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Adolescent Use of School-Based Health Centers and High School Dropout

Suzanne E. U. Kerns, PhD; Michael D. Pullmann, PhD; Sarah Cusworth Walker, PhD; Aaron R. Lyon, PhD; T. J. Cosgrove, MSW; Eric J. Bruns, PhD

Objective: To determine the association between use of school-based health centers (SBHCs) and school dropout.

Design: Quasi-experimental longitudinal analysis of a retrospective student cohort, with SBHC use as the independent variable. We statistically controlled for dropout risk and used propensity score regression adjustment to control for several factors associated with SBHC use.

Setting: Integrated database from an urban public school district (academic outcomes) and department of public health (SBHC use).

Participants: District-enrolled students in their first semester of ninth grade in 2005 (N=3334), followed up through their anticipated on-time graduation semester of 12th grade in 2009. Students were divided into 4 groups: never used (47%); low use (23%); moderate use (20%); and high users (10%).

Outcome Measure: Time to nongraduation (described as dropout).

Results: Low to moderate SBHC use (0.125-2.5 visits per semester) was associated with a 33% reduction in dropout compared with non-SBHC users. The high-use group (>2.5 visits per semester) did not have dropout rates that differed from nonusers. For SBHC users who did drop out, dropout occurred approximately 1 semester later than nonusers. Exploratory analyses revealed that the association between SBHC use and prevention of dropout was greatest for higher-risk students.

Conclusions: This study found an association between low to moderate SBHC use and reductions in dropout for high school students in an urban school district, especially for students at higher risk for dropout. This study supports the theory that benefits of SBHCs extend beyond managing physical and mental health needs to include academic outcomes.

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Author Affiliations: University of Washington (Drs Kerns, Pullmann, Walker, Lyon, and Bruns) and Public Health–Seattle and King County (Mr Cosgrove), Seattle.

SCHOOL DROPOUT IN THE United States is a considerable public health concern.[1] Sequelae of nongraduation from high school extends beyond well-established income and occupational impacts to include significant health effects, even early mortality.[2] Along with variables such as educational and instructional quality, social/environmental factors, resiliency, and school climate, student health status is hypothesized to be an important predictor of school dropout.[3,4] School-based health centers (SBHCs) have the potential to impact academic performance by exerting an indirect effect through improving health status.[4] Malleable health risk factors associated with academic achievement that may be addressed within a school-based clinic include unmanaged chronic health conditions (eg, asthma), substance use, attention problems or depression, risky sexual behavior, and adjustment problems.[5]

School-based health centers represent a partnership between schools and community health and mental health centers to increase health care access for ethnically, socioeconomically, and clinically diverse students[6] through providing onsite clinics in schools. Since their inception, SBHCs have evolved to provide broad services, including medical, mental health and, occasionally, dental services. Additionally, many SBHCs have expanded beyond the student population to provide services to students' families and the community more broadly.[6]

Although SBHCs were not initially developed to expressly address student academic needs, SBHCs are now widely proposed as a mechanism to manage physical and mental health barriers to academic success.[4] While previous research has docu-

Table 1. Sample Descriptives and Significant Differences Comparing No Use and Any Use[a]

	%			
	No SBHC Use (n=1580)	Low SBHC Use (n=751)	Moderate SBHC Use (n=672)	High SBHC Use (n=331)
Male[b]	65	54	32	18
Race/ethnicity				
Asian[c]	25	23	22	15
African American[b]	19	24	27	43
White[b]	43	40	34	29
Hispanic	10	10	14	12
American Indian	2	3	3	2
Free/reduced lunch[b]	42	46	54	61
Limited English[c]	19	18	16	8
RN visit first semester[b]	21	27	42	61
Disciplinary action	4	5	4	8
In special education	11	12	11	19
GPA, mean (SD)	2.82 (1.05)	2.87 (0.98)	2.73 (0.93)	2.48 (0.89)
Attendance, %, mean (SD)	91 (14)	93 (11)	92 (10)	90 (12)

Abbreviations: GPA, grade point average; RN, registered nurse; SBHC, school-based health center.
[a] All indicators are from the first semester of high school. Statistical tests were 1-way analyses of variance comparing SBHC users with nonusers and were calculated while determining propensity score models.
[b] $P<.001$.
[c] $P<.01$.

mented several intermediate outcomes for SBHC use (eg, increased health care access,[7] decreased teen pregnancy,[8] and decreased hospitalizations[9]), there remains a lack of rigorous research examining the relationships between use of SBHCs, health outcomes, and academic outcomes, such as school attendance or high school completion.[10]

Early research failed to find definitive relationships between SBHC use and academic indicators largely because of significant methodological challenges including difficulties linking health and academic data, paucity of longitudinal designs, and nonstandardized outcome measures.[4] Some research describes a positive relationship between SBHC use and graduation for specific subpopulations of youth (eg, pregnant adolescents[11]) while other studies have found little impact.[7] We found only 1 peer-reviewed study establishing a favorable relationship between SBHC use and graduation.[12] However, to date, the study has not been replicated and their restricted sample (an alternative high school serving a high-risk population) limits the potential generalizability of findings.

Our previous research has demonstrated a positive association between SBHC use and academic indicators, including grade point average and attendance, for students at heightened risk for academic failure.[13] The present study extends this work by examining the longitudinal relationship between SBHC use and an additional academic indicator, "time to dropout." To our knowledge, this is the first study examining this relationship using a population sample (entire urban school district) and longitudinal methods spanning a student's entire high school career.

METHODS

STUDY POPULATION

Our study sample consisted of a cohort of youth in an urban school district scheduled to be in the graduating class of 2009 based on date of entry into high school. This included all youth who began high school in the fall semester 2005 and excluded those who dropped out of school during that semester (n=153), transferred into the school district after that semester (n=237), and those for whom we had no data on grade point average by spring of 2006 (n=113). The final sample was 3334 students.

Our study sample was divided into 2 groups: (1) students who used SBHCs at any point during their time enrolled in the school district (n=1754; 53%) and (2) students who never used SBHCs (n=1580; 47%). When compared with those who did not use SBHCs, users were more likely to be female, have had a school nurse visit (separate from SBHC), be eligible for free/reduced lunch, and be African American. School-based health center users were less likely to have limited English proficiency, be white, and be Asian (**Table 1**).

For those who used SBHCs, the number of visits over 4 years of high school ranged from 1 to 168 visits, but most students only used a SBHC a few times (mean=10.9, median=5, mode=1). The number of visits per semester that the student attended school, which adjusts for periods during which some students temporarily left school, ranged from 0.12 to 21 (mean=1.5, median=0.75, mode=0.12).

The University of Washington institutional review board approved this study.

DESCRIPTION OF THE SCHOOL-BASED HEALTH CENTERS

The SBHCs accessed in this study are each staffed by a midlevel medical provider, a masters-prepared mental health counselor, and a clinic coordinator. The SBHCs are open before, during, and after school. Physical health services provide a full range of adolescent health primary care: immunizations, well-child examinations, management of chronic conditions, reproductive health/family planning, and minor acute care. Services by mental health counselors commonly address depression, interpersonal issues, and anxiety, primarily through individual counseling. All services focus on prevention, with routine risk assessments of student users and an emphasis on identifying nonacademic barriers to success in school.

Table 2. Descriptives by Graduation Status

	%		
	Graduated (n=2098)	Dropout (n=496)[a]	Censored (n=740)[b]
Male[c]	48	58	57
Race/ethnicity[c]			
American Indian	2	5	2
African American	18	40	33
Asian	26	14	20
White	46	23	30
Hispanic	8	18	15
GPA in 9th grade, mean (SD)[d]	3.13 (0.75)	1.94 (1.06)	2.21 (1.10)
Attendance in 9th grade, %, mean (SD)[d]	95 (6)	82 (19)	88 (15)
Free lunch eligible in 9th grade[c]	35	73	63
Limited English proficiency in 9th grade[d]	16	20	19
Any disciplinary action in 9th grade[c]	2	10	9
Any special education services in 9th grade[c]	8	19	20
Any RN visit in 9th grade[c]	27	36	37
Semester student graduated, ended school without graduation, or was censored[d,e]			
1st (fall 2005)	...	...	...
2nd	0	10	13
3rd	0	6	8
4th	0	12	15
5th	0	7	7
6th	0.5	14	9
7th	0.3	10	8
8th	99	42	7
9th	0.3	0	32
Average SBHC visits per semester[c]			
None (n=1580)	44	50	55
Low (0.125-0.5) (n=751)	26	18	17
Moderate (0.51-2.5) (n=672)	22	19	17
High (>2.51) (n=331)	9	13	11

Abbreviations: ANOVA, analysis of variance; ellipses, not applicable; GPA, grade point average; RN, registered nurse; SBHC, school-based health center.

[a] "Nongraduates" are defined by the public school system and include students who were expelled, attained maximum age without graduation (including students receiving special education), completed a General Educational Development program, or left school for various known reasons (suspension, expelled, employment, consecutive absences) and did not return or confirm transfer to another school.

[b] "Censored" cases primarily include those who transferred to schools outside the school district or transferred to a private school or home-based instruction. This also includes smaller numbers of people who died or who were released with no reason listed (ie, "unknown").

[c] $P<.001$ (Pearson χ^2 or univariate ANOVA).

[d] $P<.05$ (Pearson χ^2 or univariate ANOVA).

[e] Starting with the first semester representing the first semester of the ninth-grade year. For a person who was not retained any years, the eighth semester would represent the last semester of the 12th-grade year.

MEASUREMENT

Two administrative databases provided variables for this study, the public school database and the public health database, which were linked through unique identifiers.

The school district's database provided academic and demographic information for all youth enrolled in high school at any time between September 2005 and December 2009. Variables used as covariates and for our propensity scoring model (described later) were taken from the youth's status in fall 2005 (time 1).

The public health data set was used to construct the primary independent variable, a categorical indicator of average monthly SBHC use (0=none, 1=low, 2=moderate, 3=high). We derived the mean amount of use per semester, instead of the total number of visits, to standardize use over time because not all students had the same amount of possible time to access SBHCs because of dropout, transfers, and temporary nonattendance. Non–SBHC users represented 47% of the sample. Of the remaining sample, the top 10% of users were categorized as "high users." "Low users" (23% of the sample) had between 0.125 and 0.5 visit on average per semester and "moderate users" (20% of the sample) had between 0.51 and 2.5 visits.

The SBHC user groups differed in terms of the types of services they received. While the majority of visits across all user groups were for medical services, the relative proportion of mental health services differed. Forty-one percent of the total visits by the high users were for mental health reasons, compared with 24% of moderate and 14% of low users.

The outcome variable, dropout, was calculated as the number of semesters between fall 2005 (the first semester of freshman year) and the semester of nongraduation, defined by the school district as being expelled, attaining maximum age without graduation (including students receiving special education), completing a General Educational Development program, or leaving school for various reasons (suspension, employment, consecutive absences) without returning or confirming transfer to another school. At the final semester of analysis (spring 2009), 2098 (63%) graduated from high school, 496 (15%) dropped out, and 740 (22%) were lost to follow-up (eg, they transferred from the school district to another educational setting, they died, or they were still enrolled in school after spring 2009). Descriptive information about students in each academic outcome category is presented in **Table 2**.

Table 3. Cox Regressions Predicting Dropout

	HR (95% CI)
Average SBHC visits per semester[a]	
Low SBHC use (0.125-0.5)	0.67 (0.52-0.85)[b]
Moderate SBHC use (0.51-2.5)	0.68 (0.52-0.87)[c]
High SBHC use (>2.51)	0.82 (0.61-1.12)
Propensity score	0.70 (0.23-2.17)
GPA 1st semester	0.63 (0.58-0.70)[b]
Attendance % 1st semester	0.98 (0.98-0.99)[b]
Any disciplinary action 1st semester	1.19 (0.97-1.46)
Race/ethnicity[d]	
African American	1.14 (0.96-1.35)
Asian	0.56 (0.44-0.70)[b]
White	0.73 (0.59-0.90)[e]
Hispanic	1.44 (1.17-1.77)[b]
Male	1.06 (0.76-1.47)
Free lunch eligible 1st semester	2.12 (1.64-2.74)[b]
Limited English 1st semester	0.93 (0.71-1.21)
In special education 1st semester	1.02 (0.81-1.29)
Model statistics	
χ^2	828.98
P value	<.001
–2 Log likelihood	7302.69
df	15

Abbreviations: CI, confidence interval; GPA, grade point average; HR hazard ratio; SBHC, school-based health center.

[a] Indicator contrast comparing each group to the category of no SBHC use.

[b] $P<.001$.

[c] $P<.05$.

[d] Deviation contrast comparing each group to the overall average, American Indian (smallest category) as excluded category.

[e] $P<.01$.

STATISTICAL ANALYSIS

Cox regression time-to-event analyses were used to determine significant predictors of time until dropout. These analyses calculated a probability of dropout for every semester between fall 2005 and spring 2009 for all students with data available at that semester and used these probabilities to calculate a longitudinal hazard function.[14] Participants were included in the analysis up until dropout, or when they were lost to follow-up, at which point they were censored (ie, removed) from the analyses.

We attempted to reduce selection bias and control for differences at baseline through use of propensity scores,[15] calculated by running a logistic regression predicting SBHC user status (0/1) at any time from fall 2005 through spring 2009, with variables collected at time 1. Dichotomous variables in this regression included the youth's sex, free/reduced lunch status, limited English proficiency, receipt of special education services, any disciplinary actions, any visit to the school nurse (separate from SBHC), and race/ethnicity (dichotomous categories for American Indian, African American, Asian, white, and Hispanic, as self-defined by the youth's caregiver at time of enrollment). For deviation contrasts in statistical modeling, American Indian was excluded because of a small sample size. Nondichotomous variables included grade point average and attendance. Attendance was calculated as the percentage of available school days attended (excused absences not included). We tested these propensity scores by comparing unadjusted analyses of variance with analyses of variance after adjusting for propensity score and found none of the variables were significant after adjustment. Hence, any possible selection bias accounted for by these covariates should be significantly reduced in models incorporating this propensity score.[15] More detailed information about our methodological approach is available on request.

RESULTS

We tested 3 models to determine the impact of SBHC use on time until dropout. Our first model was a Cox regression predicting the main effect of SBHC use on time until dropout. For the second model, we added propensity score as a covariate. Our third model included the propensity score covariate and other variables that preliminary analyses revealed had a significant bivariate relationship with time until dropout (as described in Table 2). These included first-semester grade point average, first-semester attendance, first-semester disciplinary action, race/ethnicity, sex, free/reduced lunch eligibility status, limited English proficiency status, and first-semester special education status. All 3 models were statistically significant and found highly similar estimates for variables related to our main research questions; hence, the third model is presented herein because it was the most comprehensive and had superior model fit. Our final model controlled for propensity to use SBHCs and variables predictive of graduation (**Table 3**). Compared with nonusers, low use of SBHCs was related to a 33% decreased likelihood of dropout at any point (hazard ratio=0.67; 95% confidence interval=0.52-0.85), moderate use was related to a 32% decreased likelihood of dropout at any point (hazard ratio=0.68; 95% confidence interval=0.52-0.87), and high use was not significantly related to dropout (hazard ratio=0.82; 95% confidence interval=0.61-1.12). Examining estimated survival tables indicated that, of those who dropped out, students in the SBHC groups dropped out approximately 1 semester later than students who did not use SBHCs.

ADDITIONAL ANALYSES

We conducted additional exploratory post hoc analyses examining whether there were differential effects of SBHC use related to time 1 variables associated with a high risk of dropout, including attendance less than 90%, grade point average less than 2.5, free/reduced lunch status, being African American, and being Hispanic. Our intent was to explore whether SBHC use may be related to reduced disparities for high-risk groups in graduation rates. Hence, we estimated a series of Cox regression analyses examining the relationship of SBHC use to dropout, while stratifying participants by the presence of the ethnicity and risk variables mentioned earlier; no control variables were included.

Low SBHC use had a statistically significant relationship with a decreased likelihood of dropout in almost all models with the exception of white individuals and people who did not receive free/reduced lunch (**Table 4**). However, for moderate- and high-use categories, SBHC use was related to a statistically significant decreased likelihood of dropout only for high-risk categories (as defined earlier). For categories of students not considered high risk, moderate and high amounts of SBHC use had no statistically significant relationship to dropout, or in

Table 4. Cox Regressions of SBHC Use and Dropout, Stratified by Race[a] and Risk Factors

	Sample Size	HR (95% CI)[b]			Model χ^2 (df=3)
		Low SBHC Use	Moderate SBHC Use	High SBHC Use	
Ethnicity					
African American	812	0.63 (0.43-0.90)[c]	0.47 (0.31-0.70)[d]	0.68 (0.46-0.99)[c]	16.6[d]
Hispanic	359	0.41 (0.23-0.76)[e]	0.43 (0.25-0.73)[e]	0.39 (0.17-0.91)[c]	17.4[d]
White	1304	0.64 (0.38-1.08)	1.19 (0.74-1.92)	1.79 (1.00-3.21)[c]	9.3[c]
Asian	773	0.52 (0.27-1.00)[c]	0.60 (0.31-1.17)	1.12 (0.48-2.64)	5.8
Free/reduced lunch status					
Free/reduced lunch	1569	0.56 (0.42-0.74)[d]	0.48 (0.36-0.64)[d]	0.69 (0.50-0.95)[c]	35.2[d]
No free/reduced lunch	1765	0.71 (0.44-1.14)	1.29 (0.84-1.99)	1.63 (0.93-2.85)	8.0[c]
GPA					
<2.5	1314	0.75 (0.57-0.99)[c]	0.62 (0.47-0.83)[c]	0.70 (0.50-0.97)[c]	13.6[e]
>2.5	2020	0.47 (0.29-0.76)[e]	0.79 (0.51-1.23)	1.4 (0.83-2.36)	14.0[e]
Attendance, %					
<90	743	0.69 (0.49-0.97)[c]	0.45 (0.32-0.65)[d]	0.60 (0.41-0.89)[e]	23.5[d]
>90	2591	0.69 (0.49-0.97)[c]	0.98 (0.71-1.36)	1.31 (0.87-1.97)	8.1[c]

Abbreviations: CI, confidence interval; GPA, grade point average; HR hazard ratio; SBHC, school-based health center.
[a] Native American excluded because of small sample size.
[b] Indicator contrast comparing each group to the category of no SBHC use.
[c] $P<.05$.
[d] $P<.001$.
[e] $P<.01$.

1 case (white individuals), high SBHC use was related to an increased probability of dropout.

COMMENT

We found strong and inverse relationships between SBHC use and dropout for the majority of youth using SBHCs, particularly among youth at higher relative risk for dropout. Low to moderate use of SBHCs was related to approximately 33% lower likelihood of high school dropout compared with non–SBHC users after controlling for factors related to SBHC use and graduation. The 10% of students who demonstrated the highest intensity of use did not differ from non–SBHC users in rate of dropout. Post hoc analyses provided preliminary evidence that there may be stronger inverse relationships between SBHC use and dropout for the highest-risk youth; however, because these analyses were exploratory, future research that intentionally studies this important issue is warranted.

STUDY LIMITATIONS

External Validity

A major strength of this study is that our sample greatly expands on samples in extant research by including all youth in an entire school district (not just high risk or indicated) across 4 years of high school. However, we did exclude some youth from the sample (described earlier). Because of these exclusionary criteria, our sample had a 15% dropout rate compared with the school district's overall rate for the class of 2009, which was 27%. We were unable to examine the association between SBHC use and dropout for youth meeting our exclusionary criteria, many of whom were at increased risk for dropout. Therefore, these results may not be generalizeable to the entire student population.

Furthermore, there are a variety of SBHC models across the country,[6] so these findings should be considered within the context of the SBHC model to which the students were exposed. Similarly, students from this sample were all enrolled in an urban school district, and although there is significant socioeconomic and ethnocultural variability among the students, the applicability of these findings within rural or suburban areas warrants further study.

Internal Validity

As in all quasi-experimental studies using existing data sets, randomization to treatment was not possible. We used propensity score modification to reduce potential bias in treatment effects by controlling for factors likely related to SBHC use, and we included control variables related to graduation. However, it may be that SBHC use and dropout are not conditionally independent after controlling for the propensity score (ie, exhibit no relationship beyond that of chance), but there can be no empirical test of this assumption. For example, youth who are willing to use a SBHC may be higher on preexisting levels of school engagement or general motivation, both of which are associated with academic outcomes.[16] This potential problem is inherent to use of the propensity score method; in spite of this, it remains a rigorous method to demonstrate treatment effects for quasi-experimental research.[17] In our study, propensity score adjustment successfully reduced or practically eliminated bias for the included covariates.

Other Limitations

While our findings support the overall reduction in dropout for youth using SBHCs, and we were able to explore differential impact for higher-risk groups, our data raise other questions that we could not fully address given our

reliance on administrative data sets. In particular, there is a distinction between the user groups in the extent to which service visits were related to medical vs mental health reasons, with students in the highest user groups having a greater proportion of visits for mental health reasons, thus confounding use type with use amount. We hypothesize that low to moderate use may be associated with the largest reduction in dropout because of youth getting preventive, emergent, or immediate needs met by SBHC providers that would have otherwise impacted school success. High SBHC use may be associated with qualitatively different and/or more significant problems independently associated with dropout but unable to be controlled for in our analyses.

STUDY IMPLICATIONS

To our knowledge, this is the first study to examine the longitudinal relationship between SBHC use and time to dropout using a population-based sample of youth (ie, an entire school district). There are several implications for our findings.

SBHCs Appear to Lessen the Achievement Gap

While higher-risk students were more likely to use SBHCs, a result consistent with previous research,[18] our findings indicate they were also more likely to benefit academically from SBHC use.

SBHCs Have a Role in Dropout Prevention Efforts

There are many influences on student dropout that extend beyond the purview of SBHCs, including student characteristics such as poverty, low parental education, and poor early school performance[19] and school characteristics such as school climate[20] and teacher quality.[21] However, SBHCs have a unique opportunity to address dropout risk through influencing student health status.[4] Therefore, providing greater access to needed health services generally, and SBHCs specifically, should be considered among other comprehensive dropout prevention strategies.[22] Even a minimal number of visits have a significant impact. School-based health care centers appear to play an important preventive role for many students. Unplanned pregnancies, untreated sexually transmitted diseases, and undiagnosed minor acute illness (eg, strep infections) have the potential to create significant barriers to learning, yet can be effectively addressed within brief, time-limited care. Such care may offset more challenging trajectories impacting student achievement.

Further Research Is Needed

The implications and limitations of the current study as well as the lack of development of the research base on SBHCs indicate the need for more rigorous research. A large-scale, multisite, prospective, school-level research design that either randomizes schools to condition or uses natural variation to investigate the mechanisms of impact of SBHCs could address questions left unanswered by the current study, such as what student, provider, and service factors are associated with health and academic outcomes and identifying the predictors and implications of low, moderate, and high use. Such research could also address questions of high relevance to the field of SBHC implementation, such as how well student health and mental health needs align with what is available and what other ecological outcomes (eg, short-term health, long-term health, employment, juvenile justice) are impacted by SBHC use.

Taken together with results from our previous study,[13] evidence is emerging that SBHC use is related to positive academic outcomes. Such evidence provides additional support for health care reform efforts that emphasize access to preventive services for high-risk populations of youth, as well as for promoting greater collaboration among systems. Preventing high school dropout is a shared agenda for both public health and education. Promoting the wellness of at-risk populations and keeping these groups of students connected to educational opportunities addresses inequities in health outcomes and disparities in academic achievement. In the context of both health care and education reform efforts, SBHCs are a potential intervention to be considered and promoted as new directions in policies and programs are implemented.

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Correspondence: Suzanne E. U. Kerns, PhD, Division of Public Behavioral Health and Justice Policy, 2815 Eastlake Ave E, Ste 200, Seattle, WA 98102 (sekerns@uw.edu).
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