

ATTENDANCE THROUGHOUT THE SEASONS IN THE DETROIT PUBLIC SCHOOLS COMMUNITY DISTRICT



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RESEARCH NOTE

This research used data collected and maintained by the Detroit Public Schools Community District (DPSCD). Results, information, and opinions solely represent the analysis, information, and opinions of the authors and are not endorsed by – or reflect the views or positions of – grantors, DPSCD, or any employee thereof.

DETROIT EDUCATION RESEARCH PARTNERSHIP

The Detroit Education Research Partnership is a collaboration between researchers at Wayne State University's College of Education and a constellation of community partners interested in improving Detroit schools. We orient our work around the pressing policy needs of the Detroit education community, and we seek to inform improvement in the stability and engagement of school experiences for Detroit youth. We believe that education reform in other places has important lessons for our collective work in Detroit, but that any solution for Detroit will have to respond to the unique strengths and needs of our community. Using continuous improvement methods, we work in partnership with schools, community organizations, and policymakers to identify the key problems that impede improvement in Detroit schools. We then collaboratively determine what stakeholders need to know to solve those problems and design research studies to collect, interpret, and disseminate that information to the audiences that need it most. Learn more about our work and provide your input at <https://education.wayne.edu/detroit-education-research-partnership>.

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ATTENDANCE THROUGHOUT THE SEASONS IN THE DETROIT PUBLIC SCHOOLS COMMUNITY DISTRICT

COLLABORATIVE POLICY RESEARCH

This research is the result of a collaboration between Wayne State University's College of Education and a constellation of community partners interested in improving Detroit schools, called the Detroit Education Research Partnership. We orient our work around the pressing policy needs of the Detroit education community, and we seek to inform the design of local educational reforms. We believe that education reform in other places has important lessons for our collective work in Detroit, but that any solution for Detroit will have to respond to the unique strengths and needs of our community.

ATTENDANCE THROUGHOUT THE SEASONS IN DPSCD

Detroit has the highest rate of chronic absence of any large city in the U.S. As the seasons change, how do attendance patterns change? What do those patterns suggest about how policymakers and educators can better address absenteeism? We view attendance ecologically: a variety of individual and contextual factors can affect a student's attendance. As schools and districts decide how to design interventions and direct resources, they may need to adjust their efforts over time and respond to particular barriers in different seasons. Using daily attendance data from the Detroit Public Schools Community District (DPSCD) in 2018-19, we describe how attendance patterns vary across the seasons, and we examine the relationship between weather and attendance for each season.

MAJOR FINDINGS

- The probability that a student will miss school was lowest in the Fall, higher in Winter and Spring, and the highest in Summer (June), with exceptionally high rates of absence in the last two weeks of school.
- Nearly 4,000 DPSCD students (about 7%) reached the threshold for chronic absence in the last two weeks of the school year.
- Heavy precipitation in the Winter was associated with a 5% increase in the probability that a student would be absent, but the effect of precipitation in the Fall and Spring was minimal.
- Weather had a stronger affect on chronically absent students than non-chronically absent students.

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INTRODUCTION

How do attendance patterns change across the school year and calendar year? Motivated by research documenting the significant link between school attendance and academic achievement and social-emotional outcomes (e.g., Gottfried, 2014), schools and districts are working to improve student attendance and decrease chronic absenteeism. Seasonal patterns in attendance are likely to point to policy responses that could dramatically improve attendance. For instance, high spikes of absenteeism around school breaks or at the beginning or end of the school year suggest that schools could create an outreach strategy to promote attendance on those days. Likewise, weather patterns that change between seasons may impact attendance rates. For instance, if students are more likely to be absent when it snows, school districts may implement extra transportation options on snowy days or allow students to have a late start, rather than staying home or canceling school. Indeed, our prior research suggests that weather has a meaningful relationship with attendance, as colder cities tend to have higher rates of chronic absenteeism, which is defined as missing 10% or more school days (Singer et al., 2019).

Yet, very little research has looked at changes in attendance patterns throughout the year or as a result of seasonal weather differences ([Attendance Works, 2016](#); [Koopmans, 2011](#)).¹ We view attendance ecologically: a variety of individual and contextual factors can affect a student's attendance (Gottfried & Gee, 2017; Lenhoff & Pogodzinski, 2018; Singer et al., 2019; Sugrue et al., 2016). From the ecological perspective, changes in a student or school's context and changes over time are potentially consequential. As schools and districts decide how to design interventions and direct resources, they may need to adjust their efforts over time and respond to particular barriers in different seasons.

¹ A few studies have controlled for weather patterns when looking at the relationship between air quality and attendance. See [Chen et al., 2000](#), [Curie et al., 2009](#).



In this report, we look systematically at how student attendance in 2018-19 in the Detroit Public Schools Community District (DPSCD) varied over the year and across the seasons. We used daily attendance data from DPSCD in 2018-19 to describe how attendance patterns change during the year and to examine the relationship between weather and attendance for each season.² We found:

- The probability that a student will miss school was lowest in the Fall, higher in Winter and Spring, and the highest in Summer (June), with exceptionally high rates of absence in the last two weeks of school.
- Nearly 4,000 DPSCD students (about 7%) reached the threshold for chronic absence in the last two weeks of the school year.
- Heavy precipitation in the Winter was associated with a 5% increase in the probability that a student would be absent, but the effect of precipitation in the Fall and Spring was minimal.
- Weather had a stronger effect on chronically absent students than non-chronically absent students.

² We include students in our analyses if they were enrolled in DPSCD for at least 10 days of the 2018-19 school year. This is the threshold for inclusion in the district's chronic absence data reported to the Michigan Department of Education.



ATTENDANCE PATTERNS THROUGHOUT THE YEAR

Looking at DPSCD's daily attendance by season reveals that student attendance patterns do vary over time (see Figure 1). On average, 3-4% more students are absent each day in the Winter and Spring than in the Fall, as shown in Table 1. In addition, students are more likely to be absent on Mondays and Fridays than on Tuesdays, Wednesdays, and Thursdays. The Summer, however, has a much higher average rate of student absences than any other season. In 2018-19, no day in June had less than 20% of students absent; and in the last week of school, the rate of absences increased from 40% on Monday to 60% by Thursday (the last day of school).

Figure 1: Percent of Students Absent Each Day in DPSCD, 2018-19

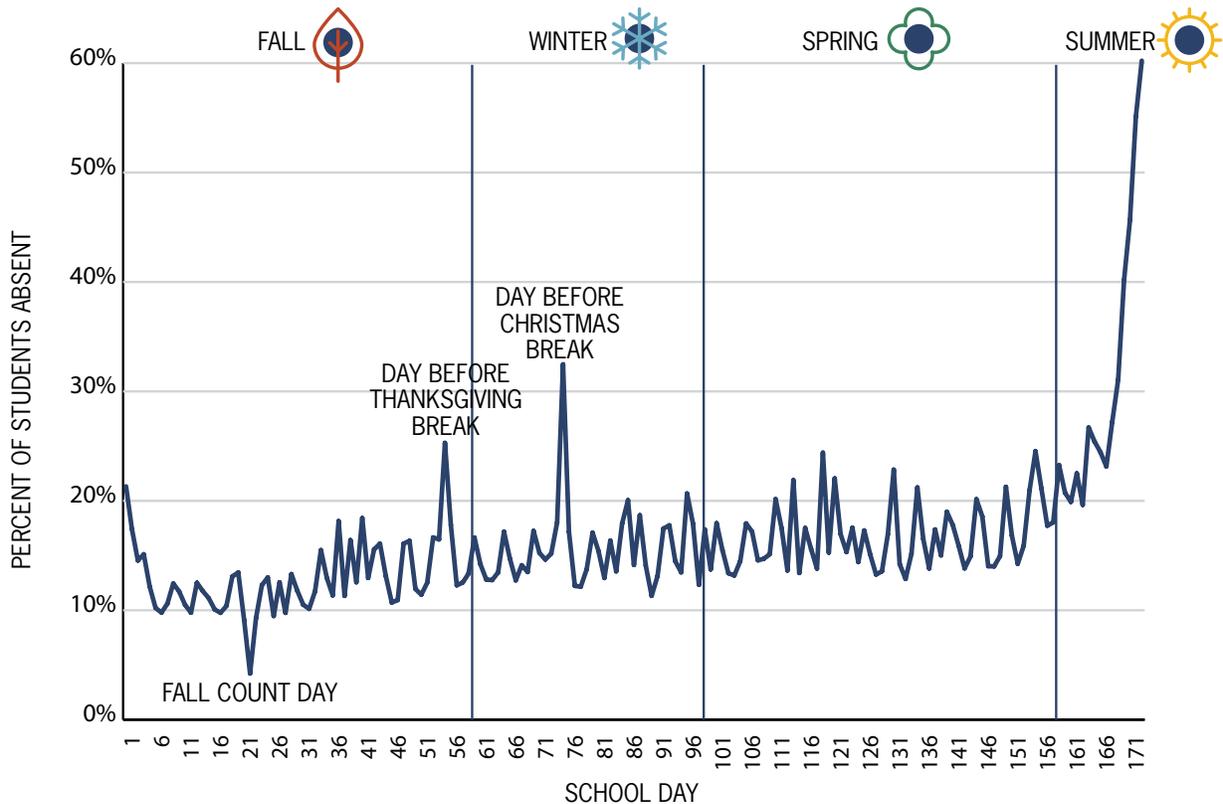
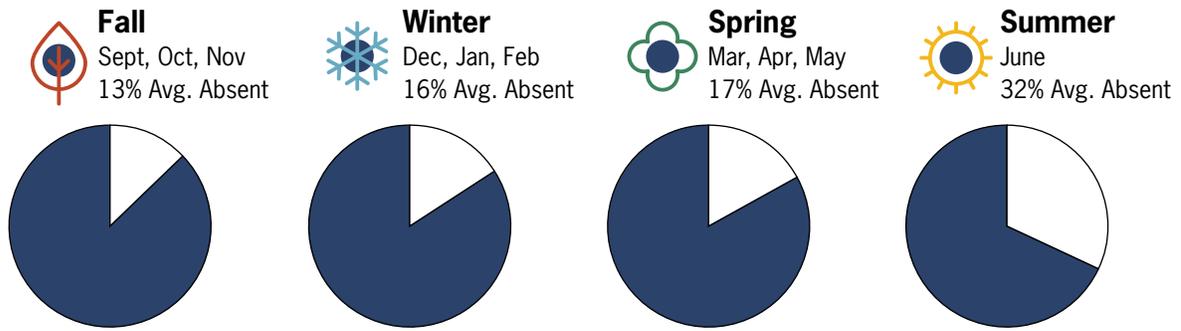




Table 1: Months and Attendance Rates for each Season, DPSCD 2018-19



Students in other cities also experience a slump in attendance in the last weeks of school. One study using data from New York City found that there was a 5.8 percentage point difference in attendance rates between April and June (Traill & Brohawn, 2014). In Detroit, that difference is doubled, with a nearly 12 percentage-point drop in attendance rate between April and June. This dip may in part be due to a sense that the school year has wound down after state assessments (which typically end by mid-May) or culminating events such as prom, after school programs ending earlier than the school year, or teachers turning their attention to planning for next year (Traill & Brohawn, 2014).

There is some reason to think that these late-year absences have less of an effect on student learning than absences earlier in the year. For instance, Gottfried and Kirksey (2017) found that student test performance was most impacted by absences in the 30 days leading up to the state test. However, absences overall have been shown to negatively impact student learning and socio-emotional skills (Gottfried, 2014), and absences may be particularly harmful for low-income students and English language learners (Gershenson et al., 2017). In addition, Michigan schools are held accountable for student attendance throughout the year, and districts are penalized financially on days



when fewer than 75% of students attend. Therefore, it is critical for school leaders to understand when students are most at risk of being absent, and proactively address the root causes of missing school.

“ 4,547 students reached the threshold for chronic absence in June, with 3,797 of them reaching it in the last two weeks of the school year.

The last two weeks of school have a significant effect on the district’s overall chronic absence rate, which is a metric incorporated into the state’s school accountability system. In DPSCD, 62% (or about 35,000 students) were chronically absent in the 2018-19 school year. On average, students missed 3 days of school in those last two weeks. In addition, 4,547 students reached the threshold for chronic absence in June, with 3,797 of them reaching it in

Figure 2: Number of Students who Reach the Chronic Absence Threshold Each Day in DPSCD, 2018-19

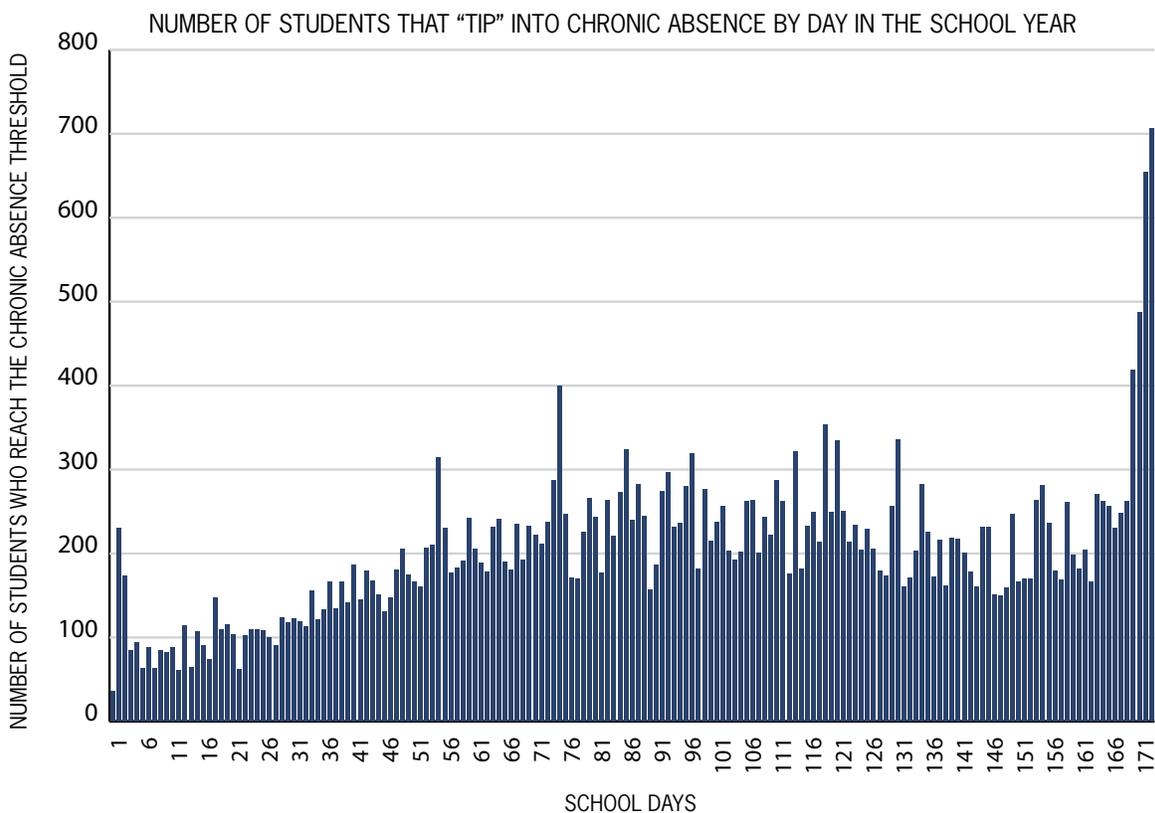




Table 2: Highest Absence Days in DPSCD

Date	Description of day	Percent Absent Districtwide
June 20	Last day of school	60%
June 19	Last week of school	55%
June 18	Last week of school	46%
June 17	Last week of school	40%
December 21	Day before Christmas break	32%
June 14	Second to last week of school	31%
June 13	Second to last week of school	27%
June 7	Third to last week of school	27%
June 10	Second to last week of school	25%
November 20	Day before Thanksgiving break	25%

the last two weeks of the school year (see Figure 2). Of those students who reached the threshold for chronic absence in the last two weeks of the school year, an average of 29% of their overall days absent were in June. On average, these students were absent 4 days out of the last two weeks of school. In addition, there were ten days in 2018-19 when the district attendance rate fell below 75%, which negatively impacted the state funding the district received. Eight of those ten days were in June (see Table 2). The other two were the day before Thanksgiving break and the day before winter break in December. This strongly suggests that the district could make substantial improvements on its overall chronic absenteeism rate by focusing on ensuring that students attend school in June, particularly in the last two weeks of school. The district may want to survey the schools that do not have as sharp of a decline in attendance in the last few weeks, to determine if there are strategies they can learn from to encourage attendance toward the end of the school year. For instance, Maybury Elementary had the lowest absence rate in the last two weeks of school among elementary schools, and Detroit School of the Arts had the lowest absence rate in the last two weeks among high schools in 2018-19.

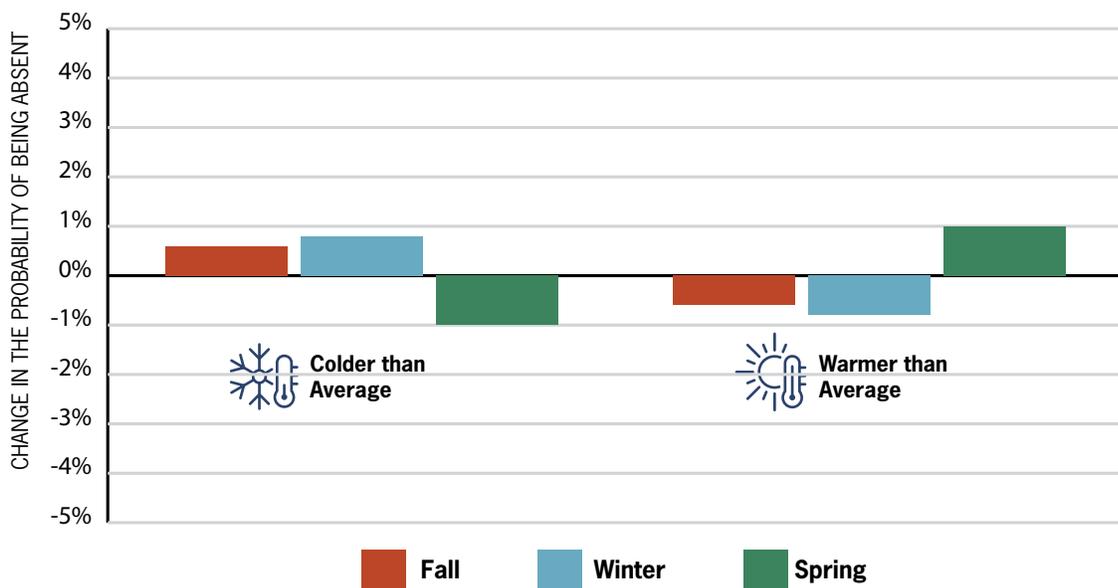


ATTENDANCE PATTERNS AND WEATHER

To consider the specific effect of weather on DPSCD’s attendance during different seasons, we used “fixed effects” models to predict the odds that a student would be absent (Appendix C) and the percentage of students that would be absent from school (Appendix D) for every school day, based on precipitation and temperature by season. In other words, we compared students’ attendance on a given day to themselves on a different day, with the weather as the main difference between each day. By doing this, we were able to examine whether temperature and precipitation had a meaningful effect on attendance when controlling for student or school characteristics, and whether the effects were different in different seasons.

The relationship between temperature and attendance reflects a seasonal difference: in the Spring, warmer weather is associated with worse attendance, but in the Fall and Winter, colder weather is associated with worse attendance (Figure 3). For example, on *warmer* Spring days, the probability that a student will be absent increases by 1%. However, the

Figure 3: Effect of Temperature on the Probability a Student is Absent by Season, DPSCD 2018-19

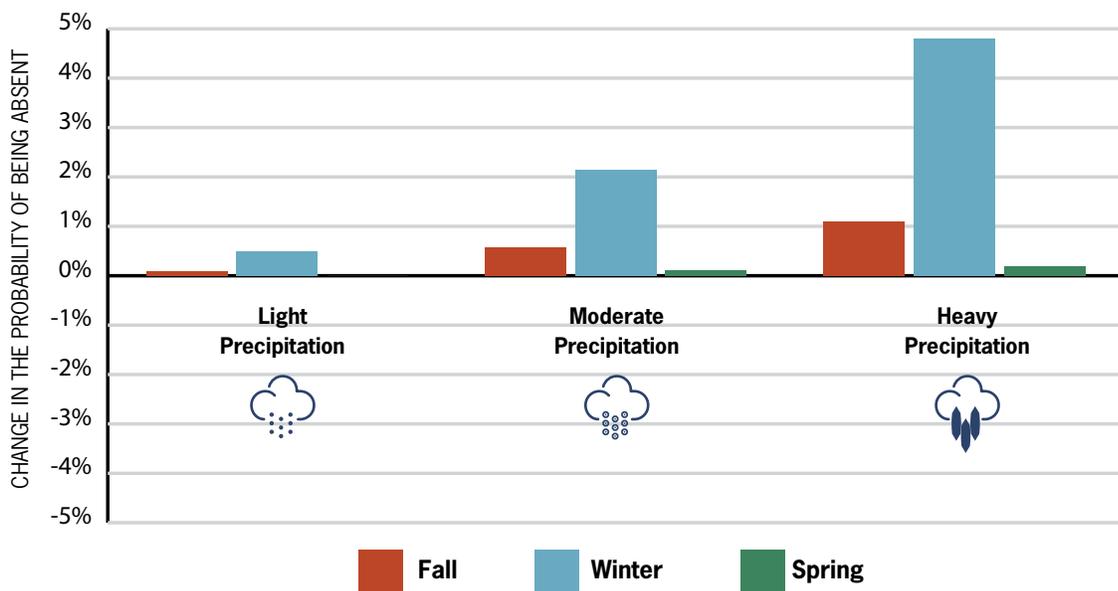


“ *In the Spring, warmer weather is associated with worse attendance, but in the Fall and Winter, colder weather is associated with worse attendance.* ”

probability that students will be absent in the Fall or Winter goes up on *colder* days, by a little less than 1%. Likewise, at the school level, our model predicts that the percentage of students who are absent will increase by 1% on warmer days in the Spring, but decrease by a little less than 1% in the Fall and Winter. Ultimately, given these small predicted changes, the effect of temperature on attendance is modest.

The relationship between precipitation and attendance highlights the impact of heavy precipitation in the Winter (Figure 4). In the Fall and Spring, precipitation is associated with negligible or modest differences in the probability that a student will miss school and the percentage of students expected to be absent. In the Winter, light precipitation also had a modest relationship with attendance. Yet, the probability that a student is absent in the Winter

Figure 4: Effect of Precipitation on the Probability a Student is Absent by Season, DPSCD 2018-19





increases by over 2% on a day with moderate precipitation (0.8 inches of snow) and nearly 5% on a day with heavy precipitation (1.8 inches of snow). The percentage of students in a school predicted to be absent increases by similar amounts on days with modest and heavy precipitation. Thus, while precipitation does not have a strong association with attendance in the Fall or Spring, heavy precipitation has a meaningful and negative association with attendance in the Winter. In 2018-19, however, only six days of school had moderate or heavy precipitation in the Winter, accounting for 15% of school days in that season. (Most Winter days have no precipitation, and a few additional heavy precipitation days were cancelled as snow days.)

Differences in the association between temperature and attendance over the seasons reflect the ways that environmental context intersects with family economic circumstances, city and district transit infrastructure, and neighborhood conditions. In Winter 2020, we randomly selected 38 families from seven DPSCD schools and interviewed them about their routines for getting school, times when their children missed school, and the resources they drew on in ensuring their students attended school. About 34% of families we spoke to told us that weather can sometimes get in the way of getting to school. Weather was most frequently raised as a concern when children had to walk to school or wait outside at a bus stop. Parents told us they sometimes felt that it was too cold or snowy to allow their children to wait outside, raising concerns about their safety and comfort, particularly when bus pickup times were unpredictable or often late. For example, one parent said that “it could be too cold. You know, too cold and they might have to have the proper clothing for it. It could be raining very bad.” Another

“ Parents told us they sometimes felt that it was too cold or snowy to allow their children to wait outside, raising concerns about their safety and comfort, particularly when bus pickup times were unpredictable or often late.

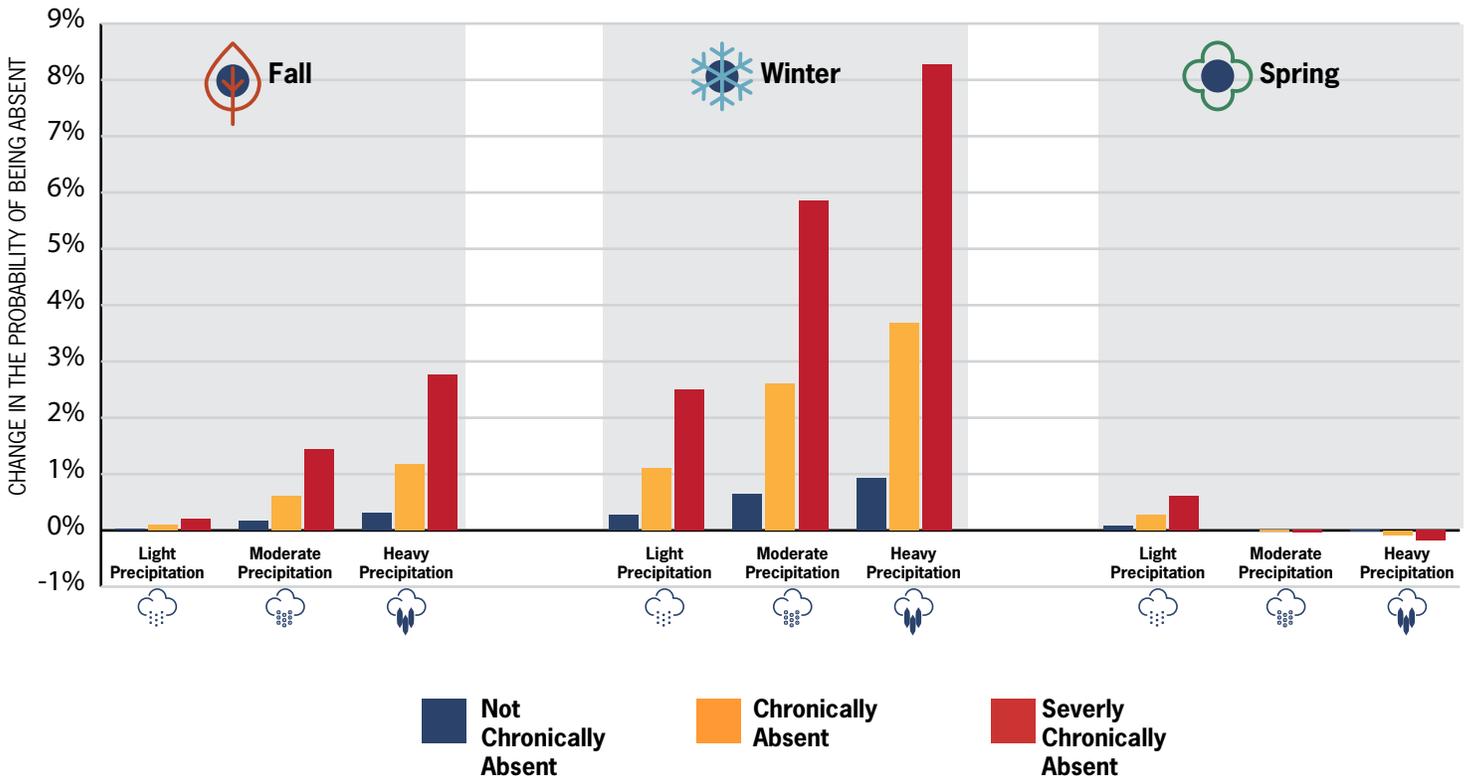


parent of a high school student said that her son takes the city bus to school everyday, but that sometimes he will wait for an hour and the bus will not arrive. When the weather is bad, that can create a barrier: “It was four times [in the last month]. It’s too cold for my son to keep standing out there, or I don’t feel like he should be walking...if it’s too cold for him to stand out there, it’s definitely too cold for him to be walking.” Another parent said that sometimes her child missed school because the streets were not clear of snow: “I just believe in the wintertime, if they plowed the streets a little bit better, that would help in getting the kids where they need to go.” Parents also described how their cars would sometimes not be reliable in the winter and backup transportation was not available: “My car has been down on snowy, real cold days, and I wouldn’t prefer for them to go catch the bus in the freezing cold.”

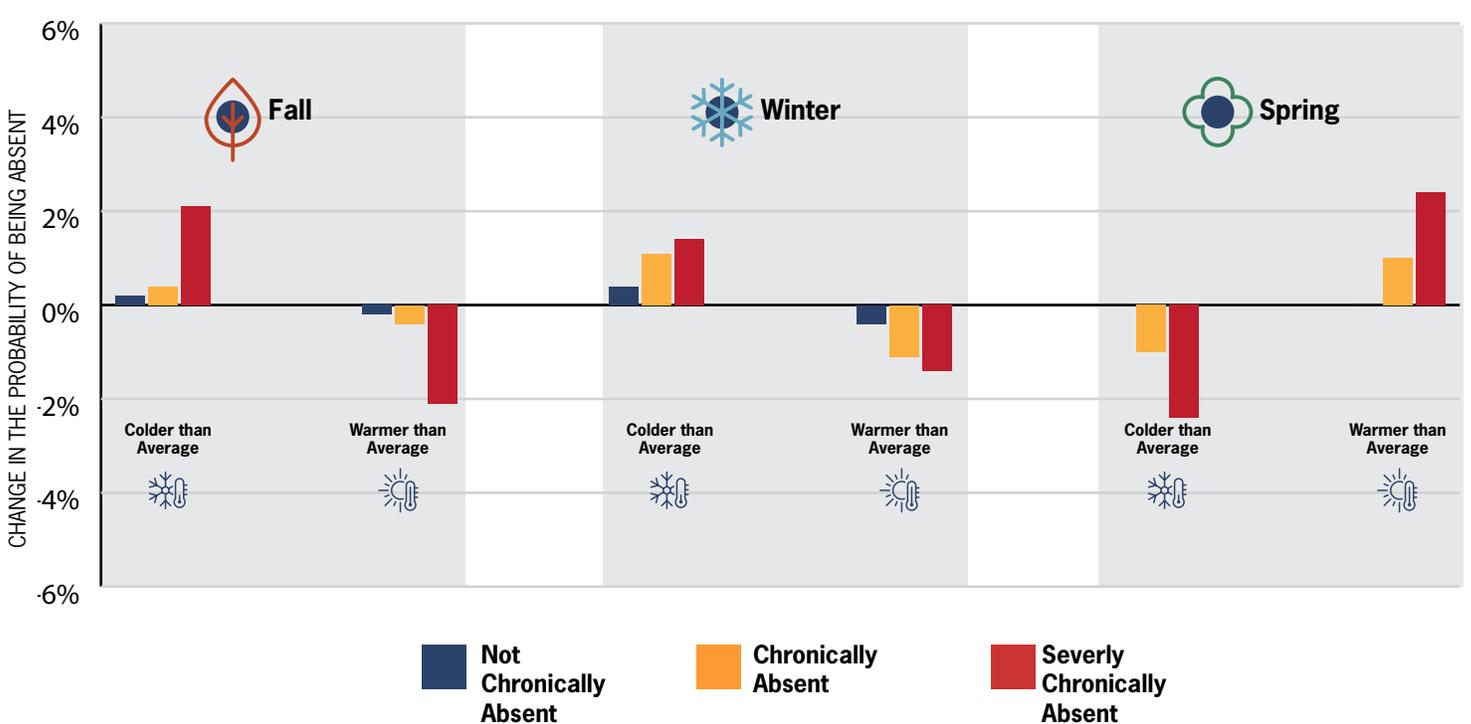
Importantly, the effect of weather on attendance is stronger for students who are chronically absent. Figures 5 and 6 show changes in the probability that a student will be absent due to the weather for three different categories of students: not chronically absent (missing less than 10% of days), chronically absent (missing 10% to 20% of days), and severely chronically absent (missing 20% or more days). The results show that the effects of weather discussed above have an even greater impact on students who are chronically absent. For example, the probability that a severely chronically absent student will miss school increases by over 8% on a heavy precipitation day in the Winter, compared to just 2.5% for a student who was not chronically absent. In fact, light precipitation in the Winter increases the probability that chronically absent and severely chronically absent students will miss school more than heavy precipitation in the Winter does for students who are not chronically absent. Temperature also had a great effect on chronically absent students.

Figures 5 and 6: Effect of Weather on the Probability a Student is Absent in Each Season by Absenteeism Level, DPSCD 2018-19

Effect of Precipitation in each Season by Chronic Absenteeism Level, DPSCD 2018-19



Effect of Temperature in each Season by Chronic Absenteeism Level, DPSCD 2018-19





POLICY AND PRACTICE IMPLICATIONS

Policymakers and educators cannot control the weather, but they can use this information to proactively address the reasons why students miss school because of the weather and plan for how to increase attendance in the last two weeks of school. School leaders should identify students who miss school in the last two weeks and determine the underlying reasons. It may be that parent schedules change in the summer, disrupting school-going routines or requiring students to take on additional responsibilities such as working outside the home or caring for younger siblings. If this is the case, schools may want to consider adjusting the school day to accommodate students' needs. They may also consider how to ensure that school can be a bridge to work for students who want or need to earn money over the summer. Perhaps schools could partner with employers to enhance the last few weeks of school with opportunities that would better prepare them for summer work. School leaders should also consider how to support teachers in these last few weeks, when they are often scrambling to pack up their rooms and prepare for next school year. How can teachers be supported to create engaging learning opportunities for students, while getting the time they need to wrap up the school year? Others have suggested that schools should reassess field trip policies, delay major events until the last week of school, or ensure that school partners continue programming through the last day of school, to further encourage attendance (Traill & Brohawn, 2014).

While the overall effects of weather on attendance are modest, even in the Winter, the reasons students miss school on bad weather days are related to other structural issues that policymakers should be addressing in order to improve attendance and create positive school-going conditions. Resources should especially be targeted toward students who are already on track to be chronically absent, given that the impact of bad weather is likely to affect them even more. Snowier Winter days may discourage families from walking their children to school or having them wait at the bus stop if they are



concerned about their health or if they lack adequate winter clothes to wear. School districts may want to consider supplementing their transportation options on snowy Winter days, perhaps by offering additional bus routes or starting school an hour or two later, when temperatures are likely to be higher and roads have been cleared. Because high school students in DPSCD use DDOT buses rather than yellow school buses, the city should consider how to ensure that students are not waiting for extended periods of time for the bus to arrive. This is true throughout the year, but especially on snowy or particularly cold days. The city transportation office should systematically evaluate the bus routes that are most used by students and strategically offer additional buses on those lines on days when students may have difficulty waiting. In addition, they may want to consider instituting a method for high school students to request backup transportation if their bus does not arrive within 20 minutes of its expected stop time.





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Appendix A: Average Temperature by Season, 2018-19 School Year in Detroit

Season	N (%) days	Mean	S.D.	Min	Max
Fall	60 (35)	52.10	15.78	24.00	83.00
Winter	40 (23)	29.43	7.60	16.00	48.00
Spring	59 (34)	47.02	13.52	13.00	68.00
Summer	14 (8)	64.76	3.85	55.50	71.30

Appendix B: Average Precipitation by Season, 2018-19 School Year in Detroit

Season	N (%) days	Mean	S.D.	Min	Max
Fall	60 (35)	0.13	0.30	0.00	1.46
Winter	40 (23)	0.02	0.05	0.00	0.21
Spring	59 (34)	0.09	0.23	0.00	1.42
Summer	14 (8)	0.08	0.12	0.00	0.32

Note: 10 inches of snow translates to about 1 inch of rain. Therefore, for example, 0.02 inches of precipitation on a day that it is snowing translates to about 0.20 inches of snow.



Appendix C: Student Fixed-Effects Linear Probability Regression Model to Predict Changes in the Probability of Student Attendance Based on Weather

	Model 1
Average Temperature (°F)	-0.0004***
Total Precipitation (inches)	0.0123***
Season (Reference = Fall)	
Winter	0.0373***
Spring	-0.0048***
Season x Temperature	
Winter	-0.0007***
Spring	0.0012***
Season x Precipitation	
Winter	0.2552***
Spring	-0.0083**
Day of Week (Reference = Monday)	
Tuesday	-0.0203
Wednesday	-0.0114
Thursday	-0.0193
Friday	0.0219
Outlier Attendance Days	
Count Day (10/4/2018)	-0.0750***
Day before Thanksgiving (11/22/2018)	0.1331***
Day before Winter Break (12/21/2018)	0.1079***
Constant	0.1483***
N days	7,889,436
N schools	57,016
R ² Overall	0.0070
R ² Within	0.0100
R ² Between	0.0377

*p<0.05, **p<0.01, ***p<0.0001

Note: Excludes any students enrolled in DPSCD for less than 10 days and students who were either present or absent on 100% of days.



Appendix D: Student Fixed-Effects Ordinary Least Squares Regression Model to Predict Changes in School Attendance Rates Based on Weather

	Model 1
Average Temperature (°F)	-0.0001***
Total Precipitation (inches)	0.0129***
Season (Reference = Fall)	
Winter	0.0495***
Spring	0.0017***
Season x Temperature	
Winter	-0.0011***
Spring	0.0008***
Season x Precipitation	
Winter	0.2584***
Spring	-0.0109**
Day of Week (Reference = Monday)	
Tuesday	-0.0214
Wednesday	-0.0147
Thursday	-0.0202
Friday	0.0152
Outlier Attendance Days	
Count Day (10/4/2018)	-0.0801***
Day before Thanksgiving (11/22/2018)	0.1357***
Day before Winter Break (12/21/2018)	0.0963***
Constant	0.1381***
N days	14,295
N schools	90
R ² Overall	0.1172
R ² Within	0.2399
R ² Between	0.0017

*p<0.05, **p<0.01, ***p<0.0001

Note: Includes general education schools only (i.e. excludes alternative schools, exceptional student education centers, etc.). Excludes students who did were enrolled in DPSCD for less than 10 days.

