

Supporting Students with Health Conditions in District of Columbia Public Schools

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To inform a plan for supporting students with health conditions, District of Columbia Public Schools (DCPS) partnered with the Regional Educational Laboratory Mid-Atlantic on a study to understand how the prevalence of health conditions differs by student characteristics, whether students are supported through a 504 plan or an individualized education program (IEP), and the relationship between student health conditions and education outcomes. The study found that 27 percent of students in DCPS had a reported health condition in 2018/19, which is lower than the percentages reported for health conditions in the city in other data sources and could thus be an undercount. Health conditions were most prevalent among DCPS students who are male, who are Black/non-Hispanic, who are economically disadvantaged, or who attended school outside their ward of residence. Asthma was the most prevalent health condition, reported by 16 percent of students, which is double the national average. Among students with a reported health condition, 28 percent received support through a 504 plan or an IEP. Students with health conditions who are Black/non-Hispanic, who are economically disadvantaged, or who attended school outside their ward of residence were more likely to receive support through an IEP than students without these characteristics. In contrast, students with health conditions who are White/non-Hispanic or who are not economically disadvantaged were more likely to receive support through a 504 plan than other groups of students. Students with a reported health condition generally fared worse on education outcomes than students without a health condition.

Why this study?

About 38 percent of children in the United States have at least one current or lifelong health condition (Child and Adolescent Health Measurement Initiative, 2018). Students experiencing health conditions can be at risk of poor education outcomes (Leroy et al., 2017).¹ Racial/ethnic minority students and students in low-income families are more likely than other students to have a health condition, potentially exacerbating achievement gaps (Currie, 2005).

The District of Columbia Public Schools (DCPS) partnered with the Regional Educational Laboratory Mid-Atlantic to conduct a study of its students with health conditions to guide its work in promoting positive outcomes for these students. DCPS sought information on the prevalence of health conditions among its students, with a focus on a core set of conditions: asthma, attention deficit hyperactive disorder (ADHD), mental health conditions, diabetes (types 1 and 2), food allergies, anaphylaxis, and intellectual and developmental disability or delay (IDDD).² This set of conditions includes those that are likely to be chronic and most prevalent in DCPS students, those that could be reliably coded and classified in the DCPS data,³ and those that could be associated with education outcomes.

1. The association between students' health conditions and education outcomes varies by condition (Leroy et al., 2017). For example, having persistent asthma is associated with absenteeism, which in turn is associated with lower academic performance (Moonie et al., 2008). In contrast, although food allergies are often associated with anxiety and to a lesser degree absenteeism, the literature is inconclusive as to whether food allergies are associated with academic performance (Brew et al., 2019; Cummings et al. 2010).
2. The order of conditions is based on groupings of similar conditions and input from DCPS.
3. The DCPS data consisted of free-form text that needed to be coded and categorized. The conditions chosen to highlight used a consistent set of terms that could be reliably coded and classified.

For additional information, including technical methods and supporting analyses, access the report appendixes at <https://go.usa.gov/xHbA4>.

In addition to understanding the prevalence of health conditions among students, DCPS also aims to understand how health disparities between student groups might be related to student success. In 2017 DCPS launched a five-year strategic plan and identified equity as a core value, aiming to give all students the support they need to thrive. To that end DCPS seeks to explore how the prevalence of health conditions might differ by student characteristics, whether the provision of support through Section 504 plans and individualized education programs (IEPs) differs across student characteristics, and how health conditions are related to education outcomes (see box 1 for definitions of key terms).

Box 1. Key terms

Any health condition. In this study a District of Columbia Public Schools (DCPS) student is categorized as having any health condition if DCPS Conditions and Treatments report data, provided by the District of Columbia Department of Health, indicate that the student had at least one of the following health conditions during the 2018/19 school year: asthma, attention deficit hyperactivity disorder (ADHD), mental health condition, diabetes, food allergies, anaphylaxis, intellectual and developmental disability or delay (IDDD), or other physical or behavioral condition such as anemia, cardiovascular disorder, metabolic disorder, or hearing impairment. (A full list of eligible health conditions is in table A3 in appendix A.)

Economic disadvantage. Students are considered to be economically disadvantaged if they meet any of the following criteria: eligible for the national school lunch program, eligible to receive Temporary Assistance for Needy Families or Supplemental Nutrition Assistance Program benefits, identified as homeless in available data on homelessness, or under the care of the Child and Family Services Agency.

Education outcomes. The education outcomes examined in the study for research question 3 were proficiency in math and reading on the Partnerships for Assessment of Readiness for College and Career tests in math and reading, chronic absenteeism, suspension, and grade point average.

Food allergies. This study categorizes a DCPS student as having a food allergy if the student has allergic reactions to food or has celiac disease.

Health condition of particular interest to DCPS. Health conditions of particular interest to DCPS include a set of core conditions, including those that are likely to be chronic and most prevalent in DCPS students: asthma, ADHD, mental health conditions, diabetes, food allergies, anaphylaxis, and IDDD.

Individualized education program (IEP). This is a program developed under the Individuals with Disabilities Education Act to ensure that children with disabilities receive special education or related services to meet their unique needs, such as mental health counseling, health services, and physical therapy.

Intellectual and developmental disability or delay (IDDD). This study categorizes a DCPS student as having IDDD if the student has autism spectrum disorder, speech and language impairments or delays, an intellectual disability, mild to severe motor delays, or other developmental delays. (A full list of conditions is in table A3 in appendix A.)

Mental health condition. This study categorizes a DCPS student as having a mental health condition if the student has any of the following conditions: anxiety, depression, adjustment disorder, bipolar disorder, mood disorder, separation anxiety, mental disability, psychosocial delay, social or emotional disturbance, psychosis, obsessive/compulsive behavior, schizophrenia, post-traumatic stress disorder, or oppositional defiant disorder.

Proficient in math or reading. Students are considered to be proficient in math or reading if they received a performance level score of 4 (met expectations) or 5 (exceeded expectations) on the Partnership for Assessment of Readiness for College and Career test in math or reading.

School-based health centers. DCPS has seven health centers, located in or near DCPS high schools in Wards 1, 5, 6, and 7, that provide comprehensive primary health services to enrolled students. The centers are staffed with health professionals and focus on the “prevention, early identification, and treatment of medical and behavioral concerns that can interfere with a student’s learning” (DCPS Health, 2020).

Section 504 plan. Section 504 of the Rehabilitation Act of 1973 is designed to help people with physical or mental impairments that substantially limit major life activities. A 504 plan, intended for students who are able to participate and succeed in a general education classroom, provides students with the services required to access their school’s general education program and learning opportunities. Students can receive services through a 504 plan even if they are not eligible for special education. A 504 plan is often related to a medical condition diagnosed by a physician and reported to the school by the student’s family, so that the child can receive an accommodation; thus, students with regular access to physicians and students whose families have a greater sense of agency to report conditions to the school might be more likely to obtain a 504 plan than other students.

Student characteristics. The student characteristics included in the study were gender, race/ethnicity, economic disadvantage, geographic location (student ward of residence and school ward), and grade span.

Ward. The District of Columbia is divided into eight wards for municipal governance purposes; each ward elects a representative to the DC Council. In the current study, *student ward of residence* refers to the ward in which a student resides, and *school ward* refers to the ward in which a student’s school is located. DCPS offers school choice options for families so that students have access to high quality public schools, regardless of where they live. Many DC families participate in school choice, and these students attend school outside their neighborhood or ward (Gallagher, 2019). In the study sample more than 34 percent of students attended a school outside their ward of residence.

DCPS intends to use the findings from this study to inform an action plan for equitably supporting students with health conditions. Prior research has pointed to inequities in the diagnosis and reporting of some health conditions across student populations. Children in low-income families and with limited access to medical care and information might be under-identified or misdiagnosed, meaning that gaps in identification of health conditions could be even larger than reported (Chokshi et al., 2015; Pennap et al., 2017; Thakur et al., 2017). Although there are limits to what schools can do to resolve inequities in the diagnosis of health conditions, schools can create opportunities for increased screening and provide resources to support students when they are identified as having a health condition (National Academies of Sciences, Engineering, and Medicine, 2019).

For example, 504 plans are intended to provide students with the services needed to access their school’s general education program and learning opportunities, and IEPs are designed to see that children with disabilities receive special education or related services to meet their unique needs, such as mental health counseling, health services, and physical therapy. Thus, while students with asthma, ADHD, or food allergies often receive support through 504 plans, students with severe cases of these health conditions that affect their ability to succeed in the general education classroom might be served through IEPs (Jones & Wheeler, 2004).

Research suggests a positive association between receiving health-related support at school and education outcomes for students with health conditions (Allen, 2003; Barnard-Brak & Lechtenberger, 2010). For example, school-based asthma programs reduce absenteeism, hospital emergency department visits, and use of community health services and improve asthma regulation and management (Centers for Disease Control and Prevention, 2017; Clark et al., 2010; Currie et al., 2010). Student participation in the IEP process has been associated with development of self-determination skills that can translate into improvements in academic achievement (Barnard-Brak & Lechtenberger, 2010). Similarly, providing students with direct access to school nurses and with disease-specific information can improve their health and education outcomes (Leroy et al., 2017). Although each DCPS school is assigned a nurse who works with students and families to provide health services and reduce health-related barriers to students’ academic success (DCPS Health, 2020), having additional information on the prevalence of specific conditions and inequities in 504 plans and IEPs could help nurses better support students with specific health conditions and from different backgrounds.

Research questions

This study addressed three research questions:

1. What are the prevalence rates of different reported health conditions and the characteristics of students with health conditions in DCPS?
2. What proportion of students with reported health conditions are provided supports through a 504 plan or IEP, and does this differ by student characteristics?
3. Do the education outcomes of students with reported health conditions differ from those of students without reported health conditions?

The analyses for research question 1 explored the prevalence of students with any reported health condition as well as the prevalence of students with specific health conditions that DCPS identified as of particular interest, including asthma, ADHD, mental health conditions, diabetes, food allergies, anaphylaxis, and IDDD. These analyses also explore the prevalence of reported conditions across key student characteristics, including gender, race/ethnicity, economic disadvantage, geographic location (student ward of residence and school ward), and grade span.

The analyses for research question 2 examined differences in the provision of support through 504 plans and IEPs and whether differences were associated with specific health conditions or student characteristics. Research question 3 explored whether health conditions were correlated with key education outcomes, including proficiency in math and reading on standardized tests, chronic absenteeism, suspensions, and grade point average (GPA). These analyses also investigate whether differences in education outcomes between students with and those without health conditions vary by student characteristics or across wards. A brief description of data sources and methods is in box 2; appendix A contains additional details.

Box 2. Data sources, sample, and methods

Data sources. The study team collected data on student characteristics and most education outcomes from District of Columbia Public Schools (DCPS) administrative records. Data on student-level math and reading proficiency came from DCPS standardized testing data, based on the Partnership for Assessment of Readiness for College and Career (PARCC) tests administered to students in grades 3–8 and to high school students enrolled in Algebra I, Geometry, English I, and English II. Data on student-level health conditions and support came from the DCPS Conditions and Treatments report dataset, provided by the District of Columbia Department of Health, which houses these data. That dataset includes only students with reported health conditions, based on universal health certificates provided by physicians or parents, 504 plans, individualized education programs (IEPs), and data about student health conditions recorded by school nurses. Students are identified as having a health condition in the Conditions and Treatments report dataset if one or more of these sources indicate the condition. The study team linked data from DCPS administrative records, PARCC tests, and the Conditions and Treatments report using confidential DCPS student identification codes that match across data sources. (See appendix A for additional detail.)

Sample. The study population for research question 1 included all 45,410 students from 114 DCPS schools in grades K–12 during the 2018/19 school year. The study sample for research question 2 was the 12,082 students in DCPS schools with a reported health condition. The target population for specific analyses for research question 3 varied by outcome, as shown in table A2 in appendix A. For example, the target population for analyses that included students' math and reading proficiency was DCPS students who took the PARCC math and reading tests, which excludes students in grades K–2 and most high school students.

Methodology. The study team used descriptive research methods across all three research questions. To compare health condition prevalence at the ward level (research question 1), *F*-tests assessed whether distributions across wards differed by more

than would be expected by chance. Significant ward-level differences in health condition prevalence are displayed on ward maps, color coded by prevalence quartiles (figures 1 and 2 and figures B1–B8 in appendix B). Because many DCPS students attend school outside their ward of residence, the findings are presented by students' wards of residence as well as the wards in which they attend school. *F*-tests assessed whether health condition prevalence differed by school and student characteristics. For research question 2 on percentage of students with a reported health condition who received supports through a 504 plan or IEP, *F*-tests assessed whether support differed by student characteristics, such as gender, race/ethnicity, economic disadvantage, and grade span. For research question 3 on education outcomes of students with reported health conditions, regression analyses compared education outcomes of students with health conditions to education outcomes of students without health conditions and examined differences across student characteristics. The study team used sensitivity analyses that controlled for student characteristics and included school fixed effects to investigate unexpected findings. The study team used difference-in-differences regressions to compare ward-level differences between students with health conditions and students without them to average differences across all other wards.

Limitations. The study was unable to track the average number of visits to the school nurse or the severity of health conditions. For students with multiple health conditions, the study team was not able to determine which health condition was being supported through a 504 plan or an IEP. Associations between health conditions and education outcomes do not mean that the health condition caused the outcome and should not be interpreted as such. More detailed descriptions of the study data sources, sample, methodology, and limitations are in appendix A.

Findings

Prevalence of reported health conditions among students in District of Columbia Public Schools

More than a quarter of students in DCPS had a reported health condition in 2018/19, with prevalence varying by the specific condition. Overall, 27 percent of students in DCPS had a reported health condition during the 2018/19 school year, according to their school records (table 1). In contrast, data from the National Survey of Children's Health (NSCH) showed that an estimated 38 percent of children (ages 0–17) in the District of Columbia had a reported health condition in 2017–18 (Child and Adolescent Health Measurement Initiative, 2018). The NSCH health condition prevalence rates are higher still for students in school-age subgroups, averaging around 50 percent for children ages 6–17 (see limitations section in appendix A for more information on NSCH data). Differences in prevalence are even greater for Black/non-Hispanic students (referred to as Black students throughout the report): 46 percent of Black children (ages 0–17) had a reported health condition in the NSCH data, compared with 31 percent in the current study.⁴ These differences could suggest that health conditions among DCPS students are underreported, underdiagnosed, or under-identified in data systems, especially for Black students.

In 2018/19, 22 percent of students had at least one reported health condition of particular interest to DCPS, with asthma being the most prevalent (16 percent), followed by food allergies (5 percent), ADHD (3 percent), and IDDD (2 percent). The prevalence of asthma among DCPS students is double the national average of 8 percent (Child and Adolescent Health Measurement Initiative, 2018), suggesting that a high level of support is needed for this condition. Less than 1 percent of students in DCPS have mental health conditions, anaphylaxis, or diabetes.⁵ Among students with a reported health condition, 83 percent have at least one condition among those of particular interest to DCPS, and 28 percent receive support through a 504 plan or IEP (see table 1).

4. The NSCH interactive data query tool does not display data by age-level within race/ethnicity groups, so the percentage among Black students ages 6–17 could not be separately reported (Child and Adolescent Health Measurement Initiative, 2018).

5. Similar to the prevalence of overall health conditions, the prevalence of specific conditions in DCPS data is lower than in other data sources; for example, more than 7 percent of students in the District of Columbia have a developmental delay according to the NSCH data, compared with just 2 percent in the DCPS data (Child and Adolescent Health Measurement Initiative, 2018).

Table 1. Prevalence of reported health conditions in District of Columbia Public Schools, 2018/19

Health condition	Number of District of Columbia Public Schools (DCPS) students	Percent among DCPS students with health conditions	Percent among all DCPS students (n = 45,410)
Any health condition	12,082	100.0	26.6
Has any health condition and has 504 plan or individualized education program	3,382	28.0	7.4
Condition of particular interest			
Asthma	7,269	60.2	16.0
Attention deficit hyperactive disorder	1,119	9.3	2.5
Mental health condition	177	1.5	0.4
Diabetes	101	0.8	0.2
Food allergies	2,091	17.3	4.6
Anaphylaxis	113	0.9	0.2
Intellectual and developmental disability or delay	933	7.7	2.1
Has at least one condition among the seven of particular interest to DCPS	9,970	82.5	22.0
Has more than one condition among the seven of particular interest to DCPS	1,651	13.7	3.6

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and the District of Columbia Public Schools Conditions and Treatments report.

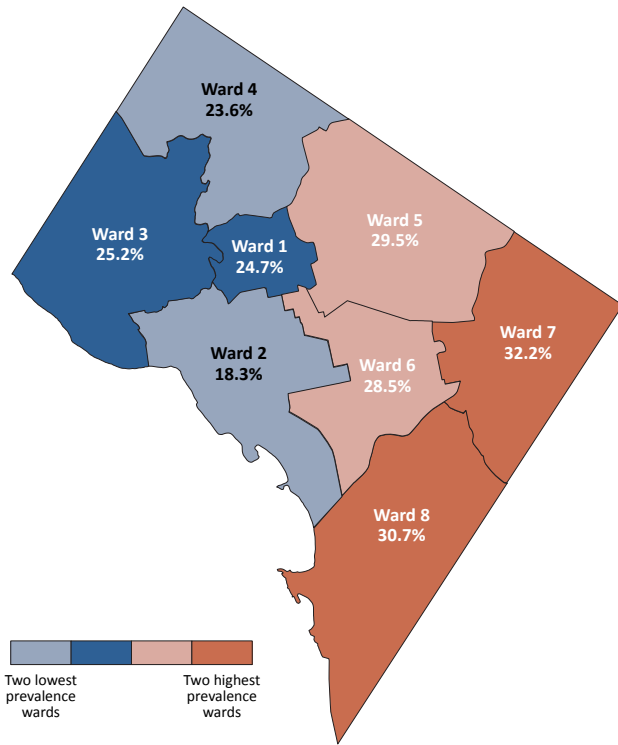
The prevalence of reported health conditions varied by student ward of residence, school ward, and school. The average prevalence and the minimum, median, and maximum prevalence of health conditions by ward of residence, school ward, and school are presented in tables B1 and B2 in appendix B. In general, variation in prevalence levels was similar for wards of residence and school wards. However, although asthma is the most prevalent condition in each ward of residence and school ward, asthma rates varied more by ward of residence than by school ward.

Among wards of residence, Wards 7 and 8 had the highest prevalence of students with a reported health condition (more than 30 percent in each ward), and Wards 2 (18 percent) and 4 (24 percent) had the lowest prevalence (figure 1). These findings correspond with differences in economic disadvantage among families in those wards: more than 90 percent of students who lived in Wards 7 and 8, which had the highest prevalence of health conditions, were economically disadvantaged compared with 49 percent in Ward 2 and 72 percent in Ward 4, the wards with the lowest prevalence of health conditions (table 2).

Because DCPS offers school choice options to families, many DC students attend school outside their neighborhood or ward of residence. Schools in Wards 6 and 7 served the highest percentage of students with any reported health condition in 2018/19, with more than 30 percent of students in each ward having a health condition. Schools in Wards 1 and 4 served the lowest percentage of students with a reported health condition, with 23 percent of students in Ward 1 having a health condition and 19 percent in Ward 4 (figure 2).

The prevalence of some conditions of particular interest to DCPS, including asthma, ADHD, food allergies, and IDDD, varied significantly across students' wards of residence and school wards, with some wards having significantly higher or lower rates than others (see figures B1–B8 and tables B3 and B4 in appendix B). Again, some prevalence findings correspond to differences in economic disadvantage across wards. For example, the wards of residence with the lowest prevalence of asthma (Wards 2 and 3) also had lower percentages of economically disadvantaged students (49 percent and 7 percent, respectively) than other wards of residence (60–95 percent; see table 2 and figure B1 in appendix B). And the three school wards with the highest prevalence of asthma (Wards 5, 7, and 8) had the highest percentages of students who were economically disadvantaged (see table 2 and figures B1 and B2). However, the school wards with the highest prevalence of food allergies (Wards 2 and 3) had lower percentages of economically disadvantaged students (32 percent and 12 percent, respectively) than all other school wards (64–93 percent; see figure B6 in appendix B).

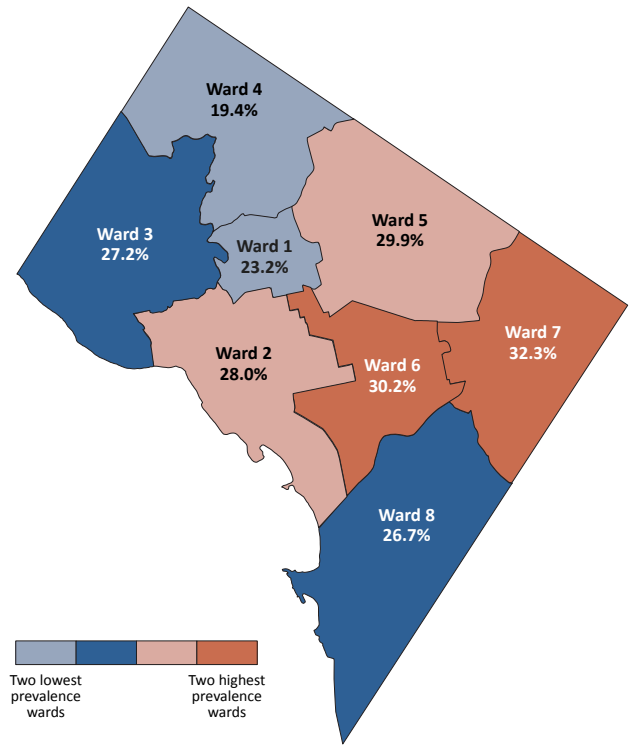
Figure 1. Prevalence of any reported health condition among District of Columbia Public Schools students, by ward of residence, 2018/19



Note: An *F*-test used to assess differences in ward-by-ward distributions was statistically significant at the $p < .05$ level.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and the District of Columbia Public Schools Conditions and Treatments report.

Figure 2. Prevalence of any reported health condition among District of Columbia Public Schools students, by school ward, 2018/19



Note: An *F*-test used to assess differences in ward-by-ward distributions was statistically significant at the $p < .05$ level.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and the District of Columbia Public Schools Conditions and Treatments report.

Table 2. Percentage of students who are economically disadvantaged and percentage who are proficient in math and reading, by ward of residence and school ward, 2018/19

Ward	Students by ward of residence			Students by school ward		
	Economically disadvantaged ^a	Proficient in math ^b	Proficient in reading ^b	Economically disadvantaged ^a	Proficient in math ^b	Proficient in reading ^b
Ward 1	82.4	16.5	20.7	89.3	14.3	17.7
Ward 2	48.6	21.7	24.9	31.7	22.4	34.7
Ward 3	7.3	37.7	44.3	11.7	33.3	42.4
Ward 4	71.5	20.6	25.8	78.7	15.6	17.0
Ward 5	86.7	12.1	18.8	90.0	7.2	13.8
Ward 6	60.3	18.3	23.1	63.6	15.1	20.1
Ward 7	91.3	8.3	13.4	92.7	5.9	8.5
Ward 8	94.6	7.2	10.9	90.9	5.4	7.3

a. Students are considered to be economically disadvantaged if they are eligible for the national school lunch program, Temporary Assistance for Needy Families, or Supplemental Nutrition Assistance Program benefits; if they are identified as homeless; or if they are under the care of the Child and Family Services Agency.

b. Students are considered to be proficient if they receive a performance level score of 4 (met expectations) or 5 (exceeded expectations) on the Partnership for Assessment of Readiness for College and Career test in math or reading.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and District of Columbia Public Schools standardized testing data.

The prevalence of reported health conditions varied by student characteristics, including gender, race/ethnicity, economic disadvantage, whether students attended school outside their ward of residence, and grade span.

For example:

- Health conditions were more prevalent among boys (29 percent) than girls (24 percent). More specifically, higher percentages of boys than girls had asthma, ADHD, or IDDD (table 3).
- A higher percentage of Black students had any health condition, asthma, ADHD, or diabetes compared with students of other race/ethnicity groups. Mental health conditions and food allergies were more prevalent among White/non-Hispanic students (referred to as White students throughout the report) than among students of other race/ethnicity groups. There were no race/ethnicity-based differences for anaphylaxis.
- Economically disadvantaged students were more likely to have any health condition, asthma, or IDDD than students who were not economically disadvantaged. Food allergies were more often reported among students who were not economically disadvantaged.
- Students who attended school outside their ward of residence were more likely to have any health condition, asthma, ADHD, food allergies, or IDDD than students who attended school in their ward of residence.
- Middle school students were more likely to have any health condition, asthma, ADHD, food allergies, anaphylaxis, or IDDD than students in other grade spans; this finding was unexpected and could warrant further investigation by DCPS. High school students were more likely to have a mental health condition or diabetes than students in other grade spans, which could reflect that the onset of these conditions often occurs during adolescence (Centers for Disease Control and Prevention, 2020; Kessler et al., 2007).

Table 3. Prevalence of reported health conditions by student characteristic, 2018/19 (percent)

Student characteristic	Any health condition	Asthma	Attention deficit hyperactive disorder	Mental health condition	Diabetes	Food allergies	Anaphylaxis	Intellectual and developmental disability/delay
Gender								
Female	23.8*	14.0*	1.5*	0.4	0.2	4.5	0.2	1.2*
Male	29.3*	17.9*	3.4*	0.4	0.2	4.7	0.3	2.9*
Race/ethnicity								
Black/non-Hispanic	30.5*	20.2*	2.9*	0.4	0.3*	5.1*	0.3	2.2*
Hispanic	19.7*	11.8*	1.3*	0.3	0.1*	2.7*	0.2	2.2
White/non-Hispanic	22.4*	7.3*	2.4	0.5*	0.2	5.5*	0.2	1.3*
Other	19.6*	7.9*	2.3	0.2	0.1	4.3	0.4	2.3
Economically disadvantaged								
Yes	28.4*	18.7*	2.5	0.4	0.2	4.3*	0.3	2.5*
No	25.9*	11.0*	2.7	0.5	0.2	6.4*	0.2	1.3*
Attends school in ward of residence^a								
Yes	26.0*	15.9*	2.2*	0.4	0.2	4.3*	0.2	1.8*
No	30.5*	17.9*	3.1*	0.5	0.3	5.7*	0.3	2.8*
Grade span								
K–5	24.7*	14.9*	1.5*	0.2*	0.1*	4.2*	0.3	2.3*
6–8	33.4*	20.6*	3.9*	0.5	0.3*	5.8*	0.4*	2.7*
9–12	25.9	15.3*	3.5*	0.8*	0.4*	4.6	0.2*	1.0*

* Indicates a significant difference (at the $p < .05$ level) in the prevalence of health conditions across subcategories of a given student characteristic. For example, an asterisk for the percentage of grade 6–8 students who have a condition means that the prevalence of that health condition is significantly different for students in grades 6–8 than the prevalence for students in the other grade-level subcategories combined.

a. Of the 12,082 students with any health condition, 6,479 students attended a school within their ward of residence, 4,767 students attend a school outside their ward of residence, and 836 students were missing the data needed to determine ward of residence.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and the District of Columbia Public Schools Conditions and Treatments report.

Differences in 504 plan and individualized education program support provided to students with reported health conditions

Among students with any reported health condition, 28 percent received support through either a 504 plan or an IEP (see table 1), indicating that most DCPS students with health conditions do not receive support through a 504 plan or IEP.

This section examines differences in 504 plan and IEP support to understand which students were receiving support through these processes and which were not. The findings focus on the three most prevalent health conditions of particular interest to DCPS (asthma, ADHD, and food allergies) and examine differences in students who received support through a 504 plan or an IEP and those who did not, by student characteristics.

The percentage of students who received support through a 504 plan or an IEP varied by health condition. Some 24 percent of students with asthma and 19 percent of students with food allergies received support through either a 504 plan or an IEP, suggesting that most students with these two conditions are not supported through these processes (table 4). The percentage is higher for students with ADHD, 68 percent of whom received support through either a 504 plan or an IEP. Students with asthma, ADHD, or food allergies were more likely to receive support through an IEP than a 504 plan.

The percentage of students with asthma, ADHD, or food allergies who received support through a 504 plan or an IEP varied by student characteristics.

Among students with asthma (see table 4):

- Students who were White, not economically disadvantaged, or attended school outside their ward of residence were more likely to receive support through a 504 plan than were students without those characteristics.
- Students who were male, Black, economically disadvantaged, or attended school outside their ward of residence were more likely to receive support through an IEP than were students without those characteristics.
- Students in grades 9–12 were more likely to receive support through a 504 plan than were students in lower grade spans, but there were no grade-based differences in IEP support.

Among students with ADHD (see table 4):

- Students who were White or who were not economically disadvantaged were more likely to receive support through a 504 plan than were students who were Black or who were economically disadvantaged.
- Students who were Black, economically disadvantaged, or attended school outside their ward of residence were more likely to receive support through an IEP than were students without those characteristics.
- There were no differences by gender or grade span.

Among students with food allergies (see table 4):

- Students who were not economically disadvantaged and those in grades 9–12 were more likely to receive support through a 504 plan than were students who were economically disadvantaged or in lower grade spans.
- Students who were male, Black, economically disadvantaged, or attended school outside their ward of residence were more likely to receive support through an IEP than were students without those characteristics.

Across all three health conditions, Black students, those who were economically disadvantaged, and those who attended school outside their ward of residence were more likely to receive support through an IEP than were students without those characteristics.

Table 4. Type of support received by students with asthma, attention deficit hyperactivity disorder, and food allergies, by student characteristics, 2018/19

Student characteristic	Asthma			Attention deficit hyperactive disorder			Food allergies		
	504 plan or IEP	504 plan only	IEP only	504 plan or IEP	504 plan only	IEP only	504 plan or IEP	504 plan only	IEP only
All students	24.1	3.8	20.2	67.5	18.8	48.5	19.0	4.9	14.0
Gender									
Female	17.5*	3.4	14.1*	66.2	18.5	47.7	14.0*	4.0	9.9*
Male	29.0*	4.1	24.8*	68.0	18.8	48.9	23.6*	5.7	17.7*
Race/ethnicity									
Black/non-Hispanic	25.8*	3.6*	22.2*	66.4	13.4*	52.7*	21.6*	4.6	16.8*
Hispanic	19.9*	3.4	16.5*	65.1	21.4	43.7	17.8	4.3	13.6
White/non-Hispanic	17.6*	7.8*	9.8*	73.6	37.1*	36.5*	12.0*	6.6	5.1*
Other	7.3*	1.2	6.1*	70.8	45.8*	25.0*	11.4	2.3	9.1
Economically disadvantaged^a									
Yes	25.9*	3.4*	22.4*	66.9	12.3*	54.5*	22.3*	4.2*	18.0*
No	16.8*	6.1*	10.7*	71.6	36.6*	34.7*	13.7*	6.5*	7.1*
Attends school in ward of residence									
Yes	22.7*	3.4*	19.2*	64.8*	18.8	45.8*	17.5*	4.7	12.6*
No	26.2*	4.5*	21.6*	71.8*	19.5	52.2*	21.2*	5.3	15.8*
Grade span									
K–5	23.0*	3.0*	20.0	68.2	19.2	48.8	16.8*	3.7*	13.0
6–8	24.7	4.4	20.3	67.7	19.3	48.5	21.6	5.4	16.1
9–12	25.7	4.9*	20.6	66.6	18.0	48.3	21.2	7.0*	13.9

* Indicates a significant difference (at the $p < .05$ level) in support across subcategories of a given characteristic. For example, an asterisk for students in K–5 means that there is a significant difference in the percentage of grade K–5 students who receive support for that health condition through that process than the percentage for students in all other grade spans combined for that column.

IEP is individualized education program.

Note: This table presents raw descriptive data with no adjustments for student characteristics.

a. Students are considered to be economically disadvantaged if they are eligible for the national school lunch program, Temporary Assistance for Needy Families, or Supplemental Nutrition Assistance Program benefits; if they are identified as homeless; or if they are under the care of the Child and Family Services Agency.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records and the District of Columbia Public Schools Conditions and Treatments report.

Comparing education outcomes of students with and those without reported health conditions

The next set of findings compares key differences in education outcomes of students with and those without reported health conditions and for students with and those without the three most prevalent health conditions of particular interest to DCPS (asthma, ADHD, and food allergies). DCPS already examines education outcomes of students with IDDD, and the small number of students with each of the other conditions makes further examination less actionable.

Students with any reported health condition generally had poorer education outcomes than students without a health condition. Students with any reported health condition were less likely to be proficient in math and reading, more likely to be chronically absent, and more likely to be suspended than students without a health condition (table 5). Students with a reported health condition had higher GPAs (2.59 out of 4.00) than students without a health condition (2.48). This difference was not statistically significant, however, after a sensitivity test

Table 5. Comparison of education outcomes for students with and those without a reported health condition, 2018/19

Outcome	Any health condition		Asthma		Attention deficit hyperactive disorder		Food allergies	
	With	Without	With	Without	With	Without	With	Without
Proficient in math ^a (%)	26.8*	32.1	22.6*	32.3	17.7*	30.8	32.5	30.3
Proficient in reading ^a (%)	36.4*	40.9	31.6*	41.4	25.9*	40.0	45.8*	39.1
Chronically absent (%)	32.2*	27.8	34.9*	27.8	44.0*	28.9	28.7	29.0
Suspended (%)	11.0*	7.3	11.9*	7.6	25.2*	7.9	8.8	8.3
Grade point average (grades 9–12)	2.59*	2.48	2.50	2.51	2.25*	2.52	2.67*	2.50

* Indicates a significant difference (at the $p < .05$ level) in raw unadjusted education outcomes between students with and those without a health condition. Significant differences that favor students with a health condition are shaded in **blue**. Differences in grade point average between students with and those without a health condition and those with and those without food allergies are no longer statistically significant after student characteristics and school-specific effects are controlled for; these results are shown in **light blue**. Significant differences that favor students without a health condition are shaded in **red**. Differences between students with and those without a health condition are no longer significant when the sample is limited to students with an individualized education program; these results are shown in **light red**.

a. Students were considered to be proficient if they received a performance level score of 4 (met expectations) or 5 (exceeded expectations) on the Partnership for Assessment of Readiness for College and Career test in math or reading.

Source: Authors' analysis based on data from District of Columbia Public Schools administrative records, District of Columbia Public Schools standardized testing data, and the District of Columbia Public Schools Conditions and Treatments report.

was applied that controlled for student characteristics and school-specific effects, suggesting that the raw difference in GPA could be driven by other characteristics than health conditions.⁶

Additional descriptive analyses by student characteristics suggest that students with health conditions generally fared worse on education outcomes than students without health conditions, regardless of gender, race/ethnicity, economic disadvantage, or attendance in a school in or outside their ward of residence (see table B5 in appendix B).⁷

Health-based differences in education outcomes vary by health condition: in general, students with food allergies fare better than students without food allergies, whereas students with asthma or ADHD fare worse than students without these conditions.

For example (see table 5):

- Students with asthma were less likely to be proficient on standardized math and reading tests and more likely to be chronically absent or suspended than students without asthma. Students with and those without asthma had no difference in GPA. As reported earlier, asthma is more common among economically disadvantaged students, who may have fewer resources and more obstacles to overcome to achieve academically.
- Students with ADHD fared worse on all education outcomes than students without ADHD. Students with ADHD were less likely to be proficient on standardized math and reading tests, were more likely to be chronically absent or suspended, and were more likely to have a lower GPA than students without ADHD.
- Students with food allergies were more likely to be proficient on standardized reading tests and to have a higher GPA than students without food allergies. After school-specific effects and student characteristics, including economic disadvantage, were controlled for, the difference for proficiency in reading remained significant but the difference in GPA did not.

6. The study team used sensitivity analyses to further investigate any unexpected findings reported in table 5, including those for students with any health condition and those for students with food allergies.

7. Raw descriptive data suggested that among Hispanic students, those with a health condition fared better than those without a health condition (see table B5 in appendix B), though these differences were no longer statistically significant after other student characteristics were adjusted for and school fixed effects were added to the model.

- There were no differences between students with food allergies and students without them on the other education outcomes: proficiency on standardized math tests, suspensions, and chronic absenteeism. Food allergies might be less likely to prevent students from attending school than conditions such as asthma and ADHD, which could require students to miss school because of symptoms associated with their health condition or doctor appointments.

Additional descriptive analyses reported ward-level differences in education outcomes between students with and those without asthma, ADHD, or food allergies, comparing differences within wards to those across other wards in DCPS. In general, these findings suggest that ward-level differences in education outcomes between students with and those without health conditions were similar to DCPS-wide differences. There were, however, some distinctions by student ward of residence (see tables B6a, B6b, B6c in appendix B) and school ward (see tables B7a, B7b, and B7c).

Implications

The study findings have several implications that DCPS could consider in its work to promote positive outcomes for students with health conditions.

Consider developing a plan to better identify students with health conditions so that these students can be better served

The prevalence of reported health conditions in DCPS is more than 10 percentage points lower than the prevalence data from the NSCH (Child and Adolescent Health Measurement Initiative, 2018). Differences in prevalence are especially large for Black students: this study found that 31 percent of Black children had a reported health condition, whereas NSCH data show a prevalence of 46 percent in 2018. Taken together, this suggests that health conditions are underreported to DCPS or underdiagnosed by DCPS staff.⁸ DCPS could evaluate its collection and monitoring of health condition data to ensure that processes are consistent and uniform. Health Insurance Portability and Accountability Act (HIPAA) privacy rules allow non-school system health care providers to share information on students' health conditions with school nurses for treatment purposes (Dworkowitz & Mann, 2020). DCPS could consider working with service providers and other community partners, such as after-school programs, school health centers, nurses, physicians, and local government agencies, to develop data sharing agreements and increase community health screening.

Relatedly, this study's findings suggest possible disparities in the recognition of health conditions among different groups of students in DCPS, highlighting the importance of further exploration of prevalence by race/ethnicity and economic disadvantage. In general, reported health conditions are most prevalent among DCPS students who are Black and students who are economically disadvantaged. Food allergies, however, are most often reported among students who are White and students who are not economically disadvantaged. These differences are consistent with the findings of other research, which suggest that recognition and reporting of food allergies are higher in children in higher-income and non-racial/ethnic minority groups (McGowan et al., 2016). This could, in part, be because families of color and those that are economically disadvantaged experience systemic racism, discrimination, and other obstacles that limit their access to health care, including information related to the signs and symptoms of food allergies (Chokshi et al., 2015; Thakur et al., 2017).

8. The health conditions included in the NSCH database are based on parents' recollection and not independently verified by medical professionals. The DCPS data classifies students based on current health conditions that were identified by medical professionals, reported to schools, or supported within the school year. The NSCH database excluded conditions such as blood disorders, cystic fibrosis, and genetic or inherited conditions, which were included in the current study's definition of "any health condition."

Though data on racial/ethnic disparities in food allergies in the United States are limited (Greenhawt et al., 2013), recent data suggest that Black children might have a higher overall prevalence of food allergies but lower odds of being formally diagnosed (Gupta et al., 2011; Keet et al., 2014). Another explanation for racial/ethnic disparities in reported food allergies in DCPS could be the misidentification of food allergy symptoms. For example, wheezing after exposure to food allergens might be misinterpreted as being caused by asthma (Chokshi et al., 2015). Reported asthma rates are significantly higher among Black students in DCPS than among students of other race/ethnicity groups; it is possible that some of these students have food allergies. A single food allergy information session for school nurses could improve the identification of food allergy symptoms by clarifying differences between asthma and allergic reactions to food. This could lead to the development of food allergy prevention and treatment plans for more students and thus increase the availability of life-saving drugs at schools (Best et al., 2018; Chokshi et al., 2015).

Consider offering more support for students with asthma, given its high prevalence among students

In total, 16 percent of students in DCPS were reported to have asthma in 2018/19, which is double the national average of 8 percent (Child and Adolescent Health Measurement Initiative, 2018). Among DCPS students with asthma, 24 percent received support through either a 504 plan or an IEP, indicating that most students with asthma are not supported through these processes. DCPS might want to examine ways to provide these students' families with information about 504 plans to ensure that they are aware of this potential process for providing school-based support. The district could also encourage schools to organize support groups for students and families, to help them learn from each other and better understand and manage asthma. Additionally, DCPS could provide families with other resources, such as lists of common asthma triggers, ways to avoid or decrease these triggers at home and at school, and contact information for local treatment services (Clark et al., 2010). DCPS could also consider evaluating possible asthma triggers within school buildings, such as dust, mold, and scented cleaning products (Jones & Wheeler, 2004).

Consider further investigation of the types of supports students receive and whether student characteristics or severity of condition are associated with any differences in supports

Each DCPS school is assigned a nurse who provides basic health services and aims to reduce health-related barriers to students' academic success. School-based health centers are also located in or near DCPS high schools in four wards (DCPS Health, 2020). DCPS students with health conditions can also receive supports through a 504 plan or an IEP, depending on the condition and severity of the symptoms. This study, however, did not examine the specific types of supports students received from nurses, school-based health centers, or as part of their 504 plan or IEP or whether these supports were associated with the severity of the health condition.

DCPS might want to gather consistent, detailed student-level data on the services students receive and the severity of their health conditions so that analyses could investigate whether specific supports differ by student characteristics or the severity of their health condition. For example, among students with asthma who have a 504 plan or an IEP, do the specific supports students receive differ depending on whether they are provided through a 504 plan or an IEP, or by student characteristics such as gender and race/ethnicity? Are students with less severe health conditions the ones who are not receiving support through a 504 plan or an IEP? Are the number of trips to the school nurse associated with the severity of the health condition, and does this differ by condition or student characteristics?

These future data collection efforts and associated analyses could potentially help unpack other findings of the study. For example, among students with asthma, ADHD, or food allergies, those who are Black, those who are economically disadvantaged, and those who attend school outside their ward of residence are more likely than other students to receive support through an IEP. These differences in support could be based on the severity of students' health conditions. For example, Black students and those who are economically disadvantaged could have more severe cases of asthma, on average, than other students, which could lead to increased need for support through an IEP.

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