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School-based health centers, academic achievement, and school discipline: A systematic review of the literature

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ABSTRACT

School-based health centers (SBHCs) mitigate the long-term effects of poor health on children and adolescents. Although varied in staffing patterns and services provided, SBHCs aim to advance health equity among populations with histories and ongoing experiences of oppression. Reforms in education policy and the growing recognition of the role schools have in social mobility and economic prosperity beg the question of whether SBHCs demonstrably promote educational success alongside improved health outcomes. However, the current literature to elucidate the relationship between SBHCs and educational outcomes is limited. The purpose of this systematic review was to examine the recent evidence linking SBHCs and educational outcomes. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, this review explored and summarized studies examining SBHCs and educational outcomes. A total of 16 articles met the criteria for inclusion. School attendance was the most commonly observed academic outcome, while school discipline outcomes were understudied. Each publication included varying amounts and types of information delineating SBHC characteristics. The findings of this systematic review indicate that despite the expansion of SBHCs, there remains limited research studying the relationship between SBHCs and educational outcomes. Future research will benefit from accessing data for a broader array of outcome variables. Given the heterogeneity of SBHCs, it will be important for future studies to describe the delivery model, provider teams, types of service, and funding structures of SBHCs in detail.

1. Introduction

Since the 1960s, medical clinics known as school-based health centers (SBHCs) have offered health services to children and adolescents in the school setting (Keeton, Soleimanpour, & Brindis, 2012; Love, Schlitt, Soleimanpour, Panchal, & Behr, 2019). Although varied in staffing patterns, delivery models, and services provided, SBHCs are designed to advance health equity among populations with histories and ongoing experiences of oppression, such as those from uninsured and low-income backgrounds or communities of color (Love et al., 2019). Previous research demonstrates that SBHCs positively impact health and social outcomes, including illness prevention, disease management, and access to care (Keeton et al., 2012). However, the advent of educational reforms such as No Child Left Behind has increased scrutiny of public school programming, including SBHCs, and mandated the evaluation of schools on the basis of student achievement (Bradley & Greene, 2013; Kober & Rentner, 2011; Smith, 2005; Tanner, 2013). In this era of increased school accountability, there is a need to determine if and how SBHCs impact educational outcomes.

In 2004, Geierstanger and colleagues published a seminal review of studies investigating the relationship between SBHCs and academic performance. Among seven studies included in the review, six identified a positive relationship between the presence or use of SBHCs and the academic indicator(s) of interest. The study examined 13 unique academic indicators, and attendance was the most commonly measured variable (Geierstanger, Amaral, Mansour, & Walters, 2004). Since its publication, two other literature reviews have summarized findings of the relationship between SBHCs and education outcomes, as well as health-related outcomes (Knopf et al., 2016) and financial, physical, and mental health outcomes (Arenson, Hudson, Lee, & Lai, 2019).

Health and education mutually reinforce one another (Basch, 2011). Integrated into schools to promote equity, SBHCs may illuminate the reciprocal relationship between health and education, particularly among youth populations at greater risk of detrimental outcomes. To

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date, Geierstanger et al. (2004) is the only review to focus entirely on the association between SBHCs and education in the last 15 years despite heightened interest in factors that facilitate or hinder student success. It is necessary to examine a range of factors hypothesized to influence student outcomes to understand the breadth of impact SBHCs may have on youth in the school setting. This systematic review describes the evidence linking SBHCs and educational outcomes, including variables related to academic achievement and school discipline.

2. Methods

Based on literature published between the years 2004 and 2020, the objectives of this systematic review were to (1) describe the study designs, samples, variables of interest, findings, and limitations of studies examining the impact of SBHCs on educational outcomes, (2) describe the staffing and clinic characteristics of studies evaluating SBHCs and educational outcomes, and (3) report what is known to date on the effects of SBHCs on educational outcomes and note implications for future research.

2.1. Eligibility and article selection

This review adhered to the guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement. The inclusion and exclusion criteria for this review were determined by the study (1) population, (2) intervention, (3) outcomes, and (4) study design. Articles were eligible for full-text review in this systematic literature review if they were United States-based studies published in academic, peer-reviewed journals in English. This review was limited to research published between the years 2004 and 2020. The search was limited to peer-reviewed journals to ensure an acceptable level of quality of the studies included.

The population inclusion criteria were public school students in grades pre-K-12. Studies were excluded if the sample solely included family members of students, teachers, school staff, school administrators, and other school personnel. Studies that assessed outcomes for both a student and adult population were included. Intervention inclusion criteria were studies evaluating the exposure to or use of SBHCs. Studies of the exposure to or use of school nurses and other school-based health or education programs were excluded. Outcomes of interest were educational outcomes associated with discipline and academic performance. Examples of disciplinary outcomes included but were not limited to rates of exclusion, suspension, expulsion, in-school arrest, corporal punishment, restraint, change of placement, and behavioral referrals for discipline. Behavioral referrals for special education evaluation or mental health services were excluded. Outcomes regarding academic performance included but were not limited to rates of absenteeism, college preparation, grade level advancement, grade point average, seat time, and school connectedness, engagement, or climate. Outcomes measured at the student, school, and district level were included. Descriptive studies and acceptability or feasibility studies without preliminary data were also excluded. See Table 1.

2.2. Data sources

This systematic literature review used three research databases. Investigators queried the Cumulative Index for Nursing and Allied Health Literature (CINAHL), PubMed, and PsycINFO databases at the beginning of December 2019 through June 2020. The review categorized advanced keyword searches by (1) intervention and (2) outcome. The researchers separated category keywords with the Boolean phrase "OR," and separated each category with the Boolean phrase "AND." The review selected keyword terms from the United States National Library of Medicine index of medical subject headings (MeSH) and earlier systematic reviews of similar topics (Knopf et al., 2016; Valdebenito, Eisner, Farrington, Ttofi, & Sutherland, 2019). Due to differences in indexing methodology between the databases used in this study, the authors modified search strings and filters where applicable. See Table 2 for the full electronic search strategy for this review.

3. Results

Peer-reviewed studies regarding SBHCs and educational outcomes among youth populations within public school settings were eligible for selection. The authors applied all inclusion and exclusion criteria to the titles and abstracts rendered during database searching. If the authors identified a relevant abstract or could not reach consensus, they completed a full-text review. The first author pearled systematic reviews, meta-analyses, and the SBHC literature database maintained by the School-Based Health Alliance (SBHA) for grey literature that may have been missed by the initial database searches (Alliance, 2019).

The initial search yielded 4,710 results. A total of 3,792 articles remained after the removal of 918 duplicate articles. Through title and abstract screening, investigators selected 807 publications for full-text review. See Fig. 1 for an illustration of the data extraction process. Among the four systematic reviews remaining after the title and abstract screening (Arenson et al., 2019; Keeton et al., 2012; Knopf et al., 2016; Murray, Low, Hollis, Cross, & Davis, 2007), the authors did not identify any articles unique from those yielded by initial database searches. A total of 16 articles met all of the systematic review eligibility criteria. See Table 3 for a summary of study details and outcomes.

3.1. Study designs

In the present systematic review, nine studies were quasi-experimental. Six were observational (Barnet, Arroyo, Devoe, & Duggan, 2004; Bersamin et al., 2019; Foy & Hahn, 2009; Nystrom, Lovrien, Gallant, Johnston-Silverberg, & Shelton, 2004; Strolin-Goltzman, Sisselman, Melekis, & Auerbach, 2014; Westbrook, Martinez, Mechergui, & Yeatman, 2020). A single study used mixed methodology (Johnson, Ellis, & Hutcherson, 2020).

3.2. Sample characteristics

The largest sample of students among the studies was 7,314 students representing a single school district (Stone, Whitaker, Anyon, & Shields,

Table 1
Eligibility criteria.

	Study Type	Population	Intervention	Outcome
Inclusion	Peer-review United States English Published 2004–2020	Youth populations grades pre-kindergarten through 12	School-based health center	Academic and disciplinary
Exclusion	Non-Peer review Non-United States Non-English Published pre-2004	Family of students, teachers, school staff, and other personnel	School nurse, other school-based or school-linked programs	Non-educational outcomes

Table 2
Keyword Search Terms.

	Keywords
Intervention	((((((((((("School Health Services"[Mesh]) OR "School Based Health Centers") OR "School Based Health Center") OR "School Based Health Clinics") OR "School Based Health Clinic") OR "School Based Health Services") OR "SBHCs") OR "SBHC"))) OR "School Based") OR "School Program") OR "School Located") OR "School Wellness") OR "School Health Based"
Outcome	((("Behavior Control/legislation and jurisprudence"[Mesh]))) OR "Juvenile Delinquency" [Majr:NoExp]) OR "Law Enforcement" [Majr:NoExp]) OR "Punishment" [Majr:NoExp]) OR "Restraint, Physical"[Majr:NoExp]) OR ("Schools/legislation and jurisprudence"[Mesh])) OR "Classroom Management") OR "Corporal Punishment") OR "Discipline Referral") OR "Expelled") OR "Expulsion") OR "Out of School Suspension") OR "School Discipline") OR "School Expulsion") OR "School Police") OR "School Suspension") OR "School to Prison Pipeline") OR "Suspended") OR "Zero Tolerance") OR "Absenteeism"[Mesh]) OR "Academic Failure"[Mesh]) OR "Academic Performance"[Mesh]) OR "Academic Success"[Majr]) OR "College Admission Test"[Majr]) OR "Education"[Majr:NoExp]) OR "Educational Status"[Majr:NoExp]) OR "Schools/standards"[Majr:NoExp]) OR "Student Dropouts"[Mesh]) OR "Test Taking Skills"[Mesh]) OR "Academic Achievement") OR "Academic Performance") OR "Academic Success") OR "College Preparation") OR "Dropout") OR "Early Dismissal") OR "Educational Outcomes") OR "Grade Point Average") OR "Grade Promotion") OR "Graduation") OR "Learning Outcomes") OR "School Absence") OR "School Attendance") OR "School Enrollment") OR "School Refusal") OR "Seat Time") OR "Standardized Test") OR "Student Attendance") OR "Student Enrollment") OR "Tardiness") OR "Truancy"

Note: This keyword search strand was used with the PubMed search engine.

2013). Walker, Kerns, Lyon, Bruns, and Cosgrove (2010) studied the largest sample of students from a single school (N = 2,306). The smallest sample included 75 students from an undisclosed number of high schools (Lintz, Sutton, & Thurstone, 2019). The largest sample of schools was comprised of 503 high schools (Bersamin et al., 2019), and the smallest sample of schools included three (19%) studies that each examined a single high school (Barnet et al., 2004; Mears, Lawler, Sanders, & Katz, 2009; Walker et al., 2010).

A total of 14 (88%) of the 16 studies included high schools, while six (38%) of the 16 studies included elementary or middle school students (Foy & Hahn, 2009; Johnson et al., 2020; Nystrom et al., 2004; Strolin-Goltzman et al., 2012, 2014; Strolin-Goltzman, 2010). Two studies (13%) examined a single grade-level. Foy and Hahn (2009) analyzed data for only first-grade students, and Walker et al. (2010) limited the study to ninth-grade students.

Among the studies that provided age data, the average student age was 15.22 years old (Barnet et al., 2004; Lintz et al., 2019; Mears et al., 2009; Stone et al., 2013). Six (38%) of the 16 studies were majority

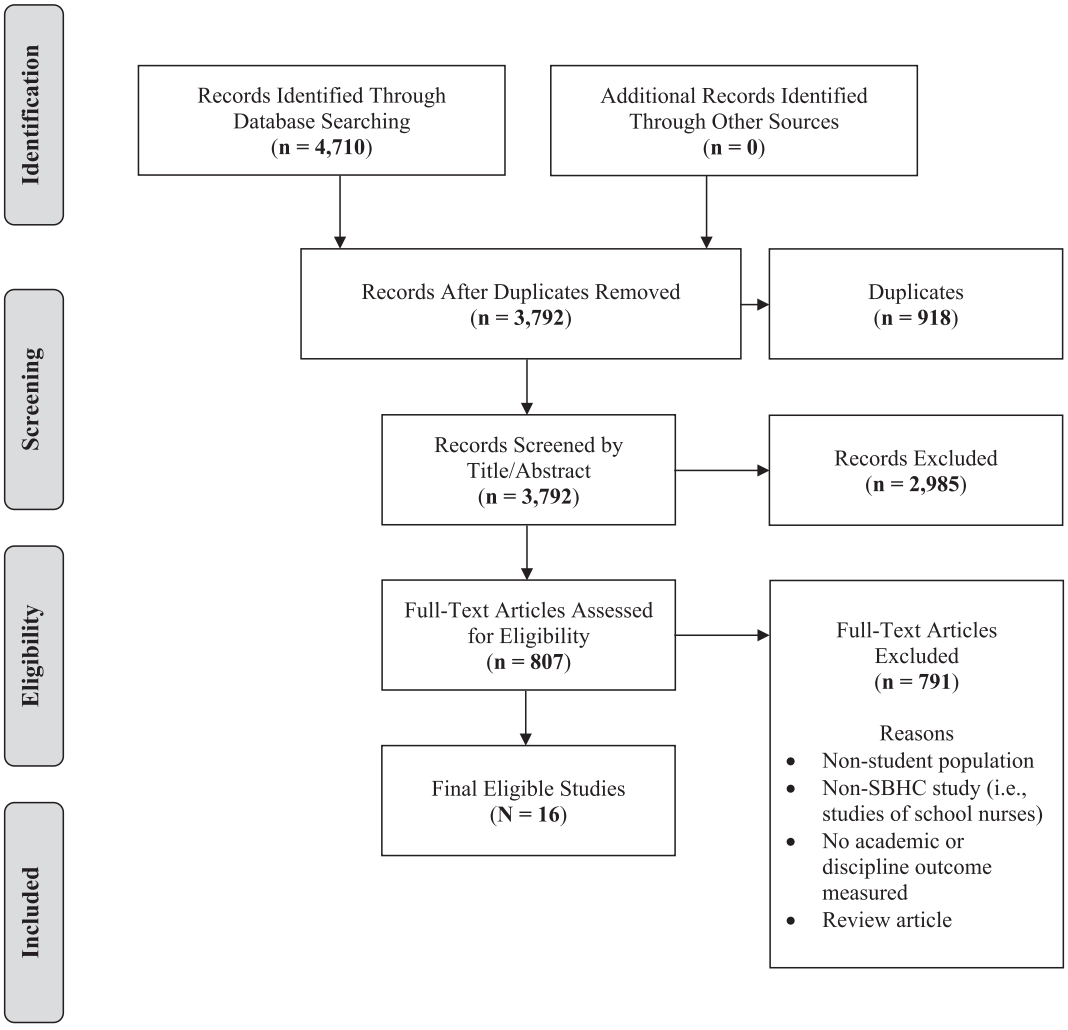

Fig. 1. PRISMA flow diagram.

Table 3
Study details and outcomes.

Study	Design	Sample Characteristics	Study Description	Educational Outcome	Result
Barnet et al., 2004	Observational	N = 431; School-Based Prenatal Care n = 100, Non-School-Based Prenatal Care n = 331; Female (%) 100.0; Alternative Junior-Senior High School; Mean Age 15.1; African American (%) 98.0 SBPC, 95.0 Non-SBPC; Receiving Medicaid (%) 99.0 SBPC, 72.0 Non-SBPC; Median Household Income ($) 21,500 SBPC, 21,141 Non-SBPC; Urban	Retrospective cohort study examining school roster data for pregnant adolescent females; Comparison of SBHC users and non-users; 3 year span examining 1 year pre-pregnancy, pregnancy year, 1 year post-pregnancy; on-site SBHC provided services including primary, prenatal, delivery, postpartum care, family planning, primary care for infants and children, episodic care, case management, nutrition ed, parenting ed, mental health services; medical care provided by family physicians (unspecified number), a social worker, a part-time psychiatrist, a medical assistant, a health educator, and a receptionist	Attendance; Dropout	SBPC group missed significantly fewer days than did those in the non-SBPC group (60 vs. 72 days; p = .001); rates of dropout were twice as high in non-SBPC group (15% vs. 6%; p = .02); hierarchical logistic regression showed SBPC group less likely to dropout during pregnancy year (OR = 0.39; 95% CI, 0.15–0.99; p = .048)
Nystrom et al., 2004	Observational	N = 631 Students; Female (%) 74.0; Grade 6 (%) 6.0; Grade 7 (%) 6.0; Grade 8 (%) 9.0; Grade 9 (%) 17.0; Grade 10 (%) 25.0; Grade 11 (%) 19.0; Grade 12 (%) 17.0	Proportional random sample of student users of 41 SBHCs in state of Oregon completed 16-item survey during the 2000–01 service year; survey conducted over 1 month period	Classes Missed	343 (55%) students reported not missing any class while using the SBHC; 255 (41%) indicated missing 1 to 2; 3 (0.5%) indicated missing 3 to 5; 5 (0.8) indicated missing the entire day; 16 (2.6%) did not know number of missed classes. Among student with access to other care providers, 39 (13%) estimated they would not miss any class; 133 (43%) estimated missing 1 to 2 classes; 63 (20%) estimated missing 3 to 5 classes; 59 (19%) estimated they would miss the entire day; 17 (6%) did not have an estimate
Foy & Hahn, 2009	Observational	Sample N = 1,387 Students; 1st grade; Race (%) 28.0 Asian, 21.0 African American, 27.0 Hispanic, 13.0 White, 11.0 Other; Uninsured (%) 99.0; Urban	Physical exam by SBHC to meet state mandated documentation of physical exam; a certified nurse practitioner, a bilingual medical assistant; SBHC open 2 days/week; 4 year period	School Exclusion	−74.1% in exclusion rate (p < 0.05)
Mears et al., 2009	Quasi-Experimental	Sample N = 417 Students; LAIV-T n = 86, TIV n = 41, control n = 234; 1 high school; 6th–10th grade; Ages 11–17; Avg. Age 14.41; Race (%) 72.0 Black, 21.0 Hispanic, 5.0 Asian, 2.0 Other; Low Income (%) 97.0; English Language Learners (%) 9.9; Urban	SBHC administered influenza vaccine; students received LAIV-T unless medically ineligible or objected; in which case injectable inactivated TIV was offered; those with neither vaccination served as a control; 6 month period	Non-Suspension Absenteeism	2.5-day reduction in mean Absenteeism from Jan to June in LAIV-T vs unvaccinated (p = .027); 31% reduction in mean absenteeism from Jan to June in LAIV-T recipients; students who received the LAIV-T had significantly less absences (mean absences = 5.53, SD = 5.00) compared to TIV (mean absences = 9.45, SD = 9.07) and control (mean absences = 7.97, SD = 7.59)
Strolin-Goltzman, 2010	Quasi-Experimental	Sample N = 416 Schools; Mean Enrollment n = 711; Elementary, Middle, High Schools; Race (%) 52.0 Hispanic, 37.0 Black, 4.0 White, 4.5 Asian, 0.5 Native Am.; Free Lunch (%) 73.0; English Language Learners (%) 17.0; Special Ed (%) 13.5; Urban	Applying propensity score methods, examined moderating effect of school type on relationship between SBHCs and learning environment using secondary survey data; student, parent, teacher data	Learning Environment: Academic Expectations; Communication; Engagement; Safety	Students in SBHC schools rated academic expectations significantly higher (7.0) than comparison (6.8); also rated engagement significantly higher (6.5) than comparison group (6.3) (p = .018); Students in SBHC schools rated safety and respect higher (6.0) than comparison (5.9); also rated communication higher (5.7) than comparison (5.5), but both differences non-significant
Van Cura, 2010	Quasi-Experimental	Sample N = 764 Students; School A n = 91, School A2 SBHC n = 351, School B n = 322; 2 high schools; Race (%) School A 67.9 Black, 20.4 Hispanic, 10.2 White, 1.3 Asian, 0.2 Native Am. School B 62.6 Black, 17.9 Hispanic, 12.7 White, 6.4 Asian, 0.4 Native Am. Poverty Status (%) School A 78.4, School B 79.6; Urban	Comparison of rates of early dismissal and loss of seat time between students who received SBHC and traditional school nursing services and students who received only traditional school nursing service; a FT nurse and nurse's aide in both schools; 3 FT nurse practitioners, 1.5 FT medical assistants, a FT billing specialist, a PT site coordinator in SBHC; 3 week period	Early Dismissal; Loss of Seat Time	SBHCs significantly reduced number of early dismissals from school (p = .013) in comparison to students who received school nursing services alone; students not enrolled in an SBHC lost 3 times as much seat time as students enrolled in an SBHC

(*continued on next page*)

Table 3 (*continued*)

Study	Design	Sample Characteristics	Study Description	Educational Outcome	Result
Walker et al., 2010	Quasi-Experimental	Sample N = 2,306 students; One High School; 9th grade; Female (%) Intervention 60.9, Control 38.3; Race (%) Intervention 40.4 Black, 11.0 Hispanic, 31.0 White, 14.4 Asian, 3.4 Native American, Control 19.5 Black, 42.3 Hispanic, 2.5 White, 26.3 Asian; Free Lunch (%) Intervention 44.9, Control 28.2; Urban	Longitudinal comparison of SBHC users and non-users; SBHC services: primary care, contraceptive counseling, mental health; a nurse practitioner, a physician assistant, a masters-level counselor, a patient care coordinator; 2 year period	Grade Point Average; Attendance; Discipline Incidents	Medical services use in SBHCs was related to increases in attendance as compared to non-users; mental health service use associated with greater increases in GPA than non-users ($p < 0.05$); discipline incidents were not associated with SBHC use
Kerns et al., 2012	Quasi-Experimental	Sample N = 3,334 High School Students; One School District; SBHC Users n = 1,754, SBHC Non-Users n = 1,580; Urban	Retrospective cohort study of high school students from first semester ninth-grade to anticipated on-time graduation semester; comparison of SBHC users and non-users to determine association between SBHC use and school dropout; SBHC services: adolescent health primary care and mental health counseling; a midlevel medical provider, a masters-prepared mental health counselor, a clinic coordinator; SBHC open before, during, and after school	Dropout (Time to Non-Graduation)	For both models of analysis, SBHC use was not significantly related to school dropout
Strolin-Goltzman et al., 2012	Quasi-Experimental	Sample N = 416 Schools; Elementary, Middle, High Schools; Mean Enrollment 711; Race (%) 52.0 Hispanic, 37.0 Black, 4.0 White, 4.5 Asian, 0.5 Native Am. Free Lunch (%) 73.0; English Language Learners (%) 17.0; Special Ed (%) 13.5; Urban	Applying propensity score methods, examined moderating effect of school type on relationship between SBHCs and learning environment using secondary survey data; student and parent data	Learning Environment: Academic Expectations; Communication; Engagement; Safety	Regression indicated students in SBHC schools rated learning environment higher by 2.4 points than comparison participants regardless of school type ($p < .01$)
Stone et al., 2013	Quasi-Experimental	Sample N = 7,314 Students; 15 Schools; One School District; Mean Age 15.89; SBHC Use (%) 42.0; Race (%) 62.0 Asian, 13.0 Latino, 7.0 Black, 12.0 Pacific Islander or Multiple; Free Lunch (%) 47.0; Urban	Used student-reported survey data and propensity score methods to examine association between student SBHC utilization and caring relationships with program staff and school assets	Relationships with Staff and School Assets; domains examined: presence of caring adults, high behavioral expectations, opportunities for meaningful participation	Any vs. no SBHC use positively related to student report of caring relationship with SBHC staff ($p < .001$), total schools assets ($p < .001$), specific domains including caring relationships ($p < .01$), high expectations ($p < .001$), meaningful participation ($p < .001$); dose–response relationship between SBHC users 1 to 2 times, 3 to 5 times, and > 10 times (vs. no use) and reports of caring relationship with SBHC staff; each asset domain report among students with SBHC use > 10 significantly higher than those using it 1 to 2 times, 3 to 5 times, 6 to 10 times
Strolin-Goltzman et al., 2014	Observational	Sample N = 793 Students, Elementary n = 233, Middle n = 110, High School n = 450; SBHC Use (%) 61.0; Female (%) SBHC Users 49.0, Non-Users 48.0; Race (%) SBHC Users 59.2 Hispanic, 20.5 Black, 5.1 White, 6.6 Asian, 1.3 Native American, 5.1 Other, Non-Users 62.2 Hispanic, 18.2 Black, 8.9 White, 0.7 Asian, 3.8 Native American; Urban	Comparison between users and non-users of SBHC at school with SBHC access	Grade Level Advancement; Grade Point Average	SBHC users significantly more likely to advance a grade level (8.4% increase, $p < 0.01$) and GPA approximately 2 points higher than non-users (3.5% increase, $p < 0.01$)
Bersamin et al., 2016a	Quasi-Experimental Observational	Sample N = 296 Schools, SBHC Schools n = 99, Control Schools n = 197; 9th–12th Grade; High Schools ≥ 100 Students; Enrollment SBHC Schools 1,730, Control Schools 1,843; Free Lunch (%) SBHC Schools 53.7, Control Schools 55.9; English Language Learner (%) SBHC Schools 17.59, Control Schools 12.6	Applying propensity score methods, examined matched-comparison of school-wide measures of academic achievement and college preparation among schools with presence of an on-site SBHC and those without	College Board Exams Participation (SAT, ACT, and AP); Graduation Rates; State Graduation Requirements	Adjusted models indicate SBHC presence positively associated with college preparation outcomes: ACT ($p < 0.01$), AP ($p < 0.01$, and SAT ($p < 0.01$) participation rates; no significant associations between SBHC presence and graduation rates or state graduation requirements

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Table 3 (*continued*)

Study	Design	Sample Characteristics	Study Description	Educational Outcome	Result
Bersamin et al., 2019		Sample N = 503 Schools, SBHC Schools n = 49, Non-SBHC Schools n = 454; 9th–12th grade; Female (%) SBHC and Non-SBHC Schools 51.6; Race (%) SBHC Schools 7.1 Black, 9.1 White, 46.4 Hispanic, 28.8 Asian, 8.6 Other, Non-SBHC Schools 3.4 Black, 24.1 White, 50.1 Hispanic, 12.4 Asian, 10.0 Other; Free Lunch (%) SBHC Schools 18.5, Non-SBHC Schools 25.9	Comparison of youth attending schools with SBHCs to those attending schools without SBHCs; examination of relationship between SBHC and school connectedness regardless of SBHC use	School Connectedness: caring relationships with school-based adult, high expectations from a school-based adult, meaningful participation at school	Youth in schools with an SBHC did not differ from those in schools without SBHCs with regards to school connectedness; SBHCs more positively associated with school connectedness among lower socioeconomic status youth as compared to those of higher SES
Lintz et al., 2019	Quasi-Experimental	Sample N = 75; High Schools; Female (%) 32.0; Mean Age 15.5 years; Ethnicity (%): 58.6 Hispanic, 16.0 None, 14.6 Mexican American, 10.6 Unknown; Race (%): 57.3 White, 13.3 Other, 13.3 Unknown, 9.3 Declined, 6.6 Black; Urban	Voluntary SBHC substance abuse treatment program consisting of motivational interviewing, acceptance, and commitment therapy, family sessions, case management, psychiatric consultations, and urine drug screens; therapy delivered by 3 social workers; medication adherence performed by 2 board-certified child psychiatrists; 16-week program	Attendance; Behavioral Incidents; Grade Point Average	Participants had a significant reduction in behavioral incidents, average decrease from 1.2 to 0.41 incidents per semester ($p < 0.01$); reduction in average number of missed classes, 148 per semester to 127 ($p = 0.001$); average GPA showed marginal, non-significant increase from 1.5 to 1.62
Johnson et al., 2020	Mixed Methods	Sample N = 3 Elementary Schools with SBHCs; School 1: Urban, majority Hispanic, Title I School, 95% Free Lunch, 24% in Poverty, 49% Medicaid Enrollment County-Wide; School 2: Semi-rural, majority Black, Title I School, 77% Free Lunch; 33% in Poverty, 85% Medicaid Enrollment; School 3: Rural, majority White, Title I School, 67% Free Lunch, 19% in poverty, 63% Medicaid Enrollment	State SBHC Project administered grants to expand SBHCs in 3 phases: planning, implementation, and sustainability; primary issues of concern were community need and financial sustainability; 3 grantees awarded; 2 year period	Attendance; Seat Time	School 1: For the 2013–14 and 2014–15 school years, 40% and 38% increase in seat time from pre-SBHC to post-SBHC, years 1 and 2, respectively; 62% of students sent home did not miss any subsequent days of school in 2014–15, as compared to 25% in 2013–14; analysis of total number missed school days by month for students referred to SBHC decreased ($p < 0.05$) 16 days/mo. in 2013–14 to 11 days/mo. in 2014–15; Schools 2 and 3 did not report any data
Westbrook et al., 2020	Observational	Sample N = 132 High Schools; n = 117 without SBHCs, n = 15 with SBHCs; Female (%) Schools without SBHCs 49.0, SBHC Schools 48.0; Minority (%) Schools without SBHCs 21.0, SBHC Schools 37.0; Free Lunch (%) Schools without SBHCs 22.0, SBHC Schools 42.0; Rural (%) Schools without SBHCs 23.0, SBHC Schools, 40.0	Longitudinal analysis of data from Colorado state years 2000–2018; high schools that opened SBHCs during study period compared to high schools that did not open SBHCs	Graduation	SBHC opening associated with 4.1% increase in overall graduation rate ($p = .077$); gender stratification showed 4.8% increase in male graduation rate ($p = .051$) and 3.0% increase among female graduation rate ($p = .163$)

Hispanic/Latinx populations (Bersamin et al., 2019; Foy & Hahn, 2009; Lintz et al., 2019; Strolin-Goltzman et al., 2012, 2014; Strolin-Goltzman, 2010). Three (19%) study populations were majority Black (Barnet et al., 2004; Mears et al., 2009; Van Cura, 2010), and one (6%) was majority Asian (Stone et al., 2013). One study described the total proportion of minority students in the study setting and did not differentiate between race or ethnicity (Westbrook et al., 2020). The remaining studies' distribution of race and ethnicity varied per intervention and comparison groups (Johnson et al., 2020; Kerns et al., 2011, 2012; Walker et al., 2010) or were not captured (Bersamin, Garbers, Gaarde, & Santelli, 2016a; Nystrom et al., 2004).

Metrics for youth socioeconomic status varied. Three (19%) studies measured the proportion of students uninsured (Foy & Hahn, 2009) or enrolled in Medicaid (Barnet et al., 2004; Johnson et al., 2020). Three studies examined income, Barnet et al. (2004) investigated median household income, Mears et al. (2009) measured the percentage of low-income students in the school, and Van Cura (2010) measured poverty status. Eight (50%) publications examined the proportion of students eligible for free or reduced lunch (Bersamin et al., 2016a, 2019; Kerns et al., 2012; Stone et al., 2013; Strolin-Goltzman et al., 2012; Strolin-Goltzman, 2010; Walker et al., 2010; Westbrook et al., 2020). Three (19%) studies did not capture this metric (Lintz et al., 2019; Nystrom et al., 2004; Strolin-Goltzman et al., 2014).

Two publications examined rural samples. Two of the three schools studied by Johnson et al. (2020) were rural, and the third was an urban locale. In a state-level analysis by Westbrook et al. (2020), the authors determined that 40% of schools with an SBHC were in rural areas as compared to 23% of schools without an SBHC. Two studies (13%) did not specify a locale (Bersamin et al., 2016a, 2019), and one examined an entire state (Nystrom et al., 2004). The majority of studies (75%) analyzed an urban sample (Barnet et al., 2004; Foy & Hahn, 2009; Johnson et al., 2020; Kerns et al., 2012; Lintz et al., 2019; Mears et al., 2009; Stone et al., 2013; Strolin-Goltzman et al., 2012, 2014; Strolin-Goltzman, 2010; Van Cura, 2010; Walker et al., 2010).

3.3. SBHC characteristics

Studies differed in the reporting of SBHC characteristics. Eight (50%) studies specified SBHC provider care teams. Barnet et al. (2004) described an unspecified number of family physicians, and one social worker, one part-time psychiatrist, one medical assistant, one health educator, and one receptionist. Foy and Hahn (2009) mentioned one certified nurse practitioner and one medical assistant, and SBHCs accessed by Kerns et al. (2011) employed a midlevel medical provider, a masters-level mental health counselor, and a clinic coordinator. SBHCs examined by Johnson et al. (2020) were staffed by either an advanced practice nurse practitioner or physician's assistant, and one medical assistant. Another study indicated the SBHC included three full-time nurse practitioners, one and a half full-time medical assistants, one full-time billing specialist, and one part-time site coordinator (Van Cura, 2010). The SBHC in the study described by Walker et al. (2010) employed one nurse practitioner, one physician assistant, one masters-level counselor, and one patient care coordinator. Another article indicated the SBHC staffed three licensed clinical social workers and two board-certified child psychiatrists (Lintz et al., 2019). SBHCs investigated by Stone et al. (2013) required at least one wellness coordinator, school nurse, community health outreach specialist, and behavioral health therapist.

Five (31%) studies restricted analyses to on-site SBHCs (Barnet et al., 2004; Bersamin et al., 2016a, 2019; Johnson et al., 2020; Lintz et al., 2019), while the remaining publications did not describe whether the SBHCs were on-site, school-linked, telehealth, or offered some combination of service delivery. Regarding services delivered, five (31%) of the articles indicated that the SBHCs provided both primary and behavioral health care (Barnet et al., 2004; Kerns et al., 2012; Lintz et al., 2019; Stone et al., 2013; Walker et al., 2010). The on-site SBHC examined by Barnet et al. (2004) provided primary and mental health care, prenatal, delivery, and postpartum services, family planning services, and nutrition and parenting education. Kerns et al. (2012) described physical health services such as immunizations, chronic disease management, reproductive health, and minor acute care. Mental health services commonly addressed depression, anxiety, and interpersonal conflicts, typically through one-on-one counseling (Kerns et al., 2012). No other studies specified the types of services rendered within the SBHCs. Johnson et al. (2020) reported that all SBHCs examined were sponsored by a Federally Qualified Health Center. This study was the only one that included details about the sponsor organization. Two studies included days or hours of operation for SBHCs. According to Foy and Hahn (2009), the clinic provided student services two days per week. Kerns et al. (2012) reported all SBHCs in the district as open before, during, and after school hours.

3.4. Outcomes

Studies measured outcomes at the student, school, and district-level. Six (38%) examined student-level data (Barnet et al., 2004; Kerns et al., 2012; Lintz et al., 2019; Mears et al., 2009; Walker et al., 2010). Eight (50%) studies had outcomes at the school-level. Two (13%) of the 16 studies measured results at the district-level (Foy & Hahn, 2009; Stone et al., 2013).

The most frequently measured indicator was related to time in the classroom, with nine (56%) studies measuring this outcome using varying definitions. Four (25%) studies examined attendance as measured by the number of days absent per year (Barnet et al., 2004), missed school days by month (Johnson et al., 2020), classes missed per semester (Lintz et al., 2019), or the ratio of days present/or excused absences over days available (Walker et al., 2010). Other studies analyzed the rates of early dismissal before the end of the school day (Van Cura, 2010), the number of classes missed per SBHC visit (Nystrom et al., 2004), the number of students excluded from attendance due to lack of state-mandated physical examination (Foy & Hahn, 2009), or the rates of non-suspension absence in a single semester (Mears et al., 2009). In one study, researchers calculated loss of seat time as the elapsed time from when a student entered the health center until the end of the school day (Van Cura, 2010). According to the article, students not enrolled in an SBHC lost seat time at three times the rate of SBHC users (Van Cura, 2010). All studies found a positive relationship between SBHC use and increased time in the classroom.

By combining multiple survey domains into one metric, four (25%) studies measured an indirect relationship between SBHCs and academic outcomes. Two studies operationalized academic performance with a summary score of schools' learning environments (Strolin-Goltzman et al., 2012; Strolin-Goltzman, 2010). Four domains measured a positive learning environment: academic expectations, communication, engagement, and safety and respect. These studies found that students in schools with an SBHC rated the learning environment more favorably than students in schools without an SBHC (Strolin-Goltzman et al., 2012; Strolin-Goltzman, 2010). Using a framework from Geierstanger et al. (2004) and Stone et al. (2013) examined the indirect effects of SBHC use on students' academic functioning. Student reports of two outcomes measured academic function: (1) caring relationships with SBHC staff and (2) school assets, including caring adults, high behavioral expectations, and opportunities for meaningful participation. The study found that any versus no SBHC use was positively related to a caring relationship with staff and total school assets. In another study of the indirect relationship between SBHCs and academic outcomes, Bersamin et al. (2019) measured school connectedness or the belief by students that adults within the school care about their learning and them as individuals. The three subscales of school connectedness were adult caring, adult expectations, and meaningful participation. The study found that student reports of school connectedness did not differ between students in schools with SBHCs and those without SBHCs.

However, multilevel models indicated that students of low-income status in schools with an SBHC scored higher on all three dimensions for school connectedness as compared to students of low-income status in schools without SBHCs (Bersamin et al., 2019).

Among three (19%) studies measuring grade point average, each found a positive relationship between student use of SBHCs and improvement in grade point average (Lintz et al., 2019; Strolin-Goltzman et al., 2014; Walker et al., 2010). Bersamin et al. (2016a) examined college board exam participation, graduation rate, and graduation requirements. The authors found that SBHC presence was positively associated with college board exam preparation and participation measure, such that schools with an SBHC had higher proportions of eligible students participating in the Scholastic Aptitude Test (SAT), American College Test (ACT), and Advanced Placement (AP) exams. Conversely, Westbrook et al. (2020) found that Colorado high schools that opened an SBHC over a 19-year period experienced larger increases in graduation rates (4.1%) as compared to schools that did not establish an SBHC during this time. In the only study to examine grade-level advancement (Strolin-Goltzman et al., 2014), SBHC users were significantly more likely to be promoted to the next grade level than non-users. In a retrospective cohort study, Barnet et al. (2004) found that high school dropout rates were twice as high among non-SBHC users as compared to SBHC users (15% vs. 6%, $p = .02$). However, a later study by Kerns et al. (2012) found no such relationship between high school dropout and SBHC use.

Two (13%) of the 16 included studies examined disciplinary outcomes (Lintz et al., 2019; Walker et al., 2010). One study observed a significant reduction in behavioral incidents, i.e., suspensions and expulsions, per semester among students receiving substance abuse treatment within an SBHC (Lintz et al., 2019). The article published by Walker et al. (2010) also examined discipline incidents as measured by the count of suspensions and expulsions per semester. However, the authors did not report significant findings between discipline rates and student SBHC use. See Table 3.

4. Discussion

More than half of the studies were quasi-experimental in the current review, six were observational, and one study employed mixed methods. In general, observational studies lack randomization and limit causal inference (Rosenbaum & Rubin, 1983), and earlier reviews consistently cite this as a limitation of SBHC impact evaluations (Arenson et al., 2019; Bersamin et al., 2016b; Geierstanger et al., 2004; Murray et al., 2007). Qualitative or mixed methods are alternative approaches that may allow future investigations to assess causality (Creswell & Plano Clark, 2011, 2017; Wing, Simon, & Bello-Gomez, 2018). Among the studies selected in this review, four (25%) analyzed longitudinal data (Barnet et al., 2004; Kerns et al., 2012; Walker et al., 2010; Westbrook et al., 2020). The remaining studies did not examine outcomes longitudinally, limiting what can be understood about the use and exposure to SBHCs.

Several studies had small sample sizes with students of similar characteristics, limiting the generalizability of these findings. The majority of studies ($n = 14$) examined high school student populations, and the mean age of students was 15.22 years old among the studies that reported age. According to national data, there are SBHCs in more than 10,000 public schools in the United States. Of the schools with SBHC affiliations, 40% are in elementary schools, 30% are in middle or high schools, and the remaining 30% are in schools with other combinations of grade levels (Love et al., 2019). This review's findings suggest that elementary and middle school populations are underrepresented in the research of SBHCs and school outcomes. As of 2019, 36% of SBHCs were in rural communities (Love et al., 2019). In the present study, 12 of the 16 publications analyzed data from urban locales. This is consistent with previous research and suggests a need for the deliberate examination of rural populations in future SBHC evaluations (Knopf et al., 2016) to ascertain whether a differential impact of SBHCs on school outcomes based on geographic variables exists.

In the last 40 years, the SBHC program has evolved substantially, resulting in variability between SBHCs' delivery models, provider teams, and funding sources or sponsors (Love et al., 2019). Among the 16 studies in this review, five examined fixed, on-campus sites. No other studies reported this data. Half ($n = 8$) reported information about provider teams, and the composition of these teams differed per study. One study reported an FQHC as its sponsor organization, and the remaining studies did not include this information. Given the known heterogeneity of SBHCs, future research should systematically include information on delivery models, staffing patterns, types of service, and funding structures of the SBHC. Each of these SBHC characteristics may exert influence on the variables of interest and confound a study's results.

An enduring issue in the evaluation of SBHCs is how studies define exposure to the intervention (Arenson et al., 2019; Geierstanger et al., 2004). Five studies examined the effect of SBHC presence on a school campus, regardless of student use of the clinic (Bersamin et al., 2016a, 2019; Strolin-Goltzman et al., 2012; Strolin-Goltzman, 2010; Westbrook et al., 2020). As described by Geierstanger et al. (2004), this method assumes that the presence of an SBHC will diffuse among an entire student body, irrespective of an individual's utilization. Arenson et al. (2019) referred to this as 'whole-school effects' in a recent review. Other studies in the present review analyzed the effects of exposure among SBHC users as compared to non-users (Barnet et al., 2004; Kerns et al., 2012; Stone et al., 2013; Strolin-Goltzman et al., 2014; Van Cura, 2010; Walker et al., 2010). However, only one of these studies examined dosage by frequency of visits to an SBHC (Stone et al., 2013). These findings suggest that future analyses should include both whole-school and user-only effect estimates and distinguish whether specific health care services or rates of utilization are responsible for observed outcomes when possible.

According to relevant theory and substantial evidence, school discipline is consequential to a child's academic success (Gonzalez, Etow, & De La Vega, 2019; Hirschfield, 2018; Howard & Rabie, 2013; Javdani, 2019; Sanders, Munford, & Boden, 2018; Schiff, 2018). Despite this, research on the association between SBHCs and school discipline is varied and understudied. Following the Gun-Free Schools Act in 1994, punitive and exclusionary discipline became commonplace in the K-12 education system (Martinez, 2009). To address student misconduct, schools began using suspension, expulsion, law enforcement referral, in-school arrest, physical restraint, and corporal punishment (Curran, 2016; Perry & Morris, 2014; Skiba et al., 2011; Smith & Harper, 2015; Steinberg & Lacoe, 2017). Evidence now shows these practices are not efficacious given their short- and long-term correlates with poor outcomes, including antisocial behavior, absenteeism, grade repetition, school failure or dropout, and juvenile justice involvement (Arcia, 2006; Boyd, 2009; Christle, Nelson, & Jolivette, 2004; Fabelo et al., 2011; Gonzalez et al., 2019; Justice Policy Institute, 2011; Losen, 2011; McCarter, 2017; Rosenbaum, 2020; Skiba & Eaton, 2004; Welsh & Little, 2018). Current research also shows that these practices penalize youth of color and those from low-income households at rates greater than expected given their representation in schools (Balfanz, Byrnes, & Fox, 2012; Bradshaw, Mitchell, O'Brennan, & Leaf, 2010; Christle et al., 2004; Fenning & Rose, 2007; Morris & Perry, 2016; Nichols, 2004; Skiba et al., 2014; Skiba, Michael, Nardo, & Peterson, 2002; Sullivan, Klingbeil, & Van Norman, 2013; Sullivan, Van Norman, & Klingbeil, 2014; Theriot, Craun, & Dupper, 2010; Wallace, Goodkind, Wallace, & Bachman, 2008). In the present review, a study investigating school discipline combined suspension and expulsion into a single composite variable referred to as 'behavioral incidents' (Lintz et al., 2019). Another article defined discipline incidents as the count of suspensions and expulsion per semester, categorizing this variable into three groups: not present, one incident, and two or more incidents (Walker et al.,

2010). Although each is a form of school discipline, suspension and expulsion are fundamentally different from one another. A lack of differentiation between the variables limits these studies' findings and the implications for mitigating negative consequences. To a great extent, there is an overlap between the populations of youth overrepresented in school discipline and those served by SBHCs (Love et al., 2019). This intersection justifies the need for additional investigation of how SBHCs may influence school discipline outcomes among these vulnerable populations of youth.

Several academic outcomes were examined by a single study, such as grade level advancement and loss of seat time. Conversely, nine articles studied time in the classroom using differing metrics, congruent with the findings described in the earliest review of SBHCs and education (Geierstanger et al., 2004). As noted by Geierstanger et al. (2004), a lack of consensus as to how variables are defined makes any comparison of study outcomes inappropriate. The persistence of these issues may indicate a limited amount of readily or publicly available data for researchers. Future investigations will benefit from accessing comprehensive datasets, which can provide a broader array of outcomes for analysis and uniformity in the definitions of variables. Examples of relevant data repositories include the Stanford Education Data Archive (Reardon et al., 2019), Civil Rights Data Collection (United States Department of Education, Office for Civil Rights, 2020), and the National Center for Education Statistics Common Core of Data (U.S. DOE, n.d.). These sources provide longitudinal data for variables that remain understudied in SBHC evaluations, such as achievement gaps and school discipline.

At the time of publication, Geierstanger et al. (2004) provided a novel conceptual framework to demonstrate how multiple factors may influence educational outcomes. See Fig. 2. According to the study, SBHCs influence multiple intermediate factors, such as health status or resiliency, which influence educational outcomes among youth. More recent studies have applied similar ecological frameworks to depict the external factors that may influence educational outcomes and how the support offered by SBHCs may indirectly influence educationally relevant behaviors and outcomes (Larson, Chapman, Spetz, & Brindis, 2017; Van Cura, 2010). The findings of this review suggest that research has broadened to consider how the influence of SBHCs on youth health outcomes may interact with the school environment at large (Bersamin et al., 2019; Stone et al., 2013; Strolin-Goltzman et al., 2012; Strolin-Goltzman, 2010). Further research will be necessary to determine if this approach best depicts the link between SBHCs and education.

There are limitations to the present review. It is possible that the limiters and keyword search terms used in this study did not capture all relevant published research. In addition, limiting the initial literature review search to three databases may have restricted the findings. The search examined only articles in the English language between 2004 and 2020, and the final eligible study count was ultimately limited to 16 articles. This review also excluded articles that did not explicitly mention an SBHC; given this judicious approach, the final analysis may have inadvertently excluded relevant studies.

5. Conclusion

Through a systematic review of the current literature, the present study critically evaluated the evidence to support the relationship between SBHCs and educational outcomes. This review is the first to examine the relationship between SBHCs and education outcomes since the seminal publication by Geierstanger et al. (2004). In general, the review revealed a dearth of research studying this relationship, with 16 studies included in the final full-text evaluation.

Previous research has shown that academic success is both an indicator and a result of a child's health. Relevant theory also argues that the conceptualization of academic success must include school discipline measures. As legislation and incentives pertaining to school performance on the basis of student outcomes continue to emerge, there is a growing need to determine if and how SBHCs impact student education outcomes. Further research is necessary to understand this bidirectional relationship between health and education as the number of SBHCs increases nationwide.

CRediT authorship contribution statement

Casey L. Thomas: Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Investigation. **Olga Acosta Price:** Conceptualization, Writing - original draft, Writing - review & editing, Supervision. **Stephen Phillippi:** Conceptualization, Writing - original draft, Validation, Supervision. **Ashley Wennerstrom:** Writing - original draft, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial

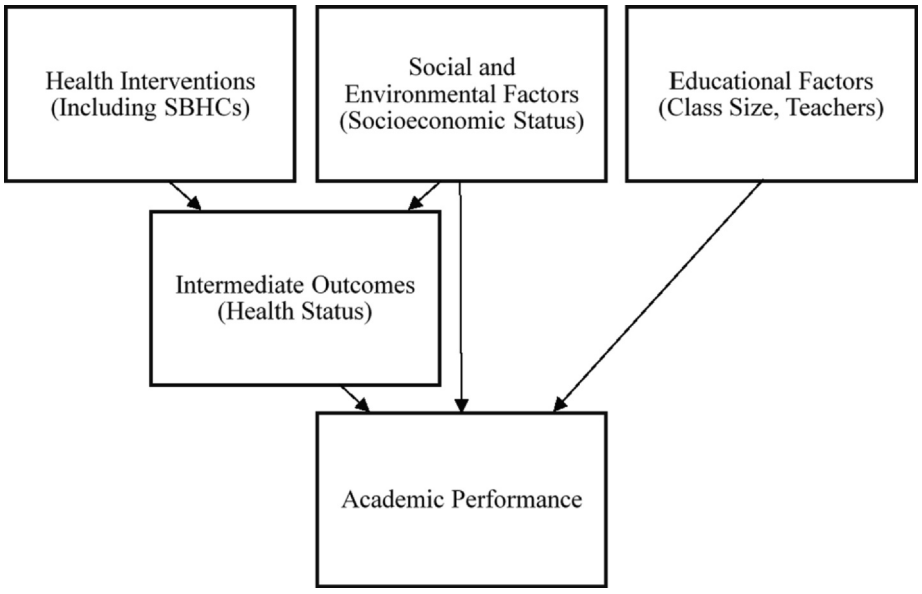

Fig. 2. Multiple influences on academic performance (Adapted from Geierstanger et al., 2004).

interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.childyouth.2020.105467.

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