at helping students make up lost instructional time may be one way to help chronically absent students re-engage in school. This approach may also help to ensure that chronic absenteeism does not persist (or worsen) in later school years. It is important to remember that school years are not discrete events – the absence patterns of a student in a prior year have clear effects of student academic outcomes at the start of the following year. As such, policies should not only focus on positively impacting student attendance patterns; steps should also be taken by schools to positively affect the achievement trajectory of those students who have demonstrated a significant number of absences in previous school years. This is especially true given that existing research shows that students who struggle academically are more likely to be absent from school compared to students who are performing well (Chang & Romero, 2008; Roby, 2004).

References

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton, NJ: Princeton University Press.

Attendance Works (n.d.). Tiered system of supports for improving attendance. Retrieved from https://www.attendanceworks.org/chronic-absence/addressing-chronic-absence/3-tiers-of-intervention/.

Aucejo, E.M., & Romano, T.F. (2016). Assessing the effect of school days and absences on test score performance. *Economics of Education Review, 55*, 70-87.

Balfanz, R., & Byrnes, V. (2012). *The importance of being in school: A report on absenteeism in the nation's public schools*. Baltimore, MD: Johns Hopkins University Center for Social Organization of Schools.

Bauer, L., Liu, P., Schanzenbach, D.W., & Shambaugh, J. (2018). *Reducing chronic absenteeism under the Every Student Succeeds Act*. Washington DC: Brookings Institution.

Caldas, S.J. (1993). Reexamination of input and process factor effects on public school achievement. *The Journal of Educational Research, 86*(4), 206-214.

Chang, H.N., & Romero, M. (2008). *Present, engaged, and accounted for: The critical importance of addressing chronic absence in the early grades*. New York, NY: National Center for Children in Poverty.

Cohen, Jacob (1988). *Statistical Power Analysis for the Behavioral Sciences.* Routledge. ISBN 978-1-134-74270-7.

Connolloy, F., & Olson, L.S. (2012). *Early elementary performance and attendance in Baltimore City schools' pre-kindergarten and kindergarten*. Baltimore, MD: Baltimore Education Research Consortium.

Gershenson, S., Jacknowitz, A., & Brannegan, A. (2017). Are student absences worth the worry in U.S. primary schools? *Education Finance and Policy, 12*(2), 137-165.

Ginsburg, A., Jordan, P., & Chang, H. (2014). *Absences add up: How school attendance influences student success*. San Francisco, CA: Attendance Works.

Goodman, J. (2014). *Flaking out: Student absences and snow days as disruptions of instructional time*. NBER Working Paper No. W20221

Gottfried, M.A. (2010). Evaluating the relationship between student attendance and achievement in urban elementary and middle schools: An instrumental variables approach. *American Educational Research Journal, 47*(2), 434-465.

Gottfried, M.A. (2014). Chronic absenteeism and its effects on students' academic and socioemotional outcomes. *Journal of Education for Students Placed at Risk, 19*(2), 53-75.

Gottfried, M.A. (2015). Chronic absenteeism in the classroom context: Effects on achievement. *Urban Education*.

Gottfried, M.A., & Kirksey, J.J. (2017). "When" students miss school: The role of timing of absenteeism on students' test performance. *Educational Researcher, 46*(3), 119-130

Hancock, K.J., Shepherd, C.C. J., Lawrence, D., & Zubrick, S.R. (2013). *Student attendance and educational outcomes: Every day counts*. Report for the Department of Education, Employment and Workplace Relations, Canberra, Telethon Institute for Child Health Research, University of Western Australia.

Kearney, C.A. (2016). *Managing school absenteeism at multiple tiers: An evidence-based and practical guide for professionals*. New York City, NY: Oxford University Press.

Kemple, James J., Segeritz, Micha D., & Stephenson, Nickisha (2013). Building on-track indicators for high school graduation and college readiness: Evidence from New York City. *Journal of Education for Students Placed at Risk (JESPAR),* 18:1, 7-28, DOI: 10.1080/10824669.2013.747945

Kostyo, S., Cardichon, J., & Darling-Hammond, L. (2018). *Making ESSA's equity promise real: State strategies to close the opportunity gap: Eliminating chronic absenteeism* (research brief). Palo Alto, CA: Learning Policy Institute.

Lamdin, D.J. (1996). Evidence of student attendance as an independent variable in education production functions. *The Journal of Educational Research, 89*(3), 155-162.

Morrisey, T.W., Hutchison, L., & Winsler, A. (2014). Family income, school attendance, and academic achievement in elementary school. *Developmental Psychology, 50*(3), 741-753.

Nichols, J.D. (2003). Prediction indicators for students failing the state of Indiana high school graduation exam. *Preventing School Failure: Alternative Education for Children and Youth, 47*(3), 112-120.

Ready, D.D. (2010). Socioeconomic disadvantage, school attendance, and early cognitive development: The differential effects of school exposure. *Sociology of Education, 83*(4), 271-286.

Roby, D.E. (2004). Research on school attendance and student achievement: A study of Ohio schools. *Educational Research Quarterly, 28*(1), 3-14.

Romero, M., & Lee, Y. (2007). *A national portrait of chronic absenteeism in the early grades*. New York, NY: National Center for Children in Poverty.

Tables & Figures

Table 1. Descriptive Statistics, 2015-16 & 2016-17

Variables	2015-16 Mean (SD)	2016-17 Mean (SD)
Attendance		
Avg. Attendance Rate	0.976 (0.03)	.976 (.03)
% Chronically Absent	0.033 (0.18)	.031 (.17)
Student Demographics		
% Female	0.493 (0.50)	.495 (.50)
% Hispanic	0.960 (0.20)	.961 (.19)
% Free-Reduced Price Lunch	0.848 (0.36)	.889 (.32)
% Ever English Learner	0.824 (0.38)	.816 (.39)
% Special Education	0.103 (0.30)	.108 (.31)
Student Achievement		
Avg. Math Scale (RIT) Score (Spring)	204.85 (28.22)	204.98 (28.04)
Avg. Reading Scale (RIT) Score (Spring)	201.01 (22.48)	201.17 (22.69)
	Median	Median
Median Ach. Percentile - Math (Spring)	36th	35th
Median Ach. Percentile - Reading (Spring)	35th	35th

Table 1. Average Attendance Rates and Number of Days Absent by Absence Category, Combined 2015-16 & 2016-17

Absence Category	Absence Category Range	Absence Category Range - Days Missed (180 School Days)	N of Students	Proportion of Student	Avg. Attendance Rate	Avg. N of Absences
Chronic Absence	10%+	18+	1,711	0.02	86.0%	25.4
High Absence	5.0-9.9%	9 to 18	7,712	0.10	93.3%	12.1
Moderate Absence	0.1-4.9%	1 to 9	47,979	0.63	98.0%	3.5
No Absence	0%	0	18,700	0.25	100.0%	0.0
Total			76,102		97.8%	4.01

Note: Statistics include only students with greater than 180 membership days who have a valid Fall RIT, Fall Grade, Spring RIT, and Spring Grade.

Table 3. Percent of Students by Absence Category by Grade, Combined Fall 2015- Spring 2017

		2015-16 & 2016-17 Absences			
Grade	N of Students	CA	HA	MA	NA
K	6,300	3.9%	15.4%	63.6%	17.1%
1st	6,940	2.4%	12.1%	63.1%	22.4%
2nd	7,310	1.7%	10.3%	64.6%	23.4%
3rd	7,762	1.8%	8.9%	63.5%	25.8%
4th	7,851	1.4%	9.2%	64.4%	25.0%
5th	7,926	1.6%	8.6%	63.5%	26.3%
6th	7,414	2.1%	8.4%	62.2%	27.4%
7th	7,136	2.6%	9.1%	62.3%	26.0%
8th	7,068	3.2%	10.8%	61.9%	25.0%
9th	6,580	3.5%	10.6%	61.9%	24.1%
10th	6,624	4.5%	12.7%	60.8%	22.1%
Total	78,911	2.5%	10.4%	62.9%	24.2%

Note. Statistics include only students whose fall and spring grades match and have prior year attendance data.

Table 4. Coefficients and Effect Sizes by Absence Category

	Mathematics				Reading			
Ending Grade	Grade Count	10% + Absences (CA)	9.9%-5% Absences (HA)	4.9% - .1% Absences (MA)	Grade Count	10% + Absences (CA)	9.9%-5% Absences (HA)	4.9% - .1% Absences (MA)
1		**-3.84*****	**-2.27*****	**-1.35****		--	--	--
	6,100	0.31	0.18	0.11	404			
2		**-5.54*****	**-2.41*****	**-1.47*****		--	--	--
	6,848	0.46	0.20	0.12	1,024			
3		**-3.50*****	**-1.88*****	**-1.09*****		--	--	--
	7,243	0.36	0.20	0.11	2,138			
4		**-2.20****	**-1.53*****	**-0.61****		-1.33	-0.76	-0.5
	7,417	0.24	0.17	0.06	6,128	0.13	0.07	0.05
5		-1.47	**-1.45*****	**-0.81*****		-1.66	**-1.07***	-0.39
	7,516	0.16	0.16	0.09	7,493	0.12	0.08	0.03
6		**-2.74****	**-1.20*****	**-0.99*****		-1.23	**-1.45****	**-0.76****
	6,983	0.21	0.09	0.08	6,866	0.12	0.14	0.07
7		**-2.65****	**-2.08*****	**-0.96*****		-0.89	**-1.69***	-0.57
	6,525	0.21	0.16	0.08	6,376	0.05	0.10	0.03
8		**-2.26****	**-2.47*****	**-1.57*****		-2.32	**-1.60****	**-1.07*****
	6,549	0.16	0.18	0.12	6,348	0.18	0.13	0.09
9		**-3.79****	**-2.49*****	**-1.57*****		-2.06	**-2.54*****	**-1.30*****
	5,636	0.30	0.19	0.12	5,632	0.18	0.22	0.11
10		**-3.40*****	**-2.20****	**-0.97****		**-3.58*****	**-2.20*****	**-1.06*****
	5,587	0.12	0.08	0.03	5,536	0.15	0.09	0.04

*p<.05;**p<.01;***p<.001

-- Grade not included due to small sample size.

Note: Coefficients are in the first row by grade, effect sizes are in the second row of the grade

Table 5. Effect Size of Individual Absence on Starting Achievement, by Grade

	Mathematics		Reading	
Ending Grade	RIT Score	Effect Size	RIT Score	Effect Size
1	-.15***	0.012	--	
2	-.15**	0.012	--	
3	-.16***	0.017	--	
4	-.14***	0.015	-.06*	0.018
5	-.11***	0.012	-.10***	0.007
6	-.10***	0.008	-.09**	0.009
7	-.15***	0.011	-.12**	0.007
8	-.13**	0.010	-.10**	0.008
9	-.15**	0.012	-.13**	0.012
10	-.14**	0.005	-.15***	0.006

-- Not included due to small sample size

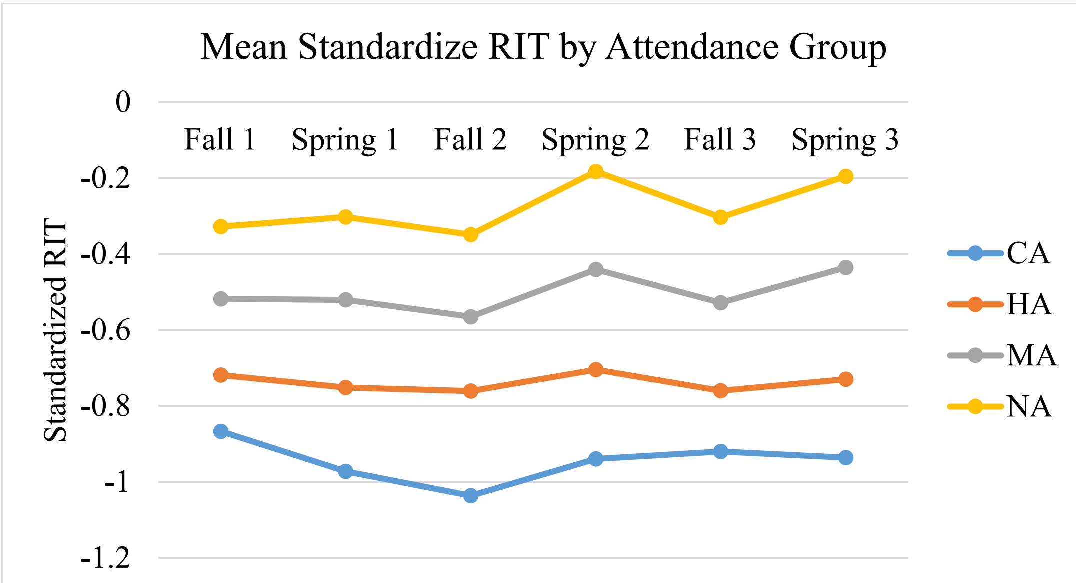

Figure 1. Cross-sectional Mean Standardized RIT across data by attendance category

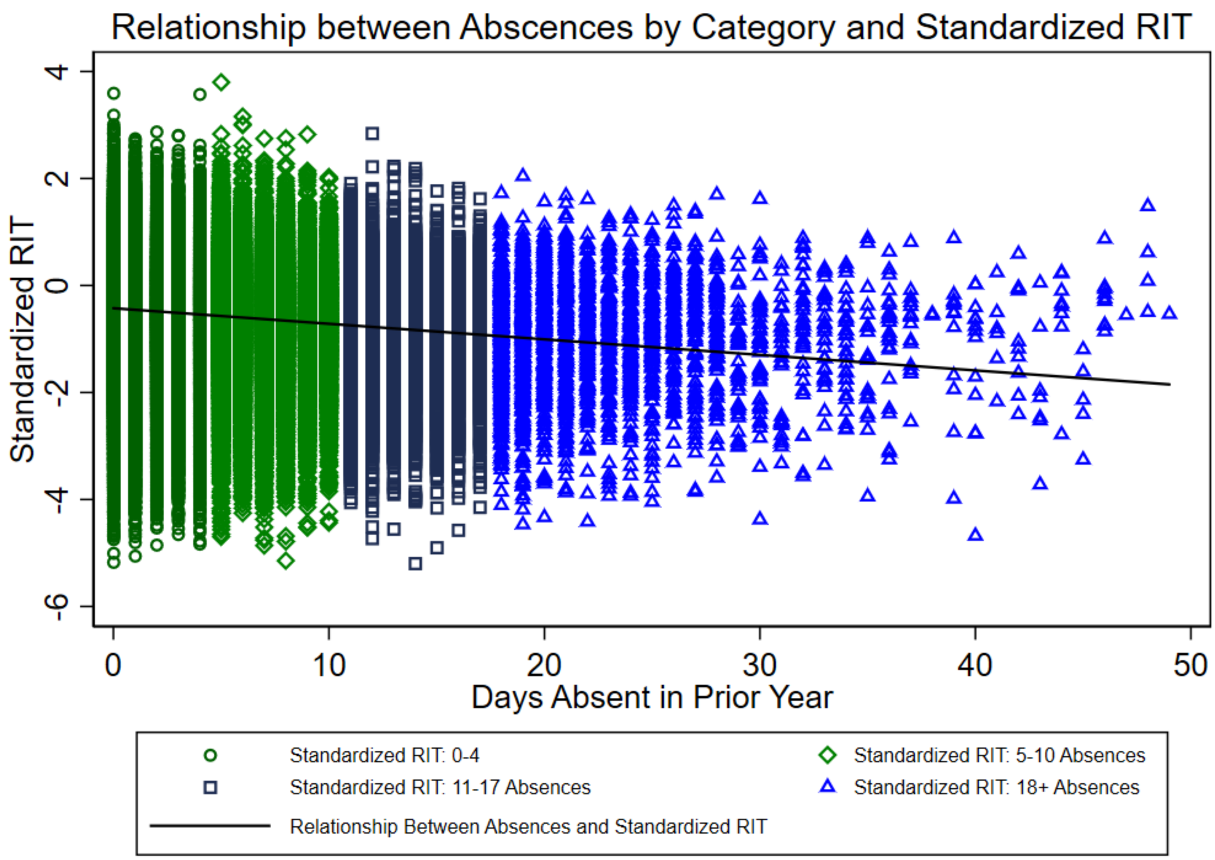

Figure 2. RIT is standardized by grade, scale, and year.

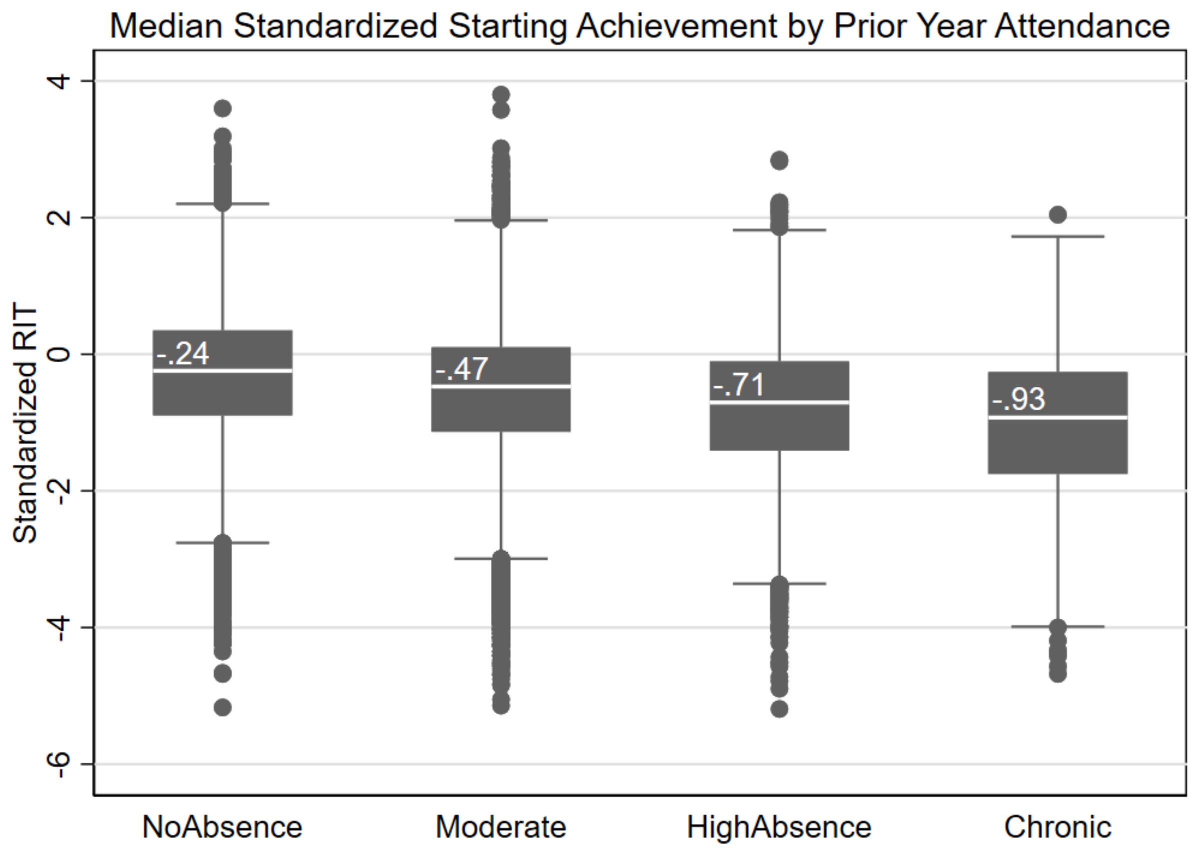

Figure 3. Box Plots combine subjects and year

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