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# Effect of Elementary School-Based Health Centers in Georgia on the Use of Preventive Services

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**Introduction:** This study measures effects on the receipt of preventive care among children enrolled in Georgia's Medicaid or Children's Health Insurance Program associated with the implementation of new elementary school-based health centers. The study sites differed by geographic environment and predominant race/ethnicity (rural white, non-Hispanic; black, small city; and suburban Hispanic).

**Methods:** A quasi-experimental treatment/control cohort study used Medicaid/Children's Health Insurance Program claims/enrollment data for children in school years before implementation (2011−2012 and 2012−2013) versus after implementation (2013−2014 to 2016−2017) of school-based health centers to estimate effects on preventive care among children with (treatment) and without (control) access to a school-based health center. Data analysis was performed in 2017−2019. There were 1,531 unique children in the treatment group with an average of 4.18 school years observed and 1,737 in the control group with 4.32 school years observed. A total of 1,243 Medicaid/Children's Health Insurance Program−insured children in the treatment group used their school-based health centers.

**Results:** Significant increases in well-child visits (5.9 percentage points, $p<0.01$) and influenza vaccination (6.9 percentage points, $p<0.01$) were found for children with versus without a new school-based health center. This represents a 15% increase from the pre-implementation percentage (38.8%) with a well-child visit and a 25% increase in influenza vaccinations. Increases were found only in the 2 school-based health centers with predominantly minority students. The 18.7 percentage point ($p<0.01$) increase in diet/counseling among obese/overweight Hispanic children represented a doubling from a 15.3% baseline.

**Conclusions:** Implementation of elementary school-based health centers increased the receipt of key preventive care among young, publicly insured children in urban areas of Georgia, with potential reductions in racial and ethnic disparities.

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## INTRODUCTION

School-based health centers (SBHCs) are physically located in or near schools to provide health care to students. At a minimum, these clinics provide primary health care and whenever possible, mental, vision, and oral health services. Optimal core staff includes a pediatrician, nurse practitioner or physician assistant, social worker/mental health counselor, school nurse, medical assistant, and community outreach worker.

Early philanthropy and government policies (e.g., Medicaid expansions) at the state level helped expand SBHCs,[1] whereas provisions of the Affordable Care Act recognized SBHCs as federally authorized programs and

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provided one-time start-up funding for new centers.[2] In 2016–2017, there were 2,584 SBHCs nationwide; 40% of the SBHCs served only elementary schools (Kindergarten through 5th or 6th grades), and more than half of all the SBHCs were sponsored by Federally Qualified Health Centers (FQHCs).[1]

Although schools with access to an SBHC have higher percentages of minorities,[1] disparities in access to care persist for children from low-income and racial or ethnic minority populations in the U.S.[2] Racial and ethnic minorities are disproportionately poor; 33% of African American and 26% of Hispanic children aged <18 years lived in poverty in 2017.[3] Poor children in rural areas have lower access; the rates of well-child visits and advice about exercise/healthy eating are lower than those in metro areas.[4] This is exacerbated in the rural south where 55% of poor rural African American children live.[5] Low-income children are more likely to develop some comorbid chronic health problems,[6] miss school,[7,8] and have lower scholastic performance.[9] Medicaid-insured children with multiple chronic conditions are more likely to have high rates of emergency department use[10] and more likely to have higher healthcare costs.[11] Although states report that 89% of Medicaid/Children's Health Insurance Program (CHIP)–insured children saw a primary care provider in the past 2 years, the rates of well-child and preventive dental care were lower and only 41% of children aged 3–17 years had their BMI percentile documented.[12] SBHCs can help children and their families overcome the barriers by increasing access to preventive and other routine care and the needed referrals.[3,13–16]

Approximately 25% of preschool and elementary-aged children (2–8 years) have significant health problems (e.g., asthma, obesity, behavior/learning problems).[17,18] The utilization of SBHCs by elementary-aged children correlates heavily with these health issues.[19] Despite a growing literature on SBHCs,[1] there has been little focus on elementary schools. Importantly, research is lacking on SBHCs' performance in low-income communities with differing racial/ethnic compositions, especially for rural and Hispanic youth.[15] Yet, students' utilization patterns are likely affected by cultural and contextual processes.[20]

This study examines the use of preventive care by elementary school-aged children who are enrolled in either Medicaid or PeachCare (Georgia's CHIP), with and without access to a new SBHC, and living in racially and geographically diverse communities. These communities were the first in Georgia to establish an SBHC in 14 years. Initial planning was partially funded by the Zeist Foundation as a pilot project aimed at assessing the success of scaling up from a model that showed improved health among Medicaid children.[21] Communities competed for funds by demonstrating the first 2 of Silverberg and Cantor's criteria for sustainability[22]: (1) community support and (2) financial sustainability, with staffing through an existing FQHC. A total of 3 were selected solely on the quality of their applications. Recognizing that these communities could comprise a natural experiment because of disparate geographic and demographic populations, funding was obtained to examine the remaining criteria: (1) evidence of health and cost impact and (2) fidelity to the model.[22,23] This analysis focuses on the third criterion.

## METHODS

A quasi-experimental treatment/control design was used to measure the differences in change in the use of preventive care services for the treatment group of children with new access to an SBHC and a comparison group of children without access to an SBHC throughout the school years before and after SBHC implementation. To be included, a child had to be enrolled in Georgia's Medicaid/CHIP program for ≥1 month in both the pre-SBHC implementation period and post-SBHC implementation period. Comparison schools for the SBHCs were pragmatically chosen to be (1) within the same county and (2) comparable in terms of race/ethnicity, percentage school lunch eligible, and student–teacher ratio (Table 1). The Lake Forest/Mimosa schools with predominantly Hispanic populations in the metro suburban area were larger (974 and 1,004 students) than the 4 remaining schools (401–534 students). Students at Turner/Northside located in a small city were predominantly black, whereas students at Tiger Creek/West Side located in a rural area were predominantly non-black, non-Hispanic in the 2016–2017 school year.

All the 3 study SBHCs offered comprehensive medical and mental health services, which included health promotion and prevention along with the treatment of acute and chronic health conditions. Staff included a medical assistant and an advanced practice practitioner with physician oversight. Lake Forest and Turner also had on-site mental health providers. A total of 2 of the sites (Tiger Creek and Turner) offered on-site dental services, whereas Mimosa's staff included a health educator. The remaining part of this paper refers to Lake Forest/Mimosa schools as T:Urban/Hispanic and C:Urban/Hispanic, Turner/Northside as T:SmallCity/Black and C:SmallCity/Black, and Tiger Creek/West Side as T:Rural/White and C:Rural/White. In this notation, T represents treatment and C represents comparison.

Claims/encounter and enrollment data for children (aged 5–12 years) ever enrolled in Georgia Medicaid or PeachCare (CHIP) were obtained from the Georgia Department of Community Health through their vendor (IBM Watson Health Analytics). Data contained all inpatient, outpatient, professional, and pharmaceutical encounters, dates of service, dollar amounts billed/paid to individual providers, diagnosis and procedure codes, and provider identifications (IDs). Provider and enrollment files included providers' place of service and children's residential addresses. Analytic files for August through May of school years 2011–2012 through 2016–2017 were created. Unique encrypted IDs were used to follow individual Medicaid/CHIP children over

**Table 1.** Georgia SBHCs and Comparison Schools, 2015–2016 and 2016–2017 School Years

| Characteristics | SBHC | Comparison | SBHC | Comparison | SBHC | Comparison |
|---|---|---|---|---|---|---|
| County | Fulton | Fulton | Dougherty | Dougherty | Catoosa | Catoosa |
| School[a] | Lake Forest | Mimosa | Turner | Northside | Tiger Creek | West Side |
| Environment | | | | | | |
| Metro suburban | X | X | — | — | — | — |
| Small city/small suburban | — | — | X | X | — | — |
| Rural fringe/suburban | — | — | — | — | X | X |
| ZIP codes | 30,328 | 30,076 | 31,705 | 31,701 | 30,755 | 30,741 |
| Students | | | | | | |
| Grades | PK–5 | PK–5 | PK–5 | PK–5 | PK–5 | PK–5 |
| Number enrolled | 974 | 1,004 | 534 | 401 | 498 | 501 |
| % black | 3.2 | 15.0 | 85.4 | 86.3 | 0.0 | 3.6 |
| % Hispanic | 94.5 | 75.9 | 3.7 | 1.5 | 4.0 | 10.2 |
| % minority | 98.9 | 94.4 | 93.3 | 90.5 | 6.8 | 19.1 |
| % free lunch eligible | 99.7 | 92.1 | 99.4 | 99.3 | 67.5 | 72.9 |
| School | | | | | | |
| Student–teacher ratio | 12.3 | 11.6 | 14.6 | 14.6 | 14.7 | 15.7 |
| Title I school | Yes | Yes | Yes | Yes | Yes | Yes |
| Title I schoolwide program | Yes | Yes | Yes | Yes | Yes | Yes |

Source: Common Core Public School Data, 2015–2016 and 2016–2017, https://nces.ed.gov/ccd/schoolsearch/. Accessed October 23, 2018.
[a]In subsequent tables and in the paper, schools are referred to by their treatment/comparison status, location, and predominant racial/ethnic population as T:Urban/Hispanic (Lake Forest); C:Urban/Hispanic (Mimosa); T:SmallCity/Black (Turner); C:SmallCity/Black (Northside); T:Rural/White (Tiger Creek); and C:Rural/White (West Side).
PK, pre-Kindergarten; SBHC, school-based health center.

time. A total of 1,531 unique children in the treatment group were followed for an average of 4.18 school years, and 1,737 unique children in the control group were followed for an average of 4.32 school years. A total of 1,243 Medicaid/CHIP-insured children used their SBHCs. The child/school year observations were flagged as in the pre-SBHC implementation period (school years 2011–2012 and 2012–2013; *n*=5,359) versus post-SBHC school years (2013–2014 through 2016–2017; *n*=8,529).

This study received approval from the Emory University IRB (#00073358).

## Study Population

One study population identified children in school district areas with a new SBHC. Addresses for children in each month/year and a geo-coder database of the X/Y longitude and latitude for street addresses resulted in matches for 90% (ArcGIS, version 10.6.1). A map of elementary level school districts' coordinates was used to identify the name of the school a child should attend. School names were merged with the Medicaid/CHIP enrollment database to identify children in a school district area with and without a new SBHC. Medicaid/CHIP-enrolled children who were in both SBHC and comparison school district areas at any time were excluded (*n*=532). This study population is akin to those examining whole school effects in that it assessed the effects on both users and nonusers in the SBHC's area.[15]

Another study population was identified as children who used some outpatient services in the pre-SBHC implementation period and specifically used the SBHC in the post-SBHC implementation period. Users were identified by (1) provider IDs on the claims/encounters whose place of service was the SBHC or (2) Medicaid IDs of children using the SBHC directly reported by 2 SBHCs. T:Urban/Hispanic SBHC users were identified only by provider IDs. The comparison sample was Medicaid/CHIP-enrolled children in the school district area without an SBHC who were users of some outpatient services in both pre- and post-SBHC implementation periods. Earlier studies of user-only effects compared users with nonusers of SBHCs or users of community care clinics.[15]

The total number of child/school year observations for Medicaid/CHIP enrolled in at least 1 month of both pre- and post-SBHC implementation periods totaled 13,888. The number of child/school year observations varied from 2,204 for the T:Rural/White, C:Rural/White schools to 4,309 for the T:SmallCity/Black, C:SmallCity/Black schools to 7,375 for children in the T:Urban/Hispanic, C:Urban/Hispanic schools (Table 4). Child school year observations for users of services were smaller (*n*=7,994).

## Measures

The analysis focused on measures of diagnostic or preventive services: (1) well-child/Early and Periodic Screening, Diagnosis, and Treatment visits, (2) influenza immunization, (3) any preventive dental care, (4) receipt of 2 or more dental visits, (5) diagnosis of obese/overweight, (6) receipt of diet counseling services overall, and (7) receipt of diet counseling among those diagnosed as obese/overweight. Adverse outcomes of hospitalization and emergency department visits were also analyzed. Service receipt was measured using ICD and Current Procedural Terminology procedure codes as well as the category of service (e.g., Early and Periodic Screening, Diagnosis, and Treatment). The use of preventive dental services was based on Current Dental Terminology claims from D1000 through D1999[24]; receipt of 2 or more dental claims was used to capture preventive plus restorative care.

### Statistical Analysis

Multivariate logistic regression models were used to test whether the implementation of the 3 new SBHCs was associated with a change in the receipt of preventive care among Medicaid/CHIP children with access to the SBHCs compared with Medicaid/CHIP children without access to an SBHC. The statistical method was a difference-in-differences approach.[25] This method provides an average marginal effect, which is interpreted as the percentage point change in the outcome (preventive care) for the SBHC versus comparison groups of children.[26]

Models included controls for (1) age at the beginning (August) of the school year; (2) race/ethnicity (Hispanic; black, non-Hispanic; white, non-Hispanic; and other, non-Hispanic); (3) Medicaid eligibility category, which indirectly reflects income levels (lower-income Medicaid, higher-income Medicaid [referred to as Right from the Start Medicaid in Georgia], and CHIP/PeachCare [highest income]), disabled, and other, (4) relation of the child to head of household (parent, grandparent, foster child, other), and (5) months (1–3, 4–6, 7–9, and 10 months) in Medicaid/CHIP during the school year. School-level variables included (1) percentage qualifying for free/reduced lunch at school, (2) student–teacher ratio, and (3) percentage of the population in poverty at the county level. Analyses were conducted in 2017–2019 using Stata, version 16.1.

## RESULTS

Sociodemographic characteristics of Medicaid/CHIP-enrolled children in the SBHC and comparison group were similar before and after implementation of the SBHCs (Table 2). Where changes occurred over time, groups moved in the same direction. As children were in the study for some part of both the pre- and post-SBHC implementation periods, the average age increased from 7.5 to slightly higher than 9 years.

The study population was largely nonwhite, with >70% as either Hispanic or black, non-Hispanic in the pre-SBHC implementation period. More than 60% (61.2%–71.8%) of the children in the SBHC and comparison areas were enrolled in Medicaid/CHIP in the full school year (10 months). Most children resided in their school area for >5 years. From 67.8% to 71.9% of children were in the higher-income Medicaid eligibility group (family income ~50% to 133%–138% of the federal poverty level). CHIP/PeachCare children's families had income >133%–138% but <200% of the federal poverty level and comprised 9.9%–13.6% in the post-SBHC implementation period.

There was a significant increase in well-child visits for children in both school district areas, with a larger increase for SBHC children (Table 3). The data indicated a decline in influenza vaccinations for comparison children and a slight decline in preventive dental care for children in the SBHC school district areas. There was a doubling of the percentage of children with a diagnosis of obese/overweight from pre- to post-SBHC implementation periods and an increased percentage of those receiving diet counseling.

The 2 sets of estimated marginal effects are shown in Table 4. The top set is for all children in the SBHC and comparison school district areas and indicated an average of 5.9 percentage point increase in the probability of a well-child visit ($p<0.001$) and a 6.9 percentage point increase in the probability of influenza vaccination ($p<0.001$) for Medicaid/CHIP children with access to an SBHC compared with those without access. Compared with the baseline (38.8%) of children in SBHC areas with a well-child visit before the SBHC, this increase is meaningful (5.9/38.8=15%).

There were marked differences in the results across SBHCs. Results for T:SmallCity/Black and T:Urban/Hispanic SBHCs reflected significant increases in well-child visits and influenza vaccinations but were insignificant for T:Rural/White. Effects were largest (14–15 percentage point increases) for children in the T:SmallCity/Black school district area. There was an increase in the receipt of diet/nutrition counseling among those diagnosed as obese/overweight only in the T:Urban/Hispanic SBHC.

The second set of results in Table 4 indicated an increase of 13 percentage points in the probability of well-child visits ($p<0.001$) as well as an increase in influenza vaccinations equal to almost 19 percentage points for users of T:Urban/Hispanic compared with children without access to an SBHC but using outpatient services. Among users of T:SmallCity/Black, there was an 8.8 percentage point increase in the receipt of 2 or more dental visits in the school year. For both T:SmallCity/Black and T:Urban/Hispanic, there was an increase in the probability that a child who used the SBHC was diagnosed as obese/overweight (from 7 to almost 10 percentage points). At T:Urban/Hispanic, there was an increase of 7 percentage points in the probability of children using that SBHC who received diet/nutrition counseling and almost a 32 percentage point increase in this probability among children with an obese/overweight diagnosis receiving this counseling.

The forgoing analysis assumed that the effect of the SBHCs did not grow over time. Sensitivity analysis tested for differences in each post-SBHC implementation year and found that effects on well-child visits and influenza vaccination generally increased in the 2 predominantly minority SBHCs. These are available in electronic format (Appendix Table 1, available online).

## DISCUSSION

Healthy People 2020 added goals for a previously neglected age group—early (birth to age 8 years) and

**Table 2.** Characteristics of Medicaid/CHIP Children in School District Areas Before and After SBHC Implementation

| | Schools with SBHC | | Comparison schools | |
|---|---|---|---|---|
| Characteristics | Before SBHC implementation, *n*=2,890, % | After SBHC implementation, *n*=4,606, % | Before SBHC implementation, *n*=2,469, % | After SBHC implementation, *n*=3,923, % |
| Sociodemographic | | | | |
| Age in years (mean)[a] | 7.6 | 9.4 | 7.5 | 9.4 |
| 5–7 | 51.4 | **17.3**** | 51.7 | **16.9**** |
| 8–12 | 48.6 | 82.7 | 48.3 | 83.1 |
| Female | 48.4 | 49.0 | 49.5 | 49.2 |
| Race/ethnicity | | | | |
| Hispanic | 41.8 | **38.1**** | 41.6 | **37.9*** |
| Black, non-Hispanic | 31.0 | 27.7 | 32.1 | 29.0 |
| White, non-Hispanic | 26.4 | 31.6 | 23.9 | 29.3 |
| Other, non-Hispanic | 0.8 | 2.6 | 2.4 | 3.8 |
| Months in Medicaid during the school year | | | | |
| 1–3 | 9.0 | **8.7**** | 9.1 | **9.3**** |
| 4–6 | 9.0 | 7.7 | 12.4 | 9.9 |
| 7–9 | 16.8 | 11.8 | 17.3 | 14.0 |
| 10 | 65.2 | 71.8 | 61.2 | 66.9 |
| Years in school area during the study | | | | |
| 2 | 5.3 | **3.3**** | 7.0 | **4.5**** |
| 3 | 23.3 | 10.5 | 26.2 | 13.2 |
| 4 | 22.2 | 18.3 | 20.5 | 18.0 |
| 5 | 22.5 | 34.2 | 22.4 | 33.4 |
| 6 | 26.7 | 33.7 | 23.9 | 30.9 |
| Medicaid program | | | | |
| Eligibility | | | | |
| CHIP/PeachCare | 12.2 | **9.9*** | 16.0 | **13.6*** |
| Higher-income Medicaid | 69.4 | 71.9 | 67.8 | 69.0 |
| Lower-income Medicaid/other | 16.9 | 16.7 | 14.9 | 16.4 |
| Missing | 1.5 | 1.5 | 1.3 | 1.0 |
| Relation to head of household | | | | |
| Child | 81.2 | 81.3 | 78.3 | 79.1 |
| Self | 14.3 | 14.3 | 17.9 | 16.9 |
| Grandchild | 3.0 | 3.1 | 2.3 | 2.5 |
| Other | 1.5 | 1.3 | 1.4 | 1.6 |
| School level | | | | |
| Free or reduced lunch | 90.2 | 90.3 | 90.4 | **90.8*** |
| Student–teacher ratio | 15.2 | **14.2**** | 13.8 | **14.2**** |
| Percentage in poverty in the county | 23.5 | **21.3**** | 22.4% | **20.1**** |

*Note:* Boldface indicates statistical significance (**p*<0.05, ***p*<0.01). Pearson chi-square test was used for sociodemographic and Medicaid program variables. Student's *t*-test was used for school-level variables.
[a]Areas defined by addresses and school boundaries for SBHCs (T:Urban/Hispanic, T:SmallCity/Black, T:Rural/White) or comparison (C:Urban/Hispanic, C:SmallCity/Black, C:Rural/White) schools. The children who are ever in Medicaid/CHIP and residing in the school district area during the school year with a new SBHC are considered area exposed to an SBHC.
[b]Age at the beginning of school year (August) of the 6 school years, August through May: 2011–2012 to 2016–2017. An increase in mean age reflects that the sample only includes children in the areas for at least some part of the pre- and post-SBHC implementation periods.
CHIP, Children's Health Insurance Program; SBHC, school-based health center.

middle (age 6–12 years) childhood—thereby highlighting the importance of access to high-quality health care for child development and prevention of diseases with pathways that begin in early and middle childhood.[27] Policymakers emphasize the continued disparities in children's access through insurance and geographic availability as well as ease of communication with providers.[28] In Georgia, 71% of children (475,000) in

**Table 3.** Utilization Under Medicaid/CHIP Before and After SBHC Implementation

| Utilization measures | Schools with SBHC[a] Before SBHC implementation, n=2,890, % | Schools with SBHC[a] After SBHC implementation, n=4,606, % | Comparison schools[a] Before SBHC implementation, n=2,469, % | Comparison schools[a] After SBHC implementation, n=3,923, % |
|---|---|---|---|---|
| Well-child visit[b] | **38.8** | **51.5****[b] | **41.9** | **46.6**** |
| Influenza vaccination[c] | 27.7 | 28.1 | **37.0** | **24.7**** |
| Dental visit, preventive[d] | **73.8** | **70.8**** | 72.9 | 72.6 |
| Dental visit, any 2 or more[e] | 41.9 | 40.0 | 43.7 | 41.8 |
| Overweight/obese diagnosis[f] | **10.2** | **22.2**** | **6.4** | **13.2**** |
| Diet/nutritional counseling[g] | **1.9** | **24.5**** | **0.8** | **13.1**** |
| Diet/nutritional counseling if overweight/obese[h] | **15.3** | **62.7**** | **10.7** | **39.3**** |
| ≥1 ER visit | 24.2 | 22.6 | **23.4** | **21.0*** |
| ≥1 hospitalization | 1.07 | 1.24 | 0.73 | 1.02 |

Notes*:* Boldface indicates statistical significance (*$p<0.05$, **$p<0.01$). Pearson chi-square test was used for comparing pre— and post-implementation utilization measures.
[a]Areas defined by addresses and school boundaries for SBHCs (T:Urban/Hispanic, T:SmallCity/Black, T:Rural/White) or comparison (C:Urban/Hispanic, C:SmallCity/Black, C:Rural/White) schools. The children who are ever in Medicaid/CHIP and residing in the school district area during the school year with a new SBHC are considered area exposed to an SBHC.
[b]Well-child visit defined as EPSDT or ICD-9 V202/Z0012X.
[c]Flu vaccination defined using procedure codes 90,630, 90,656, 90,653, 90,654, 90,657, 90,658, 90,660, 90,661, 90,662, 90,664, 90,666, 90,667, 90,668, 90,672, 90,685, 90,673, G0008, G9142, Q2034, Q2035, Q2036, Q2037, Q2038, Q2039, 90,674, 90,682, 90,686, 90,687, 90,688, 90,756.
[d]Procedure codes D1000—D1999.
[e]Provider-type code claim of dentist service provider (12).
[f]ICD-9 diagnosis codes 278.0X, V85.53, V85.54; ICD-10 diagnosis code E66, Z68.53, Z68.54. We noted that whereas the introduction of ICD-10 in 2015 introduced more coding detail in the area of obesity/overweight, the coding of these outcomes was increasing before the SBHCs similarly for both the SBHC and the comparison groups.
[g]ICD-9 diagnosis codes V65.3 and ICD-10 diagnosis codes Z71.3 and Z72.4.
[h]Subset of students with obese/overweight diagnosis (SBHC n=1,316; control n=675).
CHIP, Children's Health Insurance Program; EPSDT, Early and Periodic Screening, Diagnosis, and Treatment; ER, emergency room; SBHC, school-based health center.

poverty are African American or Hispanic.[29] With the majority of low-income and minority children in public schools, they offer an important venue to reduce health disparities.

Results of this natural experiment comparing outcomes of children in schools with and without a new SBHC before and after SBHC implementation were largely consistent with a systematic review of SBHC studies on the basis of the whole school and user analyses.[15] The authors noted no clear pattern of differences in results across these approaches but expressed concern that users and nonusers, or SBHC and non-SBHC sites, may not be comparable. The present results were based on pre–post comparisons of users of SBHCs with users of non-SBHCs and carefully chosen non-SBHC sites. Among users, there were larger percentage point increases in diagnostic and preventive services (obese/overweight and diet/nutrition counseling) in 2 SBHCs and additional dental visits in 1. Results indicated that the most effective policy is getting children to use the SBHC once it is there.

Although the earlier review[15] and specific studies[30,31] reported that SBHCs led to fewer emergency department visits and hospitalizations, this was not found here. The use of difference-in-differences analysis may be one reason, but the earlier Georgia study using this method found lower emergency department expenses.[21] That study was before the 2006 mandate that nondisabled Medicaid/CHIP children be enrolled in Care Management Organizations with capitated payment incentives to reduce emergency department and hospital use. The present findings indicated that children served by Care Management Organizations and SBHCs in Georgia received more preventive care without increasing costs to the Medicaid program.

Important to the potential of SBHCs to increase access to preventive/other routine care[3,13–16] and reduce disparities, significant effects were only found in SBHCs predominantly serving the minority children. Increased diet counseling among those obese/overweight was found in the predominantly Hispanic school, whereas increased dental visits were found among users of the predominantly black SBHC. Differences may be partially attributable to staffing. All had a medical assistant and advanced practitioner but the predominantly white and black SBHCs had a dentist and dental assistant. The

**Table 4.** Changes in Probability of Utilization Under Medicaid/CHIP Before and After SBHC Implementation, Marginal Effects

| | In school district area and Medicaid/CHIP both before/after SBHC implementation[a] | | | | In school district area, Medicaid/CHIP, and SBHC user[b] | | | |
|---|---|---|---|---|---|---|---|---|
| **Utilization measures** | **Rural/ White,[c] *n*=2,204** | **Small City/ Black,[c] *n*=4,309** | **Urban/ Hispanic,[c] *n*=7,375** | **All, *n*=13,888** | **Rural/ White,[c] *n*=1,074** | **Small City/ Black,[c] *n*=2,257** | **Urban /Hispanic,[c] *n*=4,663** | **All, *n*=7,994** |
| EPSDT/well-child visit | −3.32 | **13.84**$^{**}$ | **5.38*** | **5.91**$^{**}$ | 11.17[d] | **33.58**$^{**}$ | **9.07**$^{**}$ | **13.4**$^{**}$ |
| Immunization, influenza | −5.63 | **15.58**$^{**}$ | **11.81**$^{**}$ | **6.99**$^{**}$ | −10.5 | **37.99**$^{**}$ | **18.51**$^{**}$ | **21.47**$^{**}$ |
| Dental visit, preventive | −**10.86**$^{**}$ | −1.71 | 0.24 | −0.79 | −**15.08*** | −1.23 | 2.10 | −1.27 |
| Dental visit, any 2 or more | −5.70 | 4.25 | 1.14 | 0.72[d] | 8.48 | **8.80*** | −0.13 | 0.92 |
| Overweight/obese diagnosis | −2.24 | 3.04 | 1.60 | 1.09 | 15.17 | **9.75**$^{**}$ | **7.12**$^{**}$ | **7.74**$^{**}$ |
| Diet/nutrition counseling | N/E | N/E | −2.30 | −1.37 | N/E | N/E | 6.58 | **8.02*** |
| Counseling if overweight or obese | N/E | N/E | **18.70**$^{**}$ | **12.26*** | N/E | N/E | **31.50**$^{**}$ | **26.04**$^{**}$ |
| ≥1 ER visit | −2.18 | −0.90 | 1.35 | −0.95 | 7.36 | −3.28 | 2.11 | 0.38 |
| ≥1 hospitalization | 0.35 | −0.76 | −0.14 | 0.01 | −1.61 | −0.53 | −050 | −0.12 |

*Note:* Boldface indicates statistical significance (*$p$<0.05, **$p$<0.01). N/E indicates that the preparallel trends test failed for this outcome for this analytic group. This DID estimate is therefore not reliable and is not discussed in the paper.

MEs were estimated using the margins command in Stata, version 16.1. MEs adjusted for age, race/ethnicity, eligibility category, relation to head of household, months in the study during school year, percent free/reduced lunch at school, student−teacher ratio, percent poverty in county, school year, and school. MEs indicate the percentage point change in the probability of the outcome.

[a]In Medicaid/CHIP and school district catchment area in the pre- and post-SBHC implementation periods.

[b]In Medicaid/CHIP and school catchment area in the pre- and post-SBHC implementation periods and user of services in post-SBHC implementation period (user list from SBHC/provider ID for SBHC and from outpatient claims for comparison school) and in pre-SBHC implementation period (outpatient claim).

[c]T:Rural/White, C:Rural/White; T:SmallCity/Black, C:SmallCity/Black; T:Urban/Hispanic, C:Urban/Hispanic.

CHIP, Children's Health Insurance Program; DID, difference-in-difference; EPSDT, Early and Periodic Screening, Diagnosis, and Treatment; ER, emergency room; ID, identification; ME, marginal effect; N/E, not estimated; SBHC, school-based health center.

predominantly Hispanic SBHC was staffed with a full-time health educator focused on childhood obesity. The latter reflects the recommendation to make schools a focal point for addressing childhood obesity and higher rates among Hispanic children.[32,33] Community characteristics that reduced enrollment in Medicaid/CHIP among eligible children may have diminished success in the predominantly white, rural SBHC. Reluctance to access public funds among eligible white families may be a barrier to improving the health of poor, rural White families.[34,35]

The subsequent growth of SBHCs in Georgia's public elementary schools exemplifies the positive impact on preventive practices[36] of a natural experiment founded on the principles of sustainability.[22] Because of this and an earlier analysis showing a positive impact of these SBHCs on school attendance,[37] more than 80% of the 54 SBHCs in Georgia, along with the majority of other SBHCs nationally, now serve children through an FQHC sponsor.

### Limitations

Children identified as living in the SBHC school district area may have been home-schooled or attended a private/magnet school outside this area. However, charter schools represent <5% of all schools in Georgia, and it is unlikely that the lower-income children analyzed here would attend one.[38] The broader effects of SBHCs on uninsured or undocumented children could not be measured. Users of the SBHCs were based on complete lists for 2 of the 3 SBHCs and T:Rural/White became a clinic for adults in the area that may have reduced capacity to serve children. Finally, there was a possible selection bias because these were the first community schools that received competitive pilot funds. However, only those findings where tests of trends in the preventive care measures among children before the SBHC were not significantly different from those for children in the comparison school areas were reported (Table 4).

## CONCLUSIONS

In elementary schools serving minority populations, publicly insured children newly served by SBHCs experienced significant increases in preventive care as measured by well-child visits and influenza vaccinations. Findings support the further expansion of elementary SBHCs in Georgia as one means of addressing unmet needs and disparities among lower-income children in nonrural areas. Further understanding of the barriers to the success of SBHCs in Georgia's rural area is needed.

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EKA led the work on the analysis of Medicaid/Children's Health Insurance Program claims/enrollment and drafting and editing of this manuscript. AES completed literature reviews and participation in the drafting of the paper. CJH (co-Principal Investigator) and VCJ (Principal Investigator) led the overall project and participated fully in the drafting of the manuscript. PJJ managed the Medicaid/Children's Health Insurance Program data files, completed statistical analyses and tabling, and worked closely with JNH as he completed the geocoding and identification of school district boundaries. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. The contents of this manuscript have not been previously presented elsewhere.

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## SUPPLEMENTAL MATERIAL

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