

Vital Signs for Pediatric Health: High School Graduation

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June 26, 2023

This paper is part of a series on pediatric vital signs. The other selected measurements in this series include infant mortality, school readiness, and chronic absenteeism. These papers can be found at <https://doi.org/10.31478/202306a>, <https://doi.org/10.31478/202306b>, and <https://doi.org/10.31478/202306c>.

Introduction

In 2015, the Institute of Medicine (now the National Academy of Medicine) released the report *Vital Signs: Core Metrics for Health and Health Care Progress* as a “basic, minimum slate of core metrics for use as sentinel indices of performance at various levels with respect to the key elements of health and health care progress” (IOM, 2015). Although indicators of pediatric health were included in that report as key elements of healthy behaviors, healthy communities, and preventive services, the core measures in the report emphasized indicators of adult health. This series of papers, “Vital Signs for Pediatric Health”, describes four metrics across the pediatric life course, each measuring how well the health care system is building the physical, cognitive, and socio-emotional health of the pediatric population, thereby laying the foundation for life-long health and well-being. The metrics—infant mortality, school readiness, chronic absenteeism, and high school graduation—were selected to focus on four different developmental stages of growth. A standardized set of core metrics to assess pediatric health could provide data to support health systems in identifying important areas for attention among their pediatric population and enable them to respond in a timely way. This rapid response is especially important in pediatric health systems as children undergo rapid development within a short time span.

This paper discusses one of those four measures—high school graduation—as a pediatric vital sign because it reflects more than a number. Successful completion of high school also reflects the degree to which healthy growth and development has been supported throughout childhood.

Earning a high school diploma is a predictor of adult success, including better employment outcomes, better adult physical and mental health, and decreased likelihood of involvement with the criminal justice system (NCES, 2021b; Blackwell et al., 2014; Lochner and Moretti, 2004). Those who do not graduate from high school face a greater likelihood of health risks as adults, including lower life expectancy, limited employment prospects, lower lifetime wages, and increased risk of incarceration (APHA, 2018).

The remainder of this paper defines high school graduation rate, the selection of the specific measure that can assess high school graduation, and the technical integrity of the measure. The paper also describes disparities by state, race and ethnicity, and socio-economic status and delineates the importance of a high school diploma, including impacts on employment, future earnings, and individual health. It is important to note that the General Equivalency Diploma (GED) is not considered in this paper. Research shows that adults with GEDs have health outcomes more similar to high school dropouts than to graduates and perform at the level of dropouts in the labor market (Zajacova, 2012; Heckman and LaFontaine, 2007). Finally, the paper lays out the challenges in linking education data with health systems data to help communities have a broader impact on improving the health and well-being of their populations, implementation challenges more broadly, and potential ways to improve use of this metric to increase high school graduation rates.

Defining High School Graduation

High school graduation rate is a potentially useful metric for analyzing pediatric health and well-being because it is the

same for every school system in the U.S. and is publicly available online through the National Center for Education Statistics (NCES) website at <https://nces.ed.gov/>. There are two federally mandated measures of high school graduation that are collected by local school districts and reported to state departments of education who then submit them annually to the U.S. Department of Education (DOE). The two measures are the Adjusted Cohort Graduation Rate (ACGR) and the Average Freshman Graduation Rate (AFGR) (McFarland, 2017).

The ACGR provides information about the percentage of public high school students who graduate on time (four years after starting ninth grade for the first time) with a regular diploma. ACGR is calculated by dividing the number of students graduating in four years with a regular high school diploma by the number of students who form the adjusted cohort for the graduating class (McFarland et al., 2020). Using ACGR as a metric allows for the comparison of graduation rates across states more easily than the graduation rates previously compiled by the DOE (McFarland et al., 2020). ACGR reports are available at the national, state, district, and school levels on the NCES website, and these reports are easily accessible with breakdowns for demographic variables (e.g., race, language, etc.) for each state.

On the other hand, the AFGR uses aggregated student enrollment data to estimate the size of an incoming freshman class, which is compared to the number of high school diplomas awarded four years later. The incoming freshman class size is estimated by averaging eighth grade enrollment in year one, ninth grade enrollment in year two, and tenth grade enrollment in year three of an identified cohort. Since the estimate is based only on aggregate annual counts of enrollment and graduate data, the AFGR can be derived from student populations dating back to the 1960s—an advantage for tracking trends over time.

The authors of this paper selected the ACGR to define and track high school graduation rates because it is more accurate than the AFGR in the following ways:

1. The AFGR's estimate of the incoming freshman class is fixed and is not adjusted to account for students entering or exiting the cohort during high school, and thus, AFGR can over- or under-estimate graduation rates.
2. The diploma count used in the AFGR includes any students who graduate with a regular high school diploma in a given school year, which may include students who took more or less than four years to graduate.
3. The AFGR's average enrollment base is sensitive to the presence of eighth and ninth grade dropouts. Since more students typically drop out in ninth grade than in eighth grade, the overall impact is likely to underestimate the AFGR enrollment base relative to the true ACGR cohort (McFarland, 2017).

These three factors appear to largely balance out at the national level, and the AFGR closely tracks the ACGR—in 2012–2013, there was less than one percentage difference between the AFGR (81.9%) and the ACGR (81.4%) (McFarland, 2017). AFGR data for 2013–2014 and later years are currently unavailable. At the state level, however, especially for small population subgroups, there is often more variation between the two measures (McFarland, 2017). To allow for more granular analysis of high school graduation rates, the authors believe that the ACGR is the preferred data set.

Additionally, the ACGR was adopted by all 50 U.S. states in 2005, and in 2008, the DOE issued regulations that created a standard method for collecting high school graduation rate data (DOE, 2017). Additionally, the Every Student Succeeds Act legislated the key components of the common graduation rate definition, including guidance for counting the total ninth grade cohort, accounting for transfers (in and out of the cohort), and for refining cohort totals (e.g., closing the cohort after summer after the fourth year of high school) (DOE, 2017). This allows for comparison of aggregate rates at both the state and national levels.

Selecting High School Graduation as a Pediatric Vital Sign

The American Public Health Association has called for “reframing school dropout as a public health issue because disparities in education predict disparities in health outcomes” (APHA, 2018). Thus, for reasons explained below, the authors of this paper selected high school graduation from among the readily available and aspirational measures of healthy functioning among older adolescents for several reasons:

1. High school graduation rate reflects a *community's* support for keeping students in school and enabling them to graduate with their peers;
2. High school graduation rate is associated with other indicators of a *community's health*, such as crime rates, unemployment rates, and drug abuse; and
3. Health providers and systems can play a role in promoting good health, which enables youth to stay in and perform well in school.

In addition, high school graduation rate is a frequently used measure for the educational sector in national dashboards and reports—for example, Healthy People 2030 and America's Children in Brief: Key National Indicators of Well-Being (ODPHP, 2021; FICFS, 2018).

High school graduation rates reflect the input of a wide array of different human service sectors, including but not limited to: housing (in 2018–2019, students experiencing homelessness had a lower ACGR than the overall rate in 49 states and the District of Columbia); health care (i.e., limited access to quality health care may affect school attendance, which in turn affects high school

graduation); early childhood education programs; community resources (i.e., the availability of libraries and therefore library-based homework and tutoring programs); community-based out-of-school time programs; and state and federal policies that impact local education systems (i.e., state taxation systems that provide funding to under-resourced districts) (NCES, 2020; Zaff et al., 2017; Jackson et al., 2016; Attendance Works, 2015; New York Comprehensive Center, 2011; Schweinhart, 2005).

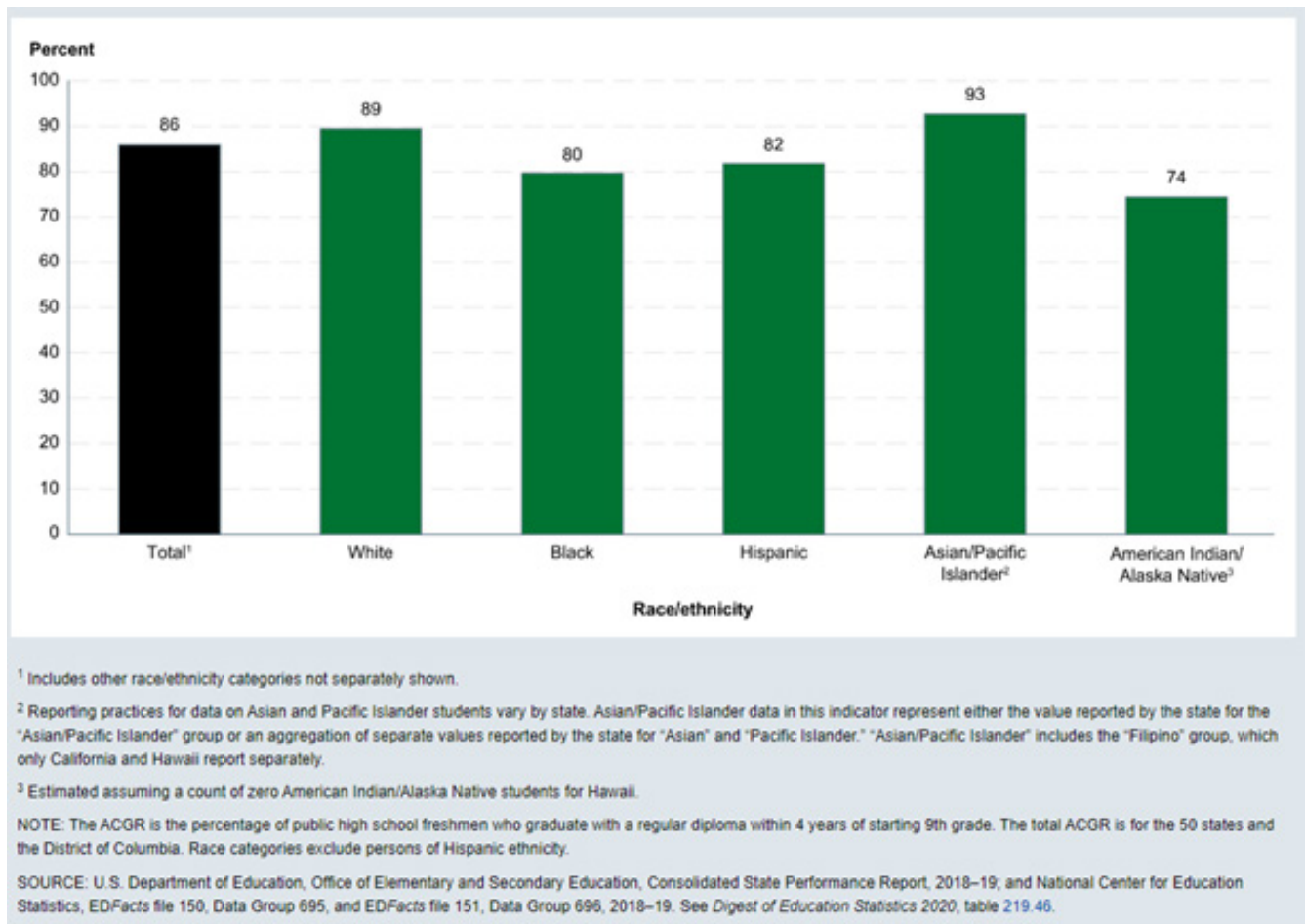
Measures exist on other educational issues besides high school graduation, including measures related to suspensions, expulsions, and dropout rates. However, these measures are still associated with high school graduation rates and are not systematically collected across all public school systems (Balfanz et al., 2014; Skiba et al., 2014). High school graduation rate, by contrast, has a standardized method of collection and reporting that is the same for every public school system in the country. Because chronic absenteeism (defined as a student missing 15 days of school for any reason in a single school year)—even a single instance of it between eighth and twelfth grade—is as-

sociated with a seven-fold increase in the likelihood of dropping out of high school, the authors of this paper discuss that measure separately in a different paper in this series (Johnson et al., 2023; DOE, 2019).

Recent Data and Trends in High School Graduation

Overall, the U.S. average ACGR has been increasing, from 79% in 2010–2011 to 85% in 2016–2017 (NCES, 2021a). While 40 states had ACGRs that were between 80–90%, ACGRs ranged from 71% (New Mexico) to 91% (Iowa) (McFarland et al., 2019). The average 2013–2017 dropout rates ranged from 3.8% in Massachusetts to 9.6% in Louisiana. However, as discussed below, certain groups have lower ACGRs than the overall graduation rate, including students of color, students from economically disadvantaged communities, limited-English-proficient students, and students receiving special education services.

FIGURE 1 | Adjusted Cohort Graduation Rate (ACGR) for Public High School Students, by Race/Ethnicity: 2018–2019



SOURCE: U.S. Department of Education, Office of Elementary and Secondary Education, Consolidated State Performance Report, 2018–2019; and National Center for Education Statistics, ED Facts file 150, Data Group 695, and ED Facts file 151, Data Group 696, 2018–2019.

Disparities

In 2018–2019 the average ACGR for American Indian/Alaska Native (74%), Black (80%) and Hispanic (82%) students were below the U.S. average of 86% (see Figure 1). The ACGRs for White students (89%) and Asian/Pacific Islander students (93%) were above the U.S. average ACGR. White students had higher ACGRs than Black students in every state and the District of Columbia.

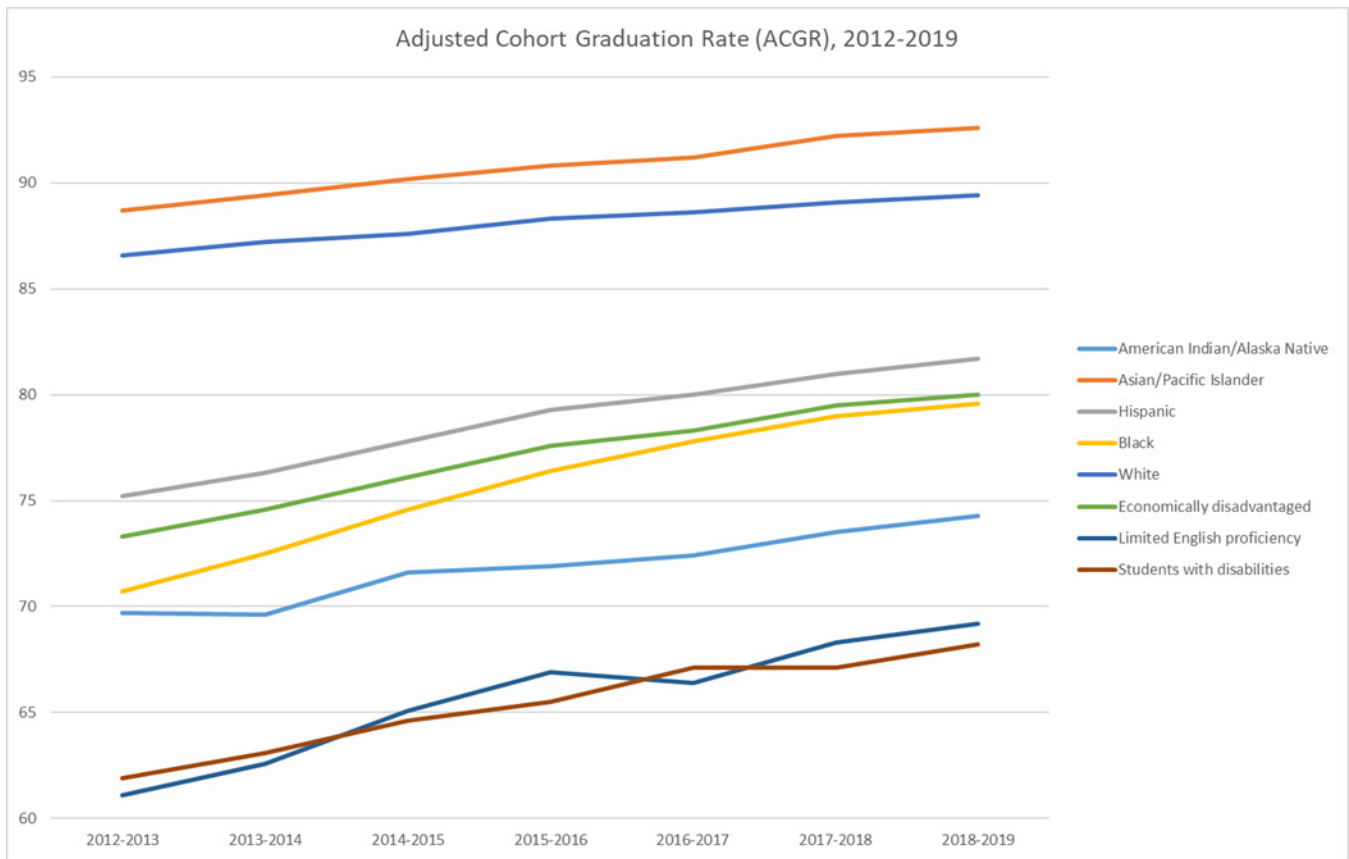
Furthermore, during this same period, the U.S. average ACGR for White students (89%) was nine percentage points higher than the U.S. average ACGR for Hispanic students (82%) (see Figure 1). The ACGRs for White students were higher than the ACGRs for Hispanic students in 46 states and the District of Columbia.

Most of the progress in the national ACGR—from 2012 to 2017 (see Figure 2)—was attributable to Black and Hispanic students’ graduation rates absolute increases of 12 and 10 percentage points respectively, which nearly doubles the national average increase in high school graduation rates of 6.3%. However, there remain significant graduation rate gaps for both Black and Hispanic populations, as they comprise a disproportionately large percentage of the country’s non-graduates (Atwell et al., 2020).

Additionally, in 2018–2019, the U.S. average ACGR for economically disadvantaged students was 80%, lower than the U.S. average ACGR of 85.8% (NCES, 2020). In the same period, the U.S. average ACGR for limited-English-proficient students was 69.2%, lower than the U.S. average ACGR of 85.8% (NCES, 2020).

Significant disparities also exist for students with disabilities. According to data from the Institute for Education Sciences, in 2018–2019, the U.S. average ACGR for students with disabilities was 68.2%, lower than the U.S. average ACGR of 85.8% (McFarland et al., 2020; NCES, 2020). The high school dropout rate also differed by disability status in 2017—it was 12.1% for youth receiving special education services and 5.0% for youth not receiving special education services. The ACGR for 18- to 24-year-olds receiving special education services was lower than that of their peers not receiving special education services—84.8% versus 93.6%, respectively. For students with disabilities, the lowest to highest ACGR ranged from 36% in Mississippi to 84% in Arkansas. The four-year ACGR gap between students with disabilities and all students remained at 18 points (67% versus 85%, respectively).

FIGURE 2 | Adjusted Cohort Graduation Rate (ACGR) from 2012–2017



SOURCE: National Center for Education Statistics. n.d. 2021 *Public high school graduation rates*. Available at: <https://nces.ed.gov/programs/coe/indicator/coi> (accessed February 14, 2023).

While the ACGR data does not include information about students' sexual or gender minority status, some research indicates lesbian, gay, and bisexual students may be more likely than heterosexual students to drop out of high school. However, additional research is needed in this area.

Challenges in Measuring High School Graduation Rates

Although there is a standard reporting system for collecting ACGR data, rates could be inflated by various means, including adding alternative diplomas awarded to special education students in the diploma count, removing students from the cohort with no justification, or no longer counting students who have transferred to charter schools (Dynarski, 2018). However, despite the inconsistencies in some states and districts, the increase in high school graduation rates from 2001 to 2016 appears to reflect a real increase in human capital (e.g., health, education, and skills that contribute to a person's ability to be productive) (Harris, 2020).

Though the ACGR metric is now in its ninth year, there are still opportunities to improve its data quality (Atwell et al., 2020). For example, there is not a uniform definition of a 'regular' diploma nor a set method for counting transfer students across states, which can make cross-state comparison difficult. States may also have different methods for identifying subgroups such as English language learners or students with disabilities. Additionally, about 9% of students attend private schools and therefore may not be reflected in the ACGR data (NCES, 2022).

Furthermore, data at the school district level may not correspond to the geographical area being used for other measures. While measures such as infant mortality are available at the city, town, county, and zip code level, the ACGR may be reported for different geographical areas. For example, ACGR is not available at the zip code level, and thus, it may be impossible to compare trends in measures such as infant mortality to the ACGR.

Another limitation of using the ACGR is that it cannot yet be linked to health system data. The Family Educational Rights and Privacy Act (FERPA) is a federal law that protects the privacy of student education records (DOE, 2021). It applies to all schools that receive federal funds and requires parent or guardian consent before student education records can be shared. The Health Insurance Portability and Accountability Act (HIPAA) is a federal law that protects sensitive patient health information from being disclosed without the patient's consent or knowledge (HHS, n.d.). HIPAA requires appropriate administrative, physical, and technical safeguards to protect the confidentiality, integrity, and security of electronic personal health information. Although there are local instances of navigating the HIPAA and FERPA data protection regulations to share education and health data, such linking has not yet occurred on a larger scale (Hewitt et al., 2019).

As health and public health systems are increasingly focused on integrating social determinants of health and related data into their electronic health records, there may be an opportunity for the integration of educational attainment data with pediatric health data that can inform interventions to maximize school attendance rates and ultimately improve high school graduation rates, particularly for children of color or ethnic minority groups (Cantor and Thorpe, 2018). Tools are also emerging to assist health departments and systems in using available data to assess pediatric well-being on a population level. For example, the Public Health Informatics Institute developed a playbook to guide the planning and implementation of a child and adolescent mental health surveillance program using existing data sources, including the metrics of school readiness, chronic absenteeism, and high school graduation (PHII, 2021).

Importance of Measuring High School Graduation to Understand Children's Health

High school graduation rate is a strong predictor of adult success, including being linked to better employment outcomes, better physical and mental health, and less likelihood of becoming involved with the criminal justice system (Hahn and Truman, 2015; Wilson and Tanner-Smith, 2013). Those who do not graduate from high school face a greater likelihood of health risks as adults, including lower life expectancy, limited employment prospects, lower wages, and increased risk of incarceration (Hummer and Hernandez, 2013; Wilson and Tanner-Smith, 2013).

Linkages to Health Outcomes Later in Life

Youth who do not graduate from high school are more likely to be involved in the criminal justice system. High school dropouts are more likely to be arrested for larceny, assault, drug possession, or drug sales relative to peers who did graduate from high school (Maynard et al., 2014). Lower rates of high school graduation are observed for racial minority groups, particularly Black and Hispanic students, and for economically disadvantaged students from economically disadvantaged communities (NCES, 2020). These observed lower rates of high school graduation may be a driving factor in disparities in incarceration rates (Gase et al., 2016). Nationally, the majority of men incarcerated in state and federal prisons—approximately 80%—did not graduate high school, and they are disproportionately Black men from impoverished backgrounds (Heckman and LaFontaine, 2007).

One factor that can prevent girls from graduating high school is teenage pregnancy. Although there are services and programs in place to prevent teen pregnancy and to support those who do become pregnant, becoming pregnant remains a major barrier to completing high school (Steinka-Fry et al., 2013). Other factors that may prevent students from graduating high school include a dislike of school, not doing well on schoolwork, and financial difficulties at home (Doll et al., 2013). For additional

information on reasons students may not attend school, see “Vital Signs for Pediatric Health: Chronic Absenteeism” (Johnson et al., 2023).

Lower educational attainment has long been linked to lower wages and lower earning potential. According to the U.S. Bureau of Labor Statistics, median weekly earnings for those with the highest levels of educational attainment—doctoral and professional degrees—were more than triple those with the lowest level of education (BLS, n.d.). In 2018, the unemployment rate was also highest for those with less than a high school degree (5.6%), compared to those with doctoral degrees (1.6%) (BLS, n.d.).

Socioeconomic status, calculated by creating a composite of education, income, and occupation, is also a significant predictor of health outcomes in later life (Kivimäki et al., 2020; Fiscella and Williams, 2004). Low socioeconomic status and associated risk factors have been linked with a higher risk for cardiovascular disease, similar to that of traditional risk factors like smoking, obesity, and diet and exercise (Schultz et al., 2018).

Potential Health Systems Benefits

Given the racial and ethnic disparities that exist in high school graduation rates, equalizing graduation rates for all children will likely require more than improving educational content. Integrating education data with health systems’ data could inform communities’ efforts to improve local graduation rates. Being able to identify high school graduation rates and its precursors—e.g., chronic absenteeism (see “Vital Signs for Pediatric Health: Chronic Absenteeism” [Johnson et al., 2023]) and teenage pregnancy—within health systems could allow health systems to act earlier and potentially prevent decreased engagement with the educational system. Interventions that may contribute to school completion, such as services and programs to address mental health, substance use, violence, pregnancy, and school climate, also have evidence for improving health outcomes (Freudenberg and Ruglis, 2007). Finally, students who drop out of school lose opportunities to benefit from services such as school-based health centers, which have documented benefits including reducing health care costs (Ran et al., 2016).

The COVID-19 pandemic has likely affected educational achievement milestones, including high school graduation rates, in ways yet unknown. Given that student achievement has suffered from a year or more of limited or virtual schooling, the rates of high school graduation may well also decrease (Krause et al., 2022; Hammerstein et al., 2021). This decrease may reflect continued issues of racial and ethnic disparities, especially since youth from racial or ethnic minority groups and youth from disadvantaged economic situations are less likely to have high-speed internet and the technology necessary to participate in online schooling (Irwin et al., 2021). Following trends pre- and post-COVID-19 to identify the pandemic’s impact on high school graduation rates and particularly any differential impact on stu-

dents from disadvantaged communities could inform schools’ and communities’ efforts to correct inequities and provide social and educational support to facilitate optimal pediatric health.

Conclusion

Although standardized data on high school graduation rates exist, their use as a potential health system metric remains aspirational. The Adjusted Cohort Graduation Rate (ACGR) could serve as a vital sign for pediatric health based on evidence suggesting that health systems’ and other service sectors’ actions are associated with higher (or lower) graduation rates in communities. Graduating from high school can lead to better health and higher income later in life, as well as reduced likelihood of involvement in the juvenile justice or criminal justice systems. The ACGR may therefore offer health systems a sentinel index of the health of adolescents and the adults they may become.

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DOI

<https://doi.org/10.3147/202306d>

Suggested Citation

Hoagwood, K., D. Klein Walker, A. Edwards, J. W. Kaminski, K. J. Kelleher, J. Spandorfer, and E. G. Fox. 2023. Vital Signs for Pediatric Health: High School Graduation. *NAM Perspectives*. Discussion Paper, National Academy of Medicine, Washington, DC. <https://doi.org/10.3147/202306d>.

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Acknowledgments

This manuscript was supported in part by funding (Task Order 200-2011-38807/0070) from the Centers for Disease Control and Prevention.

This paper benefited from the thoughtful input of **Christopher B. Forrest, MD, PhD**, Children's Hospital of Philadelphia; and **Alwyn T. Cohall, MD**, Columbia University Medical Center.

Conflict-of-Interest Disclosures

Erin Fox discloses employment by the National Academies of Sciences, Engineering, and Medicine while this paper series was being drafted.

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