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What we're missing: A descriptive analysis of part-day absenteeism in secondary school

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ABSTRACT

For schools and teachers to help students develop knowledge and skills, students need to show up to class. Yet absenteeism is high, especially in high schools. This study uses a rich dataset tracking class attendance by day for over 50,000 middle and high school students from an urban district in Academic Years 2007-'08 through 2012-'13. Our results extend and modify the extant findings on absenteeism that have been based almost exclusively on data on full-day absenteeism, missing class-by-class absences. Notably, part-day absenteeism is responsible for as much class time missed as full-day absenteeism, raising chronic absenteeism from 9 to 24 percent of total students. Incorporating part-day absences sharply increases the chronic absenteeism gap between underrepresented minority students and their peers. Both full- and part-day absenteeism show a discrete jump at the point of transition from middle school to high school, but full-day absenteeism then declines while part-day absenteeism remains high in grades 10 and 11 and increases again in grade 12. While 55 percent of full-day absences are unexcused, 92 percent of part-day absences are unexcused. Absenteeism from individual classes varies considerably by time of day, but less by class subject matter.

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What we're missing: A descriptive analysis of part-day absenteeism in secondary school

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Abstract

For schools and teachers to help students develop knowledge and skills, students need to show up to class. Yet absenteeism is high, especially in high schools. This study uses a rich dataset tracking class attendance by day for over 50,000 middle and high school students from an urban district in Academic Years 2007-'08 through 2012-'13. Our results extend and modify the extant findings on absenteeism that have been based almost exclusively on data on full-day absenteeism, missing class-by-class absences. Notably, part-day absenteeism is responsible for as much class time missed as full-day absenteeism, raising chronic absenteeism from 9 to 24 percent of total students. Incorporating part-day absences sharply increases the chronic absenteeism gap between underrepresented minority students and their peers. Both full- and part-day absenteeism show a discrete jump at the point of transition from middle school to high school, but full-day absenteeism then declines while part-day absenteeism remains high in grades 10 and 11 and increases again in grade 12. While 55 percent of full-day absences are unexcused, 92 percent of part-day absences are unexcused. Absenteeism from individual classes varies considerably by time of day, but less by class subject matter.

What we're missing: A descriptive analysis of part-day absenteeism in secondary school

In recent years, education leaders and scholars have become increasingly concerned about student absenteeism (Attendance Works, n.d.; Balfanz & Byrnes, 2012; Office for Civil Rights, 2016). Secondary students have particularly high rates of absenteeism, missing nearly three weeks (14 days) per year on average.[1] While several authors have published studies on absenteeism, the focus of research has been almost exclusively on full-day absences, their cause and effects (see Cortes et al. (2012) for the one exception). Yet, many secondary school students are absent from some of their classes on days that they attend other classes.

This paper addresses the gap in the literature on part-day absences, using detailed data on attendance by each student in each class in each day of the school years 2007-'08 through 2012-'13. The only published paper we know of to date utilizing class-level attendance data, Cortes et al. (2012), reports on absences across class periods in Chicago high schools and assesses differences in class absences between black students and other students. While that study, like ours, uncovers substantial differences in the amount of absences across different class periods and between racial/ethnic groups, our study goes substantially further in describing the extent and distribution of absences, both part day and full and both excused and unexcused.

Specifically, we address the following research questions:

1. How prevalent is part-day compared to full-day absenteeism?
2. To what extent do characteristics of the class predict part-day absence, where class characteristics include period, core vs. noncore subject, and class subject area?
3. Does prevalence of part-day absences differ across students by grade level, family income and race/ethnicity, and do patterns across class periods vary by income and race/ethnicity?

[1] Average daily attendance of 92 percent among secondary students was reported for the 2010-11 school year in the Digest of Education Statistics, Table 203.90 (Snyder & Dillow, 2013), and the average school year is 179 days.

This study is inherently descriptive instead of causal, aiming to identify patterns of absenteeism that are either causes of concern or indicators of possible avenues for improvement. This descriptive study makes two substantive contributions. First, we provide evidence that part-day absenteeism is as prevalent as full-day absenteeism, highlighting the importance for education researchers and school leaders of focusing resources on understanding and addressing part-day absences. Second, by identifying the characteristics of students who are absent and the classes that they miss, our study informs possible efforts to better target approaches to reduce absences. As one example, since students miss the first class of the day more than any other, scheduling planning periods for core-subject teachers during first period could potentially increase attendance in these key classes. Other locations may also want to examine if, as in the district in our study, the influence of first period is stronger among black and Hispanic students than other students, and target efforts to improve attendance to those classes to meet the needs of underrepresented minority students.

Background

Student absenteeism predicts as well as causes a number of key student outcomes. Quasi-experimental research suggests that fewer days of attendance leads to less learning (Goodman, 2014; Hansen, 2011; Marcotte & Hemelt, 2008).[2] Absences can cause lower achievement even among non-absent students since the teacher has a "coordination problem," such that when an absent student returns to school, the teacher likely needs to allocate instructional time to catching the student up on what they missed (Goodman, 2014).

[2] Quasi-experimental evidence better identifies the effects of attendance on achievement than correlations, given the risk of omitted variable bias: i.e., students who are more likely to have low achievement are also less likely to attend.

Less rigorous studies that are vulnerable to omitted variable bias, such as comparing absences across siblings, still make a case for absence as an important indicator of student risk. Students are more likely to participate in risky behaviors such as drug use and crime when they have unexcused absences[3] (Henry, 2007; Henry & Thornberry, 2010; Lochner & Moretti, 2004; Pérez, Ariza, Sánchez-Martínez, & Nebot, 2010; Vaughn, Maynard, Salas-Wright, Perron, & Abdon, 2013). Chronic absenteeism[4] also strongly predicts school dropout net of other important factors such as academic achievement (Allensworth & Easton, 2007; Balfanz & Byrnes, 2012; Balfanz, Herzog, & Mac Iver, 2007; Gottfried, 2011). Although scholars and practitioners agree that absence in secondary school is a problem, the empirical literature on absence is relatively weak and information on part-day absence is particularly lacking.

Prevalence of absence in secondary school

Secondary students are absent on eight percent of school days, according to the national average daily attendance (ADA) rate (Snyder & Dillow, 2013). However, the total amount of absence from secondary school classes is likely higher, since ADA does not fully take part-day absences into account. It is difficult to guess how much higher the total proportion of school time missed might be than the ADA statistic because ADA rules differ widely from state to state, and states generally do not report the amount of part-day absence that is not counted in ADA. In California, where the district in our study is located, a student only needs to show up for a single

[3] Unexcused absences are sometimes also called "truancies." Students are usually marked unexcused absent initially. In order to get their absence excused, students need to take several steps. While procedures vary somewhat across schools, in general students younger than 18 need to bring a note from their parent stating an excused reason for an absence such as illness or a family emergency (those older than 18 can sign the note themselves), ask their teacher to sign the note, and return the note to the school office in order to have an absence designated as excused.

[4] In a recent report, the U.S. Department of Education defines chronic absence as missing 15 or more days of school per year (Office for Civil Rights, 2016), but definitions vary. Many reports use ten percent of school days, while others use 18 or a different number of school days.

class in order to be counted present for ADA (Attendance Works, 2014). To our knowledge, no statistics are available at the national or state level on the prevalence of part-day absence.

While a majority of students have relatively few absences, a substantial number of students are chronically absent, and in recent years there has been growing concern among academics, practitioners, and policy-makers about chronic absenteeism. A recent report from the U.S. Department of Education using daily attendance data finds that 18 percent of high school students are chronically absent from school, which they define as missing 15 or more days of school per year (which is equivalent to 8.3 percent of school days in a school year of 180 days) (Office for Civil Rights, 2016). In some places, rates are even higher. For example, in Oregon the proportion of students absent at least ten percent of the time increases steadily throughout middle and high school grades from 17 percent in 6th grade to 38 percent in 12th grade (Buehler, Taponga, & Chang, 2012). Despite the alarmingly high proportions of students who are chronically absent according to these reports, to the extent that the rates are failing to include part-day absences, total chronic absence rates may be even higher in many places.

Reasons for and predictors of student absence

Some authors have categorized the reasons for absences as "pull" or "push" factors, where pull factors "are located outside the school and pull students away from attending" and push factors "are located within the school and push students out of school" (Youth Justice Board, 2013, p. 7).

Pull factors fit into three broad categories (Balfanz & Byrnes, 2012). The first category is that "students cannot come to school because circumstances or obligations compel them to be somewhere else during the school day" (Balfanz & Byrnes, 2012, p. 20). Unsurprisingly, one reason within this category, poor health, is a strong predictor of absences net of other leading

factors (Romero & Lee, 2008). However, only in six percent of cases nationally does illness or injury cause children to miss more than 11 days of school, meaning that illness alone is not sufficient to explain absences (Balfanz & Byrnes, 2012). Illness is by definition a primary reason for excused absences, but not unexcused absences. Students also miss school during disruptive times of residential or school mobility according to administrative data (De La Torre & Gwynne, 2009; Hanushek, Kain, & Rivkin, 2004). In surveys, low-income adolescents sometimes cite family obligations such as a need to take care of younger siblings (Balfanz & Byrnes, 2012; Youth Justice Board, 2013) or difficulty with transportation to school (Balfanz & Byrnes, 2012) as reasons for absence, though outside employment is rare (Allensworth & Easton, 2007). A second "pull factor" category includes students' perceived need to avoid interactions on their way to or from school, such as walking through a neighborhood where they feel threatened (Balfanz & Byrnes, 2012). The third pull factor category differs from the first two in that the students are able to attend school but choose not to go because they enjoy the pull factors more (Balfanz & Byrnes, 2012). For example, students report on surveys that they "skip school" because they prefer to participate in "fun" activities outside of school, often with friends (Get Schooled & Hart Research Associates, 2012; Youth Justice Board, 2013).

While pull factors may be largely outside of schools' control, push factors, such as disengagement with school or particular classes, could also lead to habitual unexcused absence (Vaughn et al., 2013). Some students report on surveys that poor relationships with school staff and worries about bullying or safety in school make them less likely to attend (Get Schooled & Hart Research Associates, 2012; Youth Justice Board, 2013). Among students who participated in interviews in more than 20 U.S. cities, the number one reason they cited for skipping (endorsed by roughly half) was "school is boring" (Get Schooled & Hart Research Associates,

2012).[5] Push factors, while strong contributors to absenteeism, may be more malleable than pull factors, and more under schools' control.

While some of the factors discussed above would likely affect student attendance in all classes relatively equally, some of them can play a much bigger role in some classes than others. With attendance data at the individual-by-class level, we are able to directly differentiate the role of class characteristics from the role of student characteristics.

Class period. Each type of pull factor may be at play in causing absence from school in the morning. Circumstances such as illness or logistical issues with transportation may delay students' arrival at school. Students may fear for their safety when traveling to school. Students may also feel more averse to going to school first thing in the morning because of feeling tired. Students frequently report on surveys that early school start times make them more likely to be absent (Get Schooled & Hart Research Associates, 2012; Youth Justice Board, 2013), and most medical experts agree that traditional school start times are too early to be appropriate for adolescent sleep cycles (Au et al., 2014).

Many of the same factors might make students more likely to miss classes at the end of the school day. For example, if students fear for their safety traveling home from school they might want to leave before other youth who might threaten them. In addition, students might miss later classes because they have less time to be found out by school administrators than if

[5] The extent to which disengagement with school *causes* unexcused absence has not been established using rigorous causal methods. It is possible that the relationship runs in the opposite direction (absence causes disengagement), and/or that some omitted factor underlies the relationship. One study is suggestive of a causal relationship: emotional and behavioral disengagement with school as reported by boys on a survey in 5th grade predicts higher school misconduct in middle school (where school misconduct is an index that includes frequency of skipping school, cheating on tests, bringing alcohol or drugs to school, and being sent to the principal's office) (Hirschfield & Gasper, 2011). The reverse direction is not as strongly supported: school misconduct predicts decreased cognitive engagement, but does not predict changes in emotional or behavioral engagement (Hirschfield & Gasper, 2011). In addition, lower engagement in 10th grade predicts dropping out of school in 12th grade using a nationally representative sample (Fall & Roberts, 2012), and school dropout tends to correlate highly with habitual absence.

they left earlier in the day, because they have made plans with friends to leave school early together, or because they feel tired of making the effort to pay attention and self-regulate in class by the end of the day.[6]

The one prior published study we know of that uses data on absences from specific classes finds support for the hypothesis that students are substantially more likely to miss their first period class than other classes (Cortes, Bricker, & Rohlfs, 2012)[7]. On average, students in Chicago Public Schools have about 4 to 7 more absences from their first period class than their other classes, or about 2 to 4 percentage points more out of the schooldays each year (the ranges depend on class subject and whether the student is black or non-black). The study also finds that students are more likely to be absent from classes at the end of the day than from classes in the middle of the day (Cortes et al., 2012). Overall, absences are U-shaped from periods 1 to 7, with the highest amount in period 1, the lowest amount in period 3, and then a gradual rise from periods 4 through 7 (Cortes et al., 2012). Our study provides more detailed statistics on absences across class periods while incorporating a rich set of control variables.

Class subjects. A student's decision to attend class could depend in part on how interesting they find that class content as well as on how important they think the class content will be for their future. In one national survey, students report higher engagement (defined by their self-reported levels of interest, enjoyment, and concentration) in art, computer science, vocational, and social studies classes compared to their other classes including science, foreign language, history, and English, all of which were higher than their engagement in math

[6] While we expect a substantial number of students to have unexcused absences from the classes just before or after lunch, we do not have historical records of lunch schedules, though current bell schedules suggest that lunch most commonly occurs after 3rd or 4th period (complicating the picture, in many cases, students are assigned different lunch times within the same school).

[7] The Cortes et al. (2012) study did not aim to describe class absences comprehensively, as does this paper. Instead, that paper used absences from first period as an instrumental variable to examine the effect of absence on achievement.

(Shernoff, Csikszentmihalyi, Shneider, & Shernoff, 2003). Three of the four subjects in which students report the highest engagement (art, computer science, and vocational) are non-core rather than core subjects. On the other hand, students in New York City reported the main reasons they attend class included wanting to get a high school degree, go to college, and get a good job (Yazzie-Mintz, 2010), so conceivably students may be more likely to attend the classes that they see as instrumental to their future education and career goals such as their core academic classes (i.e., math, English language arts, science, social studies, history, and foreign language).

In the sparse available data on absences across different class subjects, Cortes et al. (2012) find that black students in Chicago have more absences in math than in ELA classes by about two days (one percent of days) per year, and more absences in ELA than in science and social studies by about one day per year—findings that are relatively similar to those for engagement across these four subjects reported in Shernoff et al. (2003) in terms of math being at the bottom and social studies at the top. Non-black students show less variation across classes with the only apparent difference across the four subjects being two days fewer absences from science than from the other three subjects. The differences in absences across class periods are therefore much larger and more robust than the differences by subject in the Chicago study.

We delve into differences in attendance by class subject more deeply than the Cortes et al. study. That study does not report on whether differences in attendance across subjects are statistically significant, as we do. We also include student-year fixed effects to account for student selection into particular class subjects. Furthermore, we examine whether attendance is higher in core academic subjects than in non-core subjects.

Student characteristics. Older students tend to have higher rates of absences than

younger students – a trend driven largely by an increase in unexcused absences as students age. For example, rates of total unexcused absence reported in Chicago Public Schools administrative data (where total absence rates sum part-day and full-day absences) increase sharply when students transition to high school (Rosenkranz, De La Torre, Stevens, & Allensworth, 2014). On average, students in 8th grade had 5 excused and 5.5 unexcused days absent during the 2007-08 school year, but in 9th grade the same students had roughly the same amount of excused absences but about four times as many unexcused absences, putting the total 9th grade average absence rate (including both excused and unexcused absences) at about 15 percent (Rosenkranz et al., 2014). Similarly, another report finds higher chronic absence rates as students progress through school grades in various states and districts (Balfanz & Byrnes, 2012). Older students report higher rates of "skipping" full days of school than younger students on a national survey (Vaughn et al., 2013). We extend this analysis by showing not just the changes in total unexcused and excused absences as students progress through the full range of secondary grades 6-12, but also how those trends differ for full-day compared to part-day absences.

We hypothesize that part-day absence rates will vary by students' background characteristics. We generally expect that on average students from historically disadvantaged backgrounds face more pull factors than other students (e.g., poorer health, longer work hours, less safe commutes to school) as well as push factors (schools that are less safe, less qualified teachers). Thus, just as students from historically disadvantaged backgrounds have lower achievement levels than other students, these factors would lead to higher rates of absence as well. We might expect similar gaps between these groups of students for part-day absences as full-day absences, though little theory and empirical evidence exists to address this hypothesis.

Prior empirical literature supports the hypothesis of high levels of absences among more

historically disadvantaged students. Cortes et al. (2012) find that black high school students have higher average yearly absences from a given class (ranging from 25 to 36 per year across periods and subjects) than their non-black peers (19 to 26) in Chicago Public Schools (Cortes et al., 2012)[8]. While 18 percent of high school students are chronically absent nationwide (calculated using average daily attendance), rates are slightly higher among black (22 percent) and Latino students (20 percent), as well as English learners (20 percent) (Office for Civil Rights, 2016). In addition, high school students with disabilities "are 1.3 times as likely to be chronically absent as high school students without disabilities" (Office for Civil Rights, 2016, p. 7).

Lower-income students tend to have more full-day absences than their higher-income peers (Goodman, 2014; Vaughn et al., 2013). For example, in Massachusetts, high school students eligible for free or reduced-price lunch are absent from school for a full day six percent of the time, compared to four percent among their peers. Surprisingly, given higher rates of high school dropout, risky and delinquent behavior, and lower achievement among males compared to females, studies do not generally find differences in attendance by gender (Goodman, 2014; Vaughn et al., 2013).

Our paper goes beyond the prior literature in comparing part-day and full-day absence and chronic absence rates across students from different racial/ethnic backgrounds and different levels of neighborhood income. This analysis allows us to see whether trends in terms of heterogeneity of part-day absences are similar to those for full-day absences. In addition, because disadvantaged students likely face more pull factors than other students, and those pull factors may affect the beginning of the day in particular as we described above, we test a hypothesis that black and Hispanic students, as well as low-income students, will be differentially strongly

[8] These statistics from Cortes et al., 2012 count total absences from a given class whether the student was part-day or full-day absent.

affected by class period.

Synthesis

In summary, the research literature, while lacking data on part-day attendance, provides some insights into the types of students who may be more likely to be absent and the types of classes they may be more likely to miss. In what follows, we examine these differences in detail that goes beyond the previous analyses (Cortes et al., 2012). In particular, our study provides a more complete picture both of the rates of part-day and full-day absences for excused and unexcused reasons, and of how part-day class absences vary across students by racial/ethnic groups and income, the full range of middle and high school grades as well as class periods and subjects.

Data

We utilize a rich dataset for our study from a large urban school district in California. The dataset includes longitudinal administrative records for school years 2007-2008 through 2012-2013, with student attendance records from each class on each school day, information about classes including subject and period of the day, and background information about students and schools. We create student neighborhood and median income of the neighborhood based on the U.S. Census tract where the student lives using student address data. Having longitudinal, student-level data on absences from every class along with numerous background characteristics allows us to quantify the prevalence and predictors of part-day absences in much greater detail across characteristics of the classes and students. It also allows us to incorporate stronger controls for student background characteristics and fixed effects than in past studies in order to better identify the relative importance of different predictors of part-day class absences.

During the years of this study, the district offered students choice of where to attend middle and high school. Thus, some students did not attend their neighborhood school and some had relatively long commutes to school. Such conditions might make it more likely for students to miss first period than in districts without school choice.

During the school years we examine, teachers in this district used a paper scantron to mark a student as absent or present in each class. For an absent student, a clerk in the school office would mark the student as excused absent if they receive a phone call or a note from parents providing reasons for absence. Otherwise the student was identified as unexcused absent for that class.

Table 1 presents descriptive information. The first column describes all students in the district dataset in grades 6 to 12 during school years 2007-2008 through 2012-2013, with 184,089 student-year observations and 61,928 students. The second column describes the analytic sample with 151,512 student-year observations and 51,514 students. The analytic sample includes 82 percent of student-year observations and 83 percent of students who are in the full district sample. We dropped student-class-semester observations if they had missing data on key variables[9] (gender, race/ethnicity, grade, special education status, class period); if they occurred during summer school; if they dropped the class; if they had fewer than ten days which have valid attendance marks (i.e., excused or unexcused absent, present or tardy); [10] or if students at the school were only enrolled in one period per day.

[9] We drop relatively few student-year observations (4,984 out of 184,089, or less than three percent of observations in the dataset) due to missing background variables. When we include these observations in our main analyses (in supplementary analyses not shown in this paper), we find qualitatively similar results to those reported in the paper that exclude them.

[10] Valid attendance mark is defined as present, tardy, excused or unexcused absent. Non-valid attendance marks include alternative schedule and no record of attendance. Overall, 98 percent of all attendance marks are valid.

The students in the analytic sample come from diverse backgrounds, which allows us to compare absences across background characteristics. Specifically, the sample includes 8.1 percent white non-Hispanic students, 9.8 percent black, 21.8 percent Hispanic, and 52.3 percent Asian, as well as 20.0 percent classified as English learners, 10.9 percent in special education, and 32.4 percent gifted. The analytic sample differs somewhat from the full dataset, most notably underrepresenting black students (9.8 percent compared to 12.6 percent in the full district dataset) and over-representing Asian students (52.3 percent compared to 47.1 percent in the full district dataset) as well as gifted students (32.4 percent compared to 30.1 percent in the full district dataset). The students in the analytic sample have slightly higher standardized math achievement scores by 0.01 standard deviations.

In their yearly data on students, the district includes a statistic for the percentage of all the student's classes in the year in which they were marked present or tardy. The rates are not significantly different from each other across the full district data and the analytic sample. However, these district-calculated rates include summer school and do not restrict to classes in which the student had at least ten valid attendance marks. Using the attendance data for our study, with the sample restrictions, the present rate is higher by about 1.1 percentage points (91.6 percent compared to 90.5 percent). On average, students had about 1.7 excused absences and 3.8 unexcused absences per class per semester.[11] Students do not always take every class every day since some schools have alternative or block schedules (a class meeting is only included in the dataset if the student is marked excused or unexcused absent, present, or tardy). After dropping cases in which the student had ten or fewer valid attendance marks, students have 72.8

[11] We calculate number of absences for a given class per semester rather than per year, since students have different classes each semester.

attendance marks per class per semester on average, with a fairly large standard deviation of 14.5 days.

Methodology

RQ 1: How prevalent is part-day class absenteeism compared to full-day absenteeism?

We address the first question by reporting on rates of full-day versus part-day absences. Students are considered full-day absent if they were marked as either excused or unexcused absent in each class that day that had a valid attendance mark, and part-day absent if they were excused or unexcused absent from at least one class but marked present or tardy to another class during the same day. We report overall rates (excused plus unexcused) and rates for unexcused absences only. We also describe part-day class absences (defined as absences from class on a day that a student attended at least one other class) in terms of how they are clustered within school days: what proportion of the class absences are singular (i.e., the only class that students missed during the day); what percentage of classes do students miss on average when they are part-day absent; and what percentage of the time does a class absence follow an absence from the period immediately prior on the same day. Finally, we report the chronic absence rate (i.e., the proportion of students with a higher than ten percent absence rate) when we count only full-day absences compared to counting part-day absences from class as well.

RQ 2: To what extent do characteristics of the class predict part-day class absence, as defined by period, core vs. noncore subject, and class subject?

To examine how characteristics of the class predict part-day class absences, we regress the part-day class absence rate on each of the following class characteristics, entered in separate

regressions: a) class period;[12] b) whether the class is taught in a core subject (i.e., math, English, social studies, science, and foreign language); and c) class subject. For example, to examine the role of class subject, we run the following regression where English Language Arts (ELA) class is the reference group:

$$Absence_{it} = \beta_0 + \beta_1 Math_{it} + \beta_2 Social\ Studies_{it} + \beta_3 Science_{it} + \beta_4 PE_{it} + \beta_5 Foreign\ Language_{it} + \beta_6 Electives_{it} + \mu_{it} + \zeta_{it} + \varepsilon_{it} \quad (1)$$

The dependent variable is the part-day class absence rate for student *i* in semester and year *t*. Each subject has an indicator variable, such as Math, which is equal to 1 for math classes and equal to 0 otherwise. In our preferred specification, we include a period fixed effect μ_{it} as well as a student-by-year fixed effect ζ_{it} so that we compare absences across classes within the same student and year, controlling for period, and thus any associations should not be driven by some omitted variable having to do with student sorting into classes. For example, more motivated students might take more years of foreign language than other students, and students who are struggling might take extra ELA or math courses, so it is best to compare classes within student-years to account for these types of selection effects. We also run models with controls for student background characteristics (gender, race, special education, English Language Learner) as well as the student's number of classes in the semester and number of valid attendance marks in the class, and a school fixed effect rather than student-year fixed effect to account for differences across schools, since schools vary somewhat in terms of class schedules and course offerings and how they assign classes across different types of students.

[12] Only classes in periods 1-7 are included in these regressions examining class period, not period 0 (which is homeroom in 99 percent of cases) or periods greater than 8 (less than 4 percent of classes). Observations are not distributed equally across period, ranging from 9.2 percent of observations in period 7 to 13.9 percent of classes in period 2. Students take classes in periods 2, 3, and 6 at slightly higher rates than period 1 (which may be a home study class in some cases), followed by periods 4 and 5 (which are lunch periods for some students) and are least likely to take class in period 7 since that period is not offered in some schools.

RQ 3: Do prevalence and patterns in part-day class absences differ across different types of students in hypothesized ways?

3.1 Differences in prevalence across grades. We examine how prevalence of part-day class absences varies by grade. We show rates of excused and unexcused part-day and full-day absences, as well as chronic absence (i.e., missing over ten percent of total class meetings in a school year), graphically across grades. In regression analysis, we include a student fixed effect in order to examine how part-day class absences change within students as they progress through grades. We then run the same regressions using the total absence rate (including part- and full-day absences) as the dependent variable.

3.2 Differences in prevalence across race/ethnicity and income. We examine how prevalence of part-day class absence varies by race and income by running regressions similar to those described in previous sections. The income variables are based on the income of the student's neighborhood, defined as their census tract. Since income is measured at the tract level and not the student level, it might not a precise measure of students' resources at home. To mitigate measurement error and ease interpretation, we divide census tracts into four quartiles according to median income in that tract, with "low income" meaning the student lives in a tract in the lowest income quartile and "middle income" meaning the student lives in a neighborhood in the second or third quartile.[13] We run similar models that include race/ethnicity and income simultaneously, as well as year, grade and period fixed effects and controls for the student's number of classes in the semester and number of valid attendance marks in the class. In separate models for each, we include school, neighborhood, and classroom fixed effects to account for

[13] Income varies substantially across low, middle, and high-income quartiles. The median income in the lowest quartile is $41,476. The median income across quartiles 2 and 3 is $74,500. The median income in the highest quartile is $115,574.

student sorting into schools and classes according to their background characteristics. We also examine how chronic absence rates vary across school grades by racial/ethnic group.

3.3 Differential effects of class characteristics across subgroups of students. We examine differential effects of having a class in period 1 compared to other periods on black and Hispanic students compared to other students, and on low- and middle-income compared to higher-income students. We run similar regressions to those shown above and add interaction terms to identify differential effects. We add subject, grade, and year fixed effects. Additional models control for other student characteristics (neighborhood median income, gender, special education, English Language Learner) as well as the student's total number of valid attendance marks and the student's number of classes in the semester; a third model adds school fixed effects.

Results

RQ 1: How prevalent is part-day class absenteeism compared to full-day absenteeism?

On a given day, part-day absence is much more prevalent than full-day absence. A much larger proportion of students have zero or near-zero full-day absences than part-day absences, as shown in Figure 1. On average, students are part-day absent (i.e., they have at least one class absence but are in attendance at some point during the day) 12.2 percent of their school days, which is 3 times as common as full-day absenteeism (4.2 percent), as shown in Table 2. The median rate of part-day absence (6.7 percent) is about 4 times higher than the median rate of full-day absences (1.7 percent). We further differentiate those absences by unexcused or excused reasons. Specifically, if the student was marked unexcused absent in every class on a given day, then we count that day as an unexcused full-day absence. Similarly, if the student missed only part of the day and all class absences during that day were unexcused, that is an unexcused part-

day absence. Slightly more than half (55 percent) of full-day absences are unexcused. However, 92 percent of part-day absences are unexcused rather than excused. In sum, Table 2 shows that when students are absent from middle or high school on a given day, they are most often accruing unexcused absences from some but not all of their classes. Mean rates of full-day and part-day absences are higher than median rates because the distribution is right-skewed, but the median rates of part-day absences are still sizeable.

Table 3 provides details on absences from classes. In total, students are absent from a given class 7.9 percent of the time on average (counting absences on days they are part-day and full-day absent), with a median rate of 3.3 percent. Students are absent from class on part days 4.1 percent of the time[14], meaning *that over half (52 percent) of all absences from class are on part days rather than full days*. Class absences on part days are unexcused rather than excused 88.6 percent of the time. Slightly more than a third (36.9 percent) of part-day absences are on days that students miss only that single class during the day and attend all their other classes. Nearly all (96.7 percent) of those single class absences are unexcused. When students are part-day absent, they miss about a quarter of their classes that day on average (24.6 percent), which would be about two classes for the typical class schedule. The classes missed on the same day are often contiguous periods: when a student has a class absence in period 2 or later in a given day, a majority of the time (63.2 percent) they also missed the prior class that day.

In keeping with these average trends, we examine how the chronic absence rate changes when we factor in part-day absence. A student is chronically absent if they miss more than ten percent of their total class meetings in a year across all their classes. If we only consider class absences on days the student is full-day absent, the average chronic absence rate is 9.2 percent

[14] If we add up all the fractions of days on which students have part-day absences from class, these part-day absences are equivalent to about 5 full days of school missed per year on average.

over all grades and years. After incorporating part-day absence, this rate jumps to 23.6 percent, more than doubling the previous number.[15]

RQ 2: To what extent do characteristics of the class predict part-day class absence, as defined by period, core vs. noncore, and class subject?

Students have part-day class absences from their first-period classes more often than classes in periods 2-7 and across the day the trend is U-shaped, as shown in Figure 2. Table 4 examines differences between periods in more detail. Students have a roughly 5 percent absence rate to period 1 and are second-most absent from their 7th period class with a rate of about 4.7 percent. Rates are about 1 to 2 percentage points lower for periods 2-6 compared to the beginning and end of the day, with the lowest rate of absences in period 3 at about 3.1 percent. The differences between periods remain qualitatively similar with the addition of various controls and fixed effects in models 2-4.[16]

Unlike these relatively large differences across class periods, there are smaller differences across classes in core academic subjects compared to those not covering core subjects. As shown in Table 5, students are only slightly less likely to have an unexcused class absence from a core class (math, ELA, science, social studies, and foreign language) than a non-core class (P.E. and elective). Model 3, which includes a student-year fixed effect to account for student selection

[15] The Department of Education recently used 15 days of school absences per year or more as their definition of chronic absence (Office for Civil Rights, 2016). When we use this definition, we find a chronic absence rate of 10.8 percent when only counting absences on days the student was full-day absent. The rate more than doubles to 22.9 percent when we include absences from class on part-days as well. Thus, our findings are quite similar under this alternative definition of chronic absence.

[16] For ease of comparison, these period analyses only include schools in which students take 6 to 8 periods per day (83 percent of all observations in this dataset). In auxiliary analyses that include all observations, available on request, we examine absence patterns depending on whether the class is the student's own first through nth period of the day, and find qualitatively similar patterns to those shown here.

into courses, finds that absences from non-core classes are only 0.36 percentage points higher than core classes.

Similarly, differences in attendance across specific class subjects are small (Table 6). Within each student-year in Model 3, controlling for period, students are more likely to be absent from their P.E. class than any other class (0.78 percentage points more than to their ELA class), followed by their foreign language class (0.61 percentage points more than to their ELA class), their math class and elective class (0.32 and 0.31 percentage points more than to their ELA class, not significantly different from each other), their science class (0.25 percentage points more than to their ELA class), and are least likely to be absent from their social studies class (0.18 percentage points less than to their ELA class).

RQ 3: Do prevalence and patterns in part-day class absences differ across different types of students in hypothesized ways?

The rate of unexcused part-day class absences is higher in high school than middle school, and highest in 12th grade (about 6 percent), with a sharp increase between 8th and 9th grades (Figure 3). Overall, in high school, unexcused part-day class absences are far more common than excused part-day class absences, and both excused and unexcused absences on full-days. Unexcused class absences on part-days show a slight decline in 11th grade relative to 10th grade across students, since many students with high rates of absence drop out or leave the district schools during those grades.[17] Unexcused absences on full-days also increase quite dramatically between 8th and 9th grades, but then decline in 10th and 11th grades relative to 9th

[17] The overall dropout rate by grade 12 of 9th grade students in the sample is 15.4 percent, and the correlation between 9th grade unexcused class absence rate and dropout is relatively high at 0.43. However, when limiting just to students who persisted to 12th grade in the 2013 senior cohort in order to compare the same sample of students across grades 7-12 and thus account for any influence of high school dropout, trends are relatively similar to the trends across all students (Appendix Figure 1).

grade and level out between 11th and 12th grades. On the other hand, excused part-day class absences are extremely rare across all grades. Excused absences on full-days stay relatively steady across grades, with a slight decline between 8th and 9th grades.

Examining the changes in part-day class absences across grades more closely in Table 7, rates increase from 1.9 percent in 6th grade to 6.1 percent in 12th grade, with the largest magnitude increase between grades 8 and 9 (about 1.4 percentage points within students on average, a relative increase from grade 8 to 9 of 58 percent) and another large increase between grades 11 and 12 of about 1.2 percentage points within a given student. Within students, absences increase with each additional grade.

Columns (3) and (4) present results using total class absences on both part-days and full-days. The overall trend is quite similar to those only using part-day class absences, with or without student fixed effects. When we compare the results of all the columns, it is clear that part-day class absence is a major driving force behind the increase of total absences, and its importance seems to grow when students progress through grades. For example, the increase of total absences from 8th to 9th grade is about 3.4 percentage points (2.6 percentage points within student), where the growth of part-day absences accounts for 50 percent (56 percent within student). In contrast, part-day absences contribute nearly 69 percent of the total increase in the transition from 11th to 12th grade (57 percent within student).

Figure 4 shows how chronic absences, considering both full- and part-day absences, increase by grade among each racial/ethnic group, to reach a rate of 47.7 percent in 12th grade across all students. Black and Hispanic students have a much larger share of chronically absent students than other racial and ethnic groups, and also experience a more dramatic increase when

they enter high school. In 12th grade, 69.9 percent of black students are chronically absent, compared to only 23.4 percent of Asian students.[18]

Unsurprisingly, given these striking findings for chronic absence rates, we also find substantial differences in part-day class absence rates by students' race/ethnicity, as shown in Table 8. We find that black students are absent from class significantly and substantially more than students of any other race in the district, unconditionally (Model 1) and even with fixed effects for school and controls for neighborhood income quartile (Model 4), neighborhood fixed effects (Model 5) or classroom fixed effects and controlling for neighborhood income quartile (Model 6). In the unconditional model 1, Asian students have the lowest part-day class absence rate (2.6 percent), while black students have part-day class absence rates 5.7 percentage points higher than Asian students, following by Hispanic students (3.5 percentage points higher) and white students (1.3 percentage points higher).

Table 8 also shows that low-income students have more absences than other students, though differences are smaller than those defined by race/ethnicity, particularly when we include controls for race/ethnicity, school fixed effects (Model 4) and classroom fixed effects (Model 6). In the unconditional Model 2, students from the lowest neighborhood income quartile have part-day class absence rates 1.96 percentage points higher than those from the highest income quartile neighborhoods, while students from the middle income quartiles have rates 0.18 percentage points higher than those from the highest income quartile neighborhoods.

[18] We also change the definition of chronic absence to missing over ten percent of total school days, as shown in appendix figure 2. Consistent with figure 4, black and Hispanic students still have much larger portion of chronically absent students, but overall the rates are much smaller. In addition, chronic absence rates for black and Hispanic students gradually drop after 9th grade, with a small increase in 12th grade, which is very different from what we find in Figure 4. This finding further confirms the importance of considering part-day class absences.

Black and Hispanic students are differentially more strongly affected by period 1 than are their peers (Table 9). Black and Hispanic students are about 1.3 percentage points more likely to be absent from period 1 than their peers, controlling for the main effects of period 1 and race/ethnicity. Similarly, lower-income students are more affected by period 1 than higher-income students (Table 10). Those living in neighborhoods with the lowest-quartile median income were more likely to be absent from period 1 than those from the highest quartile by about 1.1 percentage points in each model, while middle quartiles were more likely to be absent from period 1 than the highest quartile by about 0.42 to 0.46 percentage points, again controlling for main effects of period 1 and race/ethnicity.

Discussion

We find that part-day absenteeism in secondary school is extremely prevalent and, in fact, explains more classes missed by students than does full-day absenteeism. The vast majority of these part-day absences are unexcused and they increase with each middle school grade, and then increase dramatically at the transition to high school, particularly among underrepresented minority students. Class period plays an important role in absences. The absence rate by period is U-shaped, with the greatest percentage of absences from first period, followed by seventh period, and lower rates of absence from classes in the middle of the day by up to 2 percentage points.

These part-day absences likely have negative consequences for students. As one indication, Cortes et al. (2012) find that having a class first period reduces students' grades by

more than a tenth of a standard deviation and significantly reduces test performance in math for black students by about .021 to .038 standard deviations.[19]

In qualitative interviews, several school and district staff members offered a variety of hypotheses for why students are missing first period more than other periods. Echoing some of the "pull factors" in the literature review, they mentioned that taking care of younger siblings, difficulties with transportation to school or feeling unsafe traveling to school play an important role in driving high rates of absence from first period, particularly for more disadvantaged students. Staff members also said that students from all backgrounds often stay up late at night using technology, causing them to oversleep the next morning and miss first period. For example, one staff member said that "a lot of students stay up late on their phones…they don't go to bed until around 1 or 2 am" while another said that "kids are more addicted to technology than alcohol and cigarettes combined… they're up all night, their parents tell me that."

To our knowledge, this is the first study to quantify differences in attendance across subjects,[20] including student-year fixed effects to account for student selection into subjects. We find only small differences across subjects. Students have higher rates of absence from math classes than other core subjects, with the exception of foreign language, and have the lowest rates of absence from social studies. However, these cross-subject differences are small relative to differences across time of day and across student characteristics. Moreover, despite Shernoff et al. (2003) study's reports that students report higher engagement in elective subjects (art, computer science, vocational) than most core academic subjects, we find that students are

[19] The effects of first period on grades and achievement likely operate not just through absences but also through grogginess for students who do show up during first period (Cortes et al., 2012).
[20] Cortes et al. (2012) include a simple line graph showing how absence rates by subject area vary by class period for black students and non-black students in Chicago, but they do not report descriptive statistics or run analyses using student fixed-effects, as we do.

slightly more likely to attend their core subject than non-core subject classes. Future research and practice might determine whether differences in student interest, enjoyment, and expected future value are driving the differences in attendance across class subjects, and if so, how to improve engagement in lower-attendance subjects such as math. Overall, though, differences by subject are small, meaning that districts may need to address attendance improvement efforts to all subjects rather than particular subjects.

These results suggest directions for future research. Policy-makers and practitioners could benefit from knowledge about why absence rates are particularly high among black and Hispanic students in order to reduce differentially high rates of part-day absences among these types of students. Future research might also examine how part-day and total absences vary by other student characteristics. For example, while not a focus of our study, we find that chronic absence rates (missing over ten percent of all classes in a year) are shockingly high at 46 percent among students with special education status, compared to 24 percent who are not designated for special education. We also find higher chronic absence rates among English learner students (29 percent) than non-English learners (23 percent).

Rigorous research is needed on the effectiveness of interventions to reduce absences (Sutphen, Ford, & Flaherty, 2010). Staff members we interviewed suggested other methods of increasing student attendance such as making teaching more engaging and employing more school and district staff dedicated to supporting student attendance. In addition, our findings suggest a need for policies and practices that reduce absences at the beginning and end of the day, and that target students at the transition to high school. While much future research is needed to help address absences in secondary schools, this paper contributes to these efforts by taking the initial steps of describing the prevalence and predictors of part-day absences.

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Tables

Table 1. Descriptive data from full district dataset compared to final analytic sample

	Full district dataset	Analytic Sample			
	Mean	Mean	SD	Min	Max
Percentage of students with each background characteristic:					
Female	48.0	48.6 [a]			
White	9.2	8.1 [a]			
Black	12.6	9.8 [a]			
Hispanic	23.2	21.8 [a]			
Asian	47.1	52.3 [a]			
Special Education	11.4	10.9 [a]			
Gifted	30.1	32.4 [a]			
English Language Learner	18.7	20.0 [a]			
Standardized Math Achievement Score	0.00	0.01 [a]	1.00	-4.29	3.87
Standardized English Achievement Score	0.00	0.00	1.00	-5.89	4.35
Percentage of Classes in Which Student is Present per Year, District Created Variable[1]	90.6	90.5	13.81		
Percentage of Classes in Which Student is Present, Summer Classes Excluded[2]	N/A	91.6	12.49		
Number of Excused Absences from Class per Semester	N/A	1.7	2.82	0	89
Number of Unexcused Absences from Class per Semester	N/A	3.8	6.63	0	89
Number of Total Attendance Records per Class per Semester	N/A	72.8	14.53	11	99
Number of Student-Year Observations	184,089	151,512			
Number of Students	61,928	51,514			

Note: Full district dataset refers to all student-year observations in grades 6-12 in years 2007-08 to 2012-13 present in the district's administrative dataset. Analytic sample refers to the observations used in analysis in this paper.

[a] Analytic sample statistic differs significantly from full district data statistic at $p<.05$ level.

[1] District provides this calculation of percentage of the time the student is present across all of the student's classes in fall and spring plus summer terms. We do not use these district-provided rates in our main analyses, but are provide them here for comparison. They are calculated as the number of times a student was marked present or tardy divided by total present, tardy, excused or unexcused attendance marks across all the student's classes that year.

[2] Author's calculations based on attendance data at the student-class-day level. Includes only fall and spring terms—i.e., excludes summer term.

Table 2. Rates of full day and part day absences, and percentage of those absences that are unexcused rather than excused

	Mean	Median	SD
Full day rate: Percentage of days students are full-day absent	4.2	1.7	8.6
Percentage of full-day absences that are unexcused	54.8	0.0	7.4
Part day rate: Percent of days students are part-day absent	12.2	6.7	14.1
Percentage of part-day absences that are unexcused	91.8	85.1	13.8
Student-Year Observations	151,512		

Note: Students in grades 6-12. Years 2007-08 to 2012-13.

Table 3. Rates and description of class absences

	Mean	Median	SD
Total class absence rate: Percentage of classes from which a student is absent	7.9	3.3	13.0
Part-day class absence rate: Percentage of classes from which a student is absent, on days that student was part-day absent	4.1	1.4	7.7
Descriptive analysis of absences on part-days			
Percentage of part-day class absences that are unexcused rather than excused	88.6		
Percentage of the time a student is absent from only one class, on days they are part-day absent	36.9		
Percentage of these single class absences that are unexcused rather than excused	96.7		
Percentage of the student's scheduled classes from which they are absent, on days they are part-day absent	24.6		
Percentage of the time when student miss both the current and prior classes, on days they are part-day absent[1]	63.2		
Student-year-semester-class observations	2,019,568		

Note: Total absence rate includes any absences from class, whether they occurred on a day the student was part-day or full-day absent. Students in grades 6-12. Years 2007-08 to 2012-13.

[1] Among classes for which it is possible to miss the prior class that day – i.e., excluding the first class of the day.

Table 4. Differences in class absence rate by class period (reference category is Period 1)

	(1)		(2)		(3)		(4)	
Period 2	-1.359***	f	-1.489***	c	-1.454***	c	-1.379***	d
	(0.020)		(0.020)		(0.014)		(0.019)	
Period 3	-1.878***	g	-2.025***	e	-2.023***	f	-1.945***	g
	(0.020)		(0.020)		(0.014)		(0.019)	
Period 4	-1.284***	e	-1.901***	d	-1.936***	e	-1.859***	f
	(0.022)		(0.021)		(0.015)		(0.020)	
Period 5	-1.159***	d	-1.512***	c	-1.560***	d	-1.472***	e
	(0.021)		(0.021)		(0.015)		(0.020)	
Period 6	-1.001***	c	-1.113***	b	-1.118***	b	-1.025***	c
	(0.021)		(0.020)		(0.014)		(0.019)	
Period 7	-0.236***	b	0.002	a	-0.001	a	0.122***	b
	(0.023)		(0.022)		(0.016)		(0.021)	
Constant	4.962***	a	3.548***	a	4.895***	a	6.825***	a
	(0.015)		(0.027)		(0.013)		(0.112)	
Control for student characteristics?							x	
Student-year fixed effect?					x			
School fixed effect?							x	
Subject fixed effect?			x		x		x	
Year and grade fixed effects?			x				x	
F-test of joint significance	1918.47***		2594.79***		5021.29***		3336.45***	
Observations	1,673,067		1,673,067		1,673,067		1,673,067	
Adjusted R-squared	0.007		0.057		0.528		0.160	

*** p<.001, ** p<.01, *p<.05, ~p<.10

Superscripts denote significant differences (at the p<.05 level) between the amount of class absences from each period, where a > b > c > d > e > f > g.

F-test of joint significance examines whether all of the period variables are jointly significantly different from zero.

Note: All models include only classes taught during periods 1-7 and schools that have 6-8 periods per day. Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

Model 2 includes subject, grade and year fixed effects.

Model 3 includes subject and student-year fixed effects.

Model 4 includes controls for individual characteristics (gender, race, special education, English Language Learner), the student's total number of valid attendance marks and the student's number of classes in the semester, whether the student takes homeroom, as well as grade, subject, school and year fixed effects.

Table 5. Differences in class absence rate by core subject versus non-core subject (reference category is non-core subject)

	(1)	(2)	(3)	(4)
Core subject	-0.669***	-0.602***	-0.360***	-0.400***
	(0.011)	(0.013)	(0.010)	(0.012)
Constant	4.533***	3.053***	4.981***	4.092***
	(0.009)	(0.024)	(0.012)	(0.087)
Control for student characteristics?				x
Student-year fixed effect?			x	
School fixed effect?				x
Period fixed effect?		x	x	x
Year and grade fixed effects?		x		x
Observations	2,010,256	2,010,256	2,010,256	2,010,256
Adjusted R-squared	0.002	0.047	0.488	0.099

*** p<.001, ** p<.01, *p<.05, ~p<.10
Core classes are ELA, math, social studies, science, foreign language, and ESL classes. Non-core classes include PE and electives: special education classes are excluded.
Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.
Model 2 includes grade, year and period fixed effects.
Model 3 includes period and student-year fixed effects.
Model 4 includes controls for individual characteristics (gender, race, special education, English Language Learner), the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade, period, year, and school fixed effects.

Table 6. Differences in part-day class absence rate by class subject (reference category is English Language Arts)

	(1)		(2)		(3)		(4)	
Math	0.049*	c	0.151***	c	0.319***	c	0.244***	b
	(0.021)		(0.020)		(0.015)		(0.019)	
Science	-0.058**	e	-0.015	d	0.246***	d	0.133***	c
	(0.021)		(0.020)		(0.015)		(0.019)	
Social Studies	-0.262***	f	-0.211***	e	-0.178***	f	-0.109***	f
	(0.021)		(0.021)		(0.015)		(0.020)	
Foreign language	0.176***	b	-0.512***	f	0.607***	b	0.126***	c
	(0.028)		(0.027)		(0.021)		(0.026)	
PE	0.192***	b	0.676***	a	0.781***	a	0.784***	a
	(0.022)		(0.022)		(0.016)		(0.021)	
Elective / other	0.746***	a	0.475***	b	0.307***	c	-0.041~	d
	(0.018)		(0.020)		(0.015)		(0.024)	
Constant	0.049*	d	0.151***	d	0.319***	e	0.244***	e
	(0.021)		(0.020)		(0.015)		(0.019)	
Control for student characteristics?							x	
Student-year fixed effect?					x			
School fixed effect?							x	
Period fixed effect?			x		x		x	
Year and grade fixed effects?			x				x	
F-test of joint significance	701.35***		514.50***		717.13***		361.11***	
Observations	1,944,883		1,944,883		1,944,883		1,944,883	
Adjusted R-squared	0.002		0.048		0.489		0.153	

*** p<.001, ** p<.01, *p<.05, ~p<.10

Superscripts denote significant differences (at the p<.05 level) between the amount of part-day class absence from each subject, where a > b > c > d > e > f > g.

F-test of joint significance examines whether all of the subject variables are jointly significantly different from zero.

Note: Excludes classes designated for special education or English Language Learners.

Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

Model 2 includes grade, year and period fixed effects.

Model 3 includes period and student-year fixed effects.

Model 4 includes controls for individual characteristics (gender, race, special education, English Language Learner), the student's total number of valid attendance marks and the student's number of classes in the semester, whether the student has 1, 2, or more than 2 classes in the subject that semester, plus grade, period, year, and school fixed effects.

Table 7. Class absence rates by Grade level (reference category = Grade 6)

	(1)		(2)		(3)		(4)	
			Class absence on part-days				Class absence on both full- and part-days	
Grade 7	0.625***	f	0.527***	f	0.725***	e	0.495***	f
	(0.021)		(0.018)		(0.036)		(0.025)	
Grade 8	1.049***	e	0.812***	e	1.371***	d	0.826***	e
	(0.021)		(0.019)		(0.036)		(0.026)	
Grade 9	2.752***	d	2.251***	d	4.780***	b	3.400***	d
	(0.020)		(0.020)		(0.034)		(0.028)	
Grade 10	3.165***	b	3.092***	c	4.823***	b	4.770***	c
	(0.020)		(0.021)		(0.034)		(0.029)	
Grade 11	3.048***	c	3.645***	b	4.160***	c	5.832***	b
	(0.020)		(0.023)		(0.035)		(0.031)	
Grade 12	4.157***	a	4.886***	a	5.777***	a	8.007***	a
	(0.021)		(0.024)		(0.035)		(0.033)	
Constant	1.902***	g	1.848***	g	4.640***	f	4.411***	g
	(0.015)		(0.016)		(0.026)		(0.022)	
Student fixed effects			x				x	
F-test of joint significance	11357.06****		8773.71***		8936.02***		13907.97***	
Observations	2019568		2019568		2019568		2019568	
Adjusted R-squared	0.033		0.387		0.026		0.610	

*** p<.001, ** p<.01, *p<.05, ~p<.10. Superscripts denote significant differences (at the p<.05 level) between the amount of unexcused class absence from each grade, where a > b > c > d > e > f > g. F-test of joint significance examines whether all of the grade variables are jointly significantly different from zero. Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

Table 8. Differences in class absence rate by race/ethnicity, income and unexcused class absence rate

	(1)		(2)		(3)		(4)		(5)		(6)	
White	1.286***	d			1.717***	d	1.867***	d	1.716***	d	1.687***	c
	(0.020)				(0.021)		(0.021)		(0.022)		(0.021)	
Black	5.745***	a			5.360***	a	5.045***	a	4.727***	a	4.278***	a
	(0.019)				(0.021)		(0.021)		(0.024)		(0.021)	
Hispanic	3.476***	b			3.463***	b	3.366***	b	3.132***	b	2.878***	b
	(0.013)				(0.014)		(0.016)		(0.016)		(0.015)	
Other race/ethnicity	2.271***	c			2.028***	c	1.942***	c	1.793***	c	1.683***	c
	(0.020)				(0.021)		(0.021)		(0.021)		(0.020)	
Lowest neighborhood income quartile			1.955***	a	1.054***	e	0.795***	e			0.635***	d
			(0.021)		(0.021)		(0.021)				(0.020)	
Middle neighborhood income quartiles			0.179***	b	0.267***	f	0.181***	f			0.118***	e
			(0.019)		(0.019)		(0.019)				(0.018)	
Constant	2.556***	e	3.437***	c	3.193***	g	2.500***	g	3.774***	e	4.847***	f
	(0.007)		(0.018)		(0.069)		(0.098)		(0.067)		(0.286)	
School fixed effect?							x					
Neighborhood fixed effect?									x			
Classroom fixed effect?											x	
Year, grade, and period fixed effects?					x		x		x		x	
F-test of joint significance	34210.12***		9331.86***		19598.84***		15423.83***		15042.54***		11059.70***	
Observations	2,019,568		1,679,141		1,679,141		1,679,141		1,679,141		1,679,141	
Adjusted R-squared	0.063		0.011		0.125		0.146		0.134		0.284	

*** p<.001, ** p<.01, *p<.05, ~p<.10

Superscripts denote significant differences (at the p<.05 level) between the amount of class absence from each racial/ethnic or income group, where a > b > c > d > e > f > g.

Note: For race/ethnicity, Asian students are the reference group. For neighborhood median income quartile, the highest quartile is the reference group.

Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

F-test of joint significance examines whether all of the race and income variables in a given model are jointly significantly different from zero.

Models 2-6 have fewer observations than Model 1 because of missing census tract information.

Model 4 includes controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade, period, year, and school fixed effects.

Model 5 includes controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade, period, year, and neighborhood (census tract) fixed effects.

Model 6 includes controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade and classroom fixed effects.

Table 9. Differences in the relationship between class absence rate and Period 1 by whether student is black or Hispanic

	(1)	(2)	(3)
Black or Hispanic	3.530***	3.105***	2.948***
	(0.012)	(0.014)	(0.014)
Period 1	0.992***	0.972***	0.894***
	(0.019)	(0.020)	(0.020)
Period 1 * Black or Hispanic	1.322***	1.327***	1.333***
	(0.033)	(0.036)	(0.036)
Constant	2.853***	3.837***	3.048***
	(0.061)	(0.070)	(0.099)
Controls for student characteristics?		x	x
School fixed effect?			x
Year, subject & grade fixed effects?	x	x	x
Observations	2,019,568	1,679,141	1,679,141
Adjusted R-Squared	0.107	0.117	0.137

*** p<.001, ** p<.01, *p<.05, ~p<.10

Note: Includes only classes taught during periods 1-7.

Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

Model 2 includes controls for neighborhood median income, individual characteristics (gender, special education, English Language Learner) controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade and year fixed effects.

Model 3 includes controls for neighborhood median income, individual characteristics (gender, special education, English Language Learner) controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade, year, and school fixed effects.

Table 10. Differences in the relationship between class absence rate and Period 1 by neighborhood income

	(1)	(2)	(3)
Lowest income quartile	1.454***	0.713***	0.502***
	(0.022)	(0.022)	(0.023)
Middle income quartiles	0.108***	0.153***	0.074***
	(0.02)	(0.02)	(0.02)
Period 1	0.898***	0.902***	0.840***
	(0.049)	(0.048)	(0.047)
Period 1 * Lowest quartile	1.138***	1.107***	1.142***
	(0.058)	(0.057)	(0.056)
Period 1 * Middle quartiles	0.440***	0.421***	0.463***
	(0.053)	(0.052)	(0.051)
Constant	3.401***	4.984***	4.435***
	(0.071)	(0.071)	(0.099)
Controls for student characteristics?		x	x
School fixed effect?			x
Year and grade fixed effects?	x	x	x
F-test of joint significance	195.29***	188.72***	192.74***
Observations	1,679,141	1,679,141	1,679,141
Adjusted R-Squared	0.070	0.128	0.146

*** p<.001, ** p<.01, *p<.05, ~p<.10

Note: Includes only classes taught during periods 1-7.

Dependent variable is percentage of class meetings on which student was marked absent, on days that student was marked tardy or present in at least one other class.

Income categories based on quartiles of census tract where student lives. Highest quartile is the reference group.

F-test of joint significance examines whether both the interaction terms (period 1 * lowest quartile and period1 * middle quartiles) are jointly significantly different from zero.

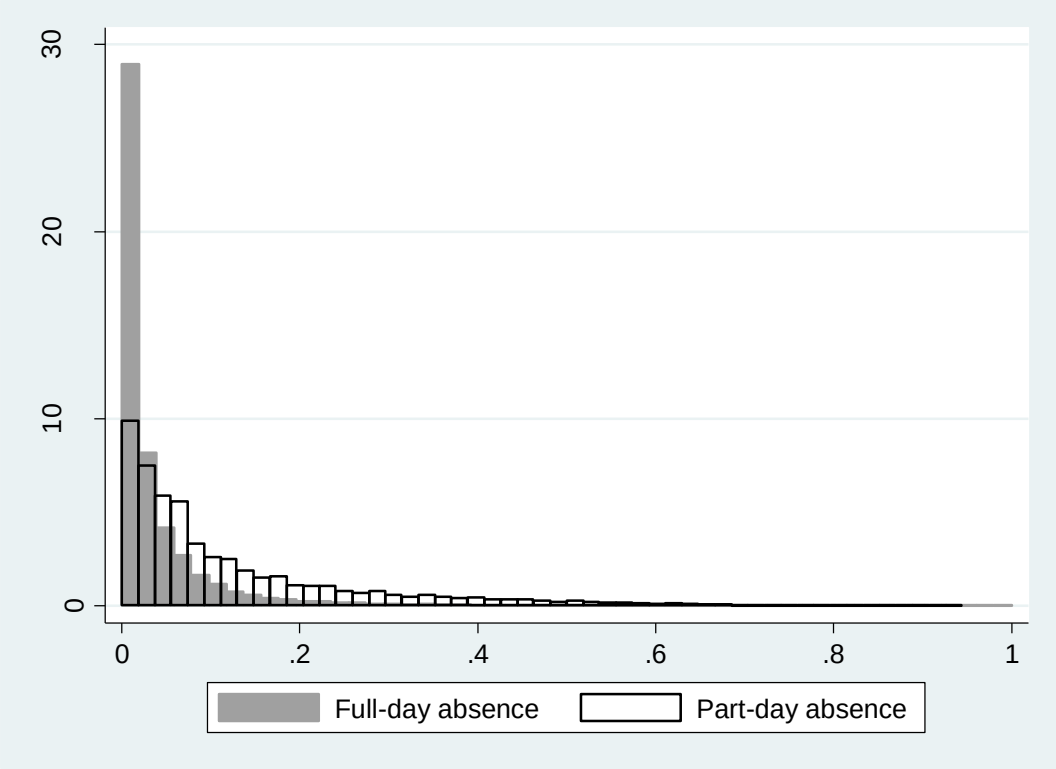
Model 1 includes controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus year and grade fixed effects.

Model 2 includes controls for individual characteristics (gender, race/ethnicity, special education, English Language Learner), controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus year and grade fixed effects.

Model 3 includes controls for individual characteristics (gender, race/ethnicity, special education, English Language Learner), controls for the student's total number of valid attendance marks and the student's number of classes in the semester, plus grade, year, and school fixed effects.

Figures

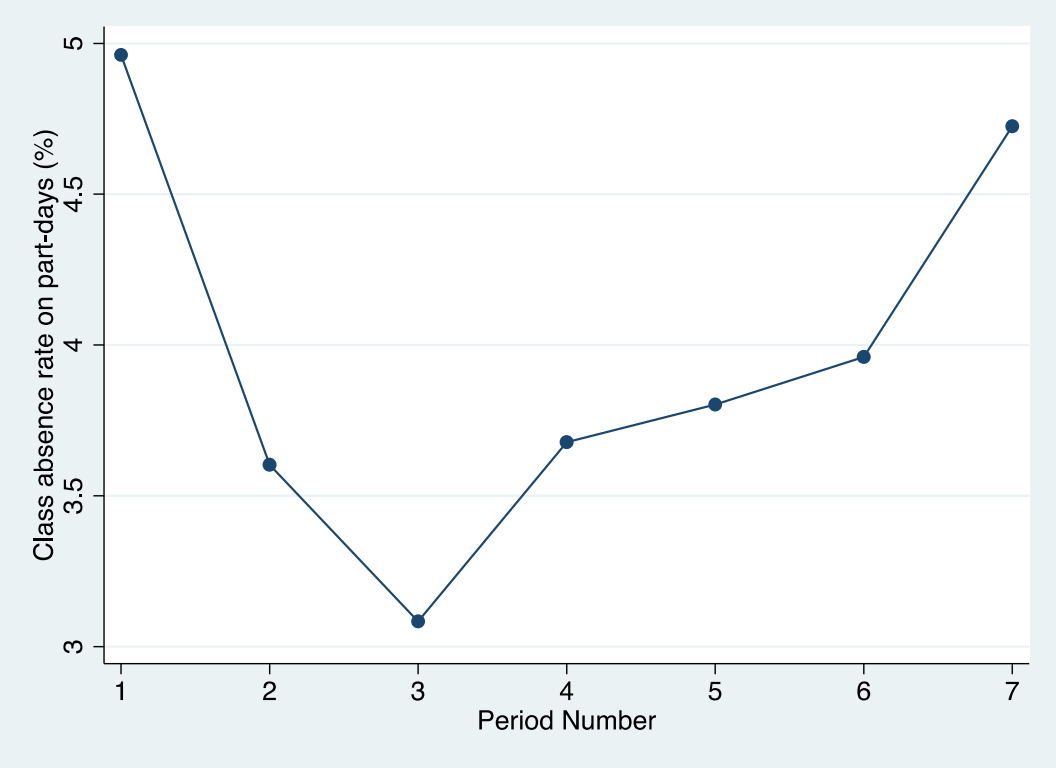
Figures 1: Distributions of full- and part-day absence rates



Note: Density means the percentage of observations at that rate, out of 151,512 student-year observations from grades 6-12, years 2007-08 to 2012-13. Full day absence rate = number of days that year on which student was marked excused or unexcused absent in every class, divided by number of days of school that year for the student (meaning days on which student received an absent, present, or tardy mark in at least one class). Part day absence rate = number of days that year on which student was marked excused or unexcused absent in at least one class but not all classes, divided by number of days of

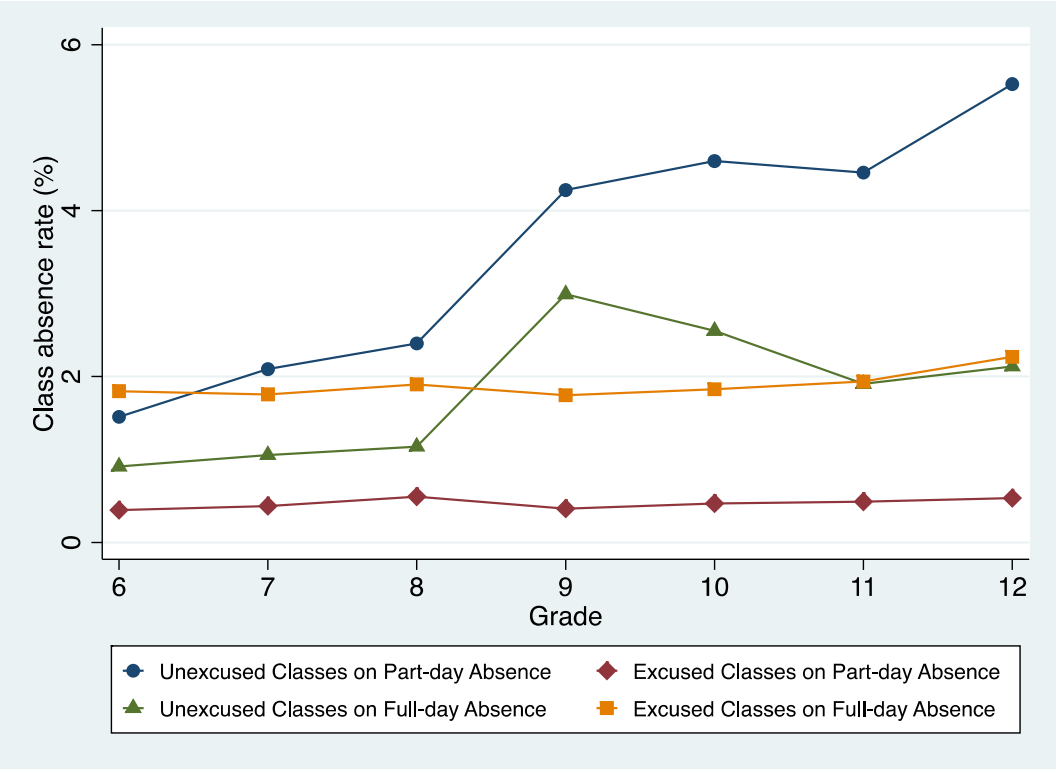
school that year for the student.

Figure 2: Class absence rate by period



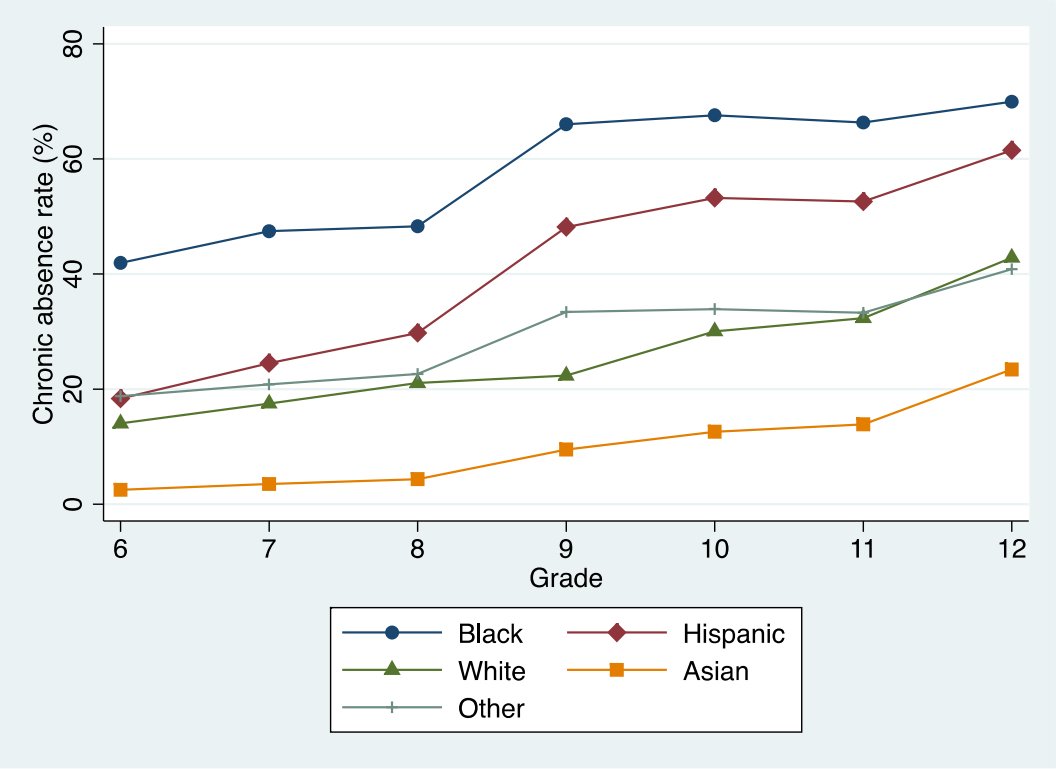
Note: Includes only students in schools that have 6-8 total periods per day. Rates represent the percentage of class meetings on which student was marked absent that period, on days that student was marked tardy or present in at least one other class (i.e., part-days).

Figure 3: Mean absence rates by grade



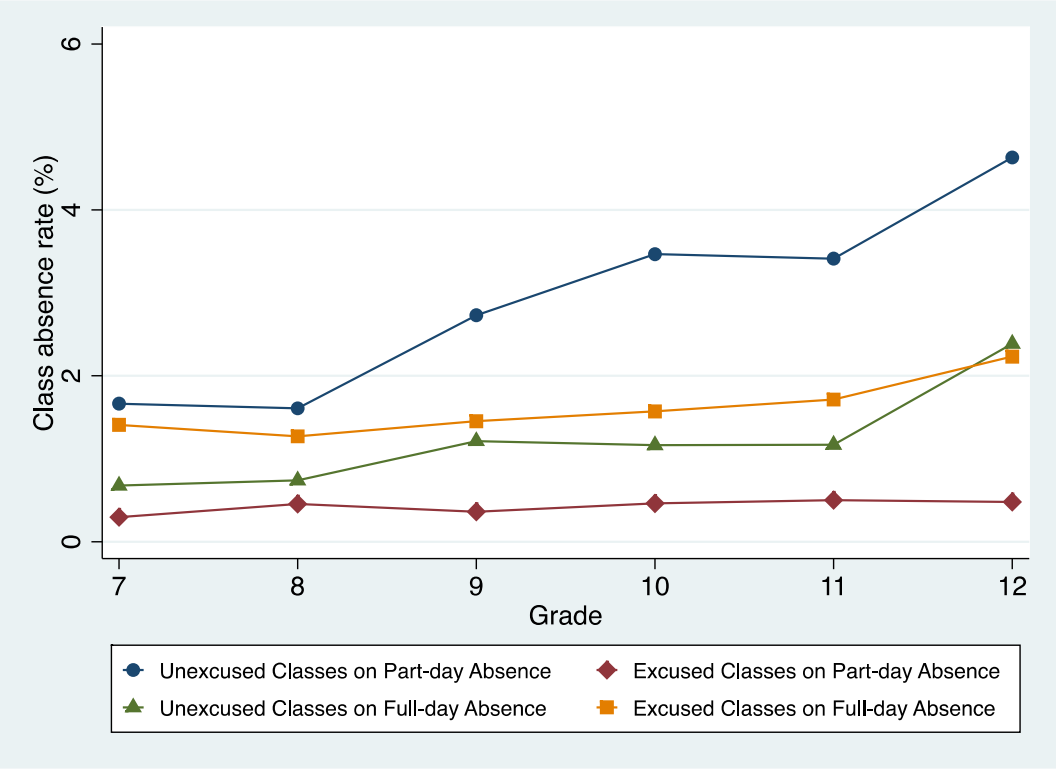
Note: Years 2007-08 to 2012-13. Rates average across all student-year-semester-class observations in a given grade. Unexcused or excused classes on part-day absence is defined as percentage of unexcused or excused absences from a class on those days when students are part-day absent. Unexcused or excused classes on full-day absence is defined as percentage of unexcused or excused absences from a class on those days when students are full-day absent.

Figure 4: Chronic absence by grade and race/ethnicity: absence rate > 10%



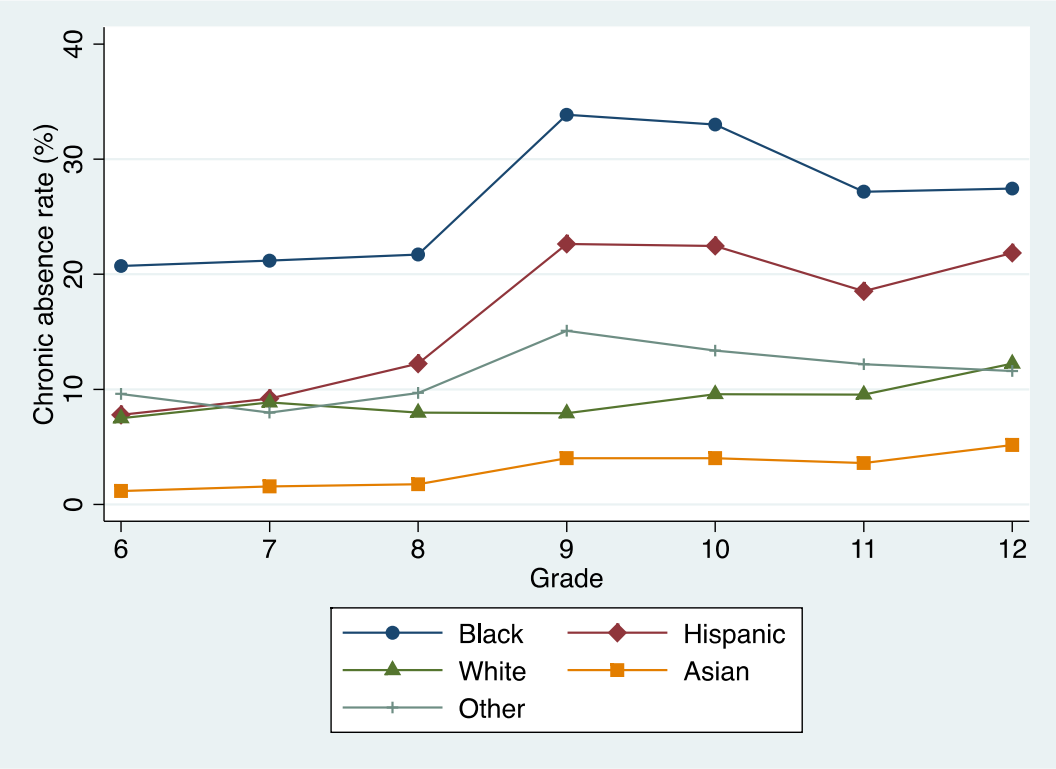
Note: Years 2007-08 to 2012-13. Rates represent the proportion of student-year observations in a given grade-race/ethnicity combination with more than 10 percent of class absences (class absence rate calculated by taking the total number of absences divided by the total number of class meetings in a given semester).

Appendix Figure 1: Mean absence rates by grade for 2013 Senior Cohort only



Note: Years 2007-08 to 2012-13. Only using students who were in 12th grade during the 2012-2013 academic year. Rates average across all student-year-semester-class observations in a given grade. 6th grade for this cohort was during the 2006-07 school year so is not included in the analysis. Unexcused or excused classes on part-day absence is defined as percentage of unexcused or excused absences from a class on those days when students are part-day absent. Unexcused or excused classes on full-day absence is defined as percentage of unexcused or excused absences from a class on those days when students are full-day absent.

Appendix Figure 2: Chronic absence by grade and race/ethnicity: full-day absence rate > 10%



Note: Years 2007-08 to 2012-13. Rates represent the proportion of student-year observations in a given grade-race/ethnicity combination with more than 10 percent of full-day absences (full-day absence rate calculated by taking the total number of full-day absences divided by the total number of school days).