

School-Based Health Centers to Advance Health Equity



A Community Guide Systematic Review

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Context: Children from low-income and racial or ethnic minority populations in the U.S. are less likely to have a conventional source of medical care and more likely to develop chronic health problems than are more-affluent and non-Hispanic white children. They are more often chronically stressed, tired, and hungry, and more likely to have impaired vision and hearing—obstacles to lifetime educational achievement and predictors of adult morbidity and premature mortality. If school-based health centers (SBHCs) can overcome educational obstacles and increase receipt of needed medical services in disadvantaged populations, they can advance health equity.

Evidence acquisition: A systematic literature search was conducted for papers published through July 2014. Using Community Guide systematic review methods, reviewers identified, abstracted, and summarized available evidence of the effectiveness of SBHCs on educational and health-related outcomes. Analyses were conducted in 2014–2015.

Evidence synthesis: Most of the 46 studies included in the review evaluated onsite clinics serving urban, low-income, and racial or ethnic minority high school students. The presence and use of SBHCs were associated with improved educational (i.e., grade point average, grade promotion, suspension, and non-completion rates) and health-related outcomes (i.e., vaccination and other preventive services, asthma morbidity, emergency department use and hospital admissions, contraceptive use among females, prenatal care, birth weight, illegal substance use, and alcohol consumption). More services and more hours of availability were associated with greater reductions in emergency department overuse.

Conclusions: Because SBHCs improve educational and health-related outcomes in disadvantaged students, they can be effective in advancing health equity.

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Context

In the U.S., inequalities by race, ethnicity, and income in key health outcomes and educational achievement are well documented.^{1–8} Although educational

inequalities have declined modestly in recent years, they persist.^{3,5,9–11} Health outcomes and educational achievement are related to each other by several causal pathways. Health problems (e.g., vision and oral health problems, asthma, teen pregnancy, malnutrition, obesity, chronic

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stress, and inattention and hyperactivity disorders) and risk-taking behavior (e.g., aggression and violence, unsafe sexual activity, unhealthy eating, physical inactivity, and substance use) are associated with low scholastic performance.^{12–22} Conversely, low academic achievement is strongly associated with risk-taking behavior, compromised health status, and reduced longevity.^{22–33} Children from low-income and racial or ethnic minority populations in the U.S. are more likely to develop chronic health problems than are more-affluent and non-Hispanic white children and less likely to have a usual source of medical care.¹ Thus, if school-based health centers (SBHCs) can increase receipt of needed medical services and overcome educational obstacles in disadvantaged populations, they can advance health equity.

For purposes of this review, SBHCs are defined as clinics that provide health services to students in pre-Kindergarten through Grade 12. Services may be offered onsite (i.e., school-based centers) or offsite (i.e., school-linked centers) and are often established in schools that serve predominantly low-income communities. SBHCs have the following characteristics:

- SBHCs must provide primary health care and may also provide mental health care, social services, dental care, and health education.
- Primary care services are sometimes provided by a single clinician, or comprehensive services may be provided by multidisciplinary teams.
- Services may be available only during some school days or hours, and may also be available in non-school hours.
- Student participation requires parental consent, and services provided for individual students are sometimes limited for specific types of care, such as reproductive or mental health.
- Services may be provided to school staff, student family members, and others within the surrounding community.
- Services are often provided by a medical center or provider independent of the school system, such as a federally qualified health center or academic institution.

In 1986, there were only 61 documented SBHCs.³⁴ By 2013, the School Based Health Alliance (“Alliance,” www.sbh4all.org/) used a census to estimate that there were 2,300 SBHCs (1.8% of public and private schools in the U.S.). CDC’s Division of Adolescent and School Health estimates a prevalence of 6.4% of SBHCs in 2006, from a representative sample of U.S. public and private schools.³⁵ Estimates from the Alliance may be low because their census may be incomplete; Division of Adolescent and School Health estimates may be high because some respondents might have misinterpreted survey questions.

According to the most recent Alliance survey, 29.2% of SBHCs provide “primary care only,” whereas 33.4% also provide mental health services and 37.4% offer additional services.³⁶ Most SBHCs report providing comprehensive health assessments (96.6%); treatment of acute illness (96.1%); prescriptions (96.0%); asthma treatment (94.6%); and screening for vision, hearing, and scoliosis (92.7%).³⁶ Most SBHCs provide primary prevention services such as immunizations; counseling for healthful eating/active living/weight management (90.1%); pregnancy testing (81.2%); substance abuse (53.2%); violence prevention (92.5%); dropout prevention (59.1%); oral health education (77%); and dental screenings (64.8%).³⁶ Most SBHCs are open beyond school hours and have prearranged source(s) of after-hours care (70.6%).³⁶

Previous reviews have found limited evidence of SBHC effectiveness in improving healthcare utilization and academic outcomes.^{19,37–41} Two reviews^{19,38} considered only academic outcomes, two^{37,41} considered only reproductive outcomes, and two^{39,40} considered only access and utilization. This Community Guide report provides the first quantitative, systematic review on the effectiveness of SBHCs, examining a wide array of educational and health-related outcomes and effect modifiers. A separate Community Guide report on the economic efficiency of SBHCs appears elsewhere in this issue.⁴² Information about the Community Guide is available in [Appendix A](#) (available online).

The primary research question for this review was as follows:

- How effective are SBHCs in improving educational and health outcomes of disadvantaged students?

Secondary research questions were as follows:

- Is intervention effectiveness affected by
 - extent of services (mental health, dental, social services) in addition to primary care?
 - focus of SBHC on specific health issues (e.g., asthma, immunization, or reproductive health)?
 - availability of services by time (hours or days per week) and proximity (onsite or offsite)?
 - demographic characteristics of the population served?
 - specific SBHC offerings, such as the availability of contraceptives onsite?
 - out-of-pocket cost versus no cost to students?
 - assessing the effect of SBHC on whole-school populations versus on SBHC users only?

Evidence Acquisition

Conceptual Approach and Analytic Framework

It is hypothesized that SBHCs improve educational and health outcomes through several pathways ([Figure 1](#)). Specifically,

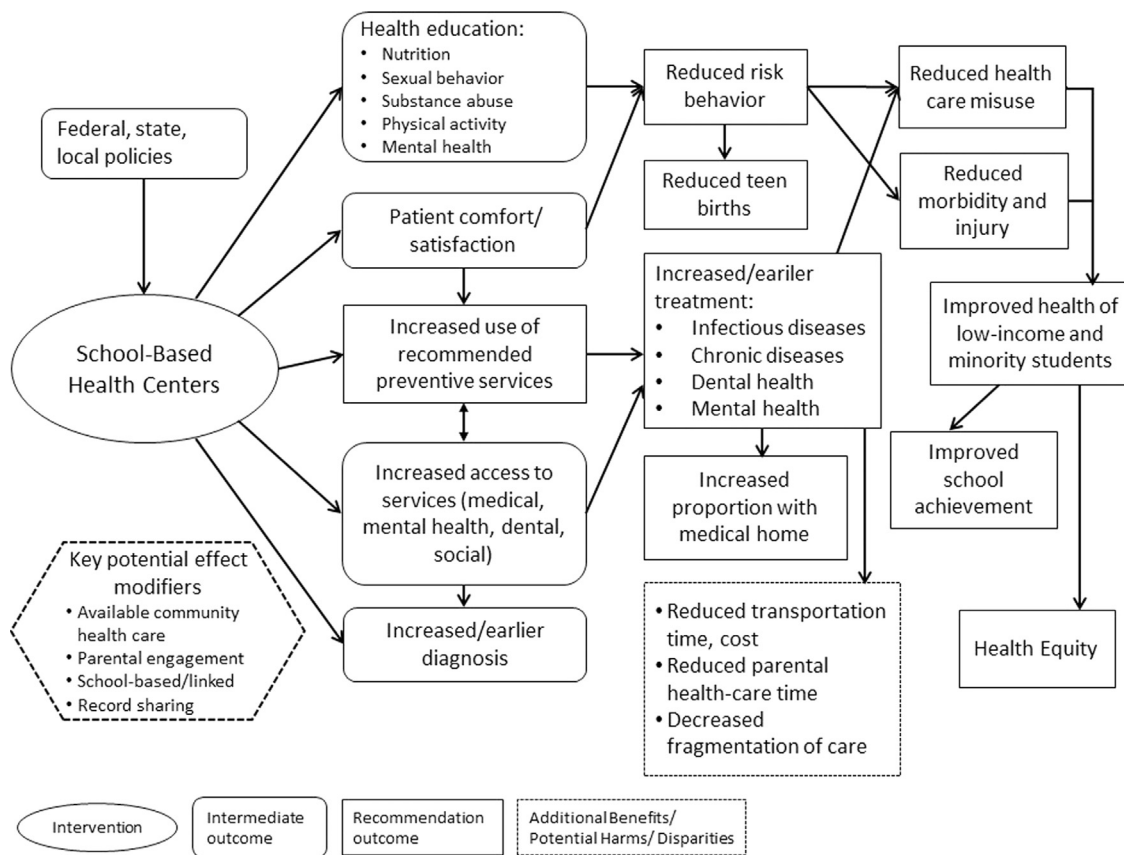


Figure 1. Analytic framework: school-based health centers to promote health equity.

increased access to and satisfaction with health-related services are expected to increase receipt of recommended services^a that lead to early detection and treatment or prevention of disease. Increases are expected in school achievement and the proportion of students with a usual place of care, along with reductions in illness, injury, and healthcare overuse (e.g., use of emergency departments [EDs] for non-urgent care). When SBHCs offer health education and counseling, reductions in risk behavior are also expected. Overall, SBHCs are expected to improve the health prospects of low-income and racial and ethnic minority students.

Search for Evidence

Eight databases were searched from first available dates to July 2014. Full details of the search strategy are in [Appendix B](#) (available online).

Inclusion Criteria

To qualify for inclusion in this review, a study had to

- evaluate the relative effectiveness of exposure to (or use of) the services of an SBHC versus a comparison condition that did not include exposure to (or use of) such services;

^aRecommended services are services recommended by an authoritative body such as the U.S. Preventive Services Task Force, the Community Preventive Services Task Force, or the Advisory Committee on Immunization Practices.

- report at least one school achievement or health-related outcome;
- evaluate an SBHC that served school-aged children (pre-Kindergarten through Grade 12);
- be published in English; and
- be conducted in a high-income nation.⁴³

Four outcomes were excluded because they lacked a plausible or clear mechanism of impact:

- asthma prevalence;
- utilization of services not recommended by an authoritative agency such as the U.S. Preventive Services Task Force;
- non-urgent ED utilization; and
- school attendance.

Although asthmatic events among asthma patients would be subject to reduction by access to SBHCs, the underlying prevalence of asthma would unlikely be affected by SBHCs. Although school attendance would be expected to increase because of SBHC-related reductions in illness, parents sometimes send sick children to school because of treatments available in SBHCs—thus increasing attendance because of sickness; further, sick children may be sent home because of increased SBHC-associated diagnoses, thus decreasing attendance.

The improvement of health equity would have been reported if assessed in included studies. In addition, it is assumed that if SBHCs are effective in improving health outcomes and are targeted

to low-income and minority communities, SBHCs are effective in improving health equity.

Assessing and Summarizing the Body of Evidence of Effectiveness

Study abstraction and quality assessment. Two reviewers independently evaluated each study included in the review. Disagreements between reviewers were resolved by consensus. Information on study methods, results, and interpretation was abstracted following standard Community Guide criteria.⁴⁴ Using Community Guide methods,^{44,45} each study was assessed for threats to internal and external validity—including inadequate descriptions of the intervention, population, sampling frame, and inclusion/exclusion criteria; inadequate measurement of exposure or outcome; inappropriate analytic methods; high attrition; and failure to control for confounding. Study quality of execution was characterized as good (one or fewer threats to validity); fair (two to four threats); or limited (five or more threats). Studies of limited quality of execution were excluded from analysis.

Statistical analysis and synthesis of results. Effect estimates were calculated for each study using relative percent or absolute percentage point change or difference in review outcomes. Absolute percentage point change or difference was used only for preventive screening or counseling and immunization. These outcomes generally have low baseline values, and small changes in the outcome could produce a large relative change or difference. With outcome measures that were sufficiently homogenous, effect estimates from individual studies were pooled to calculate an overall median as the summary measure. When at least five independent effect estimates were available, interquartile intervals (IQIs) were calculated to provide a measure of variation; otherwise, tables indicate the range of estimates. A meta-analysis was not conducted because of the heterogeneity of study designs and the small number of studies per outcome.

Whereas some studies aggregated effect estimates from multiple study sites or school grades, many studies reported multiple effect estimates per outcome (e.g., by SBHC site, grade level). To give each study equal statistical weight, medians were calculated for studies with multiple effect estimates.

Review studies were categorized into two types based on differences in SBHC exposure for the intervention and comparison groups:

- studies of the effects of SBHCs on entire student bodies (*whole-school effects*) assessed effects on all students in SBHC schools (including SBHC users and non-users) compared with all students in non-SBHC schools, or effects in school populations post-SBHC implementation compared with pre-SBHC implementation; and
- studies of the effects of SBHCs on SBHC users only (*SBHC user-only effects*) compared with SBHC non-users in schools with SBHCs or community care clinics.

When studies included both whole-school and SBHC user-only effect estimates, the former estimates were used in calculating a summary effect measure (i.e., median) because these estimates indicate schoolwide SBHC effects. Overall medians presented in this article combine whole-school and SBHC user-only effects.

Most studies that conducted longitudinal analyses did not collect baseline data before the study SBHC had been established. For studies in which the earliest data were collected within 6 months of SBHC opening and study outcomes required >6 months to manifest (e.g., birth, health status, educational outcomes), study baselines were treated as approximations of true baseline data, and the studies were considered longitudinal. Conversely, for studies in which the earliest data were collected >6 months after SBHC opening and study outcomes could be achieved within 6 months (e.g., vaccination or contraceptive uptake), the study baselines were not treated as approximations of true baselines and the studies were considered cross-sectional.

When relevant data were available, stratified analyses were conducted to investigate secondary research questions. A sensitivity analysis was conducted to determine whether studies with better design and execution—the strongest evidence available—were consistent with the overall body of evidence. Analyses were performed in 2014–2015.

Evidence Synthesis

Descriptive Results and Applicability of Findings

The literature search identified 50 studies in 52 papers that met the inclusion criteria^{46–97}; four^{50,63,64,80} of these were excluded from analysis because of quality of execution limitations (Figure 2). Six studies^{46,70,78,90,93,94} reported that a median of 59% (IQI=43%, 88%) of students in schools with SBHCs enrolled in the clinics (although not all enrollees used the clinics). Five studies^{46,70,76,78,90} reported that a median of 69% (IQI=61%, 82%) of students who enrolled in SBHCs received services. Across 15 studies,^{54,56,59,62,68,71,73,79,84,86–88,91,92,96} a median of 52% (IQI=38%, 61%) of students in schools with SBHCs used the clinics. A summary of evidence from included studies is available on the Community Guide website (www.thecommunityguide.org/healthequity/education/supportingmaterials/SET-schoolbasedhealthcenters.pdf).

Of the 46 studies in the analytic data set, 23 studies in 24 papers^{51–55,57,58,60–62,70–73,75,77,81–84,86,93,95,96} assessed SBHC whole-school effects by comparing all students in SBHCs with all students in non-SBHC settings (14 studies^{51–53,55,58,60–62,73,81,84,86,93,96}) or students in schools before and after the implementation of SBHCs (eight studies^{54,57,71,75,77,82,83,95}); one study in two papers^{70,72} included both comparisons. Seventeen studies in 18 papers^{46–49,56,65–69,74,78,85,88,89,91,92,94} assessed SBHC user-only effects by comparing users with non-users within SBHC schools (eight studies^{46,68,69,78,88,91,92,94}) or SBHC users with users of health-care sources in non-SBHC settings (nine studies in ten papers^{47–49,56,65–67,74,85,89}). Four studies^{59,76,78,90} assessed both whole-school and SBHC user-only effects. Additionally, two studies^{87,97} compared SBHCs, one⁸⁷

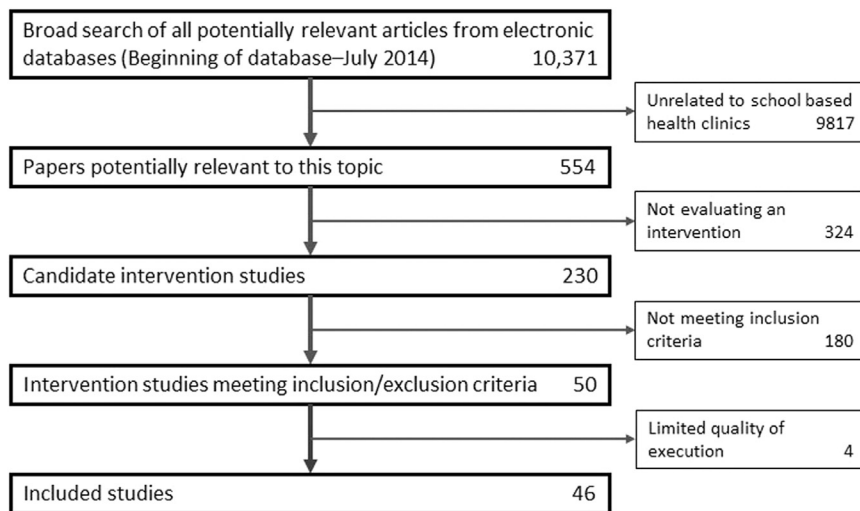


Figure 2. Search process.

comparing an SBHC with onsite contraceptive services with an SBHC without onsite contraceptive services and the other⁹⁷ comparing an SBHC before and after implementation of onsite contraceptive services—thus evaluating the effectiveness of the contraceptive services rather than the SBHC itself.

Thirty-two studies in 33 papers^{46–48,51–53,55–62,65,68,69,74,75,77,79,81–83,86–88,90–93,95,97} were published after 2000, and only four studies in five papers^{49,54,70,72,89} before 1990. Only three studies^{51,75,92} evaluated hybrid school-based and school-linked centers, and no studies evaluated exclusively school-linked centers or mobile clinics. Results of this review are largely applicable to the urban context, as only ten studies in 11 papers^{51,52,58,70,72,75,76,79,90,92,96} were conducted in mixed rural and urban or suburban areas, and none in predominantly rural areas. Applicability to younger grade levels is limited, as most studies (26 studies in 28 papers^{46–49,52,54,55,59,62,65,66,68–74,81,82,85,87,89,91,92,94,96,97}) evaluated high school SBHCs, whereas one study⁸³ assessed middle school SBHCs, seven studies^{57,58,67,77,83,93,95} evaluated pre-Kindergarten or elementary school SBHCs, and the remaining 12 studies^{51,56,60,61,75,76,78,79,84,86,88,90} assessed combinations of grade levels.

The effects of the range of SBHC services were evaluated: 23 studies in 24 papers^{49,52–56,59,69–72,74,77–79,82,85,88,89,91–93,96,97} compared SBHCs that provided primary care only (often including reproductive services); nine studies in ten papers^{47,48,62,68,73,75,81,87,90,94} assessed SBHCs that also provided mental health care; and 13 studies^{46,51,58,60,61,65–67,76,83,84,86,95} provided some combination of primary care and mental, dental, or social services. Most studies (28 studies in 29 papers^{47,48,52–56,58,59,62,69,75–79,81–83,85–88,91–94,96,97}) did not report hours

of operation; among those that did, only two SBHCs^{49,89} were open for fewer than normal school hours.

The study populations were largely from racial and ethnic minority and low-income communities. Only six studies^{61,74,89,90,96,97} evaluated SBHCs in majority white populations, with more studies evaluating SBHCs in majority black (16 studies in 18 papers^{47,48,53,60,62,69,70,72,77,78,81–86,94,95}); majority Hispanic (eight studies^{46,55,56,59,65,87,88,93}); or populations without a majority racial or ethnic group (seven studies^{49,51,68,76,79,91,92}). Nine studies^{52,54,57,58,66,67,71,73,75} did not report the race or ethnicity of the study population. Nineteen studies in 21 papers^{46–48,51,53,57,60–62,70,72,76–79,82–84,86,87,95} evaluated majority low-income populations (e.g., Medicaid, free or reduced-price lunch); 22 studies^{49,52,54–56,58,59,66,67,69,71,73–75,81,85,88,89,92–94,97} did not report the SES of study participants; and only five studies^{65,68,90,91,96} were conducted in study populations with less than half low-income participants.

School-Based Health Center Effects on Educational and Health-Related Outcomes

Substantial educational benefits associated with SBHCs included reductions in rates of school suspension or high school non-completion, and increases in grade point averages and grade promotion (Table 1; Appendix Figure 1, available online). Healthcare utilization also improved, including substantial increases in recommended immunizations and other preventive services, and a small increase in the proportion of students who reported a regular source of health care. There were benefits to students with asthma, including reductions in symptoms and incidents. Effects on self-reported health and mental health status were small; however, the

presence of SBHCs was associated with substantial reductions in ED visits and hospital utilization for all conditions. Associations between SBHC exposure and risk behaviors were mixed, with apparent increases in cigarette smoking but reductions in consumption of alcohol and other substances. Regarding sexual and reproductive behaviors associated with SBHCs, contraceptive use among females increased, childbirth decreased, and prenatal care improved (Table 1).

Additional Analyses

Range of offered services. Schools with SBHCs that offered four services experienced the greatest reduction in total ED utilization (median reduction of 25.1%; IQR=−34.1%, −12.5%; seven studies^{51,58,61,65,66,84,86}) compared with those that offered three or fewer services (median increase of 4.5%; range, −39.8% to 37.8%; six studies in seven papers^{46,62,70,72,73,76,95}) (Figure 3).

Hours of availability. SBHCs accessible outside of regular school hours were associated with greater reductions in total ED utilization and hospitalizations (median reduction of 37.0%; range, −75% to −15.5%; four studies^{46,65,66,84}) than SBHCs accessible only during regular school hours (median reduction of 5.2%; range, −47.9% to 37.8%; four studies^{61,72,73,93}) (Appendix Figure 15, available online). One study⁵² reported improved contraceptive use associated with increased hours of SBHC availability.

Socioeconomic position. One study⁷⁹ found greater reduction in high school non-completion for students at schools with SBHCs who received free or reduced-price lunch compared with those not eligible for free or reduced-price lunch.

Onsite and offsite contraceptive dispensing. Seven studies^{54,55,71,72,81,87,97} provided details on contraceptive dispensation, but results were inconclusive (Appendix Figures 16 and 17, available online). One study⁷² compared multiple study sites and found that onsite access to contraceptives increased female but not male use of contraceptives, with no effect observed for pregnancy outcomes. Two studies^{87,97} investigated this question with internal comparisons, and both found onsite access to contraceptives associated with increased contraceptive uptake and reduced pregnancy rates.

Whole-school versus school-based health center user-only effects. Analysis of the whole-school effects versus effects for SBHC users only indicated no clear pattern of differences (results not shown).

Sensitivity analyses. Overall, findings on 26 outcomes were reported, of which 16 findings were based on bodies of evidence including at least one study of greatest design suitability^{51,59–61,68,69,73,76,79,81,82,90–92}; findings for the studies of greatest design suitability were consistent with the overall body of evidence for 13 outcomes and inconsistent for three outcomes (i.e., non-asthma related ED use, contraception use, and sexual activity). Nine of the greatest design suitability studies^{51,59–61,69,81,82,90,91} were also of good quality of execution; all were consistent with the overall body of evidence.

Data were not adequate to distinguish between the effects of SBHC service proximity and the effects of SBHC service costs. Descriptions of program contents were often incomplete in available studies; in addition, there were likely associations between program focus and the assessment and reporting of targeted outcomes, thus biasing the evaluation of the association between program focus and program outcomes.

Discussion

Summary of Findings

This review found that SBHCs are effective in improving an array of educational and health-related outcomes. Increased effectiveness was associated with extended hours of availability and increased range of offered services. Because SBHCs aim to meet the needs of disadvantaged populations,³⁶ address the health-related obstacles to educational achievement, and address the cultural, financial, and privacy- and transportation-related barriers to clinical, preventive, and healthcare services, they have the potential to promote social mobility⁹⁸ and improve health equity.

Limitations

Although the review included a relatively large number of studies, synthesis presented unusual challenges, and some included studies have methodologic limitations. First, lack of randomization might have resulted in selection bias. Few studies adjusted for background health differences, and it is unclear whether users and non-users or SBHC sites and non-SBHC sites were comparable. SBHC placement was influenced by the greater healthcare needs of the school community, the presence, proximity, quality, or absence of other community health resources, or political and financial factors; the effects of these selection biases on estimates of SBHC effectiveness were not controlled. Lastly, SBHC effects might have been underestimated or overestimated because evaluators did not obtain true baseline data.

Table 1. Outcomes Associated With the Presence and/or Use of an SBHC

Outcome (Appendix Figure no.) ^a	Number of studies	Median (IQR or range)
Education-related outcomes		
Rates of high school non-completion (Appendix Figure 1)	5 ^{48,54,68,78,85}	29.1% (IQR= −53.9%, −14.8%)
GPA	3 ^{88,91,92}	4.7% (range= 3.5%, 7.2%)
Grade promotion ^b	3 ^{68,73,88}	2 studies ^{68,88} 11.5% (8.4% and 14.6%)
Percent of students excluded from school because of lack of state-mandated physical examination	1 ⁵⁷	74.1% decrease in student exclusions ($p < 0.05$)
Health care-related outcomes		
Immunization (Appendix Figure 2)	4 ^{46,56,75,96}	15.5 pct pts (range= −22.0 pct pts, 26.1 pct pts)
Other recommended clinical preventive services (Appendix Figure 3)	6 ^{48,55,59,66,74,84}	12.0 pct pts (IQR=5.7 pct pts, 45.1 pct pts)
Regular source of health care (Appendix Figure 4)	7 ^{59,62,73,76,77,86,90}	2.2% (IQR= −1.8%, 12.4%)
Asthma-specific outcomes (Appendix Figure 5)		
Asthma-related hospitalization	3 ^{61,77,93}	−70.6% (range= −79.9%, −37.5%)
Asthma-related emergency visits	4 ^{61,77,86,93}	−15.8% (range= −50.0%, −5.9%)
Asthma-related morbidity	2 ^{77,93}	−19.3% (−2.1% and −36.4%)
Other morbidity-related outcomes		
Self-reported health status ^c (Appendix Figure 6)	7 ^{51,60,73,76,79,86,90}	4 studies ^{51,73,76,86} −1.2% (range= −17.4%, 5.6%)
Self-reported mental health problems ^d (Appendix Figure 7)	8 ^{58,60,62,73,76,79,92,94}	4 studies ^{58,62,76,92} −5.7% (range= −31.6%, 8.9%)
Non-asthma-related emergency department use (Appendix Figure 8)	15 ^{46,51,58,62,65–67,69,70,73,76,84,86,90,95}	−14.5% (IQR= −33.8%, 4.6%)
Non-asthma-related hospitalization (Appendix Figure 8)	2 ^{58,84}	−51.6% (−86.9% and −16.3%)
Risk behaviors		
Smoking (Appendix Figure 9)	7 ^{62,70,73,74,76,82,92}	21.0% (IQR= −24.1%, 32.4%)
Alcohol use (Appendix Figure 10)	6 ^{62,70,73,74,82,92}	−14.8% (IQR= −19.8%, −9.5%)
Other illicit substance use (Appendix Figure 11)	5 ^{62,70,73,82,92}	−27.2% (IQR= −48.2%, 13.6%)
Any substance use (tobacco, alcohol, or other substance use)	1 ⁷⁶	15.7% decrease in any substance use (p -value not reported)
Nutrition, physical activity, and weight-related outcomes ^e	3 ^{53,62,79}	—
Sexual risk behavior and reproductive outcomes		
Contraception use ^f (Appendix Figure 12)		
Females and males	4 ^{73,74,92,96}	7.8% (range= −21.2%, 46.7%)
Females only	3 ^{55,62,72}	17.8% (range= −8.5%, 54.9%)
Males only	3 ^{55,62,72}	−3.1% (range= −6.2, 14.5%)

(continued on next page)

Table 1. Outcomes Associated With the Presence and/or Use of an SBHC (continued)

Outcome (Appendix Figure no.) ^a	Number of studies	Median (IQR or range)
Sexual activity ^g (Appendix Figure 13)		
Females/males combined	3 ^{73,74,92}	19.6% (range= −0.9%, 83.2%)
Females only	2 ^{62,72}	−3.6% (−16.0% and 8.9%)
Males only	2 ^{62,72}	−8.5% (−12.0% and −4.9%)
Becoming pregnant or causing pregnancy (Appendix Figure 14)		
Females only	5 ^{54,71–73,81}	−40.0%(IQR= −47.5%, 17.6%)
Males only	1 ⁷²	Increase of 21.5% in causing pregnancy, unfavorable
Pregnancy complications	3 ^{48,85,89}	25% (range= −16.1%, 76.3%)
Low birth weight	3 ^{48,49,89}	−58.3% (range= −60.4%, −14.4%)
Received prenatal care ^h	4 ^{48,49,54,85}	2 studies ^{48,85} 27.8% increase in the number of prenatal visits (9.4% and 46.2%) 25 pct pt increase in % of pregnant students receiving ≥ 12 visits; 1 study 87 pct pt increase in % of pregnant students who received prenatal care; 1 study
Month of initiation of prenatal care ⁱ	3 ^{48,49,89}	2 studies ^{48,49} Pregnant students received prenatal care 0.45 months earlier (0.6 months and −1.5 months); 1 additional study reported 15.1 pct pt increase in % of pregnant students registered for prenatal care during 1st trimester

^aAll Appendix figures are available online.

^bAdditional evidence: 1 study⁷³: SBHCs associated with increases in students on pace to graduate.

^cAdditional evidence: 3 studies^{60,79,90}: mixed results in self-reported physical discomfort and health-related quality of life.

^dAdditional evidence: 3 studies^{60,79,94}: favorable, non-significant, effects on psychosocial health; 1 study⁶²: 17.5% decrease in suicide planning; 1 study⁷³: 28.1% decrease in suicide attempts.

^eAdditional evidence: 1 study⁷⁹: no statistically significant increase in healthy eating or physical activity; 1 study⁶²: 1.2 pct pts change (adjusted) in % who exercise ≥ 4 days per week ($p > 0.05$); 1 study⁵³: 1.4% decrease in BMI (p -value not reported).

^fSpecific outcomes reported: % currently using contraception⁶²; % using contraception consistently last month⁷³; % using a condom at last intercourse^{55,72,74}; % always using contraception when having sex in past 2 months⁹²; % received birth control/condoms.⁹⁶

^gSpecific outcomes reported: % ever had sex^{62,74,92}; % had sex in the past month⁷³; number of times had sex in the past 4 weeks.⁷²

^hAdditional evidence: 1 study⁴⁹ reported 25 pct pts increase in % of pregnant students with ≥ 12 prenatal visits; 1 study⁵⁴ reported 75 pct pts increase in % of pregnant students receiving prenatal care.

ⁱAdditional evidence: 1 study⁸⁹ reported 15.1 pct pts increase in % of pregnant students registered for prenatal care during 1st trimester.

GPA, grade point average; IQR, interquartile interval; pct pts, percentage points; SBHC, school-based health center.

Other Benefits and Potential Harms

Increased parental work time and reduced child care, transportation needs, time, and costs have been identified in the broader literature as additional benefits of SBHCs.^{99–101} Because many SBHCs are open to others in the community,³⁶ improvements in health (and education) in the broader community are also expected. There are reports that SBHCs provide more-sensitive care (e.g., for reproductive health and mental health) than may be available in other settings,^{48,49,66,74,89,102} and improve quality of care⁷⁴ and patient satisfaction with and acceptability of care.^{58,103,104} Services provided to community members may complement rather than replace or duplicate those available in the community.^{65,66,76,105} Additionally, benefit is anticipated to extend beyond SBHC users, as many SBHCs offer health

education and promotion activities to the entire student body, and non-users may adopt some of the promoted health behaviors (e.g., abstaining from drugs and alcohol).⁷⁹ SBHCs also have been reported to improve student academic expectations, safety and respect, and school engagement¹⁰⁶; to increase adolescents' responsibility for and awareness of their health¹⁰⁴; and to strengthen connections between community and school.¹⁰⁷ Because of improved vaccination uptake, reduced transmission of vaccine-preventable diseases is also expected. Additionally, most SBHCs help children and families enroll in Medicaid and the State Children's Health Insurance Program.³⁶

Some authors^{108–110} have suggested that SBHCs might fragment a child's health care by adding a separate source of care not necessarily linked to other sources. This

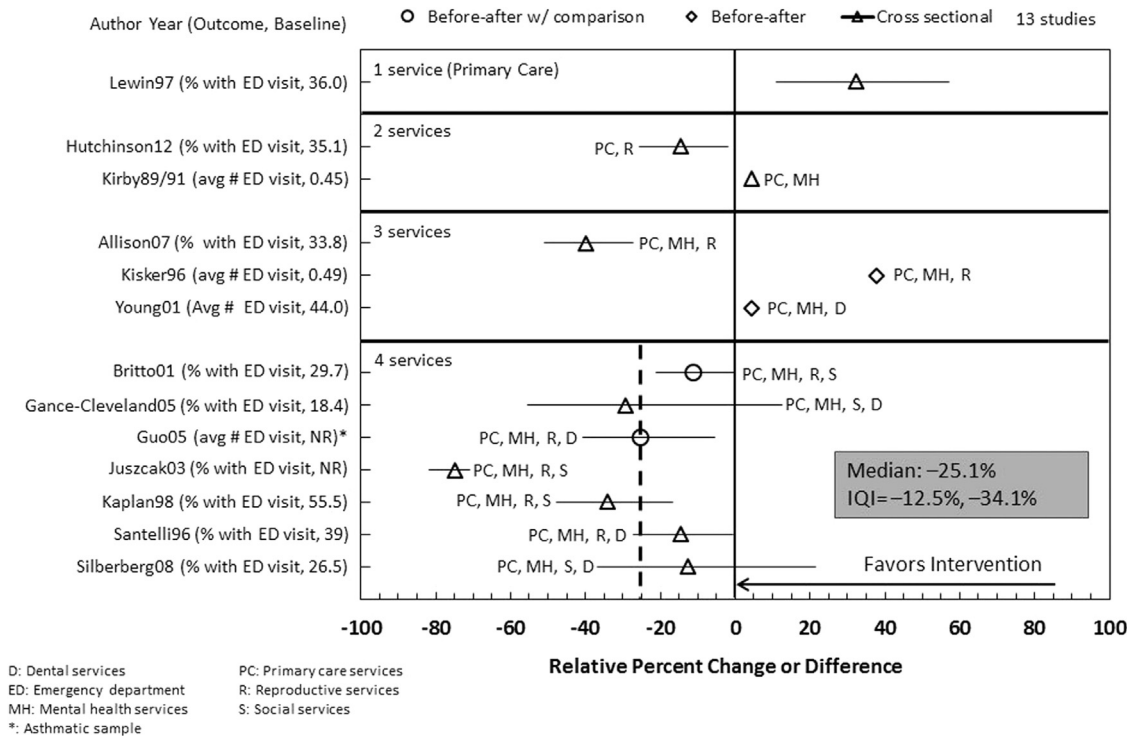


Figure 3. Effect modification: impact of range of services offered on ED visits.

review did not find evidence supporting this concern, but did find marginal increases in the proportion of students reporting that an SBHC provided a source of regular care. For disadvantaged students who have not had a usual source of care, the SBHC may become the regular source. Additionally, it has been reported that some SBHCs link with other sources of care through health information technology^{36,107} and referral to community care providers for after-hours care. Another postulated harm involves increased sexual activity owing to increased access to contraceptive services.⁵⁵ Results from this review neither support nor contradict this hypothesis. Finally, the review found no evidence regarding the concern that SBHCs undermine parental authority over medical decisions for their children.¹¹¹

Evidence Gaps

A number of research questions remain:

- Although SBHCs are usually located in high-need communities, the proportions of students who enroll, and those enrollees who receive SBHCs’ services, are often less than those in need of these services. What strategies would increase use of SBHC services?
- Are SBHCs effective in schools and communities with majorities of higher-income and non-Hispanic white

students? Are there thresholds or points of diminishing returns on community income, insurance coverage, and other measures of need above which SBHCs are less effective?

- SBHCs usually offer services to school staff, student family members, and others in the community. What are the effects of SBHCs on the health of these populations?
- How effective are SBHCs in rural areas with low population density in which a different design of SBHCs may be necessary?
- What is the effectiveness of school-linked and mobile health centers?
- Are service uptake and outcomes of SBHCs different for services provided free of charge?
- What is the relative impact on specific outcomes of focused programs—such as intensive asthma programs or programs focused on reproductive health—when compared with general programs?
- What are the components of the SBHCs being assessed and the attributes of populations they serve? Better descriptive information is needed for optimal program evaluation, design, and targeting.
- What are the long-term impacts of SBHCs in academic achievement, income, and health?
- What synergistic effects, mutual support, or redundancies might occur among SBHCs, school health polices, or classroom health education?

- Will new SBHC-related studies be able to distinguish between changes caused by SBHCs themselves and changes caused by implementation of the Affordable Care Act?

Conclusions

Despite methodologic limitations, the breadth and consistency of the evidence, and the finding that the better designed and executed studies in the body of evidence confirm overall conclusions, support the conclusion that SBHCs improve both educational and health outcomes. Because SBHCs are commonly implemented in low-income communities and communities with high proportions of racial and ethnic minority populations, this source of student health care may be a prominent means of advancing health equity.

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References

- Bloom B, Cohen RA, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2011. *Vital Health Stat*. 2012;10(254).
- Centers for Disease Control and Prevention. Surveillance of health status in minority communities—Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.) risk factor survey, United States, 2009. *MMWR Morb Mortal Wkly Rep*. 2011;60(SS-6):1–42.
- Centers for Disease Control and Prevention. CDC health disparities and inequalities report—United States, 2013. *MMWR Morb Mortal Wkly Rep*. 2013;62(3 suppl):1–187.
- Kann L, Kinchen S, Shanklin S, et al. Youth Risk Behavior Surveillance—United States, 2013. *MMWR Morb Mortal Wkly Rep*. 2013;63(4):1–168.
- U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. National assessment of educational progress (NAEP), various years, 1992–2013 mathematics and reading assessments. nces.ed.gov/nationsreportcard/subject/publications/main2013/pdf/2014087.pdf. Published 2014. Accessed September 3, 2015.
- U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Percentage of high school dropouts among persons 16 through 24 years old (status dropout rate), by sex and race/ethnicity: selected years, 1960 through 2012. nces.ed.gov/programs/digest/d13/tables/dt13_219.70.asp. Published 2013. Accessed May 11, 2015.
- U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Percentage of high school dropouts among persons 16 through 24 years old (status dropout rate), by income level, and percentage distribution of status dropouts, by labor force and years of schools completed: 1970 through 2012. nces.ed.gov/programs/digest/d06/tables/dt06_105.asp. Published 2013. Accessed May 5, 2015.
- USDHHS. *National Healthcare Quality Report, 2012*. Rockville, MD: Agency for Healthcare Research and Quality; 2013.
- Sondik EJ, Huang DT, Klein RJ, Satcher D. Progress toward the Healthy People 2010 goals and objectives. *Annu Rev Public Health*. 2010;31:271–281. <http://dx.doi.org/10.1146/annurev.publhealth.012809.103613>.
- U.S. Department of Education, National Center for Education Statistics, Institute of Education Sciences. Achievement gaps: how black and white students in public schools perform on the national assessment of educational progress. nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2009455. Published 2009. Accessed September 3, 2015.
- U.S. Department of Education, National Center for Education Statistics, Institute of Education Sciences. Achievement gaps: how Hispanic and white students in public schools perform on the national assessment of educational progress. nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2011459. Published 2009. Accessed September 3, 2015.
- Basch CE. Healthier students are better learners: a missing link in school reforms to close the achievement gap. *Equity Matters: Research Review No. 6*. 2010; A Research Initiative of the Campaign for Educational Equity.
- Bradley B, Green AC. Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviors. *J Adolesc Health*. 2013;52(5):523–532. <http://dx.doi.org/10.1016/j.jadohealth.2013.01.008>.
- CDC, National Center for Chronic Disease Prevention and Health Promotion, Division of Adolescent and School Health. Alcohol and other drug use and academic achievement: What is the relationship between alcohol and other drug use and academic achievement? *Data from the 2009 National Youth Risk Behavior Survey 2009*; www.cdc.gov/healthyyouth/health_and_academics/pdf/alcohol_other_drug.pdf.
- Davis C, Tomporowski P, McDowell J, et al. Exercise improves executive function and achievement and alters brain activity in overweight children: a randomized controlled trial. *Health Psychol*. 2011;30(1):91–98. <http://dx.doi.org/10.1037/a0021766>.
- Dilley J, Washington State Board of Health, Washington State Office of Superintendent of Public Instruction, Washington State Department of Health. Research review: school-based health interventions and academic achievement. here.doh.wa.gov/materials/research-review-school-based-health-interventions-and-academic-achievement/12_HealthAcademic_E09L.pdf. Published 2009. Accessed September 3, 2015.
- Edwards LE, Mauch L, Winkelman MR. Relationship of nutrition and physical activity behaviors and fitness measures to academic performance for sixth graders in a midwest city school district. *J Sch Health*. 2011;8(2):65–73. <http://dx.doi.org/10.1111/j.1746-1561.2010.00562.x>.
- Fox CK, Barr-Anderson D, Neumark-Sztainer D, Wall M. Physical activity and sports team participation: associations with academic outcomes in middle school and high school students. *J Sch Health*. 2010;80(1):31–37. <http://dx.doi.org/10.1111/j.1746-1561.2009.00454.x>.
- Geierstanger SP, Amaral G, Mansour M, Waleters SR. School-based health centers and academic performance: research, challenges and recommendations. *J Sch Health*. 2004;74(9):347–352. <http://dx.doi.org/10.1111/j.1746-1561.2004.tb06627.x>.

20. Henry KL. Academic achievement and adolescent drug use: an examination reciprocal effects and correlated growth trajectories. *J Sch Health*. 2010;80(1):38–43. <http://dx.doi.org/10.1111/j.1746-1561.2009.00455.x>.
21. Ickovics JR, Carroll-Scott A, Peters SM, Schwartz M, Gilstad-Hayden K, McCaslin C. Health and academic achievement: cumulative effects of health assets on standardized test scores among urban youth in the United States. *J Sch Health*. 2013;84(1):40–48. <http://dx.doi.org/10.1111/josh.12117>.
22. Lande M, Kczorowski J, Auinger P, Schwartz G, Weitzman M. Elevated blood pressure and decreased cognitive function among school-age children and adolescents in the United States. *J Pediatr*. 2003;143(6):720–724. [http://dx.doi.org/10.1067/S0022-3476\(03\)00412-8](http://dx.doi.org/10.1067/S0022-3476(03)00412-8).
23. Braveman P, Ergertter S, Williams DR. The social determinants of health: coming of age. *Annu Rev Public Health*. 2011;32:381–398. <http://dx.doi.org/10.1146/annurev-publhealth-031210-101218>.
24. Cutler DM, Lleras-Muney A. Education and health: evaluating theories and evidence. NBER Working Paper 12352. Cambridge, MA: National Bureau of Economic Research; 2006.
25. Ergertter S, Braveman P, Sadegh-Nobari T, Grossman-Kahn R, Bekker M. *Education matters for health. Issue Brief 6: Education and Health*. Princeton, NJ: Robert Wood Johnson Foundation, 2009.
26. Feinstein L. Quantitative estimates of the social benefits of learning, 2: health (depression and obesity). Centre for Research on the Wider Benefits of Learning. 2002; Wider Benefits of Learning Research Report no. 6.
27. Feinstein L, Sabates R, Anderson TM, Sorhaindo A, Hammond C. What are the effects of education on health? Measuring the effects of education on health and civic engagement. Proceedings of the Copenhagen Symposium; 2006.
28. Fiscella K, Kitzman H. Disparities in academic achievement and health: the intersection of child education and health policy. *Pediatrics*. 2009;123(3):1073–1080. <http://dx.doi.org/10.1542/peds.2008-0533>.
29. Kolbe LJ. Education reform and the goals of modern school health programs. *Educ Stand*. 2002;3:4–11.
30. Lleras-Muney A. The relationship between education and adult mortality in the United States. Princeton, NJ: National Bureau of Economic Research, 2002. NBER Working Paper No.: 8986.
31. Ross CE, Wu CL. Education, age, and the cumulative advantage in health. *J Health Soc Behav*. 1996;37(1):104–120. <http://dx.doi.org/10.2307/2137234>.
32. Ross CE, Wu CL. The links between education and health. *Am Sociol Rev*. 1995;60(5):719–745. <http://dx.doi.org/10.2307/2096319>.
33. Schoenbaum M, Waidmann T. Race, socioeconomic status and health: accounting for race differences in health in the U.S. elderly. *J Gerontol*. 1997;52:61–73. http://dx.doi.org/10.1093/geronb/52B.Special_Issue.61.
34. Kirby D. School-based health clinics: an emerging approach to improving adolescent health and addressing teenage pregnancy. *Center for Population Options*. 1985.
35. Brenner ND, Wheeler L, Wolfe LC, Vernon-Smiley M, Caldart-Olson L. Health services: results from the school health policies and programs study 2006. *J Sch Health*. 2007;77(8):464–485. <http://dx.doi.org/10.1111/j.1746-1561.2007.00230.x>.
36. Lofink H, Kuebler J, Juszczak L, et al. *2010-2011 School-Based Health Alliance Census Report*. Washington, DC: School-Based Health Alliance; 2013.
37. Mason-Jones AJ, Crisp C, Momberg M, Koech J, De Koker P, Mathews C. A systematic review of the role of school-based health-care in adolescent sexual, reproductive, and mental health. *Syst Rev*. 2012;1(1):1–13. <http://dx.doi.org/10.1186/2046-4053-1-49>.
38. Murray NG, Low BJ, Hollis C, Cross AW, Davis SM. Coordinated school health programs and academic achievement: a systematic review of the literature. *J Sch Health*. 2007;77(9):589–600. <http://dx.doi.org/10.1111/j.1746-1561.2007.00238.x>.
39. GAO US. *School-based health centers can expand access for children. No. GAO/HEHS-95-35*. Washington, DC: U.S. Government Accountability Office; 1994.
40. Santelli J, Kouzis A, Newcomer S. School-based health centers and adolescent use of primary care and hospital care. *J Adolesc Health*. 1996;19(4):267–275. [http://dx.doi.org/10.1016/S1054-139X\(96\)00088-2](http://dx.doi.org/10.1016/S1054-139X(96)00088-2).
41. Strunk JA. The effect of school-based health clinics on teenage pregnancy and parenting outcomes: an integrated literature review. *J Sch Nurs*. 2008;24(1):13–20. <http://dx.doi.org/10.1177/10598405080240010301>.
42. Ran T, Chattopadhyay S, Hahn RA. Community Preventive Services Task Force. Economic evaluation of school-based health centers: a Community Guide systematic review. *Am J Prev Med*. 2016;51(1):129–138.
43. The World Bank. World development indicators. data.worldbank.org/about/country-and-lending-groups. Accessed September 3, 2015.
44. Zaza S, Wright-De Agüero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the *Guide to Community Preventive Services*. *Am J Prev Med*. 2011;18(1 suppl):44–74. [http://dx.doi.org/10.1016/S0749-3797\(99\)00122-1](http://dx.doi.org/10.1016/S0749-3797(99)00122-1).
45. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based *Guide to Community Preventive Services*—methods. *Am J Prev Med*. 2000;18(1 suppl):35–43. [http://dx.doi.org/10.1016/S0749-3797\(99\)00119-1](http://dx.doi.org/10.1016/S0749-3797(99)00119-1).
46. Allison MA, Crane LA, Beaty BL, Davidson AJ, Melinkovich P, Kempre A. School-based health centers: improving access and quality of care for low-income adolescents. *Pediatrics*. 2007;120:e887–e894. <http://dx.doi.org/10.1542/peds.2006-2314>.
47. Barnett B, Arroyo C, Devoe M, Duggan AK. Reduced school dropout rates among adolescent mothers receiving school-based prenatal care. *Arch Pediatr Adolesc Med*. 2004;158(3):262–268. <http://dx.doi.org/10.1001/archpedi.158.3.262>.
48. Barnett B, Duggan AK, Devoe M. Reduced low birth weight for teenagers receiving prenatal care at a school-based health center: effect of access and comprehensive care. *J Adolesc Health*. 2003;33:349–358. [http://dx.doi.org/10.1016/S1054-139X\(03\)00211-8](http://dx.doi.org/10.1016/S1054-139X(03)00211-8).
49. Berg M, Taylor B, Edwards LE, Hakanson EY. Prenatal care for pregnant adolescents in a public school. *J Sch Health*. 1979;49(1):32–35. <http://dx.doi.org/10.1111/j.1746-1561.1979.tb05274.x>.
50. Bourne IB. The Department of Human Resources, Community Health Services Administration. A pilot project for improvement of school health services. *J Sch Health*. 1971;41(6):288–292. <http://dx.doi.org/10.1111/j.1746-1561.1971.tb07063.x>.
51. Britto MT, Klosterman BK, Bonny AE, Altum SA, Hornung RW. Impact of school-based intervention on access to healthcare for underserved youth. *J Adolesc Health*. 2001;29(2):116–124. [http://dx.doi.org/10.1016/S1054-139X\(01\)00196-3](http://dx.doi.org/10.1016/S1054-139X(01)00196-3).
52. Denny S, Robinson E, Lawler C, et al. Association between availability and quality of health services in schools and reproductive health outcomes among students: a multilevel observational study. *Am J Prev Med*. 2012;102(2):e14–e20. <http://dx.doi.org/10.2105/AJPH.2012.300775>.
53. Edwards B. Childhood obesity: a school-based approach to increase nutritional knowledge and activity levels. *Nurs Clin North Am*. 2005;40(4):661–669. <http://dx.doi.org/10.1016/j.cnur.2005.07.006>.
54. Edwards LE, Steinman ME, Hakanson EY. An experimental comprehensive high school clinic. *Am J Public Health*. 1977;67(8):765–766. <http://dx.doi.org/10.2105/AJPH.67.8.765>.
55. Ethier KA, Dittus PJ, DeRosa CJ, Chung EQ, Martinez E, Kerndt PR. School-based health center access, reproductive health care, and contraceptive use among sexually experienced high school students. *J Adolesc Health*. 2011;48:562–565. <http://dx.doi.org/10.1016/j.jadohealth.2011.01.018>.

56. Federico SG, Abrams L, Everhart RM, Melinkovich P, Hambidge SJ. Addressing adolescent immunization disparities: a retrospective analysis of school-based health center immunization delivery. *Am J Public Health*. 2010;100(9):1630–1634. <http://dx.doi.org/10.2105/AJPH.2009.176628>.
57. Foy JE, Hahn K. School-based health centers: a four year experience, with a focus on reducing student exclusion rates. *Osteopath Med Prim Care*. 2009;3:3. <http://dx.doi.org/10.1186/1750-4732-3-3>.
58. Gance-Cleveland B, Yousey Y. Benefits of a school-based health center in a preschool. *Clin Nurs Res*. 2005;14(4):327–342. <http://dx.doi.org/10.1177/1054773805278188>.
59. Gibson EJ, Santelli JS, Minguez M, Lord A, Schuyler AC. Measuring school health center impact on access to and quality of primary care. *J Adolesc Health*. 2013;53(6):696–705. <http://dx.doi.org/10.1016/j.jadohealth.2013.06.021>.
60. Guo JJ, Wade TJ, Keller KN. Impact of school-based health centers on students with mental health problems. *Public Health Rep*. 2008;123(6):768–780.
61. Guo JJ, Jang R, Keller KN, McCracken AL, Cluxton RJ. Impact of school-based health centers on children with asthma. *J Adolesc Health*. 2005;37(4):266–274. <http://dx.doi.org/10.1016/j.jadohealth.2004.09.006>.
62. Hutchinson P, Carton TW, Broussard M, Brown L, Chrestman S. Improving adolescent health through school-based health centers in post-Katrina New Orleans. *Child Youth Serv Rev*. 2012;34(2):360–368. <http://dx.doi.org/10.1016/j.chilcyouth.2011.11.005>.
63. Jennings J, Pearson G, Harris M. Implementing and maintaining school-based mental health services in a large, urban school district. *J Sch Health*. 2000;70(5):201–205. <http://dx.doi.org/10.1111/j.1746-1561.2000.tb06473.x>.
64. Jones ME, Clark D. Increasing access to health care: a study of pediatric nurse practitioner outcomes in a school-based clinic. *J Nurse Care Qual*. 1997;11(4):53–59. <http://dx.doi.org/10.1097/00001786-199704000-00008>.
65. Juszczak L, Melinkovich P, Kaplan D. Use of health and mental health services by adolescents across multiple delivery sites. *J Adolesc Health*. 2003;32(6):108–118. [http://dx.doi.org/10.1016/S1054-139X\(03\)00073-9](http://dx.doi.org/10.1016/S1054-139X(03)00073-9).
66. Kaplan DW, Calonge BN, Guernsey BP, Hanrahan MB. Managed care and school-based health centers: use of health services. *Arch Pediatr Adolesc Med*. 1998;152(1):25–33. <http://dx.doi.org/10.1001/archpedi.152.1.25>.
67. Kaplan DW, Brindis CD, Phibbs SL, Melinkovich P, Naylor K, Ahlstrand K. A comparison study of an elementary school-based health center: effects on health care access and use. *Arch Pediatr Adolesc Med*. 1999;153(3):235–243. <http://dx.doi.org/10.1001/archpedi.153.3.235>.
68. Kerns SEU, Pullman MD, Walker SC, Lyon AR, Cosgrove TJ, Brungs EJ. Adolescent use of school-based health centers and high school dropout. *Arch Pediatr Adolesc Med*. 2011;165(7):617–623. <http://dx.doi.org/10.1001/archpediatrics.2011.10>.
69. Key JD, Washington EC, Hulsey TC. Reduced emergency department utilization associated with school-based clinic enrollment. *J Adolesc Health*. 2002;30(4):273–278. [http://dx.doi.org/10.1016/S1054-139X\(01\)00390-1](http://dx.doi.org/10.1016/S1054-139X(01)00390-1).
70. Kirby D. *An Assessment of Six School-Based Clinics: Services, Impact and Potential*. Washington, DC: Center for Population Options; 1989.
71. Kirby D, Resnick MD, Downes B, et al. The effects of school-based health clinics in St. Paul on school-wide birthrates. *Fam Plann Perspect*. 1993;25(1):12–16. <http://dx.doi.org/10.2307/2135987>.
72. Kirby D, Waszak C, Ziegler J. Six school-based clinics: their reproductive health services and impact on sexual behavior. *Fam Plann Perspect*. 1991;23(1):6–16. <http://dx.doi.org/10.2307/2135395>.
73. Kisker EE, Brown RS. Do school-based health centers improve adolescents' access to health care, health status, and risk-taking behavior? *J Adolesc Health*. 1996;18(5):335–343. [http://dx.doi.org/10.1016/1054-139x\(95\)00236-1](http://dx.doi.org/10.1016/1054-139x(95)00236-1).
74. Klein JD, Handwerker L, Sesselberg TS, Sutter E, Flanagan E, Gawronski B. Measuring quality of adolescent preventive services of health plan enrollees and school-based health center users. *J Adolesc Health*. 2007;41(2):153–160. <http://dx.doi.org/10.1016/j.jadohealth.2007.03.012>.
75. Klostermann BK, Perry CS, Britto MT. Quality improvement in a school health program. Results of a process evaluation. *Eval Health Prof*. 2000;23(1):91–106. <http://dx.doi.org/10.1177/01632780022034507>.
76. Lewin Group. *Healthy Schools, Healthy Communities National Evaluation: Final Report*. Washington, DC: USDHHS; 1997.
77. Lurie N, Bauer EJ, Brady C. Asthma outcomes at an inner-city school-based health center. *J Sch Health*. 2001;71(1):9–16. <http://dx.doi.org/10.1111/j.1746-1561.2001.tb06481.x>.
78. McCord MT, Klein JD, Foy JM, Fothergill K. School-based clinic use and school performance. *J Adolesc Health*. 1993;14(2):91–98. [http://dx.doi.org/10.1016/1054-139X\(93\)90091-3](http://dx.doi.org/10.1016/1054-139X(93)90091-3).
79. McNall MA, Lichty LF, Mavis B. The impact of school-based health centers on the health outcomes of middle school and high school students. *Am J Public Health*. 2010;100(9):1604–1610. <http://dx.doi.org/10.2105/ajph.2009.183590>.
80. Oshitoeye JA. *Dallas Independent School District, Department of Evaluation and Accountability. Final report: Youth and Family Centers Program: 2005-2006*. Dallas, TX: Department of Evaluation and Accountability; 2006.
81. Ricketts SA, Guernsey BP. School-based health centers and the decline in black teen fertility during the 1990s in Denver, Colorado. *Am J Public Health*. 2006;96(9):1588–1592. <http://dx.doi.org/10.2105/ajph.2004.059816>.
82. Robinson WL, Harper GW, Schoeny ME. Reducing substance use among African American adolescents: effectiveness of school-based health centers. *Clin Psychol Sci Pract*. 2003;10(4):491–504. <http://dx.doi.org/10.1093/clipsy/bpg049>.
83. Sanford CC. Delivering health care to children on their turf: an elementary school-based wellness center. *J Pediatr Health Care*. 2001;15(3):132–137. [http://dx.doi.org/10.1016/S0891-5245\(01\)64403-1](http://dx.doi.org/10.1016/S0891-5245(01)64403-1).
84. Santelli JS, Kouzis A, Newcomer S. School-based health centers and adolescent use of primary care and hospital care. *J Adolesc Health*. 1996;19(4):267–275. [http://dx.doi.org/10.1016/S1054-139X\(96\)00088-2](http://dx.doi.org/10.1016/S1054-139X(96)00088-2).
85. Setzer JR, Smith DP. Comprehensive school-based services for pregnant and parenting adolescents in West Dallas, Texas. *J Sch Health*. 1992;62(3):97–102. <http://dx.doi.org/10.1111/j.1746-1561.1992.tb06027.x>.
86. Silberberg M, Cantor JC. Making the case for school-based health: where do we stand? *J Health Polit Policy Law*. 2008;33(1):3–37. <http://dx.doi.org/10.1215/03616878-2007-045>.
87. Smith P, Novello G, Chacko M. Does immediate access to birth control help prevent pregnancy? A comparison of onsite provision versus off-campus referral for contraception at two school-based clinics. *J Adolesc Health*. 2011;2(2 suppl):S107–S108. <http://dx.doi.org/10.1016/j.jadohealth.2010.11.221>.
88. Strolin-Goltzman J, Sisselman A, Melekis K, Auerbach C. Understanding the relationship between school-based health center use, school connection, and academic performance. *Health Soc Work*. 2014;39(2):83–91. <http://dx.doi.org/10.1093/hsw/hlu018>.
89. Taylor B, Berg M, Kapp L, Edwards LE. School-based prenatal services: can similar outcomes be attained in a nonschool setting? *J Sch Health*. 1983;53(8):480–486. <http://dx.doi.org/10.1111/j.1746-1561.1983.tb03171.x>.

90. Wade TJ, Line K, Huentelman T. The Health Foundation of Greater Cincinnati. *Evaluation of Health Outcomes of Students Using School-Based Health Centers*. Cincinnati, OH: Cincinnati Children's Hospital Medical Center; 2005.
91. Walker SC, Kerns SE, Lyon AR, Bruns EJ, Cosgrove TJ. Impact of school-based health center use on academic outcomes. *J Adolesc Health*. 2010;46(3):251–257. <http://dx.doi.org/10.1016/j.jadohealth.2009.07.002>.
92. Warren C, Fancsal C. *New Jersey School-Based Youth Services Program: Final Report*. New York, NY: Academy for Educational Development; 2000.
93. Webber MP, Carpiniello KE, Oruwariye T, Lo Y, Burton WB, Appel DK. Burden of asthma in inner-city elementary schoolchildren: do school-based health centers make a difference? *Arch Pediatr Adolesc Med*. 2003;157(2):125–129. <http://dx.doi.org/10.1001/archpedi.157.2.125>.
94. Weist MD, Paskewitz DA, Warner BS, Flaherty LT. Treatment outcome of school-based mental health services for urban teenagers. *Community Ment Health J*. 1996;32(2):149–157. <http://dx.doi.org/10.1007/BF02249752>.
95. Young TL, D'angelo SL, Davis J. Impact of a school-based health center on emergency department use by elementary school students. *J Sch Health*. 2001;71(5):196–198. <http://dx.doi.org/10.1111/j.1746-1561.2001.tb07316.x>.
96. Zimmer-Gembeck MJ, Alexander T, Nystrom RJ. Adolescents report their need for and use of health care services. *J Adolesc Health*. 1997;21(6):388–399. [http://dx.doi.org/10.1016/S1054-139X\(97\)00167-5](http://dx.doi.org/10.1016/S1054-139X(97)00167-5).
97. Zimmer-Gembeck MJ, Doyle LS, Daniels JA. Contraceptive dispensing and selection in school-based health centers. *J Adolesc Health*. 2001;29(3):177–185. [http://dx.doi.org/10.1016/S1054-139X\(01\)00220-8](http://dx.doi.org/10.1016/S1054-139X(01)00220-8).
98. Duncan GJ, Murnane RJ. *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*. New York, NY: Russell Sage Foundation; 2011.
99. National Assembly on School-Based Health Care. Partnering with school-based health centers: what schools need to know. Frequently asked questions for school personnel. http://ww2.nasbhc.org/RoadMap/Elev8/E8.1.FAQsgeneral_02.11.pdf. Published 2011. Accessed December 21, 2015.
100. Tai T, Bame S. Cost-benefit analysis of childhood asthma management through school-based clinic programs. *J Community Health*. 2011;36(2):253–260. <http://dx.doi.org/10.1007/s10900-010-9305-y>.
101. The Colorado Health Foundation. *School-Based Health Centers: Gateway to Healthier Children*. Denver, CO: The Colorado Health Foundation; 2009.
102. Anglin TM, Naylor KE, Kaplan DW. Comprehensive school-based health care: high school students' use of medical, mental health, and substance abuse services. *Pediatrics*. 1996;97(3):318–330.
103. Gance-Cleveland B, Costin DK, Degenstein JAK. School-based health centers: statewide quality improvement program. *J Nurs Care Qual*. 2003;18(4):288–294. <http://dx.doi.org/10.1097/00001786-200310000-00007>.
104. Keeton V, Soleimanpour S, Brindis CD. School-based health centers in an era of health care reform: building on history. *Curr Probl Pediatr Adolesc Health Care*. 2012;42(6):132–156. <http://dx.doi.org/10.1016/j.cppeds.2012.03.002>.
105. McHarney-Brown C, Kaufman A. Comparison of adolescent health care provided at a school-based clinic and at a hospital-based pediatric clinic. *South Med J*. 1991;84(11):1340–1342. <http://dx.doi.org/10.1097/00007611-199111000-00011>.
106. Strolin-Goltzman J. The relationship between school-based health centers and the learning environment. *J Sch Health*. 2010;80(3):153–159. <http://dx.doi.org/10.1111/j.1746-1561.2009.00480.x>.
107. Holmes D. School-based health centers: adapting to health care reform and the utilization of health information technology. In: Wright TD, Richardson JW, American Public Health Association, eds. *School-Based Health Care: Advancing Educational Success and Public Health*, chap 31. Washington, DC: APHA Press; 2012.
108. American Academy of Pediatrics, Committee on School Health. School health centers and other integrated school health services. *Pediatrics*. 2001;107(1):198–201.
109. Council on School Health. School-based health centers and pediatric practice. *Pediatrics*. 2012;129(2):387–393. <http://dx.doi.org/10.1542/peds.2011-3443>.
110. Lofink H, Juszczak L, Trudnak T, Koenig K, Fairbrother G. A promising future: school-based health centers and accountable care. www.ctschoolhealth.org/images/Executive_Summary_-_Care_Coordination_for_Adolescents.pdf. Accessed September 4, 2015.
111. Morone JA, Kilbreth EH, Langwell KM. Back to school: a health care strategy for youth. *Health Aff*. 2001;20(1):122–136. <http://dx.doi.org/10.1377/hlthaff.20.1.122>.

Appendix

Supplementary data

Supplementary data associated with this article can be found at <http://dx.doi.org/10.1016/j.amepre.2016.01.009>.