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The Influence of School-Based Health Center Access on High School Graduation: Evidence From Colorado

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A B S T R A C T

Purpose: To examine the association between the introduction of a school-based health center (SBHC) and high school graduation rates.
Methods: We use school-level longitudinal data from Colorado that combines data on the opening of SBHCs in high schools with 4-year high school graduation rates overall and by gender between 2000 and 2018. The analytic sample consists of high schools without an SBHC in 2000 (n = 132). We compare high schools that opened SBHCs over the period to those that did not and run school-level panel fixed effects models to assess the relationship between opening an SBHC and change in high school graduation rates.
Results: Schools that subsequently opened SBHCs had larger minority populations and lower average graduation rates in 2000. Opening an SBHC was associated with a 4.1 percentage point increase in the overall graduation rate ($p = .077$). The gender-stratified analyses indicate young men's graduation rates were most sensitive to the presence of an SBHC, increasing 4.8 percentage points ($p = .051$), compared to young women's graduation rates increasing 3.0 percentage points ($p = .163$).
Conclusions: Our findings suggest that the benefits of SBHC access may extend beyond health-specific outcomes to graduation rates.

IMPLICATIONS AND CONTRIBUTIONS

Policymakers increasingly recognize the importance of providing young adults with convenient, affordable health resources and are in need of more robust evidence for the impact of within-school resources. These findings suggest that the benefits of opening SBHCs may extend beyond health-specific outcomes to graduation rates.

Policymakers' interest in adolescent health has brought about a focus on health-care delivery within school settings [1]. School-based health centers (SBHCs) are comprehensive health-care clinics being introduced in schools across the country that provide medical care and a range of behavioral, reproductive, and dental health services. SBHCs reduce physical and financial barriers to care, improve follow-up, and increase use of self-initiated confidential services and preventive care [1]. Through promoting health and focusing on issues associated with poor academic performance (e.g. substance use, pregnancy, mental health) [2], SBHCs have the potential to improve high school completion rates.

Existing research on the relationship between SBHCs and educational outcomes is mixed. Studies find that SBHC users have higher attendance and grade point averages and fewer school suspensions [3,4], yet SBHC use may not improve graduation rates [5,6]. Studies on SBHCs, however, primarily use within-school designs that compare SBHC users and nonusers within a given school context, mostly in urban settings [3,4,7]. Such studies are limited by selection into SBHC use and may capture the underlying motivation of users rather than the role of the SBHC [7,8]. One exception found that the presence of SBHCs was associated with better college preparation but not reduced dropout [9]. To address

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individual- and school-level selection biases, we use school-level longitudinal data over two decades to assess the relationship between the introduction of an SBHC and changes in the high school graduation rate in Colorado.

Methods

Data

We combined data on high school graduation rates from the Colorado Department of Education for the period of 2000–2018—the period of fastest growth for SBHCs in Colorado—with SBHC opening dates from the Colorado Association of School-Based Health Care.

Variables

We used the 4-year graduation rate, calculated as the number of students receiving diplomas within four years of entering ninth grade divided by the number of students in that cohort that entered ninth grade, adjusting for transfers (hereafter "graduation base"). Before 2010, late graduates were lumped into the 4-year rate, and the necessary raw data are not available for recalculating earlier years. We addressed this by using the annual mean centered 4-year graduation rate for each school as our dependent variable.

The key independent variable is a dichotomous, time-varying indicator of whether the school had an SBHC in a given year. By 2018, 35 SBHCs were operating in high schools in Colorado, 15 of which opened between 2001 and 2017 (All years, including those in which an SBHC opened, refer to end of the academic year to align with graduation data. Thus, the 2017–2018 academic year is referred to as "2018".) and thus have both pre-SBHC and post-SBHC data and met the other inclusion criteria. A time-varying indicator of proportion of the graduation base (a proxy for senior class size) who identify as part of a racial and/or ethnic minority group was included as a control.

Analysis

We restricted our sample of high schools to those open during the full period with over 50 students eligible to graduate, which minimized volatility in graduation rates and improved the comparability of schools that opened SBHCs to schools that did not (see Table 1). We excluded schools that already had SBHCs (n = 10) and alternative schools (n = 5). These exclusion criteria resulted in a sample of 132 schools, which accounted for 57% of public high school students eligible to graduate in Colorado in 2018.

We used t-tests to assess differences in 2000 between schools that subsequently opened an SBHC and schools that did not. We then ran panel fixed effects models using school as the unit of analysis with 19 observations for each school (2000–2018) and no missing data. Fixed effects models yield consistent estimators by focusing on intraschool variation and controlling for all measured and unmeasured school-specific time-invariant unobserved heterogeneity [10]. This enabled us to compare the changes that occurred with the opening of an SBHC netting out other secular changes in graduation rates and in their measurement. We tested the robustness of our findings using other model specifications, including random and mixed effects, as well as difference-in-differences; findings were not sensitive to model specification. Analyses were done for the overall graduation rate and separately by gender. All analyses included robust standard errors for inference and were conducted using xt commands in Stata 14.2. We used the $p < .10$ level to denote statistical significance and reported p-values for all analyses.

Table 1
Baseline descriptive characteristics of Colorado high schools without SBHCs and schools that open an SBHC between 2001–2017, 2000

	Schools without SBHC		Schools with SBHC opening	
	Mean (SD)		Mean (SD)	
Rural	.23 (.42)		.40 (.51)	
Year SBHC opened	n/a		2010.9 (5.1)	
Graduation base	287 (172)		222 (79)	
Proportion minority[a]	.21 (.14)		.37 (.16)	
Proportion free/reduced lunch[a,b]	.22 (.15)		.42 (.21)	
Proportion women	.49 (.04)		.48 (.04)	
	2000	2018	2000	2018
Total graduation rate, %[a]	85.4	88.4	76.6	81.4
Women's graduation rate, %[a]	88.4	91.4	81.5	84.5
Men's graduation rate, %[a]	82.6	85.5	72.4	78.5
Sample size (n)	117		15	

SBHC = school-based health center; SD = standard deviation.
[a] Indicates baseline (2000) differences in schools without SBHC and schools that later obtain an SBHC are statistically significant at $p < .05$ level.
[b] Free and reduced lunch eligibility data are unavailable from the state before 2006. Between 2006 and 2018, however, proportion free and reduced lunch eligible and proportion minority are highly correlated at .83.

Results

Table 1 presents the baseline descriptive characteristics for the 15 high schools that opened an SBHC and the 117 high schools that did not between 2001 and 2017. Schools that subsequently introduced an SBHC had larger minority and free and reduced lunch eligible populations and lower average graduation rates for both men and women in 2000. Forty percent of new SBHCs were in rural areas, higher than the 23% of schools

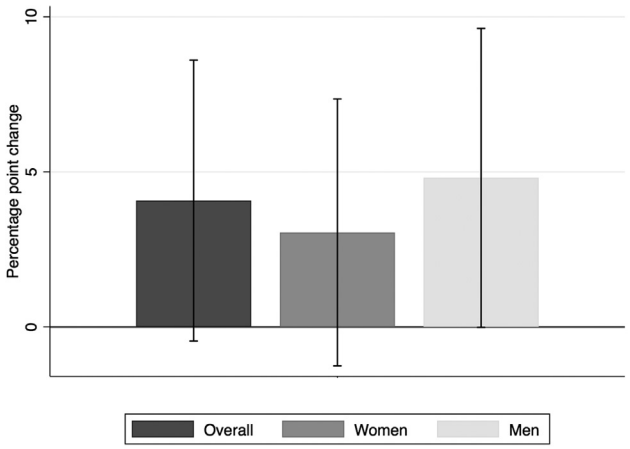

Figure 1. Estimates of the impact of SBHCs on high school graduation rates, Colorado, 2000–2018. Coefficients and 95% confidence intervals (CIs) from fixed effects models of 132 Colorado high schools between 2000 and 2018. Models additionally control for time-varying percent minority and include robust standard errors.

without SBHCs, although this difference was not statistically significant.

Figure 1 presents the coefficients and 95% confidence intervals from a series of three fixed effects models examining changes in graduation rates (overall, women, men) over time. Opening an SBHC during the study period was associated with a 4.1 percentage point increase in the overall graduation rate ($p = .077$). The gender-stratified models showed a 4.8 percentage point ($p = .051$) increase in men's graduation rates and a 3.0 percentage point increase ($p = .163$) in women's graduation rates.

Discussion

Using longitudinal school-level data over a period of 19 years, we found that high schools in Colorado that opened an SBHC experienced larger increases in their graduation rates than schools that did not open SBHCs (statistically significant at $p < .10$ level). Our data suggest that small gains in graduation rates can be made from increasing access to SBHCs and that young men's graduation rates might be most sensitive to this change. SBHCs see a higher proportion of young men compared to other health-care providers [11].

Our analysis has several limitations. Although our modeling strategy controlled for school-level time-invariant effects, other school- or community-level time-varying factors could influence graduation rates. Our inclusion of the time-varying proportion minority will proxy some—but not all—of these factors. Finally, our sample of schools is relatively small and the size of the relationships we detect is modest; thus, our findings should be interpreted with caution and replicated in other settings.

Our study points to possible impacts of SBHC access on high school graduation rates in Colorado, suggesting that providing critical health services to adolescents can support academic outcomes. Future research should continue to explore the relationship between SBHCs and graduation rates and unpack the mechanisms through which SBHCs influence educational outcomes, which services are most critical, as well as differences between urban and rural populations and by gender.

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