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ARKANSAS SCHOOL-BASED HEALTH CENTERS (SBHC) AND ACADEMIC ACHIEVEMENT

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EXECUTIVE SUMMARY

This report examines the relationship between the opening of a School Based Heath Center (SBHC) and school-level academic achievement. Using publicly available data from the Division of Elementary and Secondary Education, this research investigates whether students who attend schools where SBHCs have opened demonstrate higher academic achievement than was present prior to the SBHC. While we cannot estimate the causal effect of SBHCs on student achievement, this study found no significant relationship between having a school-based health center and improved academic achievement for students, which may be relevant to policymakers and educators in Arkansas.

I. INTRODUCTION

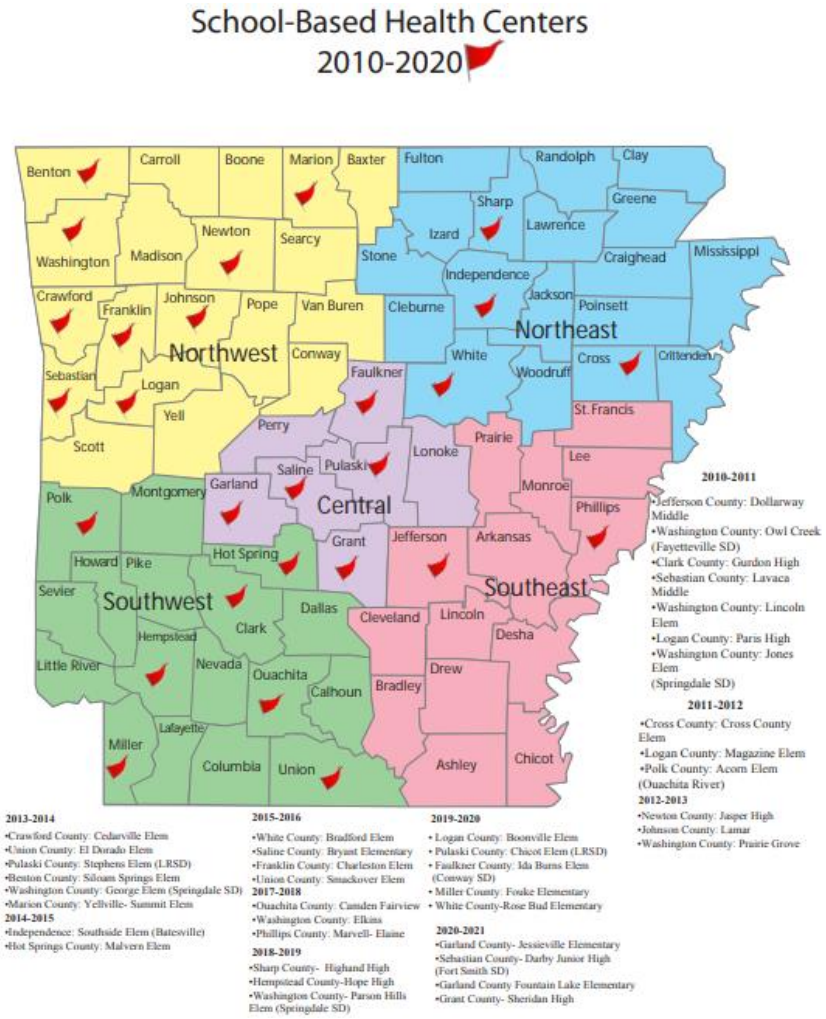
School-Based Health Centers (SBHCs) are multi-faceted healthcare facilities serving school-age children and adolescents, their family members, and the broader community (Knopf et al., 2016). SBHCs are traditionally located on or near urban and rural public-school campuses around the United States and work in collaboration with school healthcare professionals and previously established school health initiatives (Brindis, 2016). Although SBHCs began to address teen pregnancy by offering support services to teen mothers from disadvantaged communities, SBHCs currently offer an array of health services including, medical, mental, dental, and even vision (Knopf et al., 2016; Love et al., 2019). Today, there are over 2,500 SBHCs across the United States primarily in the eastern half and southern portion of the country with a spattering across the west coast (Thomas et al., 2020). Funding for SBHCs comes from a variety of sources, including but not limited to state and local tax dollars as well as community health organizations (Guo et al., 2010).

II. ARKANSAS SBHC

Arkansas launched a state SBHC grant program in 2009 open to all Arkansas public schools, (School-Based Health Centers, n.d.). The program was initially funded by the Arkansas Tobacco Excise Tax in collaboration with four separate state education and health departments. Grant applicants can apply for a maximum of $150,000 for the first year. Over a subsequent five-year period, a decreasing amount of funding is provided to grantees dependent upon the availability of tax revenue. According to DESE personnel (K. Mundell, personal communication, November 18, 2020), the grants are currently funded through a line item in the Public School Fund. There are several centers across the state that are not grant funded where providers have partnered with

districts to implement on-campus services for students.Arkansas SBHCs provide basic physical, mental, dental or other services as needed (see Appendix, Table A1). As of 2020-21, Arkansas has 40 SBHCs serving diverse populations and addressing varying levels of need.

Figure 1: School-based health centers in Arkansas



Note. This Arkansas state map uses flags to denote state counties with school-based health centers (SBHC). Schools with SBHCs are listed by county directly below and to the right of the map. Schools are listed chronologically depending on when they opened an SBHC.

Citation: School-based health center recipient by school year [Online image]. (2010). Division of elementary and secondary education.

As shown in Figure 1, SBHCs are located on public school campuses, and over are in the western part of the state. Of the 40 schools with SBHCs 62.5% are elementary schools, 27.5% are high schools, and 10% are middle schools (see Figure 2). Demographic information about the schools with SBHCs is presented in Table 1. On average these schools serve 70% of students from economically disadvantaged backgrounds, and 38% of students that are from racial or ethnic minorities.

Figure 2: Percent of SBHCs by school level

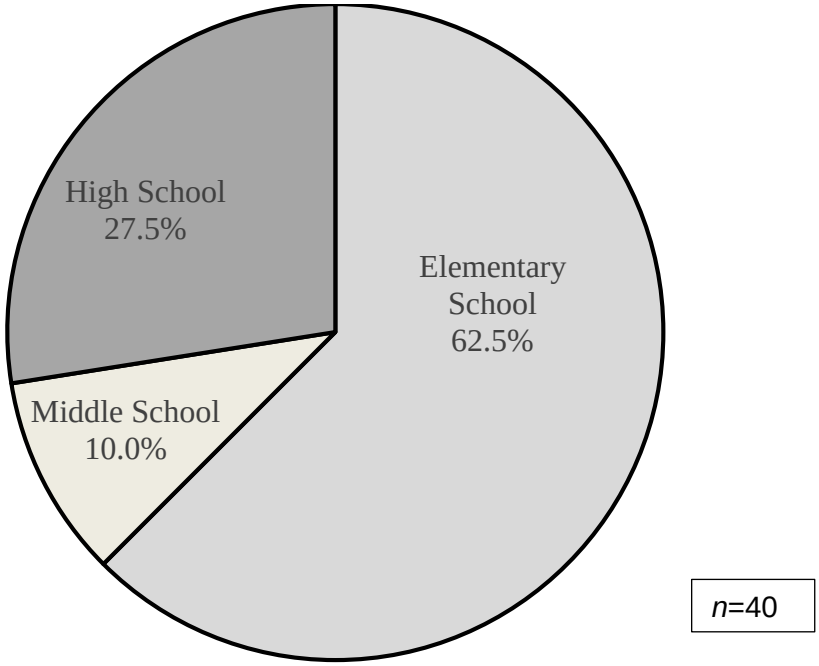


Table 1: Demographic characteristics of schools with SBHCs, by year the SBHC opens

SBHC Opens	School Name	Name	Grades served	Enroll-ment	% FRL	% Minority
2010-11	Robert F. Morehead Middle	Dollarway	6-8	369	92	93
	Owl Creek Elementary	Fayetteville	K-7	618	71	46
	Gurdon High	Gurdon	9-12	243	67	44
	Lavaca Middle	Lavaca	5-8	252	56	5
	Lincoln Elementary	Lincoln	P-5	510	75	17
	Paris High	Paris	9-12	319	54	15
	Jones Elementary	Springdale	K-5	486	96	89
2011-12	Cross County Elementary	Cross County	K-6	320	73	10
	Magazine Elementary	Magazine	P-6	254	79	8
	Acorn Elementary	Ouachita River	K-6	270	77	7
2012-13	Jasper High	Jasper	7-12	232	69	1
	Lamar High	Lamar	9-12	318	62	8
	Prairie Grove Elementary	Prairie Grove	K-2	407	50	8
2013-14	Cedarville Elementary	Cedar Ridge	K-4	301	75	7
	El Dorado High	El Dorado	9-12	1,328	56	58
	Stephens Elem	Little Rock	P-5	357	94	97
	Siloam Springs Intermediate**	Siloam Springs	5-6	626	60	38
	George Elementary	Springdale	K-5	640	85	83
	Yellville-Summit Elementary	Yellville-Summit	K-4	270	70	6
2014-15	Southside Elementary	Southside	P-3	521	62	9
	Malvern Elementary	Malvern	K-4	895	83	42
2015-16	Bradford Elementary	Bradford	K-6	245	76	4
	Bryant Elementary	Bryant	K-5	769	55	33
	Charleston Elementary	Charleston	K-6	477	53	12
	Smackover Elementary	Smackover-Norphlet	K-4	323	56	22
2017-18	Camden Fairview Middle*	Camden Fairview	6-8	548	78	68
	Elkins High*	Elkins	9-12	433	41	10
	Marvell-Elaine High*	Marvell-Elaine	6-12	174	96	96
2018-19	Highland High*	Highland	9-12	522	69	6
	Hope High*	Hope	9-12	598	73	83
	Parson Hills Elementary*	Springdale	K-5	567	95	91
2019-20	Booneville Elementary*	Booneville	PK-6	642	77	13
	Chicot Elementary*	Little Rock	PK-5	544	74	96
	Ida Burns Elementary*	Conway	K-4	370	75	49
	Fouke Elementary*	Fouke	PK-5	530	64	4
	Rose Bud Elementary*	Rose Bud	K-6	411	70	6
2020-21	Jessieville Elementary*	Jessieville	P-5	351	77	10
	Darby Junior High*	Fort Smith	7-9	695	92	76
	Fountain Lake Elementary*	Fountain Lake	K-4	469	57	18
	Sheridan High*	Sheridan	9-12	1,222	40	10
		Sample Wide Averages	-	**486**	**70**	**38**

* Schools with single asterisk are excluded from analytic sample due to limited data availability

** Siloam Springs Intermediate is excluded from the analytic sample, due to a lack of available achievement data.

- Enrollment, school %FRL, school %Min are the figures reported in the state school demographics on the Office for Education Policy (OEP) website for the year the school opens their SBHC. Since these demographic figures do not vary significantly over the years the same totals and rates are used for each year of this study period (academic years 2008-09 to 2018-19).

III. HISTORY OF SCHOOL HEALTH

School-based health in America evolved from concerns over infrastructure, school hygiene, and treating communicable diseases in the 1800 and 1900s, to currently providing primary medical care services such as: physicals, vaccinations, family planning, mental and nutrition health counseling, as well as dental and vision services (Allensworth et al., 2000; Gustafson, 2005; Keeton et al, 2012; "School Health," 2020; Veselak, 2001). In the early 1900s an outbreak of various communicable diseases resulted in an increase in student absenteeism in New York City schools (Keeton et al., 2012). Community spread perpetuated until the first school nurse was hired in 1902 to provide parent and child health education about disease transmission and hygiene, as well as treatment plans for sick students and parents (Allensworth et al., 2000; Shuler, 2000). Over the subsequent year school absenteeism rates dropped by 90% (Veselak, 2001) .

As states enacted laws requiring health and physical education in public schools, school health staff held higher medical credentials and expanded health services to school students, staff, and the wider community (Allensworth et al., 2000). Paralleling these changes in the 1970s, Dr. Philip Porter established the first SBHC in the United States to care for underserved children and communities (Keeton et al., 2012). Given the national success of school health programs and the rapid decline of adolescent health, public health officials promoted SBHCs and similar school health initiatives as solutions to the adolescent health crisis (Gustafson, 2005; Keeton et al., 2012; "School Health.", 2020). Today, addressing healthcare disparities, such as a lack of access to quality healthcare, is essential to improving adolescent health (Allensworth et al., 2000). SBHCs are intended to alleviate barriers to health care access and break the cycle of poverty, poor health, and negative education outcomes by providing convenient healthcare

options that limit, or in some cases eliminate, a parent needing to take time off of work for a child's appointments and the subsequent loss of wages (Allison et al., 2007; Allensworth et al., 2000; Kisker & Brown, 1996; Westbrook 2020).

IV. LITERATURE REVIEW

While tangible improvements in school attendance rates and community health outcomes in the early 1900s supported the early expansion of school-based health, today's school-accountability policies demand evidence of direct SBHC effects on education outcomes (Allensworth et al., 2000; Geierstanger et al., 2005). Heterogeneity of SBHC, varying and unique demographics of SBHC populations, health privacy and other policies posing limitations to accessing data, as well as insufficient resources make an examination of the impacts of SBHCs on education outcomes challenging (Geierstanger et al., 2005; Kisker, 1996; Soleimanpour, 2020; Thomas et al., 2020). When funding, resources, and data are available for studies to examine direct links, however, researchers do not find evidence of benefits, such as academic advancement of students, for large community support services programs (Dobbie & Fryer, 2011). A recent systematic review of SBHC literature finds that although SBHCs are expanding across the United States there remains limited research examining the causal effect of SBHCs on educational outcomes (Thomas et al., 2020). Less rigorous correlational studies, however, do find SBHCs associated with positive student health and education outcomes (Kong et al., 2013; Knopf et al., 2016; Mason-Jones et al., 2012; Thomas et al., 2020).

Designs, Samples, Outcomes

Some SBHC research designs are quasi-experimental studies, but observational studies make-up the majority of SBHC research designs (Knopf et al., 2016; Mason-Jones et al., 2012; Thomas et al., 2020). In certain quasi-experimental designs researchers explore questions about

the impact of specific SBHC services, or whether only a specific subset of the student population benefits from a SBHC and its services (Thomas et al., 2020). On the other hand, observational studies use retrospective student-level data to examine whether SBHC users yield academic and health benefits from accessing the SBHC compared to students who do not access a SBHC (Geierstanger et al., 2005; Kerns et al., 2011; Thomas et al., 2020; Walker et al., 2010). While the existing literature suggest numerous student-level outcomes when accessing an SBHC, there are few SBHC studies examining school-level effects (Bersamin et al., 2016; Westbrook et al., 2020).

Study samples are majority low-income, minority, and urban students (Geierstanger et al., 2005; Knopf et al., 2016; Mason-Jones et al., 2012; Thomas et al., 2020). SBHC study samples are taken from large datasets ranging from hundreds to thousands, or are smaller samples of less than a hundred to just over a hundred for single school cohort studies (Bains & Diallo, 2016; Knopf et al., 2016; Thomas et al., 2020). Samples are often student users and non-users of SBHCs (Knopf et al., 2016). School-level samples are less prevalent and examine an SBHC impact on graduation rates (Westbrook et al., 2020). Studies with student-level and school-level present mixed findings (Thomas et al., 2020).

Key outcomes of interest in SBHC research are education and health (Knopf et al., 2016; Thomas et al., 2020). Education outcome variables include attendance rates, student GPA, grade promotion, drop-out rates, college board exam scores, discipline incidents, and on-time graduation (Bersamin et al., 2016; Geierstanger et al., 2005; Kerns et al., 2011; Knopf et al., 2016; Walker et al., 2010). Health outcome variables are body mass index (BMI), number of asthma attacks, mental health status, vaccination rates, birth control distribution rates, risk-behaviors, and vision or dental screen rates (Kong et al., 2013; Mason-Jones et al., 2012; Taras

& Potts-Datema, 2005). Evidence suggests that moderating and mediating effects exist between SBHC and academic and health outcomes including specific SBHC services (medical, mental, dental or vision), school-type, level of school connectedness, and an SBHC hours of operation (dosage of SBHC services) (Kisker & Brown, 1997; Koenig et al., 2016; Strolin-Goltzman et al., 2012; Thomas et al., 2020).

V. CURRENT STUDY

SBHC research findings present mixed results but most often suggest that a positive or null relationship exists between SBHCs and education and health outcomes (Knopf et al., 2016; Thomas et al., 2020). The Division of Elementary and Secondary Education intends for SBHCs to increase standardized state test scores, reduce student absenteeism, and contribute to the overall improvement of schools' academic success (School-Based Health Centers, n.d.). There is limited research examining the school-level benefits of SBHCs relationship to changes in school-level achievement scores. Therefore, to help inform Arkansas state policy makers about the relationship of SBHCs in Arkansas and contribute to the existing, but limited, knowledge on SBHCs school-level impact on education outcomes we conduct a school-level fixed effects quasi-experimental study. We ask two research questions 1) is the presence of an SBHC associated with a change in school-level achievement scores for Arkansas public schools, and 2) is the presence of an SBHC associated with a change in school-level achievement scores for specific types of schools or specific school populations (i.e. low-income, or majority minority schools)?

Data

Our study time-period runs from academic year 2008-09 to academic year 2018-19, the most recent year for which academic data are available. We used school-level standardized exam

score data through the Office for Education Policy (OEP) at the University of Arkansas. Additional data specific to SBHCs' operations and location, as well as school-level demographics including school enrollment totals, percentage of students receiving free and reduced lunch, and the percentage of minority students are all from the Arkansas Division of Elementary and Secondary Education website and OEP.

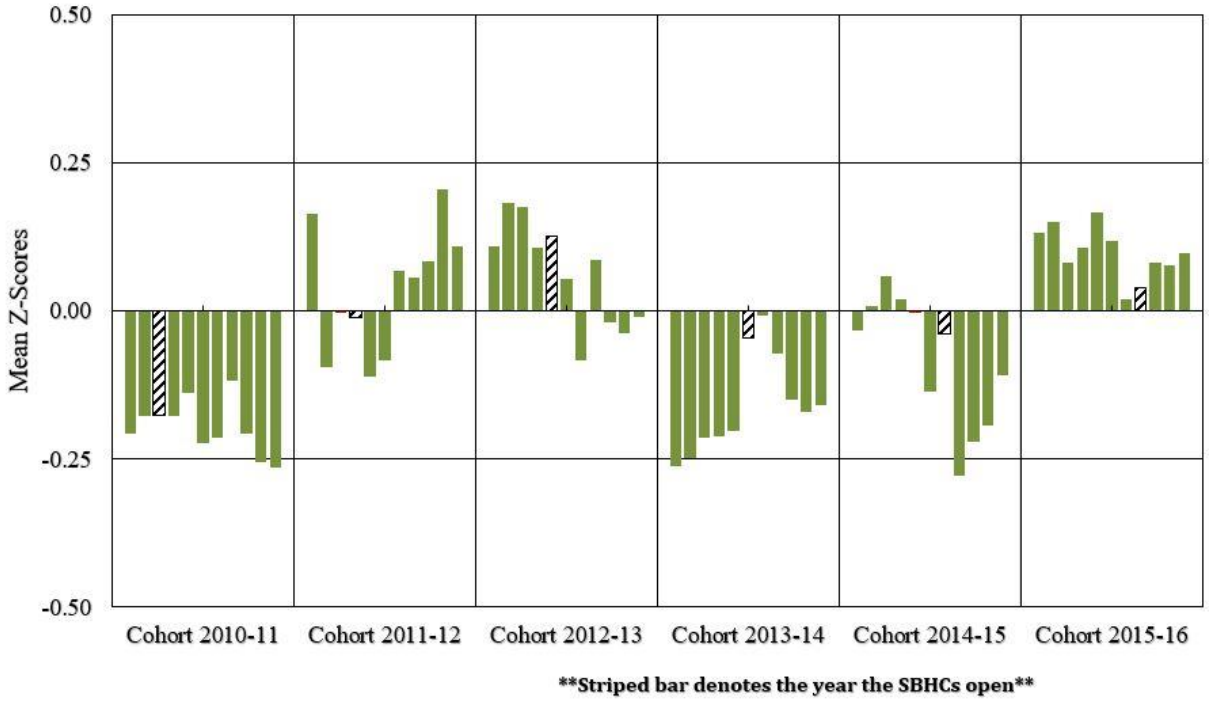
School-level demographic characteristics do not vary significantly over the time period examined. Therefore, figures for school-level enrollment rates, percentage of students receiving free-and-reduced lunch, and the percentage of minority students from the academic year the school opens their SBHC are used in this study (see Table 1). Although there are 40 schools with SBHCs, conducting an effective before-after analysis of the relationship between SBHCs and school-level achievement scores requires that schools have a minimum of two years of baseline (pre-SBHA opening) achievement data available. This two year minimum is consistent with prior research (Johnson et al., 2020). This baseline minimum and the minimum of three years of treatment (post SBHC opening) results in 24 schools with SBHCs and sufficient data to be included in the analytic sample. See Table 1 for a list of schools excluded from the analytic sample.

Descriptive Trends

School-level achievement trends for the 24 schools in our analytic sample show that average school performance does not drastically vary over time. Previously noted, schools open SBHCs at different times. To assess achievement trends, schools that open an SBHC in the same academic year are grouped into cohorts and the average achievement z-score is calculated for each academic year from schools within a given cohort starting in 2008-09 to 2018-19. For example, cohort 2010-11 consists of seven schools (see Table 1 for list of schools by name). The

average cohort achievement score is calculated for school year 2008-09 by adding all the schools' standardized achievement scores that year and dividing by seven. The trends of these cohort averages are visually depicted in Figure 3 with the striped black bar indicating the school year the SBHC opened. School achievement score trends across the six cohorts do not reflect consistent improvement after an SBHC opens on their campus.

Figure 3: Average Annual Achievement Z-scores, by SHBC Opening Year Cohort

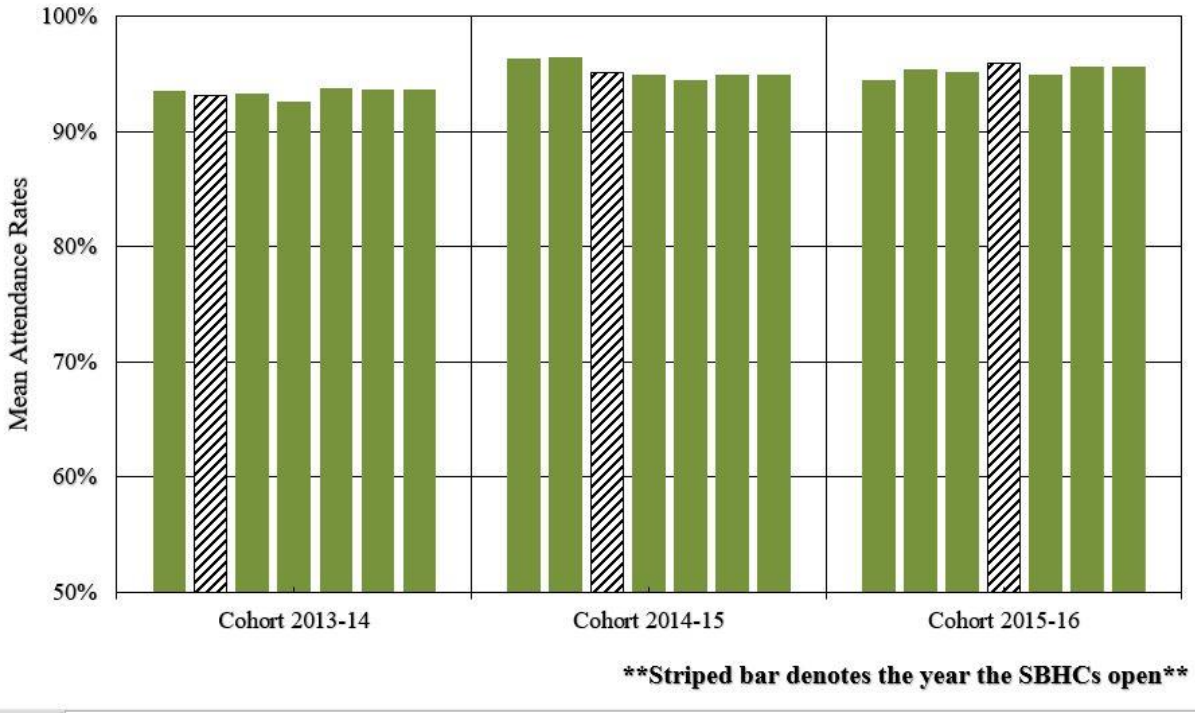


SBHCs are associated with a reduction in school absenteeism rates (Knopf et al., 2016; Thomas et al., 2020). Data limitations prohibit us from conducting an empirical analysis of the relationship between SBHCs and absenteeism rates for Arkansas schools, but a preliminary inspection of the available attendance data suggests that the presence of an SBHC is not associated with a change in school level attendance rates. Attendance data is available beginning in academic year 2012-13 to present day. Study years for this analysis are 2008-09 to 2018-19.

The first SBHCs opened in school year 2010-11. Therefore, the analytic sample of 24 schools used to estimate the relationship between SBHCs and achievement scores is reduced to 11 schools with available attendance data. Again, schools are grouped into cohorts based on when their SBHC opened. For example, cohort 2013-14 consists of five schools (see Table 1 for list of schools by name). The average cohort attendance rate is calculated for school year 2012-13 by adding all the schools' attendance rates that year and dividing by five. The trends of these cohort averages are visually depicted in Figure 4 with the striped black bar indicating the school year the SBHC opened.

Although limited data precludes us from empirically investigating the relationship between SBHCs and attendance rates for Arkansas public schools, available data do not indicate improved attendance rates after SBHC opening.

Figure 4: Average annual attendance Rates, by SHBC opening year cohort



Analytic Sample

Seventeen of the schools in this sample are elementary schools, two are middle schools, and five are high schools (see Table 1). These twenty-four schools vary in size, percentage of students at the school receiving free and reduced lunch, as well as the percentage of students at the school that are a racial or ethnic minority (see Table 1). The OEP publishes annual school-level demographic reports for all Arkansas public schools. To examine the relationship between SBHCs on schools with a majority minority student population and academic achievement we use the OEP reports of the total percentage of minority students at each school with an SBHC in this sample. Total school minority percentage as the sum of the percentage of students who are black, Hispanic, Pacific Islanders, Native Americans or two or more races, as. As evident in Table 1, although correlated (R=0.63), a school's high or low percentage of minority students is not synonymous with a school's percentage of students receiving free and reduced lunch. In fact, every school in this sample reports a majority student population receiving free and reduced lunch but the percentage of minority students enrolled ranges from one to 97.

Empirical Approach

To assess the relationship between opening an SBHC and change in school-level achievement scores, we make within-school comparisons, before-after, in schools that open SBHCs over the study period using school-level fixed effects to control within-school variation over time. We control for school-level demographics because they are correlated with the outcome variable (see Table 2). As the school's percentage of students receiving free and reduced lunch increases, school achievement scores decrease (-0.605). Similarly, when a school's percentage of minority students increase school achievement scores decrease (-0.636).

Not surprisingly, a school's percentage of students receiving free and reduced lunch is positively correlated with the percentage of minority students (0.625).

Table 2: Correlation Matrix for Dependent and Independent Variables (n=24)

Variables	Achievement z-score	School Enrollment	% FRL	% MIN	SBHC	Elem. School	Middle School	High School
Achievement z-score	1.000							
School enrollment	0.056	1.000						
% FRL	-0.605	-0.121	1.000					
% Minority	-0.635	0.341	0.625	1.000				
SBHC	-0.102	-0.099	0.084	0.045	1.000			
Elementary School	0.164	0.048	0.252	-0.026	-0.138	1.000		
Middle School	-0.314	-0.210	0.075	0.180	0.121	-0.470	1.000	
High School	0.030	0.090	-0.333	-0.093	0.072	-0.799	-0.155	1.000

The dependent variable, school-level standardized achievement scores, is a continuous variable. The independent continuous variables are percentage of students receiving free-reduced lunch and percentage of minority students, and school enrollment total is a discrete independent variable. Residual plots show heteroskedastic variance for the error terms in school enrollment totals, a violation of the constant errors' assumption (see Appendix, Figure A1). The independent variable of interest is SBHC, a dummy variable indicating the presence or absence of an SBHC at a given Arkansas public school in a specific academic year. Three other dummy independent variables are school levels, taking on a value of one when if the school is either elementary, middle, or high school and a value of zero in the remaining school level categories. For example, an elementary school is identified by a value of one for the school level elementary variable and a zero for the school level variables middle and high school. Previous research finds a moderating effect of SBHCs by school level (Strolin-Goltzman et al., 2012). Our

analysis examines whether school level is a moderating factor in identifying an association between Arkansas SBHCs and achievement. In our analytic sample elementary schools are correlated with an increase in school achievement scores (0.1638) whereas middle schools are negatively related (-0.3138) (see Table 2). High schools are positively correlated with an increase in school achievement scores, but the relationship is minor (0.0303). These correlational findings might be indicative of the variation in school level prevalence within our sample with the majority being elementary schools (see Table 1). Regression analysis will provide us with estimates of the relationship between SBHCs and different school levels so we can understand the correlational relationship in greater detail.

Additionally, we generate interaction terms to examine if the impact of an SBHC differs across school level and school demographic characteristics. We create three interaction terms with dummy and continuous variables: an SBHC dummy variable and percentage of students receiving free and reduced lunch (SBHC*FRL), an SBHC dummy variable and percentage of minority students (SBHC*MIN), and an SBHC dummy variable and school enrollment totals (SBHC*Sch_Enroll). Two additional interactions represent the specific relationship of SBHCs and school level. For example, an interaction for an SBHC dummy variable and elementary schools (SBHC*Elem.) and an SBHC dummy variable and high schools (SBHC*High). Middle schools are the comparison group used when interpreting school level regression coefficients.

Lastly, we generate school-level fixed effects so that each school serves as their own control group. Given that the demographic characteristics of schools in this sample do not change significantly over time, fixed effects allow us to control for all possible unobservable characteristics of the schools in this study. A fixed effects method allows us to make comparisons within individual schools and then average the differences across all the schools in

the sample. School fixed effects are statistically significant for all schools in this sample in what makes them different from each other.

Data Analysis

We use the statistics and data statistical software package (STATA) to run a series of ordinary least squares regression models. To correct for the finding of heteroskedastic error terms, robustness checks are part of each regression model. The initial model, a simple linear regression, estimates the presence of an SBHC on school-level achievement scores. A second model, a multi-variable linear regression model, includes an SBHC dummy variable as well as school demographic characteristics and school types as control variables. A third model, a fixed effect linear regression model, regresses school level standardized achievement scores on an SBHC dummy variable and school-level fixed effects. A fourth and final model, a multi-variable linear regression model, includes an SBHC dummy variable, all demographic control variables, as well as interaction variables.

Research question one

Our third model, a fixed effects linear regression analysis, allows us to answer the first research question, "Is the presence of an SBHC associated with a change in school-level standardized achievement scores for Arkansas Public Schools?" The hypothesis is that the presence of an SBHC results in a positive and statistically significant change in school-level standardized achievement scores. We calculate this estimate using the following fixed effects regression model:

Equation 1:

$$academY_{it} = \alpha_i + \beta_1 X_{it} + \beta_2 SBHC + \varepsilon$$

where $academY_{it}$ is the continuous dependent variable, school-level achievement scores, for school *i* in academic year *t*, α_i is a constant, X_{it} is a school-level fixed effect, $SBHC$ is a school-based health center dummy variable, and ε represents the error term. β_2 is the coefficient of interest.

Research question two

Our fourth model, a multi-variable linear regression model with demographic controls and interaction terms, allows us to answer the second research question, "Is the presence of an SBHC associated with a change in school-level achievement scores for specific types of schools or specific school populations (i.e. low-income, or majority minority schools)?" The hypothesis is that the presence of an SBHC results in a positive and statistically significant change in standardized achievement scores for elementary and high schools and among low-income and minority school populations. We calculate this estimate using the following multi-variable linear regression model with demographic controls and interaction terms:

Equation 2:

$$academY_{it} = \alpha_i + \beta_1 SBHC_{it} + \beta_2 frl_{it} + \beta_3 min_{it} + \beta_4 sch\_enroll_{it} + \beta_5 schtype\_elem_{it} + \beta_6 schtype\_high_{it} + \beta_7 SBHC * frl_{it} + \beta_8 SBHC * min_{it} + \beta_9 SBHC * sch\_enroll_{it} + \beta_{10} SBHC * Elem_{it} + \beta_{11} SBHC * High_{it} + \varepsilon$$

where $academY_{it}$ is the continuous dependent variable, school-level achievement scores, for school *i* in academic year *t*, α_i is a constant, $SBHC_{it}$ is a school-based health center dummy variable, frl_{it} is the percentage of students at school *i* receiving free and reduced lunch, min_{it} is the percentage of minority students at school *i*, sch_enroll_{it} is total school enrollment rate at school *i*, $schtype\_elem_{it}$ is an elementary school, school type dummy variable, $schtype\_high_{it}$ is a high school, school type dummy variable, $SBHC * frl_{it}$, $SBHC * min_{it}$, $SBHC *$

sch_enroll_{it}, $SBHC * Elem_{it}$, $SBHC * High_{it}$ are a series of interaction terms for all demographic and school type characteristics, and ε represents the error term. β_7, β_8, $\beta_{10}, and\ \beta_{11}$ are the coefficients of interest to answer this research question.

VI. RESULTS

Research Question 1. The fixed effects regression analysis shows that on average there is no statistically significant relationship between the presence of an SBHC and changes in academic achievement scores. The presence of an SBHC is associated with a 0.014 standard deviation decrease in school-level achievement scores, but this finding is not statistically significant at any confidence level (see Table 3). *Research Question 2.* The multivariate linear regression model with demographic controls and interaction terms reveals no statistically significant relationship between the presence of an SBHC and changes in academic achievement scores. On average the presence of an SBHC is associated with a 0.001 standard deviation increase in school-level achievement scores as a school's percentage of students receiving free and reduced lunch increases. A similar positive association (0.002) is found with the presence of an SBHC and an increase in percentage of minority students. However, both positive findings are not statistically significant. Similarly, the presence of an SBHC is associated with a 0.031 increase in standardized school-level achievement scores for elementary schools and a 0.172 decrease in scores for high schools, when both are compared to middle schools, but neither of these findings are statistically significant at any confidence level (see Table 3)

Table 3: Regression Estimates for School-level Standardized Achievement Scores (n=24)

Variables	Basic Regression	Multivariate Linear Regression	Fixed-effects Regression	Interactions Regression
SBHC	-0.059*	-0.001	-0.014	-0.124
	(0.035)	(0.023)	(0.022)	(0.188)
% School FRL		-0.008***	-	-0.008***
		(0.001)		(0.001)
% School MIN		-0.004***	-	-0.005***
		(0.001)		(0.000)
School Enrollment		0.000***	-	0.000
		(0.000)		(0.000)
School Type: Elem.		0.210***	-	0.201***
		(0.044)		(0.065)
School Type: High		-0.090*	-	0.217***
		(0.058)		(0.061)
SBHC*FRL		-	-	0.001
		-		(0.003)
SBHC*MIN		-	-	0.002
				(0.001)
SBHC*Sch_Enroll		-	-	0.000
				(0.000)
SBHC*Elem.		-	-	0.031
				(0.078)
SBHC*High		-	-	-0.172
				(0.084)
Constant	-0.037	0.440***	-0.750***	0.451***
	(0.028)	(0.010)	(0.066)	(0.126)
R-Squared	0.010	0.562	0.709	0.597

Note: ***p<0.01, **p <0.05, *p<0.1
Robust standard errors in parentheses

VII. CONCLUSION

This study explores whether the presence of an SBHC is associated with a change in school-level standardized achievement scores and if an SBHC is specifically associated with a change at certain school levels (elementary and high) as well as schools with higher percentages

of minority students and students receiving free and reduced lunch in Arkansas public schools with SBHCs on campus. We find that no benefits for school's achievement scores by having an SBHC on campus even when we consider a potential moderating association being specific school levels (elementary, middle, or high).

The lack of significant findings in our current study could be the result of a key study limitation; a small sample size (n=24) and therefore a lack of study power. Another limitation in this study is not including SBHCs services as covariates. For example, Kisker & Brown (1997), and Koenig et al. (2016), find SBHCs available services (medical, mental, dental, or vision) are mediating variables between SBHCs and academic and health outcomes. Accessing mental health services at an SBHC is an especially strong mediating variable between SBHCs and improvements in education and health outcomes (Bains & Diallo, 2016; Zhang et al., 2020).

VIII. FUTURE RESEARCH AND IMPLICATIONS FOR PUBLIC HEALTH

This study contributes to the literature on SBHCs in two ways, questioning the promotion of SBHCs as good Arkansas education policy, and suggesting changes in school-level achievement scores may only manifest after significant time passes. First, results from this study suggest SBHCs in Arkansas are not statistically significantly associated with improving school-level achievement scores. These null findings echo those in previous research examining SBHCs association with improving education outcomes (Knopf et al., 2016; Thomas et al., 2020). That said, a lack of benefit for school-level achievement scores does not imply an overall dearth in benefits from an SBHC to student's health and education outcomes, as well as the wider community. Future research should explore the perhaps heterogeneous benefits of Arkansas SBHCs to provide policy makers with a complete understanding of whether SBHCs support

education outcomes. For now, we hope policy makers and school administrators are enlightened by these findings and will prudently consider adjusting the goals for Arkansas SBHCs by eliminating "improve standardized test scores". At the very least, key stakeholders might want to adjust their expectations of seeing improvements to achievement scores with the opening of an SBHC on campus. Second, perhaps these findings fail to show significant academic benefits from SBHCs because effects are not evident within the first ten years of SBHCs operating. If this is true, then policy makers need to consider a cost-benefit-analysis to examine an appropriate timeline to begin to see a beneficial return on the investments put into opening an SBHC. In conclusion, findings from this study corroborate with Soleimanpour (2020) and Thomas et al. (2020), who suggest that further rigorous research is needed to explore the causal effect of SBHCs on education outcomes.

REFERENCES

Allensworth, D., Lawson, E., Nicholson, L., Wyche, J., K-12, Committee on Comprehensive School Health Programs in Grades, Medicine, I. o., . . . Institute of Medicine. (2000;1997;). In James Wyche, Lois Nicholson, Diane Allensworth and Elaine Lawson (Eds.), *Schools and health: Our nation's investment*. Washington, D.C: National Academies Press. doi:10.17226/5153

Allison, M. A., Crane, L. A., Beaty, B. L., Davidson, A. J., Melinkovich, P., & Kempe, A. (2007). School-based health centers: Improving access and quality of care for low-income adolescents. *Pediatrics, 120*(4), e887-e894. doi:10.1542/peds.2006-2314

Bains, R. M., & Diallo, A. F. (2016). Mental health services in school-based health centers: Systematic review. *The Journal of School Nursing, 32*(1), 8-19. doi:10.1177/1059840515590607

Basch, C. E. (2011). Healthier students are better learners: A missing link in school reforms to close the achievement gap. *The Journal of School Health, 81*(10), 593-598. doi:10.1111/j.1746-1561.2011.00632.x

Belson, S.I., Snelling, A., Heap, E. (2018). Reconsidering Maslow: The role of the school health policy in a holistic approach to child health and wellness. *Journal of Education & Social Policy, 5*(4), 9-19. doi:10.30845/jesp.v5n4p2

Bersamin, M. M., Fisher, D. A., Gaidus, A. J., & Gruenewald, P. J. (2016). School-based health centers' presence: The role of school and community factors. *American Journal of Preventive Medicine, 51*(6), 926-932. doi:10.1016/j.amepre.2016.06.025

Birch, D. A., & Auld, M. E. (2019). Public health and school health education: Aligning forces for change. *Health Promotion Practice, 20*(6), 818-823. doi:10.1177/1524839919870184

Brindis, C. D. (2016). The “State of the state” of school-based health centers: Achieving health and educational outcomes. *American Journal of Preventive Medicine, 51*(1), 139-140. doi:10.1016/j.amepre.2016.03.004

Dobbie, W., & Fryer, R. G. (2011). Are high-quality schools enough to increase achievement among the poor? evidence from the Harlem children's zone. *American Economic Journal. Applied Economics, 3*(3), 158-187. doi:10.1257/app.3.3.158

Geierstanger, S. P., Amaral, G., & National Assembly on School-Based Health Care (NASBHC). (2005). *School-based health centers and academic performance: What is the intersection? April 2004 meeting proceedings. white paper.* ().National Assembly on School-Based Health Care.

Guo, J. J., Wade, T. J., Pan, W., & Keller, K. N. (2010). School-based health centers: Cost–Benefit analysis and impact on health care disparities. *American Journal of Public Health (1971), 100*(9), 1617-1623. doi:10.2105/ajph.2009.185181

Gustafson, E. M. (2005). History and overview of school-based health centers in the US. *The Nursing Clinics of North America, 40*(4), 595-606. doi:10.1016/j.cnur.2005.08.001

Johnson, V., Ellis, R. S., & Hutcherson, V. (2020). Evaluating a strategy for implementation and sustainability of School-Based health centers in 3 disparate communities. *The Journal of School Health, 90*(4), 286-294. doi:10.1111/josh.12875

Keeton, V., Soleimanpour, S., & Brindis, C. D. (2012). School-based health centers in an era of health care reform: Building on history. *Current Problems in Pediatric and Adolescent Health Care, 42*(6), 132.

Kerns, S. E. U., Pullmann, M. D., Walker, S. C., Lyon, A. R., Cosgrove, T. J., & Bruns, E. J. (2011). Adolescent use of school-based health centers and high school dropout. *Archives of Pediatrics & Adolescent Medicine, 165*(7), 617.

Kisker, E. E., & Brown, R. S. (1996). Do school-based health centers improve adolescents' access to health care, health status, and risk-taking behavior? *Journal of Adolescent Health, 18*(5), 335-343. doi:10.1016/1054-139X(95)00236-L

Knopf, J. A., Finnie, R. K. C., Peng, Y., Hahn, R. A., Truman, B. I., Vernon-Smiley, M., . . . Community Preventive Services Task Force. (2016). School-based health centers to advance health equity: A community guide systematic review. *American Journal of Preventive Medicine, 51*(1), 114-126. doi:10.1016/j.amepre.2016.01.009

Koenig, K. T., Ramos, M. M., Fowler, T. T., Oreskovich, K., McGrath, J., & Fairbrother, G. (2016). A statewide profile of frequent users of School-Based health centers: Implications for adolescent health care. *The Journal of School Health, 86*(4), 250-257. doi:10.1111/josh.12374

Kong, A. S., Sussman, A. L., Yahne, C., Skipper, B. J., Burge, M. R., & Davis, S. M. (2013). School-based health center intervention improves body mass index in overweight and obese adolescents. *Journal of Obesity, 2013*, 575016-10. doi:10.1155/2013/575016

Love, H. E., Schlitt, J., Soleimanpour, S., Panchal, N., & Behr, C. (2019). Twenty years of school-based health care growth and expansion. *Health Affairs (Project Hope), 38*(5), 755-764. doi:10.1377/hlthaff.2018.05472

Mason-Jones, A. J., Crisp, C., Momberg, M., Koech, J., De Koker, P., & Mathews, C. (2012). A systematic review of the role of school-based healthcare in adolescent sexual, reproductive, and mental health. *Systematic Reviews, 1*(1), 49-49. doi:10.1186/2046-4053-1-49

Paschall, M. J., Bersamin, M., Finan, L. J., & Zhang, L. (2019). School-based health services and educational attainment: Findings from a national longitudinal study. *Preventive Medicine, 121*, 74-78. doi:10.1016/j.ypmed.2019.02.019

School-Based Health Centers. (n.d.). Retrieved from http://dese.ade.arkansas.gov/divisions/learning-services/school-health-services/school-based-health-center

School-based health center recipient by school year [Online image]. (2010). Division of elementary and secondary education. http://dese.ade.arkansas.gov/public/userfiles/Learning_Services/School_Health_Services/2010-2020_SBHC_locations_UPDATE_10_8_2020RV.pdf

"School Health." Encyclopedia of Public Health. . Retrieved October 16, 2020 from Encyclopedia.com: https://www.encyclopedia.com/education/encyclopedias-almanacs-transcripts-and-maps/school-health

Shuler, P. A. (2000). Evaluating student services provided by School-Based health centers: Applying the shuler nurse practitioner practice model. The Journal of School Health, 70(8), 348-352. doi:10.1111/j.1746-1561.2000.tb07272.x

Soleimanpour, S. (2020). School-based health centers: At the intersection of health and education. *Journal of Adolescent Health, 67*(3), 317-318. doi:10.1016/j.jadohealth.2020.05.009

Strolin-Goltzman, J., Sisselman, A., Auerbach, C., Sharon, L., Spolter, S., & Corn, T. B. (2012). The moderating effect of school type on the relationship between school-based health centers and the learning environment. *Social Work in Public Health, 27*(7), 699-709. doi:10.1080/19371910903323815.

Taras, H., & Potts-Datema, W. (2005). Childhood asthma and student performance at school. *The Journal of School Health, 75*(8), 296-312. doi:10.1111/j.1746-1561.2005.00041.x

Thomas, C. L., Price, O. A., Phillippi, S., & Wennerstrom, A. (2020). School-based health centers, academic achievement, and school discipline: A systematic review of the literature. *Children and Youth Services Review, 118*, 105467. doi:10.1016/j.childyouth.2020.105467

Veselak, K. E. (2001). Historical steps in the development of the modern school health program. *The Journal of School Health, 71*(8), 369-372. doi:10.1111/j.1746-1561.2001.tb03518.x

Walker, S. C., Ph.D, Kerns, S. E. U., Ph.D, Lyon, A. R., Ph.D, Bruns, E. J., Ph.D, & Cosgrove, T. J., M.S.W. (2010). Impact of school-based health center use on academic outcomes. *Journal of Adolescent Health, 46*(3), 251-257. doi:10.1016/j.jadohealth.2009.07.002

Westbrook, M., Martinez, L., Mechergui, S., & Yeatman, S. (2020). The influence of school-based health center access on high school graduation: Evidence from Colorado. *Journal of Adolescent Health, 67*(3), 447-449. doi:10.1016/j.jadohealth.2020.04.012

Whole School, Whole Community, Whole Child (WSCC). (2020, February 10). Centers for Disease Control and Prevention. Retrieved November 18, 2020, from https://www.cdc.gov/healthyschools/wscc/index.htm

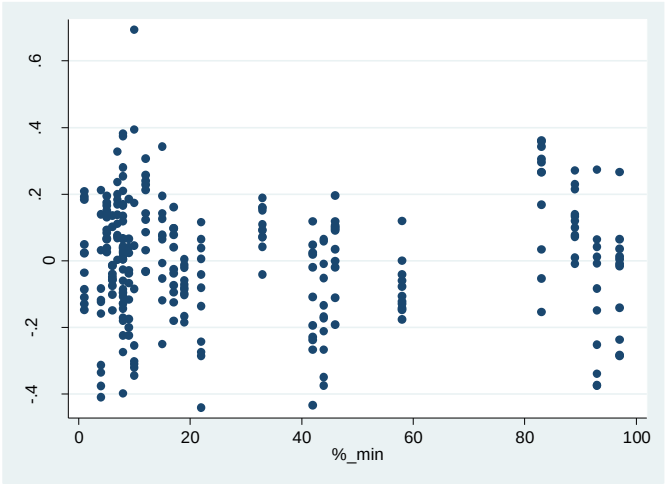
Zhang, L., Finan, L. J., Bersamin, M., & Fisher, D. A. (2020). Sexual Orientation–Based depression and suicidality health disparities: The Protective role of School-Based health centers. *Journal of Research on Adolescence, 30*(S1), 134-142. doi:10.1111/jora.12454

APPENDIX

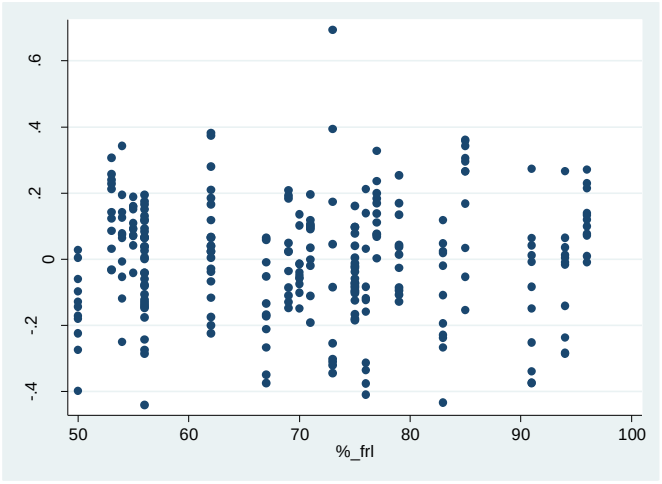
Table A1: *Available Services at Arkansas SBHCs*

Year SBHC Opens	School Name	Medical	Mental Health	Dental	Vision
2010-11	Robert F. Morehead Middle	Yes	Yes	No	Yes
	Owl Creek Elem	Yes	Yes	No	No
	Gurdon High	Yes	Yes	No	No
	Lavaca Middle	Yes	Yes	Yes	Yes
	Lincoln Elem	Yes	Yes	No	No
	Paris High	Yes	Yes	Yes	Yes
	Jones Elem	Yes	Yes	No	No
2011-12	Cross County Elem	Yes	Yes	No	No
	Magazine Elem	Yes	Yes	Yes	Yes
	Acorn Elem	Yes	Yes	Yes	No
2012-13	Jasper High	Yes	Yes	Yes	No
	Lamar High	Yes	Yes	No	No
	Prairie Grove Elementary	Yes	Yes	Yes	Yes
2013-14	Cedarville Elem	Yes	Yes	Yes	Yes
	El Dorado High	Yes	Yes	Yes	No
	Stephens Elem	Yes	Yes	Yes	No
	Siloam Springs Intermediate	Yes	Yes	No	No
	George Elem	Yes	Yes	No	No
	Yellville-Summit Elem	Yes	Yes	Yes	No
2014-15	Southside Elem	Yes	Yes	Yes	Yes
	Malvern Elem	Yes	No	No	No
2015-16	Bradford Elem	Yes	Yes	Yes	Yes
	Bryant Elem	Yes	Yes	Yes	Yes
	Charleston Elem	Yes	Yes	Yes	Yes
	Smackover Elem	Yes	No	Yes	No
2017-18	Camden Fairview Middle	Yes	Yes	No	Yes
	Elkins High	Yes	Yes	Yes	Yes
	Marvell-Elaine High	Yes	Yes	No	No
2018-19	Highland High	Yes	Yes	No	No
	Hope High	Yes	Yes	Yes	Yes
	Parson Hills Elem	Yes	Yes	No	No
2019-20	Booneville Elem	Yes	Yes	No	No
	Chicot Elem	Yes	Yes	No	No
	Ida Burns Elem	Yes	Yes	No	No
	Fouke Elem	Yes	Yes	No	No
	Rose Bud Elem	Yes	Yes	No	No
2020-21	Jessieville Elem Darby Junior High Fountain Lake Elem Sheridan High		Data Unavailable		
Total Number of Schools Offering Services		**46**	**44**	**17**	**13**

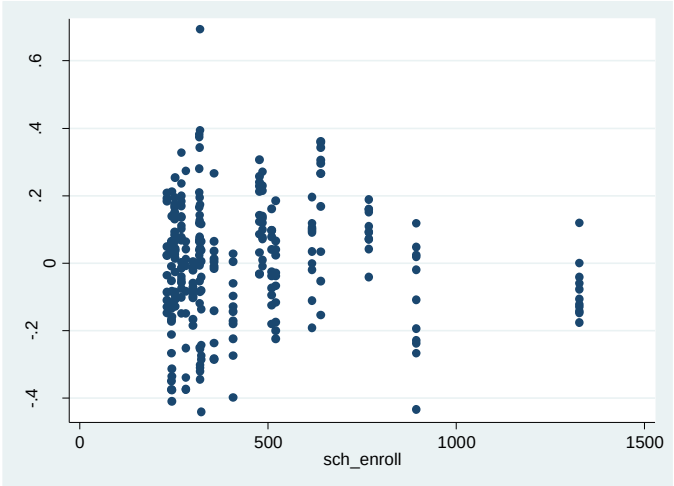
Figure A1: *Residual plot series shows unequal variance among regression model covariates* (percent minority-*plot a*, precent free and reduced lunch-*plot b*, school enrollment-*plot c*)



a.



b.



c.