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## Economic Evaluation of School-based Health Centers: A Community Guide Systematic Review

Tao Ran, PhD, Sajal Chattopadhyay, PhD, Robert A. Hahn, PhD, and the Community Preventive Services Task Force

From the Community Guide Branch, Division of Public Health Information Dissemination, Center for Surveillance, Epidemiology, and Laboratory Services, CDC, Atlanta, Georgia

### Abstract

**Context:** A recent Community Guide systematic review of the effectiveness of school-based health centers (SBHCs) showed that SBHCs improved educational and health outcomes. The objective of the present review is to evaluate the economic cost and benefit of SBHCs.

**Evidence acquisition:** Using economic systematic review methods developed for the Guide to Community Preventive Services, 6,958 papers were identified for the search period January 1985 to September 2014. After two rounds of screening, 22 studies were included in this review. Among them, 15 studies reported on cost and 10 on benefit.

**Evidence synthesis:** Analyses were conducted in 2014. Intervention cost had two main components: start-up cost and operation cost. All but two of the cost studies reported operation cost only, which ranged from \$16,300 to \$659,684 yearly per SBHC. Benefits included healthcare cost averted, productivity and other loss averted. From the societal perspective, total annual benefit per SBHC ranged from \$15,028 to \$912,878. From the healthcare payers' perspective, particularly Medicaid, SBHCs led to net savings ranging from \$30 to \$969 per visit, and \$46 to \$1,166 per person. Additionally, two benefit studies used regression analysis to show that Medicaid cost and hospitalization cost decreased with the presence of SBHCs. Finally, results from two cost-benefit studies showed that the societal benefit per SBHC exceeded intervention cost, with the benefit-cost ratio ranging from 1.38 to 3.05.

**Conclusions:** The economic benefit of SBHCs exceeded the intervention operation cost. Further, SBHCs were related to net savings to Medicaid.

### Context

School-based health centers (SBHCs) provide health services to students at centers in K-12 schools or at off-site health facilities linked to schools. Most SBHCs are targeted to students in low-income communities. Services provided by SBHCs in the U.S. include comprehensive physical and mental health assessments (97%), vision, hearing, and other screening services (93%), and immunizations (85%). In addition, a majority of SBHCs

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Address correspondence and reprint requests to: Tao Ran, Community Guide Branch, Centers for Disease Control and Prevention, 1600 Clifton Road, Mailstop E69, Atlanta, GA 30329. xgy2@cdc.gov.

The names and affiliations of the Task Force members are at <http://www.thecommunityguide.org/about/task-force-members.html>.

provide pregnancy testing (81%), contraceptive counseling (70%), and follow-up services for contraceptive users (59%).<sup>1</sup>

Conceptually, SBHCs can improve children's and adolescents' health status, and reduce health care disparities across groups. SBHCs can meet the students' physical health and mental health needs, which may not be addressed by a complex and fragmented healthcare system.<sup>2</sup> SBHCs provide students easier access to health services; this reduces time missed at school and helps parents to avoid losing work time and spending extra to transport their children to and from healthcare facilities. In addition, SBHCs provide services to students from different racial and socio-economic backgrounds, particularly underinsured/uninsured individuals who face challenges in accessing primary health care.

In October 2014, the [Community Preventive Services Task Force](#) recommended the implementation and maintenance of school-based health centers (SBHCs) in low-income communities, based on sufficient evidence of effectiveness in improving educational and health outcomes. Improved educational outcomes include school performance, grade promotion, and high school completion. Improved health outcomes include the delivery of vaccinations and other recommended preventive services, asthma morbidity, emergency department (ED) and hospital admissions, contraceptive use among females, prenatal care and birth weight, and other health risk behaviors (<http://www.thecommunityguide.org/healthequity/education/schoolbasedhealthcenters.html>).

Because SBHCs are effective in addressing the above-mentioned issues, the economic benefits of adopting SBHCs can be substantial. First, there can be considerable net savings to healthcare payers and society due to reductions in ED use. The overuse of EDs, either for non-emergency purposes or as a result of delayed treatment, can place a huge burden on society. In particular, Medicaid patients tend to use EDs frequently because of the difficulty in seeing regular healthcare providers.<sup>4</sup> Second, SBHCs can provide timely and effective care to students with asthma (asthma prevalence for children under age 18 was 9.5%<sup>5</sup> in 2010) reducing costs associated with asthma-associated ED use and hospitalization. Third, SBHCs can reduce missed school time, and avert productivity losses and transportation expenses for students and their parents. Fourth, reproductive services provided by SBHCs can provide both short- and long-term benefits to students, healthcare payers, and society by reducing unintended teen pregnancy.

Given the effectiveness and potential benefits of SBHCs, systematic assessment of their cost and benefit is important to evaluate the feasibility of implementing this intervention. The objective of this study was to conduct an economic evaluation of SBHCs based on a systematic review.

## Evidence Acquisition

For the purposes of this review SBHCs were defined as follows:

School-based health centers (SBHCs) provide health services to students preK-12 and may be offered on-site (i.e., school-based centers) or off-site (i.e., school-linked centers). SBHCs

are often established in schools that serve predominantly low-income communities and have the following characteristics:

- SBHCs must provide primary health care and may also include mental health care, social services, dentistry, and health education.
- Primary care services may be provided by a single clinician, or comprehensive services may be provided by multi-disciplinary 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 may be 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.

General methods for Community Guide systematic economic reviews are available at [www.thecommunityguide.org/about/economics.html](http://www.thecommunityguide.org/about/economics.html).<sup>6</sup> The inclusion criteria for this review followed the standard for economic evaluation studies adopted by the Community Guide.

Studies were considered relevant if they met the intervention definition and:

- provided cost or benefit information;
- were primary studies, as either a peer-reviewed paper or report;
- were conducted in high-income countries as defined by the World Bank<sup>7</sup>; and
- were written in English.

Multiple databases were used for the systematic search, including PubMed, EconLit, ERIC, JSTOR, Social Sciences Citation Index (SSCI), databases at the Centre for Reviews & Dissemination at the University of York, and Google Scholar. The search period was between January 1985 and September 2014. To identify relevant studies, the economic keywords were used in the search strategy (Appendix Table 1, available online), in addition to the effectiveness and subject keywords.

To ensure comparability of the studies, costs and expenditures were adjusted to 2013 dollars using the consumer price index (CPI) from the Bureau of Labor Statistics.<sup>8</sup> Once the intervention cost and benefit were comparable among studies, major contributors to variations in cost and benefit were identified. When data were available, estimates per SBHC user were calculated by dividing cost or benefit by the total number of SBHC users. Finally, economic evidence was summarized to evaluate the benefit of SBHC with respect to intervention costs. Evidence gaps of the studies were also listed.

## Evidence Synthesis

### Search Results

A total of 6,958 papers were found in the initial literature search, of which 6,824 were excluded after the first round of screening on abstracts. Another 115 papers were excluded after the second round of screening on main text. This yielded 19 articles from the database search. Three papers were added from the effectiveness review,<sup>3</sup> which led to 22 included studies<sup>1,2,9–28</sup> (Figure 1). Details of the included studies are available at [www.thecommunityguide.org/\\*\\*](http://www.thecommunityguide.org/**). Analyses were conducted in 2014.

### Characteristics of Studies

Seventeen<sup>1,2,10,12–18,20–22,24–26,28</sup> of the 22 papers were peer-reviewed journal articles. The non-journal articles<sup>9,11,19,23,27</sup> were mainly reports on either the cost or benefit of the intervention. Geographically, all studies were from the U.S., with five<sup>1,2,11,21,22</sup> from the Northwest, six<sup>16,19,23,25–27</sup> from the Northeast, two<sup>17,18</sup> from the Midwest, two<sup>9,10</sup> from the Southeast, and seven<sup>12–15,20,24,28</sup> covering the whole U.S. Fifteen<sup>1,11–16,18–22,24,26,28</sup> of the 22 papers provided cost information, and ten<sup>2,9–11,17–19,23,25,27</sup> provided benefit information. Three studies<sup>11,18,19</sup> provided both the cost and benefit information.

### Perspectives of the studies

On the benefit side, different perspectives were taken by the authors. The majority of the papers took either societal or Medicaid (healthcare payers') perspective, with the remaining taking either patients' (including patients' parents) or other perspectives. The societal perspective included all the relevant parties in society, whereas either Medicaid (healthcare payers') or patients' perspective was partial, in that only the benefit of a specific group was considered.

Of the ten benefit studies<sup>2,9–11,17–19,23,25,27</sup>, three<sup>11,18,19</sup> took societal perspective; four<sup>10,17,18,23</sup> took Medicaid (healthcare payers') perspective; two<sup>9,25</sup> took patients' perspective; and another two<sup>2,27</sup> provided information on savings to taxpayers or other, unidentified parties. One study<sup>18</sup> examined results from both societal and Medicaid perspectives.

### Intervention Cost

SBHC intervention costs had two main components: start-up cost (one-time, fixed costs) and operation cost (recurring annually). Table 1 provides detailed information on cost estimates from each study.

Only two studies provided estimates of start-up costs.<sup>19,22</sup> The first study<sup>19</sup> presented startup cost for the SBHCs in western and central New York State, including the cost of renovating or constructing the school space, the purchase of initial office and medical equipment, as well as staff salaries in the initial implementation phase, and found startup costs to range from \$216,402 to \$378,704 per SBHC. The second study<sup>22</sup> discussed the startup cost of 42 SBHCs in Oregon, and found it ranged from \$41,450 to \$195,324 per SBHC. The minimum of the range was based on SBHCs that used renovated space of the school, and the maximum

of the range was based on SBHCs that built a medical modular unit on campus. Of note, the startup cost components of the Oregon study were similar to those of the New York study.

Fourteen studies provided information on annual SBHC operation costs, including recurring cost of additional medical equipment and services and non-medical costs such as salaries and benefits and utilities.<sup>1,11–16,18,20–22,24,26,28</sup> Five studies used actual operation cost<sup>12,18,21,22,26</sup>, while nine studies<sup>1,11,13–16,20,24,28</sup> estimated costs from proxies such as operating budget, grant funding, or operating revenues. Operation costs ranged from \$16,322 to \$659,684 per SBHC per year. Operation cost per SBHC user (calculated from five studies<sup>11,16,18,21,22</sup> with complete information) ranged from \$142.79 to \$1,802.42.

The major operation cost driver was salaries and benefits, which accounted for 80%–90% of the operation cost. The main causes of variation in operation cost included hours of work of physicians and staff, local cost of living, nationwide versus state study, and data source. For example, Guo et al.<sup>18</sup> had relatively low operation cost, ranging from \$118,376 to \$168,700, because the pediatricians only worked 3 hours per week. Further, operation cost varied among the states. For instance, Schlitt and colleagues (2008)<sup>24</sup> provided grant funding information for 19 states, ranging from \$16,322 to \$306,476.

### Intervention Benefit

For purposes of this review, benefit components were categorized into two groups (benefit components of each study are listed in Appendix Table 2, available online):

- Healthcare cost averted (i.e., averted cost associated with hospitalization, ED, drugs, referrals, private clinic visits, and unintended pregnancy);
- Productivity and other loss averted (i.e., averted cost associated with productivity loss, travel cost, school time, and others such as ambulance use or improved health).

In terms of perspectives, benefit studies from the societal perspective reported treatment cost averted, lost productivity averted, cost of transportation averted, and other relevant benefits. Studies from Medicaid (healthcare payers') perspective reported (or were calculated by the reviewers) per SBHC user or per visit net savings to Medicaid, which were mainly related to treatment cost averted. Studies from patients' (including patients' parents) perspective reported (or were calculated by the reviewers) savings per visit in treatment cost, lost productivity and transportation, and per user savings in raising a child due to unintended pregnancy avoided. The remaining studies reported (or were calculated by the reviewers) savings per visit to taxpayers or other, unidentified parties.

Table 2 gives the details on benefit information from different perspectives. Three studies<sup>10,17,18</sup> used actual data. Of the three, two studies<sup>10,17</sup> calculated benefit using difference in differences method, and one<sup>18</sup> used pre-post study design. The remaining seven studies<sup>2,9,11,19,23,25,27</sup> estimated benefits based on different assumptions on the effectiveness of SBHC services.

From the societal perspective, total annual benefit per SBHC ranged from \$15,028 to \$912,878 (based on three studies<sup>11,18,19</sup>). The variation in benefit was mainly related to

whether the study included major benefit drivers such as savings related to unintended pregnancies averted. Of note, savings related to unintended pregnancy avoided in Brindis 1993 were the avoided “public cost of pregnancies”<sup>11</sup>, which was the largest contributor (accounting for more than 85%) to benefit. In comparison, even though Guo 2010 had six components, it did not include benefit from averted ED use or unintended pregnancy. The minimum of the range (\$15,028) was the benefit calculated in Horton,<sup>19</sup> which only included inpatient cost averted from students with asthma.

From the Medicaid (healthcare payers’) perspective, SBHCs led to net savings to Medicaid (i.e, the difference between total savings to Medicaid related to SBHCs and the Medicaid spending on SBHC services was positive), ranging from \$30 to \$969 per visit (based on three studies<sup>17,18,23</sup> that provided relevant information), and \$46 to \$1,166 per user (based on two studies<sup>10,18</sup> that provided relevant information). The variation in net Medicaid savings was large because the studies examined different benefit components. Studies with more components appeared to have had higher net savings. Further, studies reporting ED use averted tended to have higher savings. In addition, studies focused on students with asthma tended to have higher net savings.

Additionally, from Medicaid (healthcare payers’) perspective, two benefit studies<sup>10,17</sup> used regression analysis to show that Medicaid cost related to ED use and to hospitalization decreased with the adoption of SBHCs (details are provided in Appendix Table 3, available online).

From patients’ (including patients’ parents) perspective, SBHC usage was related to per visit savings of \$90 in Siegel 1987<sup>25</sup>, and to savings per user of \$23,592 in Contraceptive Technology Update report 1985<sup>9</sup>. In both studies, the enrolled students received SBHC services for free (per visit cost of \$43.86 in Siegel was covered by the Division of Public Health; and per user cost of \$345 in the second study was covered by different funding sources). Siegel concluded that students would save money in using SBHCs instead of private clinics. Contraceptive Technology Update only reported the cost saved from not raising a child due to unintended pregnancy avoided.

Benefit in the remaining two studies<sup>2,27</sup> were mainly related to ED use. Children’s Aid Society 2012 reported \$1,077 savings per visit to taxpayers. Brindis 1997 reported \$162 to \$262 savings per visit (perspective unidentified).

### Benefit-Cost Ratios

Table 3 presents benefit-cost ratios from seven schools in two studies.<sup>11,18</sup> In both studies, societal benefit per SBHC exceeded intervention cost, with the benefit-cost ratio ranging from 1.38:1 to 3.05:1. Even though the two studies were similar in terms of SBHC services and the number of users, the calculations of benefit were different. Guo<sup>18</sup> calculated benefits in a relatively comprehensive way by including six benefit components, whereas Brindis<sup>11</sup> only included two major benefit components (ED use and unintended pregnancy). Moreover, economic benefit from unintended pregnancies averted, which included the public cost of children born to teenagers, accounted for over 85% of the total benefit.

## Summary of Findings

In summary, there is evidence that the benefit of school-based health centers exceeded cost. In addition, SBHCs are related to net saving to Medicaid.

## Discussion

In conjunction with the findings of the concurrent systematic review on effectiveness<sup>3</sup>, the results of this economic review provide evidence that SBHCs are an effective, and efficient setting for healthcare delivery. Studies identified in this systematic review indicate that with moderate operation cost, SBHCs contribute meaningful economic benefits to society, healthcare payers (especially Medicaid), and patients.

In contrast to the range of educational and health outcomes examined in the effectiveness review, the studies providing economic assessments focused on health and health care-related outcomes. From the societal perspective, benefit was mainly related to savings from unintended pregnancy and productivity loss averted. From the Medicaid perspective, ED use was the major driver of the economic benefit. In addition, studies focused on SBHC services to students with asthma found that SBHCs provided significant net savings to Medicaid. Finally, SBHCs saved patients (and their parents') expenses associated with pregnancy and with lost work.

## Limitations

From the cost side, only two studies<sup>19,22</sup> reported start-up cost. This might cause the annual total cost to be underestimated. However, once the one-time start-up cost was amortized, it would be much lower than annual operation cost. Further, only four studies<sup>11,16,18,22</sup> reported the number of SBHC users, which might cause imprecise estimation of per user cost. Likewise, only two studies<sup>16,18</sup> provided information on the number of students. In addition, nine studies<sup>1,11,13–16,20,24,28</sup> used proxies such as operating budget, grant funding, or operating revenues to estimate cost, or simply quoted from other studies. However, the range of the estimated costs were similar to the range of the actual costs in the rest of the cost studies.

From the benefit side, only three studies<sup>10,17,18</sup> used actual data. The remaining studies estimated benefit based on different assumptions. For instance, Massachusetts SBHC association 2012 report assumed that ED use was reduced by 50%, an estimate higher than the median decrease of 15.8% identified in a recent systematic review.<sup>3</sup> This could lead to overestimate of the benefit. Further, only six studies<sup>2,10,17,18,25,27</sup> clearly specified the time horizon of benefit. Others were somewhat ambiguous, with one<sup>11</sup> study's time horizon implied by the context and methodology. This can cause complication in calculating benefit per year. In addition, most of the studies did not clearly specify the perspective(s) taken by the authors. Therefore, the classification of perspectives was conducted by the reviewers based on the results of the studies. Finally, studies<sup>9,11</sup> including unintended teen pregnancy averted did not specify the subcomponents or time horizon of this estimate, complicating interpretation of the overall benefit.

## Evidence gaps

More complete and comprehensive reporting of benefit and its components is needed, including clear reporting of the study time horizon. Additional economic assessments are needed to examine the broader range of outcomes considered in the concurrent effectiveness review.<sup>3</sup> In spite of the effectiveness of SBHCs in improving academic performance, for example, none of the economic studies incorporated these outcomes in their benefit assessments. Economic assessments or models based on longer-term assessments of outcomes might be needed to capture the full range of benefits attributable to SBHC services.

Finally, none of the studies identified in this review provided cost-effectiveness assessments of SBHCs. Future studies should conduct cost-effectiveness analyses, and provide evidence on cost per quality adjusted life-year (QALY) gained. Cost-effectiveness studies of overall SBHCs and focused studies of specific services (such as reproductive health) would be useful to program planners and decision-makers.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the CDC.

## Appendix

**Appendix Table 1:**

**Economic Search Terms and Overall Strategy**

Economic Search Terms	economic, cost, benefit, cost-benefit, benefit-cost, utility, cost-utility, expenditure, cost effectiveness, cost of illness, cost saving, cost averted, \$, dollar, WTP, willingness to pay, net cost, increment, opportunity cost, travel cost, treatment cost, lost productivity, fixed cost, operation cost, variable cost, sensitivity analysis, breakeven, discount rate, value, QALY, DALY, capital cost, life time cost, medical cost, time cost, treatment saving, funding, money
Additional Search Terms	Effectiveness terms <sup>a</sup> Outcome terms
Search Databases	PubMed, EconLit, ERIC, JSTOR, Social Sciences Citation Index (SSCI), databases at the Centre for Reviews & Dissemination at the University of York, and Google Scholar.
Search Period	January 1985 - September 2014
Other	Studies with economic information identified by the effectiveness review team

<sup>a</sup> Search terms used in concurrent effectiveness review search

## Appendix

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**Appendix Table 2.** Benefit Components of Studies included in the Economic Assessment of School-based Health Centers (SBHCs)

Study	Healthcare costs averted						Productivity and other losses averted			
	Hospital	ED <sup>a</sup>	Drug	Referrals	Private clinic	Pregnancy <sup>d</sup>	Productivity <sup>d</sup>	Travel	School time	Others
Adams 2000 <sup>b</sup>	✓	✓	✓	—	—	—	—	—	—	✓ <sup>c</sup>
Brindis 1993	—	✓	—	—	—	✓	—	—	—	✓ <sup>d</sup>
Brindis 1997	—	✓	—	—	—	—	—	—	—	—
Children's Aid Society 2012	—	✓	—	—	—	—	—	—	—	✓ <sup>e</sup>
Contraceptive Tech Update 1985	—	—	—	—	—	✓	—	—	—	✓ <sup>f</sup>
Guo 2010 (Societal perspective)	✓ <sup>g</sup>	—	✓	✓	—	—	✓	—	—	✓ <sup>h</sup>
Guo 2010 (Medicaid perspective)	✓ <sup>g</sup>	—	✓	—	—	—	—	—	—	—
Guo 2005 <sup>b</sup>	✓	✓	—	—	—	—	—	—	—	—
MA SBHC Assoc. 2012 <sup>b</sup>	—	✓	—	—	—	—	—	—	—	—
Horton 2009	✓	—	—	—	—	—	—	—	—	—
Siegel 1987	—	—	—	—	✓	—	✓	—	✓	—

<sup>a</sup>Major benefit drivers.

<sup>b</sup>The study took Medicaid (healthcare payers') perspective.

<sup>c</sup>Others include nonemergency transport and similar costs.

<sup>d</sup>Others include early pregnancy detection, prenatal care, and STD detection and treatment.

<sup>e</sup>Others include ambulance use.

<sup>f</sup>Others include cost averted due to avoided pregnancy such as cost of raising a child.

<sup>g</sup>Asthma hospitalization only.

<sup>h</sup>Others include improved health and relevant effect to the community.

ED, emergency department; SBHC, school-based health center.

## Appendix

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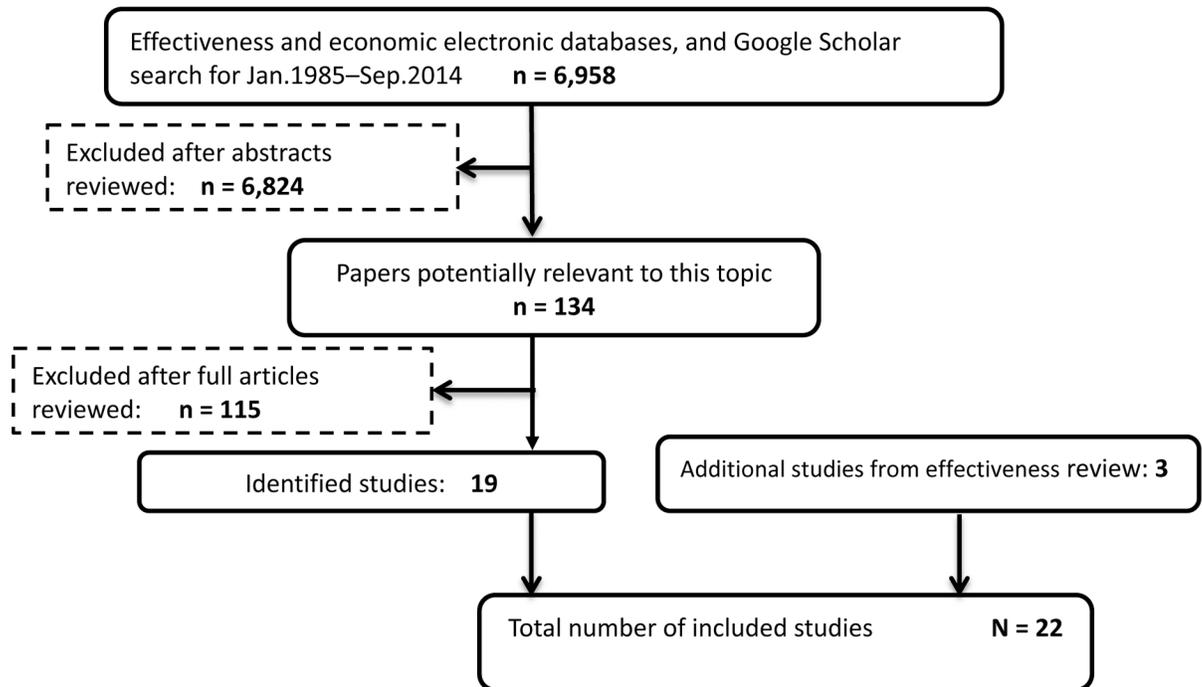
**Appendix Table 3.**  
Results from Studies Based on Regression Analysis (Intervention Benefit from Medicaid Perspective)

Study	Sample	Results
Adams 2000	Children aged 4 – 12 years	The emergency department cost per child-year enrolled decreased by \$52.39 (p=.10) after the comparison group adopted SBHC.
Guo 2005	Children with asthma in Medicaid program, with average age of 8.2 years	After SBHC opened, the cost of hospitalization per child decreased significantly over time in SBHC schools (p=.044), including the cost for African-American children (p=.023).

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**Figure 1.**  
Flowchart showing path from initial search list to included studies.

**Table 1.**

Intervention Cost (2013\$)

Study <sup>a</sup>	Location	Number of Students	Number of Users	Startup Cost/SBHC	Operation Cost/SBHC (annual)	Operation Cost/SBHC User
Brindis 1993	CA, School1	NR	462–1,071 <sup>b</sup>	NR	383,995	358.54 – 831.16 <sup>c</sup>
	CA, School2	NR	389–903 <sup>b</sup>	NR	448,290	496.45 – 1,152.42 <sup>c</sup>
	CA, School3	NR	366–848 <sup>b</sup>	NR	659,684	777.93 – 1,802.42 <sup>c</sup>
Dryfoos 1985	U.S.	NR	NR	NR	194,853 <sup>d</sup>	NR
DC School Fund 2004	DC, School1	503	130	NR	120,277	925.21 <sup>c</sup>
	DC, School2	968	890	NR	253,214	284.51 <sup>c</sup>
Dryfoos 1988	U.S.	NR	NR	NR	393,841	NR
Foch 1995	U.S.	NR	NR	NR	215,855 – 539,637	NR
Fothergill 1998	U.S.	NR	NR	NR	436,511 <sup>e</sup>	NR
Guo 2010	OH, Rural	1,018 <sup>f</sup>	461 <sup>f</sup>	NR	168,700 <sup>f</sup>	365.94 <sup>c</sup>
	OH, Urban #1	3,338 <sup>f</sup>	614 <sup>f</sup>	NR	165,838 <sup>f</sup>	270.09 <sup>c</sup>
	OH, Urban #2	648 <sup>f</sup>	410 <sup>f</sup>	NR	143,728 <sup>f</sup>	350.56 <sup>c</sup>
	OH, Urban #3	2,604 <sup>f</sup>	829 <sup>f</sup>	NR	118,376 <sup>f</sup>	142.79 <sup>c</sup>
Horton 2009	NY	NR	NR	216,402 – 378,704	NR	NR
Keeton 2012	CO	NR	NR	NR	291,196	NR
McKinney 1993	U.S.	NR	NR	NR	279,779	NR
Moore 1998	CO	NR	1,206 <sup>g</sup>	NR	464,706	385.33 <sup>c</sup>
Nystrom 2008	OR	NR	480 <sup>h</sup>	41,450 – 195,324 <sup>i</sup>	138,367 – 248,702 <sup>j</sup>	288.26 – 518.13 <sup>c</sup>
Silberberg 2002	NJ	NR	NR	NR	194,239 – 258,985 <sup>k</sup>	NR
Schlitt 2008	U.S.	NR	NR	NR	16,322 – 306,476	NR
Tereszkiewicz 1986	U.S.	NR	NR	NR	212,552 – 265,690	NR

<sup>a</sup> All studies are cost-benefit or cost only studies.

- <sup>b</sup> Calculated by the reviewer by dividing the total number of visits by the average visits per SBHC user in 1989.
- <sup>c</sup> Calculated by the reviewer by dividing total annual cost by the number of SBHC users.
- <sup>d</sup> Actual cost but quoted others.
- <sup>e</sup> Mean operating budget from a national survey.
- <sup>f</sup> Information obtained from a related report (<https://www.interactforhealth.org/docs/SBHC%20Study--Cost%20Study%20Full%20Report.pdf>).
- <sup>g</sup> Users for the whole school district, with 2,170 students.
- <sup>h</sup> Calculated by the reviewer by dividing the total users of 42 SBHCs in Oregon.
- <sup>i</sup> The minimum is the minimum cost for a center based on renovated school space; the maximum is the maximum cost for a center based on a modular unit on campus for health services.
- <sup>j</sup> Assuming 12 months' operation. The minimum is the midrange cost for the basic (core) center, and the maximum is the midrange cost for an expanded center.
- <sup>k</sup> No further explanation for the range was provided.
- NR, not reported.

**Table 2.**

Intervention Benefit: From Societal, Healthcare Payers', and Patients' Perspectives (2013\$)

<b>From Societal Perspective</b>				
<b>Study</b>	<b>Location</b>	<b>Major Benefit Driver(s) (# Components)</b>	<b>Annual<sup>a</sup> Benefit /SBHC</b>	<b>Annual Benefit /SBHC user</b>
Brindis 1993	CA, School1	Pregnancy (3)	912,878	852.36 – 1,975.93 <sup>b</sup>
	CA, School2	Pregnancy (3)	769,524	852.19 – 1,978.21 <sup>b</sup>
	CA, School3	Pregnancy (3)	843,677	994.90 – 2,305.13 <sup>b</sup>
Guo 2010	OH	Productivity (6)	361,581	784.34 <sup>b</sup>
	OH	Productivity (6)	361,581	588.89 <sup>b</sup>
	OH	Productivity (6)	361,581	881.90 <sup>b</sup>
	OH	Productivity (6)	361,581	436.17 <sup>b</sup>
Horton 2009	NY	None (1)	15,028 <sup>c</sup>	NR
<b>From Medicaid (healthcare payers') Perspective</b>				
<b>Study</b>	<b>Location</b>	<b>Major Benefit Driver(s) (# Components)</b>	<b>Net savings /visit</b>	<b>Net savings/ SBHC user</b>
SBHC users without asthma				
Adams 2000	GA	ED (4)	NR	404 <sup>d</sup>
MA SBHC Assoc. 2012 <sup>e</sup>	MA	ED (1)	203 <sup>f</sup>	NR
SBHC users with asthma				
Adams 2000	GA	ED (4)	NR	1,166
Guo 2005	OH	ED (2)	969 <sup>g</sup>	NR
MA SBHC Assoc. 2012 <sup>e</sup>	MA	ED (1)	604 <sup>f</sup>	NR
Users in general				
Guo 2010	OH	Drugs (2)	30	46
<b>From Patients' Perspective</b>				
<b>Study</b>	<b>Location</b>	<b>Major Benefit Driver(s) (# Components)</b>	<b>Savings /visit</b>	<b>Savings / SBHC user</b>
Contraceptive Technology Update 1985	MS	Pregnancy (1)	NR	23,592 <sup>h</sup>
Siegel 1987	DE	Productivity (3)	90 <sup>i</sup>	NR
<b>From Other Perspectives</b>				
<b>Study</b>	<b>Location</b>	<b>Major Benefit Driver(s) (# Components)</b>	<b>Savings /visit</b>	<b>Perspective</b>
Brindis 1997	CA	ED (1)	162 – 262	Unidentified
Children's Aid Society 2012	NY	ED (2)	1,077 <sup>j</sup>	Taxpayer

<sup>a</sup>Annual benefit was calculated by the reviewer by dividing the total benefit over three years by three for Guo 2010; while Brindis 1993 implied that the benefit was yearly.

<sup>b</sup> Calculated by the reviewer by dividing the total annual benefit by the number of users in Table 1.

<sup>c</sup> Hospital inpatient cost averted from asthmatic students only, not included in benefit-cost results.

<sup>d</sup> If SBHC was the primary provider of the user, the benefit was \$969.43/person.

<sup>e</sup> Assuming 50% of the ED use was avoided because of SBHC usage.

<sup>f</sup> For hospital sponsored SBHC, the saving was \$165 for non-asthmatic users and \$565 for asthmatic ones.

<sup>g</sup> Hospitalization savings only, the saving in ED use was not significant.

<sup>h</sup> Service was free to students (covered by the program as \$345 per user). Savings are calculated by the reviewer by dividing the total savings by 22, since total savings were from not raising a child to age 22.

<sup>i</sup> Service was free to enrolled students (covered by the Division of Public Health as \$43.86 per visit). Cost was compared with that from a private clinic.

<sup>j</sup> Calculated by the reviewer by dividing total savings to taxpayers by 248 ED visits.

Comps, components; DID, Difference-in-Differences; ED, emergency department; NR, Not reported; SBHC, school-based health centers.

**Table 3**

## Benefit-Cost Ratio and Net Benefit

Study	Location	Number of students	Number of users	Benefit-Cost ratio	Net benefit (2013\$)
Brindis 1993	CA, School1	NR	462 – 1,071	1.38:1	\$253,195
	CA, School2	NR	389 – 903	2.00:1	\$385,529
	CA, School3	NR	366 – 848	1.88:1	\$395,387
Guo 2010	OH, Rural	1,018	461	2.14:1 <sup>a</sup>	\$192,880
	OH, Urban#1	3,338	614	2.18:1 <sup>a</sup>	\$195,742
	OH, Urban#2	648	410	2.52:1 <sup>a</sup>	\$217,852
	OH, Urban#3	2,604	829	3.05:1 <sup>a</sup>	\$243,204

<sup>a</sup>Calculated by the reviewer by dividing annual benefit by annual cost.

NR, not reported.

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Author (Year):</b> Adams and Johnson (2000)</p> <p><b>Study Design:</b> Comparison control (Difference in differences)</p> <p><b>Economic Method:</b> benefit analysis (savings to Medicaid expenses)</p> <p><b>Monetary conversion:</b> CPI ratio of year 2013 against year 1994 is 1.57.</p>	<p><b>Location:</b> Atlanta, GA</p> <p><b>Population Characteristics:</b> Sample is children 4 through 12 years old enrolled in Medicaid, 97% to 98% African Americans, Whitefoord Elementary SBHC (WESBHC) had been in operation after 1994. About 90% of the Whitefoord children were enrolled in Medicaid sometime during this period.</p> <p><b>Time Horizon:</b> 1994–1996</p>	<p>The goal of the analysis is to evaluate and compare the Medicaid health care costs per child for those children whose primary caregiver was the WESBHC to children in an area without a SBHC.</p> <p><b>Control group:</b> 349–632 students from non-SBHC schools</p> <p><b>Intervention group:</b> 262–274 from WESBHC school during the two years of research study.</p>	<p>N.A</p>	<p>N.A</p>	<p>Users ever used SBHC: During 1994–1995, yearly per person expense change in Medicaid was -\$535.51 (-\$841.77 in 2013 dollars) for the intervention group. And the yearly per person expense change in Medicaid was -\$278.64 (-\$438 in 2013 dollars) for the control group. The difference in differences was -\$256.87 (-\$403.77 in 2013 dollars)</p> <p>Users having SBHC as the primary provider: During 1994–1995, yearly expense change in Medicaid was -\$895.36 (-\$1,407.42 in 2013 dollars) for the intervention group. And the yearly per person expense change in Medicaid was -\$278.64 (-\$438 in 2013 dollars) for the control group. The difference in differences was -\$616.72 (-\$969.42 in 2013 dollars)</p> <p>Asthmatic users ever used SBHC: During 1994–1995, yearly expense change in Medicaid was -\$614.97 (-\$966.68 in 2013 dollars) for the intervention group. And the yearly per person expense change in Medicaid was +\$126.51 (+\$198.86 in 2013 dollars) for the control group. The difference in differences was -\$741.48 (-\$1,165.54 in 2013 dollars)</p>	<p>SBHCs saved Medicaid Preventive care usage was also improved. Regression results: The emergency department expenses per child-year enrolled decreased by \$52.39 (p=.10) after a school as the comparison group adopted SBHC.</p>
<p><b>Author (Year):</b> Brindis et al. (1992)</p> <p><b>Study Design:</b> Cross-sectional</p> <p><b>Economic Method:</b> cost-benefit analysis</p> <p><b>Monetary conversion:</b> CPI ratio of year 2013 against year 1988 is 1.97</p>	<p><b>Location:</b> CA</p> <p><b>Population Characteristics:</b> Nine SBHCs with 1,339 to 4,375 visits per year, or 2.2 to 5.1 per person per yr. Female users range from 47% to 64%. The majority of the users are 9<sup>th</sup> and 10<sup>th</sup> graders. 56% users are Hispanics, 21% African American, 12% White, 9% Asian, and 7% others. 60% no</p>	<p>SBHCs mainly provided primary care, reproductive healthcare and counseling. No control group</p> <p><b>Intervention group:</b> School students from three schools, school size in terms of students were not reported.</p>	<p>The numbers of users were calculated by the reviewer, ranging from 462–1071 for school#1; 389–903 for school#2, and 366–848 for school#3.</p>	<p>Total cost: tcost School #1: tcost=\$335,000 (\$659,684 in 2013 dollars) (year 1989); tcost=\$421,000 (\$750,382 in 2013 dollars) (year 1991). School #2: tcost=\$195,000 (\$383,995 in 2013 dollars) (year 1989); tcost=\$162,000</p>	<p>Cost averted: 1. ER services: \$540 total (\$1,063 in 2013 dollars) for school#1, \$2,360 total (\$4,647 in 2013 dollars) for #2, and \$3,920 total (\$7,719 in 2013 dollars) for #3 (year 1989). 2. avoided pregnancy: \$452,886 for 21 avoided pregnancy (\$891,826 in 2013 dollars) for school#1.</p>	<p>B-C ratio: 1.38 for school #1; 2 for school #2; 1.88 for school #3. (year 1989) Net benefit: \$253,195 for school #1; \$385,529 for school #2; \$395,387 for</p>

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*		
					\$345,056 (calculated by the reviewer) (\$679,486 in 2013 dollars) for 16 avoided pregnancy in school #2. \$409,754 (calculated by the reviewer) (\$806,890 in 2013 dollars) for 19 avoided pregnancy in school #3: (year 1989). 3. early pregnancy detection: \$1,416 (\$2,788 in 2013 dollars) for #1; \$8,756 (\$17,242 in 2013 dollars) for #2; \$2,929 for #3 (\$5,768 in 2013 dollars) (year 1989). 4. prenatal care: \$6,333 (\$12,471 in 2013 dollars) for #1; \$28,034 (\$55,205 in 2013 dollars) for #2; \$11,522 (\$22,689 in 2013 dollars) for #3 (year 1989). 5. STD detection&treatment: \$2,402 (\$4,730 in 2013 dollars) for #1; \$6,573 (\$12,944 in 2013 dollars) for #2; \$310 (\$610 in 2013 dollars) for #3 (1989). Total Benefit: \$463,577 (\$912,878 in 2013 dollars) for #1; \$390,779 (\$769,524 in 2013 dollars) for #2; \$428,435 (\$843,677 in 2013 dollars) for #3 (year 1989).			school #3. (year 1989) Total benefit was mainly driven by the benefit from avoided pregnancy which was calculated as the public cost of raising a child. However, less than 10% of the visits to the SBHCs were for reproductive service. Benefit of avoided pregnancy/child birth might have been overestimated.
	insurance, 12% private insurance, 15% HMO, 13% Medi-Cal. 1986–1991			(\$288,745 in 2013 dollars) (year 1991). School #3: tcost=\$227,650 (\$448,290 in 2013 dollars) (year 1989); tcost=\$227,650 (\$405,759 in 2013 dollars) (year 1991). Costs were based on operating budget	Cost savings of \$95 ~ \$153 (\$162–\$262 in 2013 dollars ) \$327 million/year saved from preventive care in NY state for hospitalizations, delivery of teen pregnancies, low-birth weight babies, and chronic diseases such as asthma.			
<b>Author (Year):</b> Brindis et al. 1997 <b>Study Design:</b> N.A. <b>Economic Method:</b> benefit only analysis <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1988 is 1.97	<b>Location:</b> CA and NY (for CA, the same three schools as in Brindis 1992)		N.A	N.A				
<b>Author (Year):</b> The Children’s Aid Society, 2012 <b>Study Design:</b> N.A. <b>Economic Method:</b> benefit only analysis <b>Monetary conversion:</b>	<b>Location:</b> NY		N.A	N.A	248 emergency room visits were prevented, saving nearly \$250,000 (\$267,079 in 2013 dollars) in ambulance and emergency room costs to NY taxpayers	The savings to taxpayers in ambulance and emergency room were calculated as \$1,077 (in 2031 dollars) per visit.		

Study Characteristics	Location	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Study Characteristics</b> Monetary conversion CPI ratio of year 2013 against year 2010 is 1.07</p> <p><b>Author (Year):</b> Contraceptive Technology Update (1985) <b>Study Design:</b> N.A. <b>Economic Method:</b> benefit only analysis <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1985 is 2.41</p>	<p><b>Location</b> <b>Population Characteristics</b> <b>Time Horizon</b></p> <p><b>Location:</b> Jackson, MS. <b>Population Characteristics:</b> 5 community health center established clinics in five public schools, three urban high schools, one rural high school, and one urban junior high school.</p>	<p>N.A.</p> <p><b>Intervention group:</b> Eastern: SBHC opens all weekdays, 8.5 hours. Pediatrician, 0.5 FTE; nurse practitioner, 1.0 FTE; psychiatrist, 0.1 FTE; clinical social worker, 1.0 FTE, and medical assistants, 2.0 FTE. Brightwood: SBHC opens all weekdays, 8.5 hours. 1 nurse practitioner, 1.0 FTE.</p>	<p>N.A.</p>	<p>\$143 was spent (\$345 in 2013 dollars) per student served by the program. The service was free to the students.</p>	<p>The average cost in 1982 of raising one son to age 22 was about \$215,000 (\$519,023 in 2013 dollars), that for two sons was \$357,000 (\$861,820 in 2013 dollars), and that for three sons was \$475,000 (\$1,146,680 in 2013 dollars). Yearly savings per student for not raising the son is \$23,592 (\$519,023/22). With daughters, the cost was 9% higher</p>	<p>“School-based clinics are likely to be successful only when they offered family planning services as part of a comprehensive health care clinic.”</p>
<p><b>Author (Year):</b> DC 21<sup>st</sup> Century School Fund (2004) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2003 is 1.27</p>	<p><b>Location:</b> D.C. <b>Population characteristics:</b> public charter schools, Eastern Sr. High: 968 students, 890 students enrolled in SBHC. 19% uninsured.</p>	<p>Users: 890 students in Eastern Sr. High and 130 students from Brightwood elementary school</p>	<p>N.A.</p>	<p>Operating budget was \$200,000 (\$253,214 in 2013 dollars) for eastern and \$95,000 (\$120,277 in 2013 dollars) for Brightwood.</p>	<p>N.A.</p>	<p>Operating budget was between \$120,277 to \$253,214</p>
<p><b>Author (Year):</b> Dryfoos (1988) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1988 us 1.97</p>	<p><b>Location:</b> U.S.</p>	<p>N.A.</p>	<p>N.A.</p>	<p>Costs per client at school-based clinics are roughly estimated to be between \$150 (\$295 in 2013 dollars) and \$250 (\$492 in 2013 dollars) per year, and caseloads average about 1,000, yielding an annual estimated cost of about \$200,000 (\$393,841 in 2013 dollars) for clinic operations.</p>	<p>N.A.</p>	<p>Depending on the diversity of the program, costs ranged from \$25,000 (\$54,126 in 2013 dollars) to \$1.9 million (\$4,113,553 in 2013 dollars) providing maternity services with a number of clinic sites. \$90,000/year was</p>
<p><b>Author (Year):</b> Dryfoos (1985) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1985 us 2.165</p>	<p><b>Location:</b> U.S. <b>Population Characteristics:</b> 14 SBHCs operating in 32 schools. Caseloads ranged from 500 to 5000 students per year and handle up to 20,000 patient visits annually.</p>	<p>N.A.</p>	<p>N.A.</p>	<p>Depending on the diversity of the program, costs ranged from \$25,000 (\$54,126 in 2013 dollars) to \$1.9 million (\$4,113,553 in 2013 dollars) providing maternity services with a number of clinic sites. \$90,000/year was</p>	<p>N.A.</p>	<p>Depending on the diversity of the program, costs ranged from \$25,000 (\$54,126 in 2013 dollars) to \$1.9 million (\$4,113,553 in 2013 dollars) providing maternity services with a number of clinic sites. \$90,000/year was</p>

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Author (Year):</b> Foch (1995)  <b>Study design:</b> N.A  <b>Economic analysis:</b> Cost only  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1992 us 1.66</p>	<p><b>Location:</b> U.S  <b>Population characteristics:</b> Enrollment rates vary from 60% to 90%, mostly African-Americans, 1991–1992 school year</p>	<p><b>Intervention group:</b> 24 SBHCs in the school-based adolescent health care program</p>	N.A	<p>needed for St. Paul clinic (\$194,853 in 2013 dollars). On average, \$100 per patient per year (\$217 in 2013 dollars) was needed for comprehensive services, including family planning</p>		
<p><b>Author (Year):</b> Fothergill and Ballard (1998)  <b>Study design:</b> N.A  <b>Economic analysis:</b> Cost only  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1997 us 1.45</p>	<p><b>Location:</b> U.S                      Nationwide survey on school linked health centers (SLHCs), 41 SLHCs, 21 responded the survey.                      SLHCs' target audience is adolescents, including young adults up to 23 years of age and the children of adolescents, 37% of visits were for children of teens. Also, 81% SLHCs reported providing services to homeless youth and university students.</p>		N.A	<p>Budgets ranged from \$30,000 (\$43,543 in 2013 dollars) to \$1,500,000 (\$2,177,168 in 2013 dollars). The mean and median are \$436,511 (\$633,572 in 2013 dollars) and \$410,000 (\$595,093 in 2013 dollars).</p>	N.A	
<p><b>Author (year):</b> Guo et al. 2010  <b>Study design:</b> Comparison control  <b>Economic analysis:</b> Cost-benefit  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2002 is 1.29</p>	<p><b>Location:</b> Greater Cincinnati, OH  <b>Population characteristics:</b> 7 schools with SBHCs and 6 schools without.                      Targeted population is school aged students (kindergarten through 12<sup>th</sup> grade) enrolled in</p>	<p><b>Intervention group:</b> 3673 students enrolled in schools with SBHC. A total of 7572 encounters from the students.  <b>Control group:</b> 1383 students enrolled in schools without SBHC</p>	<p>From a related report, the sizes of four schools were: rural (1018 students and 461 users); urban#1 (3338 students and 614 users); urban #2 (648</p>	<p>For the first 3 years of operation (2001–2003), the operation funding was \$1,382,260 as proxy for the operational costs. Medicaid reimbursement value to 7,572 encounters was \$479,929. Copayment</p>	<p>A. Total value of health state change is \$954,387.                      B. additional funding attracted by SBHC is \$457,598.                      C. Cost averted:                      1. Asthma hospitalization: \$228,144.                      2. RX drugs \$443,532                      3. productivity loss \$542,761</p>	<p>Total net benefit was:                      \$1.35 million                      Specifically, net benefit for:                      rural school was \$192,880 with benefit-cost ratio of 2.14;</p>

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Author (year):</b> Guo et al. (2005)</p> <p><b>Study design:</b> Comparison control (difference in differences)</p> <p><b>Economic analysis:</b> Benefit only</p> <p><b>Regression (ANCOVA)</b></p> <p><b>Monetary conversion:</b> CPI ratio of year 2013 against year 2002 is 1.29</p>	<p>Ohio Medicaid or SCHIP from 1997–2003. A total of 7608 students enrolled in 4 school districts with SBHCs, 5056 of them used Medicaid.</p> <p><b>Location:</b> Greater Cincinnati, OH</p> <p>Population characteristics: 7 schools with SBHCs and 6 schools without</p> <p>273 asthmatic children who continuous enrolled in both their schools and the Ohio Medicaid program, including 196 in SBHC schools and 77 in non-SBHC schools, 42% female, 41.7% African-Americans, with average age of 8.2.</p>	<p><b>Intervention group:</b> 196 asthmatic students using SBHC</p> <p><b>Control group:</b> 77 non-SBHC students</p>	<p>Outcome measures are: rate of hospitalization per child; rate of ED</p> <p>The number of hospitalizations decreased from 36 to 12 in the SBHC group; while the rate remained the same in the control group.</p> <p>The total number of ED visits for all diagnoses decreased from 344 to 307 in the intervention group; while the number increased from 200 to 210 in the control group</p>	<p>by the patients were \$75,720. Market value of the space was \$60,750 for 3 years. Therefore, the total cost for 3 years was \$1,998,659 (\$2,588,113 in 2013 dollars).</p> <p>From a related report, specific cost for each school was obtained: Rural: \$168,700 Urban #1: \$165,838 Urban #2: \$143,728 Urban #3: \$118,876</p>	<p>4. travel cost \$42,956</p> <p>5. medical referrals \$42,642</p> <p>D. Multiplier effect for community: \$638,726</p> <p>E. Unquantifiable benefits</p> <p>Total benefit was \$3,350,746 (\$4,338,965 in 2013 dollars), which was \$361,581 per school per year.</p> <p>From the payers' perspective, Medicaid net savings was \$533,964, which was \$35.20 per child per year (\$46 in 2013 dollars), or \$23.5 per visit (\$30 in 2013 dollars). Total per year net savings for Medicaid was \$177,988 (\$230,481.10 in 2013 dollars).</p>	<p>school urban#1 was \$195,742 with benefit-cost ratio of 2.18;</p> <p>school urban#2 was \$217,852 with benefit-cost ratio of 2.52;</p> <p>school urban#3 was \$243,204 with benefit-cost ratio of 3.05.</p>
<p><b>Author (Year):</b> Horton and Lima-Negron (2009)</p> <p><b>Study design:</b> N.A</p> <p><b>Economic analysis:</b> Cost and benefit (startup cost only)</p> <p><b>Monetary conversion:</b> CPI ratio of year 2013 against year 2008 IS 1.08</p>	<p><b>Location:</b> NY state</p> <p><b>Population characteristics:</b> 216 SBHCs, serving 200,000 students, who made 700,000 visits in 2008. Enrollment in NY state is 87%.</p>	<p>No control group</p>	<p>One full time nurse practitioner, or physician assistants, should be available for every 700–1500 enrollees. One full-time licensed mental health provider should be available for every</p>	<p>N.A</p> <p>Start up cost reported only: Ranged from \$200,000 to \$350,000 (\$216,402 to \$378,704 in 2013 dollars)</p>	<p>benefit related to asthmatic patients were \$13,888.89 (\$15,027.93 in 2013 dollars) per SBHC</p>	<p>Benefit cost ratio not calculated because only startup cost information was available</p>

Study Characteristics	Location	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Study Characteristics</b> Monetary conversion</p>	<p><b>Location</b> Time Horizon</p>		<p>700–1500 enrollees.</p>			
<p><b>Author (Year):</b> Keeton and Brindis (2012) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2012 is 1.014</p>	<p><b>Location:</b> U.S</p>	<p>N.A</p>	<p>N.A</p>	<p>In Colorado, SBHCs operate on an average annual revenue of approximately \$287,000 (\$291,196 in 2013 dollars)</p>	<p>N.A</p>	
<p><b>Author (Year):</b> Massachusetts Association for school-based health care (2012) <b>Study design:</b> N.A <b>Economic analysis:</b> Benefit only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2010 is 1.07</p>	<p><b>Location:</b> Massachusetts 26 reporting SBHC in MA. 8059 visits during 9/1/10–6/30/11. 1234 asthma/allergy related visits, others are of the remaining 5 categories</p>	<p>No control group. <b>Intervention group:</b> Assume 50% of visits would have been delivered in an ED, even though the cases are non-emergent</p>	<p>50% reduction in visits by assumption</p>	<p>N.A</p>	<p>For each asthma-related visit, \$565 (\$604 in 2013\$) would be saved by community health center sponsored SBHCs, \$529 (\$565 in 2013\$) would be saved by hospital-sponsored SBHCs, and \$565 (\$604 in 2013\$) would be saved by others. For each visit of other categories, \$190 (\$203 in 2013 dollars) would be saved by community health center sponsored SBHCs, \$154 (\$165 in 2013 dollars) would be saved by hospital-sponsored SBHCs, and \$190 (\$203 in 2013 dollars) would be saved by others.</p>	
<p><b>Author (year):</b> McKimney and Peak (1993) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1991 is 1.71</p>	<p><b>Location:</b> U.S <b>Population characteristics:</b> 202 of 510 surveyed SBHC/SLHCs, located in 34 state. 61% were school-based and 37% were school-linked. 21% operated over 10 years, 33% operated for 5 to 9 years, and 46% less than 5 years. SLHCs on average served 5.1 schools. Mean number of eligible students was 1,948. Of them, 58% was enrolled, with rural centers having slightly higher enrollment.</p>		<p>N.A</p>	<p>The median cash operating budget per SBHC/SLHC was \$143,575, with median in-kind contributions of another \$20,000, resulting a total of \$163,575 (\$279,779 in 2013 dollars) 83% of the cash budget was on staff.</p>	<p>N.A</p>	
<p><b>Author (year):</b> Moore (1998) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only</p>	<p><b>Location:</b> Denver, CO <b>Population characteristics:</b> Sheridan school district with 2170 student, 59% are eligible</p>	<p>N.A.</p>	<p>N.A</p>	<p>\$325,155 (\$464,706.34 in 2013 dollars) spending for fiscal year 1998, 90% of which was on salary and benefits.</p>	<p>N.A</p>	
			<p>1206 users made 3837 visits.</p>			

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Monetary conversion:</b> CPI ratio of year 2013 against year 1998 is 1.43</p>	<p>for reduced-cost lunch, and 42.5% under poverty level. Year of Aug 1 1997 to July 31 1998, 1206 users made 3837 visits.</p>	<p>N.A.</p>	<p>N.A.</p>	<p>Operation cost was actual data, but based on spending. There was a deficit of \$64,960.</p> <p>Startup costs (midrange); for centers without modular is \$49,750 (\$59,343 in 2013 dollars) [\$34,750, \$95,750]; for centers with modular is \$128,250 (\$152,979 in 2013 dollars) [\$110,250, \$163,750]. Annual 9 months' operation costs (midrange); for core center is \$90,750 (\$108,248 in 2013 dollars) [\$41,000, \$212,500]; for intermediate center is \$121,750 (\$145,225 in 2013 dollars) [\$60,000, \$247,000]; for expanded center is \$152,750 (\$182,203 in 2013 dollars) [\$88,500, \$311,250]. Annual 12 months' operation costs (midrange); for core center is \$116,000 (\$138,367 in 2013 dollars) [\$56,500, \$255,000]; for intermediate center is \$162,250 (\$193,534 in 2013 dollars) [\$85,000, \$277,500]; for expanded center is \$208,500 (\$248,702 in 2013 dollars) [\$127,000, \$402,500]. Total cost was between 203,077 and 489,950 in 2013\$, with midrange of \$298,204, assuming intermediate center with modular, operating for 9 months.</p>	<p>N.A.</p>	<p></p>
<p><b>Author (year):</b> Nystrom and Prata (2008) <b>Study design:</b> N.A <b>Economic analysis:</b> Cost only <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2005 is 1.19</p>	<p><b>Location:</b> Oregon Population characteristics: State wide data, total 63863 visits by 20177 clients to 42 SBHCs</p>	<p>N.A.</p>	<p>N.A.</p>	<p></p>	<p></p>	<p></p>

Study Characteristics Monetary conversion	Location Population Characteristics Time Horizon	Intervention Description	Effect Size	Program Costs	Health Care Cost Averted/ Productivity Losses Averted	Full Economic Summary Measure*
<p><b>Author (year):</b> Schlitt, Juszczak and Eichner (2008)  <b>Study design:</b> N.A  <b>Economic analysis:</b> Cost only by grant funding  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2004 is 1.23</p>	<p><b>Location:</b> U.S  <b>Population characteristics:</b> National survey 19 states</p>	N.A	N.A	<p>Yearly operation costs by funding ranged from \$13,235 (\$16,322 in 2013 dollars) to \$248,515 (\$306,476 in 2013 dollars) per HBSC, with an average of \$91,057 (\$112,294 in 2013 dollars).</p>	N.A	
<p><b>Author (year):</b> Siegel and Kriebel (1987)  <b>Study design:</b> N.A  <b>Economic analysis:</b> benefit only  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1985 is 2.165</p>	<p><b>Location:</b> Delaware  <b>Population characteristics:</b> Middletown, rural area 30 miles south of Wilmington, Del.                      658 students (87% Caucasian, 51% female), and 50% enrolled (Caucasian females are frequent users), 80% of whom had private insurance, 6% covered by Medicaid, and 13% had no health insurance.<sup>1</sup></p>	N.A	<p>1000 medical visits were made in school year 1985–1986; nutrition service was provided to 35 individuals with 156 visits. Social worker held 158 counseling sessions. Health education services were given to 31% of the student body.</p>	<p>Cost averted to private physician's office: \$23,94/visit (\$51.83 in 2013 dollars). Productivity loss averted and travel cost averted by the parents: \$14,30/visit (\$30.96 in 2013 dollars). Student's loss of school time averted: \$4,59/visit (\$9.94 in 2013 dollars). The total cost averted is \$42.83 (\$92.73 in 2013 dollars) The cost of visiting a SBHC was \$21.5 (\$46.55 in 2013 dollars).</p>	<p>Calculated by the reviewer:                      Compared to private clinic, net savings per visit was \$21.33 (\$46.18 in 2013 dollars). This was obtained by \$42.83-\$21.5. To the enrolled patient, the service is free. Therefore, cost savings to them was \$21.33+\$20.26, or \$46.18+\$43.86=\$90.04 in 2013\$</p>	
<p><b>Author (year):</b> Silberberg and Cantor (2002)  <b>Study design:</b> N.A  <b>Economic analysis:</b> Cost only  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 2002 is 1.29</p>	<p><b>Location:</b> New Jersey</p>	N.A	N.A	<p>\$150,000 (\$194,239 in 2013 dollars) to \$200,000 (\$258,985 in 2013 dollars) annual operation cost</p>	N.A	
<p><b>Author (year):</b> Tereszkievicz and Brindis (1986)  <b>Study design:</b> N.A  <b>Economic analysis:</b> Cost only  <b>Monetary conversion:</b> CPI ratio of year 2013 against year 1986 is 2.13</p>	<p>General description of SBHC</p>	N.A	N.A	<p>"A former program administrator in St. Paul estimates that \$100,000-\$125,000 per year (\$212,552.01-\$265,690.01 in 2013 dollars) is needed to operate a full-time high school clinic, even after it has been equipped."</p>	N.A	