School-Based Health Services and Adolescents' Educational Outcomes
Is Service Provision Associated With Better Outcomes and Reduced Achievement Gaps?

Paper presented at the 2010 Population Association of America Annual Meeting

Jane E. Rochmes

University of Michigan
Department of Sociology, Ford School of Public Policy
and Population Studies Center

Please direct all correspondence to Jane Rochmes, Population Studies Center, Institute for Social Research, University of Michigan, 426 Thompson St., No. 2274, Ann Arbor, MI 48106; jrochmes@umich.edu; 510-548-7373. Support for this research was provided by an NICHD training grant to the Population Studies Center at the University of Michigan. David Cohen, David Harding, David Featherman, Amy Cooter, Alexandra Killewald, Anju Paul, Jessi Streib, and Jessica Wiederspan provided valuable comments on earlier versions of this paper. This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.

School-Based Health Services and Adolescents' Educational Outcomes
Is Service Provision Associated With Better Outcomes and Reduced Achievement Gaps?

Abstract

This paper examines the link between school-based health services and educational outcomes, and whether these services contribute to reducing racial achievement disparities. Research on health and education indicates that unhealthy students are poorly positioned to learn. Providing health-related services on campus increases students' access to needed services, making students healthier, potentially enhancing their opportunities to learn and leading to improved academic performance. Using data from the National Longitudinal Study of Adolescent Health, I identify 15 different health services that schools may provide and develop a measure of school-based service provision. I employ multilevel regression models to ascertain how this aspect of school context relates to adolescents' achievement, measured by whether they received a failing grade in a core academic course. Further, I explore the existence of heterogeneous effects of service provision across racial/ethnic subpopulations; I examine whether greater health service provision on school campus mitigates observed achievement disparities between white, African American, Hispanic, and Asian students. The results provide mixed support for the significance of the relationship of interest. School-based health service provision is positively related to academic outcomes: increases in services are associated with significantly lower odds of failing a core academic course— but any extent to which this relationship varies by racial/ethnic group is slight and not statistically significant. I discuss explanations for these results, as well as future directions for this line of inquiry within my larger research project.

Introduction

It is commonly understood in the sociology of education that students neither enter nor proceed through school on equal footing—that differences in parents' and children's demographic characteristics and economic, social, and cultural capital put some students at an advantage over others in achieving and maintaining educational success. But if the influence of student background on academic achievement is widely accepted, the independent role that schools play in educational outcomes is less so. While the existence of "school effects" has been the matter of some controversy over the past half-century, to date a broad literature demonstrates that schools can influence student achievement beyond what background characteristics would imply (for an excellent summary of some of this research, see Hallinan 1988). The implication of positive school effects, moreover, is that some school features ought to ameliorate disadvantages that emerge outside of school grounds, and that schools are not powerless in the face of achievement disparities.

Schools today face intense accountability for low achievement and failure among their students. And the passage of the No Child Left Behind Act of 2001 (NCLB) brought unprecedented public attention to racial disparities in academic outcomes and held schools responsible for ameliorating them. At the same time, and although they often support the goals of school reform, critics contend that schools are being held responsible for academic problems that preexist children's arrival at school. David J. Armor (2008) argues,

> Existing achievement gaps are not caused by schools; they are caused by powerful family risk factors that impact children well before they enter school, and they continue to operate throughout the school years. This does not mean that school programs cannot overcome the disadvantages from family background, but it is fair to say that, at the present time, there is no consensus on explicit education policies and practices that promise to work (p. 323-324).

As this statement implies, there are numerous ways that schools might seek to address children's disadvantages and the sources of achievement disparities, but ideal interventions remain under study and debate.

Health concerns are one risk factor emerging outside of school that some students must cope with. Research has demonstrated an interdependent relationship between health and achievement: scholastic difficulty often precedes health concerns and health problems have been shown to hinder academic success (Haas 2006; Ross and Wu 1995). Both major and minor health problems can exist prior to school entry, as well as recur throughout elementary and secondary school. Beyond the long-term effects that poor health in infancy and childhood can have on development, health and education interact in a more immediate sense because sick youths are not in a good position to learn (Dilley 2009; Geierstanger and Amaral 2005; Needham, Crosnoe, and Muller 2004; Novello, DeGraw, and Kleinman 1992). The distraction of headaches, stomachaches, cuts and scrapes, or breathing difficulties are a challenge for any curriculum to overcome (Symons et al. 1997), and illnesses or mental health issues that cause absences reduce the seat-time necessary to learn. Under the NCLB accountability regime, pressure to direct resources toward meeting accountability goals may dissuade school systems from focusing on student health (Rosas, Case, and Tholstrup 2009). But since health problems can negatively impact academic performance, it makes sense to examine them in the context of a focus on advancing achievement; and because schools are the primary social institution with which children and adolescents have contact, it makes sense to examine the varied ways that school policies and programs relate to student well-being. Given their level of involvement with youths, schools are in a unique position to impact health status and opportunities to learn. But in

what ways do schools meet their students' educational needs by also influencing their health? Can schools play a significant role in this capacity?

Like other school effects research, this study analyzes the impact schools have on student achievement; however, it is grounded in the notion that schools may be able to influence the relationship between student "background" factors—such as health—and educational outcomes that other education literature has shown to be of importance for students' learning (Gamoran 1987). This study examines one way that schools attempt to influence their students' health and potentially mediate negative effects that health problems can have on education. I undertake a broad view of the health services that schools provide on campus and the effect that school-based health service provision has on academic achievement. I use nationally representative data on schools and adolescents from the National Longitudinal Study of Adolescent Health (Add Health) to identify 15 different health-related services that schools across the United States may provide (such as physicals, diagnostic screenings, family planning, treatment of minor illnesses and injuries, and emotional counseling). Moreover, the clustered nature of the data provides extensive information on over 18,000 adolescents as well as rich data on their school contexts for 129 schools. Focusing on the outcome of failing a core academic course, I use multilevel models to examine racial disparities in achievement among whites, Hispanics, African Americans, and Asians. My modeling strategy involves controlling for numerous predictors of achievement at both the student and school level, before finally testing the effect of school service provision on course failure and whether this effect varies by race—potentially mitigating achievement gaps—net of other influences, to answer the following research questions:

- What influence do school-based health services have on adolescents' academic outcomes?

- Do school-based health services reduce achievement gaps? That is, are they particularly influential in the educational outcomes of certain racial or ethnic subpopulations?

I first orient the reader to the school effects literature that justifies examining how an aspect of school context like school-based health service provision impacts educational outcomes. I then discuss other relevant literature concerning the relationship between health and education, empirical work on racial disparities in health and education, the history of school-based health services and research focused on them, and the existing evidence that providing health services on school campus is beneficial for academic outcomes. I then review my data and sample, the specific measures included in this study, and the framework of multilevel modeling. I proceed through the results, which demonstrate that school health service provision is beneficial for students' educational outcomes—reducing the school average odds of student failure—but does not differ in effect across students of various racial/ethnic backgrounds and thus is unlikely to reduce achievement disparities. I conclude by discussing the implications of these results, some limitations to the study, and potential future work that may further illuminate the positive benefits school-based health services have for student achievement.

Background

The Debate Over School Effects

The 1966 publication of Coleman et al.'s *Equality of Educational Opportunity*, commonly known as the Coleman Report, touched off an intense debate about how much schools differentially influence academic achievement. Coleman et al. used national data on students and schools to calculate the amount of variance in student achievement that was

accounted for by school characteristics, finding that it was quite small and that family background is the main force driving achievement differences. Thus, the researchers contended, "The school appears unable to exert independent influences to make achievement levels less dependent on the child's background" (see Coleman 1990, p. 78). The implication that schools do not "make a difference" sparked great controversy and further research into school effects on students' outcomes.

Numerous embedded debates have emerged as the school effects literature has broadened, such as a long-standing debate over the importance of school resources and funding, which were important aspects of the Coleman Report's analyses (e.g. Hanushek 1989, 2004; Hedges, Laine, and Greenwald 1994; Payne and Biddle 1999; Wenglinsky 1997). Other school effects literature has considered broad structural features of schools such as sector (e.g. Coleman, Hoffer, and Kilgore 1982) and size (e.g. Lee 2000), and organizational/cultural features such as charter schooling (e.g. CREDO 2009), comprehensive school reform designs (e.g. Cohen et al. forthcoming; Rowan et al. 2009), and "no excuses" climates (e.g. Woodworth et al. 2008). Beyond such characteristics, features of the classroom such as class size (e.g. Krueger 1999) or ability grouping (e.g. Oakes 2005), or even teachers' preparation and qualifications (e.g. Darling-Hammond et al. 2005; Decker, Mayer, and Glazerman 2004)—to mention just a few—are ways that researchers have studied school influences on student achievement, and might broadly be considered under the umbrella of school effects research. The findings of this broad literature are quite varied, and in many cases neither the magnitude nor the direction of effects is similar across studies. Importantly, however, this extensive literature and the debates within it demonstrate that schools *do* matter, and that there are plenty of ways in which the school context potentially affects student achievement.

Many contextual features of schools are purposefully designed to meet the perceived needs of students. Schools that provide environments rich with services for students have been said to take as their central goal "changing the school environment to enable students to learn" (Dryfoos 1995, p. 154). Providing health services on school campus attempts to shape the school context to better serve educational objectives. Moreover, given the importance of individual background factors for academic achievement, ameliorating risk factors emanating from health issues gives schools the potential to lessen the importance of children's background for their eventual outcomes.

Health and Education

A large body of research demonstrates that health and education are highly interdependent dimensions of human development, with reinforcing impacts for socioeconomic status, well-being, and stratification across the life course. Much of this research has focused on socioeconomic status, including education, as a predictor for health status (Haas 2006), as higher educational attainment tends to lead to higher levels of self-rated health and physical functioning, as well as lower morbidity and mortality (Ross and Wu 1995). Research linking education and health often focuses on adults, as their education is usually already completed and can therefore be established as temporally prior to their health status (Dilley 2009).

Some researchers have addressed younger age groups, studying the ways in which health experiences and behaviors occurring in childhood powerfully shape future life chances. For example, using data from the Panel Study of Income Dynamics (PSID), Conley and Bennett (2000) show that children born at low birth weight are substantially less likely to graduate from high school by age 20, a relationship that holds in comparisons across the sample as well as

between siblings. Also using PSID data, Haas (2006) shows that adult respondents experiencing excellent childhood health completed on average half a year more education than those experiencing poor childhood health. Haas and Fosse (2008) demonstrate that this relationship holds for adolescents; using National Longitudinal Survey of Youth data from the 1997 cohort, they assess the relationship between self-rated health during adolescence and high school completion by age 20, as well as the ability of various mechanisms to attenuate this relationship. They, too, find that poor health leads to substantially lower chances of completing high school in a timely fashion net of family and socioeconomic factors; although psychosocial factors and academic performance mediate the association, they do not explain it. And at an even more proximate level, research from Washington State finds an almost linear increase in the likelihood of having low grades for each additional "health risk" a student reported (Dilley 2009).

Racial Disparities in Health and Education

In the United States the health of racial and ethnic minority children is overall worse than for white children, whether measured by child/adolescent self-report or parents' ratings (Crosnoe 2006). Many conditions have been highlighted as disproportionately impacting people of color, including asthma, obesity, diabetes, anemia, increased exposure to environmental hazards, and overall poorer physical health (Dilley 2009; Crosnoe 2006; Currie 2005). Similarly, one of the most documented relationships in research on education and inequality is that of racial and ethnic disparities in achievement. On average, black students score lower than whites on standardized tests in reading, math, writing, and science. Black students as a group also tend to have lower grades, are more likely to be enrolled in less advanced classes, are more likely to repeat a grade in school, and are more likely to drop out of school than are whites. Latinos and American

Indians also experience lower educational outcomes than do whites, and Asians tend to experience high academic achievement, surpassing whites on many indicators (Hallinan 2001; Kao and Thompson 2003).

There is evidence to support the contention that racial disparities in health and education are linked. Currie (2005) examines child and maternal health status and behaviors and their influence on disparities in school readiness. She finds that each condition alone cannot explain racial disparities, but that the cumulative impact of multiple conditions can make a significant difference. She estimates that as much as roughly "a quarter of the readiness gap between blacks and whites might be attributable to health conditions or health behaviors of both mothers and children" (p. 133). Crosnoe's (2006) analysis is similar but more concrete; he shows that the lower health of black kindergarteners compared to their white peers contributes to black children's lower math achievement and achievement growth. Poor physical health contributes to lower achievement among Latino immigrant children, as well as lower achievement growth among Asian immigrant children. Although health is not the most powerful mechanism linking race, ethnicity, and immigrant status to achievement disparities in the early school years, it does have substantial effects that Crosnoe contends substantiate "that health is an appropriate focus of policy aimed at reducing demographic inequalities in education" (p. 91).

School-Based Health Services

The rationale behind providing health care in schools—especially in high schools—is that despite teenagers' generally good health, adolescents may not be strongly tied to traditional health care institutions, and disadvantaged youth are less likely than their advantaged peers to have access to primary care. Also, adolescents' insurance coverage may be tied to parental

coverage, raising concerns about confidentiality when sensitive matters such as reproductive or mental health are at issue (Dryfoos 1995). Frequently, when many school-based health services are provided, the intention is to offer convenient, confidential, affordable, comprehensive, and culturally- and age-tailored services, as well as to reduce access barriers created by insurance and transportation problems and to encourage follow-up care (Brindis et al. 2003; Fothergill and Ballard 1998; Gustafson 2005). All of these factors should theoretically result in improved health care receipt, which should reduce health-related barriers to learning such as the distraction caused by pain/discomfort, or the need to miss school due to illness. School-based health services ease the burden on educators by improving students' readiness to learn (Geierstanger and Amaral 2005). Furthermore, health centers have been shown to decrease health disparities in the United States (Politzer et al. 2001), and thus if school-based health services augment educational abilities, they may conceivably reduce academic disparities as well.

Given the recognition that addressing student health issues can impact learning and functioning at school, schools have long offered some measure of health intervention via school nursing programs (Gustafson 2005). Beginning in 1902 in New York City, the first school nurse was employed to treat and prevent disease, as well as keep students in the classroom or encourage their quick return. Eventually, states nationwide were placing nurses in schools (Maughan 2003). The most recent analysis of the nationally representative School Health Policies and Programs Study (SHPPS), conducted in 2006, indicates that 81.5 percent of schools have a staff member to coordinate or oversee the school's health services, and 86.3 percent of schools employ a part-time or full-time school nurse to provide health services to students as needed. Over a third of schools (35.7 percent) have a full-time school nurse (RN or LPN) present, and over a third (34.4 percent) have a school health aide present to help in service

provision (Brener et al. 2007). Less recent numbers suggest that there are approximately 26,000 nurses in over 85,000 public schools in the U.S., as well as roughly 20,000 school psychologists, 81,000 guidance counselors (who may provide psychological counseling), and 12,000 social workers providing services in schools (Lear 2002).

Throughout most of the history of school health provision, community and school resources as well as local needs and desires dictated what services schools offered. Although federal legislation and funding address the educational and health service needs of students with disabilities, the federal government does not widely support school health services financially. However, state laws adopted in the last few decades generally mandate the immunizations that are required for enrollment/attendance, the health screenings that may or should be provided at school, policies for collecting and safeguarding student health records, rules about medication administration, procedures for handling and reporting infectious disease occurrence, and the capacity to respond to emergency or otherwise urgent health situations (Brener et al. 2007; Lear 2002). Yet given the high level of local control of schools, as well as state differences in supported programs, there is heterogeneity of school health programs' content, quality, and staffing. According to Lear (2002), "The most comprehensive programs have multidisciplinary teams of professionals on staff or within the building providing a broad range of preventive, emergency, and curative care…. Other schools offer only some of these services, and some schools have no health professionals on staff or on call" (p. 311). Indeed, the 2006 statistics on school nurse staffing indicate that at least 13 percent of schools do not have even a part-time nurse at school (Brener et al. 2007). This could be because some schools simply do not provide nursing services, or because school nurses' time is stretched so thin they must split their attention among several schools. On the other hand, 15.7 percent of schools have a school physician

providing services on site. So while state mandates establish minimum ways in which schools must attend to student health, schools can range from merely complying with requirements to offering an expanded array of services such as administering immunizations or offering case management, to offering a full array of services in a comprehensive school-based health center (SBHC) (Brener et al. 2007).

Although school-based health centers are relatively uncommon in schools (the SHPPS study reports that by 2006 SBHCs only existed in 6.4 percent of schools; see Brener et al. 2007), they represent the extreme upper end of health service provision on campus, and thus are an important benchmark of what is possible. Moreover, the SBHC is the most researched model of providing healthcare services in schools. SBHCs are designed to overcome common barriers that prevent adolescents from using the healthcare system optimally (Fothergill and Ballard 1998). Comprehensive SBHCs were first established in the 1970s in urban schools, where student health needs were perceived to be highest, but the model spread to suburban and rural regions. They are primarily staffed by full- or part-time nurses, though a large clinic might employ several providers (Silberberg and Cantor 2008; Gustafson 2005; Dryfoos 1995).

Studies examining SBHC influences on health demonstrate that providing health services on school campuses expands access and encourages health-seeking among students who might otherwise not be served. Kaplan et al. (1998) matched students, some of whom had SBHC access and all of whom had HMO access, based on age, sex, and socioeconomic status, and find that students with access to health services at school make more health care visits and experience longer clinic visits (which provides time to screen adolescents for various health risks) than students at comparison schools with only HMO access (Kaplan et al. 1998). SBHCs attract hard-to-reach populations (especially males and racial/ethnic minorities), and provide complementary

care by reaching underserved populations with services that are not as frequently used in other settings (Juszczak, Melinkovich, & Kaplan 2003).

Educational Impacts of School-Based Health Services

My focus on the relationship between school-based health services and educational outcomes is an attempt to see whether and how a specific type of school-level intervention is related to academic performance. Figure 1 illustrates the multiple influences on scholastic achievement, and how school-based health services are hypothesized to fit in.

--- [Figure 1 about here] ---

Much of the research on academic outcomes examines the role of social and environmental factors such as family background and individual characteristics, or educational and instructional factors such as class size, teacher qualifications, or curricular programming. School-based health services play an interstitial role, as they are both part of the school's domain and yet the types of services available and the uses students can make of them are frequently determined by family and community norms as well as policy directives governing their availability (which simultaneously influence other educational and instructional features). Health interventions may not directly influence academic achievement, but they may operate by improving health and emotional well-being, and fostering a school environment that is conducive to success. This should augment students' ability to function well at school, learn better, and therefore be better situated to achieve academically.

We might expect that if health services are located on school premises, it is easier for an adolescent to get treatment for pain that is distracting in class, easier to receive an early diagnosis and prevent health-related absences, or easier to get an immunization that might otherwise

require a special trip to the doctor during an afternoon that could be spent on homework. We also might expect that students who have no other source of health care could have basic needs met by using school-based services, possibly preventing the development of more serious conditions. In addition, students who do not visit school health services might acquire knowledge about maintaining their health from peers or school staff familiar with the services, creating an environment of better health (Kisker and Brown 1996). All of these pathways—reducing distractions, increasing time spent in the classroom or on homework, preventing illnesses from becoming more severe, and increasing knowledge about staying healthy—would likely be associated with better educational outcomes among adolescents attending schools that offer services, given the interdependence of health and education.

On the other hand, if the sickest students are the only ones who access school-based services, their health might be problematic enough that their achievement remains low or plummets regardless. Or perhaps the school nurse is the first to point out to them that they are really too sick to be at school—in effect causing absences, rather than preventing them. Although we would expect school-based health services to do more good than harm, whether they noticeably improve adolescents' educational experiences requires empirical examination, and important forces of selection need to be addressed.

Because health services were established in schools primarily to improve health status, many studies of their impact have not focused on educational outcomes (Murray et al. 2007), yet some analyses exist. Studying one SBHC program established to serve urban high school students with significant unmet health needs, Kisker and Brown (1996) find that compared to urban youths nationally, students attending schools with a Robert Wood Johnson Foundation SBHC have a small but significant advantage in finishing high school on time, though trends in

absenteeism are not significantly different. Similarly, McCord et al. (1993) examine the impact of clinic registration on academic outcomes for students at "an alternative high school for students who were not able to succeed in traditional educational programs" (p. 91). They find that students who used the school-based clinic are more likely to stay in school, be promoted, and graduate from school than those who did not, a relationship that is especially strong among African American males. The authors note that while there may not be a direct causal link between clinic use and academic performance, school clinic staff may foster trust and connection to school that helps students to function and feel engaged and connected to school. However, it is plausible that students who are already engaged in school, connected to school personnel, and/or succeeding academically are more likely to use school-based health services; a limitation of this and other analyses is that this potential for reverse causality is not considered. Kisker and Brown and McCord et al. are among seven studies identified in a comprehensive review of the literature on the impact of SBHCs on academic performance (Geierstanger et al. 2004). Each of these studies reports a positive relationship between SBHC presence and/or use on at least one academic indicator, and across all the studies, findings either show positive impacts or no effect. Although this research enhances our understanding of the role health service provision can play in aiding academic performance, most of it focuses on one site, city/district, or program, often evaluating interventions designed for highly disadvantaged or specific populations (e.g. students with asthma); it lacks generalizability to other populations or settings.

Although the SBHC model is the most comprehensive in terms of providing healthcare services, the Coordinated School Health Program (CSHP) is another model that aims to integrate school health services with other school and community features that are health promoting (Murray et al. 2007), and has been studied with regard to educational impacts. Rosas, Case, and

Tholstrup (2009) studied a sample of 158 Delaware schools, 48 of which had been trained in the CSHP model. The authors collected longitudinal data before training and after implementation. They analyzed school performance ratings (SPR) and adequate yearly progress (AYP) ratings measuring improvement toward school accountability goals, as well as results from the Delaware Student Testing Program measuring the proportion of students in each school who were proficient in core subject areas. The high-implementation schools appear to experience greater increases in mean school-level progress. Moreover, the level of implementation is significantly associated with the proportion of students that were proficient in reading and math; low implementation schools have significantly lower proportions of proficient students than both high- and non-implementing schools. These results could be attributable to non-implementing schools viewing their students as not in need of these health-related services (i.e. already succeeding in school), or could result from low-implementing schools struggling to provide multiple programs and services; unfortunately, the study did not collect information on school resources or administrative capacity. Examinations of the relationship between CSHPs and other educational outcomes support the notion that a broad array of health-promoting activities, when implemented on school campus, can positively affect students' academic achievement. The evidence base is not yet strong, but limited research suggests a positive educational benefit to attending to youths' physical, mental, and nutritional health needs on school campus (Murray et al. 2007).

One last line of inquiry is relevant to the broader study of attention to health in schools. In reviewing evidence on the role of school nurses in promoting academic achievement, Maughan (2003) asserts that having a full-time nurse has been shown to reduce dismissals for health reasons. Moreover, in school districts where school nurses are more available, children

appear to exhibit higher levels of well-being, lower absenteeism, and higher graduation rates from high school. Maughan also concludes that school nurses stand to aid in identifying students at risk of psychological problems, who often first present with physical ailments. Like research on broader SBHC or CSHP-type interventions, the studies of school nursing tend to focus on specific subpopulations of students. Also, they may lack controls for other school-level features that influence student outcomes. Maughan notes the complexity of studying school nurse impacts, due to the many pressures and interventions contemporary schools undergo and the heterogeneous causes of student absences, beyond simple illness. Although I do not examine the presence of a school nurse, SBHC, or CSHP specifically, I draw attention to these areas of research because they are among the types of "interventions" that could be represented by the level of service provision which I study, and they offer evidence that providing for students' health needs on school campus can benefit educational outcomes. Notably, although multiple researchers have reviewed the role of health service provision in schools, each calls for additional research documenting more generalizable relationships and direct linkages (Murray et al. 2007; Geierstanger et al. 2004; Maughan 2003).

Needham, Crosnoe, and Muller (2004) marshal nationally representative data in an attempt to understand how aspects of school climate, including health services, condition the relationship between student health and academic problems. Using data from the National Longitudinal Study of Adolescent Health (Add Health), the authors assess the likelihood of course failure when regressed on interactions for a student's self-rated health (which they document as a valid measure of health status) and whether his or her school offered non-athletic physical exams on site. Counter to their hypothesis, they find that despite the significant relationship between self-rated health and course failure net of other adolescent characteristics,

there is no evidence that on-campus physicals mediate the relationship between self-rated health and academic achievement. Needham et al. establish that health status is an important predictor of course failure; they also find that absenteeism is a crucial mediating factor in this relationship. Although their analysis of health services takes a useful step toward nationally representative, longitudinal analysis of the role of school health services, it is not clear that other school-level factors do not confound the relationships they examine, nor that non-athletic physicals would be the most or only important service to examine.

Unfortunately, although the concept of providing health services alongside education has spread to schools across the country serving various types of student populations, Needham, Crosnoe, and Muller (2004) are the only researchers to examine the effects of school health services nationally. Much of the research on school health services focuses on single cases or models of service provision; descriptive characteristics of the schools in which SBHCs are located and the students that attend these schools exist but are not very detailed. Furthermore, there are no examinations of schools (and their students) across a range of levels of service provision, as much of the literature focuses on either single-service interventions or comprehensive clinics. Research suggests that although on the whole SBHCs provide a wide variety of services, individual school clinics can vary greatly in which of these many services are actually provided (see, e.g., Brindis et al. 2003). Silberberg and Cantor (2008) assert that both public discourse and research literature have ignored the diversity in clinics' structure and offerings, with sparse analysis comparing different clinic models; so in research on SBHC impact on academic outcomes, it is unclear what services are offered in the particular clinics under study. Similarly, Rosas et al.'s (2009) study of Delaware CSHP schools shows that school health programs are implemented with varying levels of fidelity. Furthermore, because existing

studies have focused on certain subpopulations, it is as yet unclear how heterogeneous treatments of service provision may have heterogeneous impacts for students.

Lastly, this area of research has received little attention from sociologists. The scholarly literature on school-based health services has been almost entirely limited to journals of medicine and public or school health, and many pieces are written for an audience of practitioners. The *Social Problems* article by Needham, Crosnoe, and Muller (2004) is a notable exception in this regard. The present research aims to expand this line of inquiry by accounting for additional school-level features that are important to sociologists of education, and employing nationally representative data and methodology that is intended to examine school-level impact on student-level outcomes.

Data

Sample

Data for the present research come from the first wave of the National Longitudinal Study of Adolescent Health (Add Health), which provides nationally representative, in-depth information on students and their school contexts for adolescents who were in 7th through 12th grade during the 1994 to 1995 school year. Add Health collected extensive data from numerous sources, and several structural features of the data make it ideal for this study.

Of primary importance are measures available at the school level. Unlike most earlier research, I study the broader issue of level of service provision across a range of services provided. Although the dataset does not measure clinic presence or specific staffing on school premises, it allows me to assess the presence of 15 different health services on school campus (such as physicals, immunizations, diagnostic screenings, and emotional counseling), which is

useful in gauging how intensively a school provides services or expands its offerings beyond the "core" services that all schools tend to supply. These measures come from surveys completed by school administrators, which provide information on many other features of the school site, environment, faculty/staff, and students. Furthermore, surveys administered to all students present in school (over 90,000 students) provide additional information about school context based on characteristics of the student body.

For measuring student outcomes, Add Health's wide-ranging data on adolescents are advantageous. Long in-home surveys administered to approximately 20,000 students and their parents provide detailed information about adolescents' backgrounds, health, and educational experiences. The study includes numerous personal characteristics, and multiple measures of educational outcomes can be examined. Though the specific analysis reported here does not draw heavily on Add Health's longitudinal features, that the data were collected over a number of years allows for appending additional measures of school attributes (including select items measured in National Center for Education Statistics surveys) and student educational achievement and attainment to data collected at Wave I.

I reduce the original Add Health sample in a few important ways. Of Add Health's original 172 schools, I include only those schools that completed a school administrator questionnaire, had students participate in the in-home interview portion, and had valid school administrator weights.[1] I also drop from the sample the single boarding school, as such an environment presents a highly unusual need for campus-based services, for a final sample of 129 schools. Of the original 20,765 students who participated in in-home interviewing, I keep only

[1] Properly weighting both school and student data is essential in adjusting for Add Health's complex survey sampling design. For details, see Chantala 2006.

adolescents that have grand sample weights and students whose schools were also included. Additionally, because the analysis involves comparing students by racial/ethnic group, I dropped students that identified their race as "American Indian or Native American" or "Other," as the sample sizes for these groups were quite small. These restrictions resulted in a final sample of 18,008 students.

Measures

Key Dependent and Independent Variables

Academic Achievement. This paper follows a similar analysis by Needham, Crosnoe, and Muller (2004) and uses whether or not the adolescent failed an academic course as the outcome measure of academic achievement as. If the student reported receiving a D or F in English, history, math, or science, they received a "1" on this binary variable; otherwise, the student was coded "0."

--- [Table 1 about here] ---

Health Service Provision. The primary independent variable of interest is the level of health service provision on the school site. Each school administrator was asked about 15 different health services and whether each is "provided on school premises," "provided by district, at another school," "referred to other providers," or "neither provided or referred." Only if a school responded that the service was "provided on school premises" was it counted as offering the service. Table 1 lists the services that are included in this measure, as well as the number of sample schools providing that particular service. These individual services were then summed to produce a count of the total number of services provided at the school. The final

measure ranges from 0 to 11 services provided; Figure 2 illustrates the distribution of this variable across Add Health schools.

--- [Figure 2 about here] ---

School-Level Controls

Basic Characteristics. I control for the four school features that Add Health used in stratifying its sample: size (indicators for medium = 401-1000, large = 1001+; small = 1-400 omitted), type (indicator for public; private omitted), urbanicity (indicators for urban, rural; suburban omitted), and region (indicators for West, Midwest, Northeast; South omitted).

Measures of Advantage/Disadvantage. I control for school characteristics that capture some degree of advantage or disadvantage at the school level. Teacher variables measure the experience and credentials of the full-time teaching staff: I control for the percent of teachers that are new to the school (in the survey year), the percent of teachers that have worked at the school for at least 5 years, and the percent of teachers holding a Master's degree or higher. The percent of students testing below grade level and the percent of students in an "academic or college preparatory" instructional program are indicative of the school's academic quality; so is average daily attendance (measured ordinally in 5 percent increments with all values above 75 percent, based on the answer options available in the questionnaire). Attendance rate is also suggestive of school cohesion (as well as higher funding, which is partially determined by a school's average daily attendance). The percent of students eligible for free or reduced-price lunch[2] assesses the economic disadvantage among a school's students, and is a frequently used measure of school poverty.

[2] This variable comes from data that Add Health appended based on the 1993 Common Core of Data collected by the National Center for Education Statistics.

Aggregated Student Characteristics. I use data collected with Add Health's in-school questionnaire—administered to all students at the school who were present and willing—to create measures of the school student body. Each of these variables assesses the prevalence among the student body of characteristics that the sociological literature shows are associated with being in more advantaged or disadvantaged social positions. These controls are the percent of students that are African American or black, the percent of students that are Hispanic, the percent of students living in female-headed households, the percent of students who have at least one college-educated parent, and the percent of students who have a parent working in a professional, managerial, or technical occupation.[3]

Policy Variables. Policies exert important contextual influences on the types of reforms and programs that are available, well-known, and accepted by schools, and can also govern funding levels that can shape the quantity and quality of interventions. Because state education agencies exert considerable control over broad school-level policy, I also control for two state-specific policies at the school level: whether the state funds school-based health centers and whether the state requires schools to offer school health nurse services.

Student-Level Controls

Demographic Characteristics. I control for background characteristics of adolescents that are associated with academic achievement or may influence adolescents' ability to succeed in U.S. schools. These are sex (indicator for female), race (indicators for black, Hispanic, Asian; white omitted), language spoken at home (indicators for Spanish or other; English omitted), nativity (indicator for U.S. born), family structure (indicator for living in a single parent home),

[3] Three schools completed the school administrator questionnaire and had students participating in the in-home portion—criteria for inclusion in my sample—but did not have students participate in the in-school portion. For just these schools, I use in-home data to create aggregated student characteristics. I flag these schools in the analysis to ensure this does not unduly affect the results.

parental education (measured as the highest education attained by either parent, entered as dummies with less than high school omitted), and total family income (measured in thousands of dollars, and entered as the log of income).

Educational Characteristics. I also control for three aspects of the adolescents' education: grade level (entered as dummies for 8^{th} – 12^{th} with 7^{th} omitted), whether the student received special education services in the past year (indicator for special education), and whether the student received help from a parent on a school project in the last four weeks (indicator for received help). Special education plausibly shapes scholastic experiences if grading policies in special education classes differ, learning and/or achievement is impacted by a disability, or if teachers perceive and reward special education students differently than mainstream students. Receiving help from a parent on a school project conveys that the student's family has enough economic and social capital for parents to be available and able to assist.

--- [Table 2 about here] ---

As can be seen in the student descriptive characteristics in Table 2, the Add Health sample contains fewer whites (only 52 percent) and more blacks, Hispanics, and Asians than the population nationally; when weighted the data is nationally representative (Add Health oversampled certain racial/ethnic subpopulations, such as highly educated African American families). Also unsurprisingly, due to Add Health's sampling design, most of the adolescents are in high school grades. About 30 percent are living in a single-parent home, 11.7 percent do not speak English at home, and 9.5 percent have received special education services recently.

Table 3 shows descriptive characteristics of the sample schools. They are overwhelmingly public schools, over half are located in suburbs, and a plurality are in the South. Only 6.2 percent report average daily attendance at or below 85 percent, and on average the

schools have new teachers comprising 10.4 percent of their staffs and veterans (5 or more years on staff) comprising 63.1 percent. The average school has 21.7 percent of students testing below grade level, 39.9 percent of students in academic or college preparatory classes, and 27.1 percent of students eligible for free or reduced-price lunch. Almost three quarters of the sample schools are in states that have a policy of providing funding to SBHCs, but less than half are in states with a policy requiring schools to employ a school nurse.

--- [Table 3 about here] ---

Methods

Multilevel modeling with HLM software allows for the identification of a school-level effect on a student-level outcome, corrects for student clustering within schools (which violates assumptions about the independence of observations), and allows data to be weighted at both levels to adjust for Add Health's complex survey sampling design. However, HLM will not allow data to have *any* missing values at level 2, and substantial missing data (of non-overlapping variables between adolescents) leads to extensive data reduction if missing values are not imputed. I imputed missing data at both levels using the "ice" command in Stata.[4]

The analysis focuses in the first case on the fixed effect of school-level health service provision on student-level course failure, controlling for other characteristics at both the student and school level. I also interact school-level service provision with student race, as African American and Hispanic students have been highlighted as experiencing disadvantages that

[4] Ice requires the specification of appropriate regression equations for variables with missing data, with all other (or whichever appropriate) variables in the model as predictors. This procedure cycles through the data, filling in missing values based on plausible values determined by the distribution of the variable itself and the covariates in the equation (see "Multiple Imputation Using ICE" 2009). I imputed once for the school-level data, creating one complete dataset. I performed multiple imputation (m = 5) for the student-level data, which creates five datasets with complete plausible values. Before running analyses in HLM, I specified all five datasets for multiple imputation, which draws on all of these plausible datasets when producing final results.

contribute to achievement disparities while Asian students often perform at higher levels than whites academically. The interactions identify whether these subpopulations experience differential effects of service provision—and of particular interest, whether any differential effects might mitigate gaps in course failure. Throughout the modeling process, I allow the race coefficients to vary randomly, which captures unmeasured variation across schools in the effects of race on course failure. Significant variation here suggests that some school-level feature plays a role in moderating the relationship between race and achievement; in fact, significant variation persists as the modeling process proceeds. Including school service provision in the final two models tests whether this school feature plays a role in moderating the race-course failure relationship. Since school service provision only varies across schools (that is, in this analysis all students within the same school will have the same value for level of service provision, which assumes identical exposure or access across students within a school), the effects of service provision can be said to influence the average odds of course failure in a school. Thus, we see a school effect if the odds of course failure appear to be different in school contexts that provide differing levels of services.

The following equations represent the models in the analysis, but simplify the complex equations to only show the primary variables of interest and not all individual controls. The student-level model predicts

$$\eta_{ij} = \beta_{0j} + \beta_{1j}*(\text{HISPANIC}_{ij}) + \beta_{2j}*(\text{BLACK}_{ij}) + \beta_{3j}*(\text{ASIAN}_{ij}) + \beta_{kj}*(\text{STUDENT\_VARS}_{ij})$$

for student i in school j, for k student-level controls, where the outcome η_{ij} represents the log odds of receiving any failing grade versus no failing grades. Each of the coefficients in the student-level model is predicted by a series of equations at the school level:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(\text{SERVICE\_ PROVISION}_j) + \gamma_{0m}*(\text{SCHOOL\_VARS}_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}*(\text{SERVICE\_ PROVISION}_j) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}*(\text{SERVICE\_ PROVISION}_j) + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}*(\text{SERVICE\_ PROVISION}_j) + u_{3j}$$

$$\beta_{kj} = \gamma_{k0}$$

again, for *j* schools, and for *m* school-level controls, where the intercept γ_{00} is the overall constant, and the *u* terms are the errors. In this case, the intercept β_{0j} is predicted by all of the school covariates, while the coefficients on individual race for blacks, Hispanics, and Asians are predicted also by service provision, creating interactions. (White students serve as the reference group in this analysis.) Because the HLM framework predicts the coefficients on each student-level variable as functions of the school-level predictors in the model, these sets of equations can be combined to form a single-equation mixed model:

$$\begin{aligned}\eta_{ij} = {} & \gamma_{00} + \gamma_{01}*(\text{SERVICE\_ PROVISION}_j) + \gamma_{0m}*(\text{SCHOOL\_VARS}_j) + \gamma_{10}*\text{HISPANIC}_{ij} + \\ & \gamma_{11}*(\text{SERVICE\_PROVISION}_j*\text{HISPANIC}_{ij}) + \gamma_{20}*(\text{BLACK}_{ij}) + \\ & \gamma_{21}*(\text{SERVICE\_PROVISION}_j*\text{BLACK}_{ij}) + \beta_{3j}*(\text{ASIAN}_{ij}) + \gamma_{31}*(\text{SERVICE\_} \\ & \text{PROVISION}_j*\text{ ASIAN}_{ij}) + \gamma_{k0}*(\text{STUDENT\_VARS}_{ij}) + u_{0j} + u_{1j}*(\text{HISPANIC}_{ij}) + \\ & u_{2j}*(\text{BLACK}_{ij}) + u_{3j}*(\text{ASIAN}_{ij})\end{aligned}$$

In this representation, the fixed effect of school-health service provision is γ_{01}, and represents the effect of service provision for whites. Allowing cross-level interactions for Hispanic, black, and Asian students means computing a baseline effect for these groups (γ_{10}, γ_{20}, γ_{30}) as well as an effect specific to changes in service provision—the interaction coefficients (γ_{11}, γ_{21}, and γ_{31}). The random errors on Hispanic, black, and Asian (u_{1j}, u_{2j}, and u_{3j}) capture variation across schools in the race coefficients.

My model building sequence follows the "step-up strategy" described by West, Welch, and Galecki (2007). In each model, course failure is specified as the outcome of a logistic regression of a Bernouli distributed dependent variable.[5] I start with an "unconditional" student level model, which includes only the dependent variable course failure. Model 2 adds just the student-level race variables and their random errors, which identifies race disparities in course failure when no other factors are controlled and between-school variation in the race-course failure relationship. Model 3 includes all student covariates, and Model 4 includes all student and school covariates—except for the key predictor of interest, school health service provision. Model 5 is the first "full" model, including all controls and the key independent variable, but just on the equation for the intercept. Model 6 is the final model, which tests whether school health service provision is related to course failure, and whether the relationship differs by racial/ethnic group.

Results

Bivariate logistic regressions (not shown) demonstrate that in the Add Health sample, Hispanic and black students have significantly higher odds of course failure than do white students and Asian students have significantly lower odds, justifying examining heterogeneous effects on academic outcomes among different racial subpopulations. Additionally, bivariate logistic regression shows that poorer self-rated health is a significant predictor of course failure, meaning that adolescents reporting lower health status are more likely to receive low grades. I do not control for self-rated health in the multilevel analyses because it is endogenous to the overall relationship between school health service provision and academic course failure. But that this

[5] Models based on a more flexible specification of the variance structure did not produce different results.

simple relationship is evidenced in the data supports the supposition that in this sample health and achievement are related, and thus attending to health needs may plausibly improve academic outcomes.

The results of the model building sequence can be seen in Table 4; I display odds ratios, which have a more meaningful interpretation than the original coefficients, along with standard errors of the coefficients. The table also contains variance components for the random effects included in the modeling sequence. The unconditional model, Model 1, includes only the outcome variable, course failure, and shows that there is significant variation across schools in students' likelihood of failing a course. This model is useful for demonstrating how much of the total variance in student course failure is due to between-school variance, which is measured by the intraclass correlation coefficient (ICC) and calculated using the variance component from the unconditional model.[6] In this case, the ICC indicates that 10.2 percent of the variance is between schools (and conversely, roughly 90% of the variance is student-to-student, within schools); thus, a small but significant portion of the variance in students' odds of course failure lies between schools.

Model 2 includes only student-level race variables as predictors, which establishes that there are significant racial disparities in course failure. Hispanic and African American students' odds of failing a core academic course are both significantly higher than whites students' odds; for Hispanics, the odds are over 80 percent higher and for blacks the odds are about 45 percent higher, and both of these relationships are statistically significant. In contrast, the odds of course failure appear to be much lower (about 44 percent) for Asian students than for whites, but this

[6] The variance of the logistic distribution is defined as $\pi^2/3$. For a logit model, then, the intraclass correlation coefficient is calculated as ICC = $\tau_0/(\tau_0 + \pi^2/3)$, where τ_0 is the between-school variance, yielding 0.1017 in this model.

difference is not statistically significant (which may be due to the relatively small sample of Asian students). Additionally, the variance components for the random effects on race indicate that there is significant variance between schools in the relationship between race and course failure.

All of the student-level covariates are included as predictors in Model 3. Controlling for this set of student characteristics attenuates all of the racial disparities in achievement, though Hispanics' odds of course failure are still 57.5 percent higher than whites'—a statistically significant difference. Netting out student characteristics reduces African American students' odds to 13 percent higher than whites students' odds, which is no longer a statistically significant difference. Not surprisingly, we also see in Model 3 that being female and from a more privileged family background (higher income, higher parental education, two-parent home, receiving parental help in school) are factors significantly predicting lower odds of course failure. High school students experience higher odds of course failure relative to seventh graders, and special education students have *much* higher odds of course failure than students not receiving these services. Interestingly, while being native born and speaking Spanish at home have neither beneficial nor detrimental effects, speaking some other non-English language at home is significantly related to lower odds of failing a course. These student-level effects stay virtually identical and are statistically significant across the models that include additional covariates.

--- [Table 4 about here] ---

Model 4 includes school characteristics (control variables only) in addition to student-level variables. It reveals that some school characteristics are significantly related to the odds of course failure. Larger schools and schools in different regions of the country appear to have quite

disparate average odds of course failure. A few measures of socioeconomic composition of the school, such as the percent of students eligible for free or reduced-price lunch, are associated with average odds of course failure. But overall, most of the school covariates do not exert statistically significant influences on school average course failure.

The final two models add the key independent variable of interest—school health service provision—to the model specification. In Model 5, which includes just a fixed effect of service provision, its association with course failure is not significant; however, the variance components indicate that including it in the model explains 3.3 percent of the residual variation in average course failure for whites, [7] 9.4 percent of the residual school variation in the Hispanic-white difference, and 3.9 percent of the residual school variation in the black-white difference. Model 6, the final model, includes interaction terms that allow the effect of service provision to vary by race. School health service provision predicts significantly lower odds of course failure: the odds ratio for the fixed effect of 0.955 suggests that the average odds of failing a core academic course are 4.5 percent lower in a school for each additional service it offers. This odds ratio applies specifically to white students, because the fixed effect represents the effect for the reference group when interactions are included. However, the interaction terms for Hispanics, African Americans, and Asians are nonsignificant at conventional levels, indicating that the effect of service provision does not differ among racial groups. Thus, this final model shows that there is a significant effect of school health service provision on the odds of course failure, with perhaps some minor variation among racial groups that is nonsignificant. The variance components for the sixth model reflect only a minor reduction in residual variance in the mean for white students (0.3 percent); however, the model does more to explain residual variation in the race-course

[7] This calculation of the additional variation explained is simply (0. 1803– 0.1744)/ 0.1803 = 0.0327.

failure relationship for Hispanic and African American students. Comparing Model 6 to Model 5, we see that including the interactions in the model explains an additional 11.4 percent of residual school variation in the Hispanic-white difference, and an additional 14.9 percent of residual school variation in the black-white difference.

Discussion

The effect of school health service provision in the final model is noteworthy. The odds ratio indicates a 4.5 percent decrease in the odds of failure for each additional service offered. We can put this in perspective by calculating the change in odds this predicts if a school offered the most services found in this study compared to the least. This exercise suggests that students in schools with eleven services and all else equal have over 40 percent lower odds of failing a core academic course than do their peers in schools offering no services. In a practical context we might not expect such a perfectly linear reduction with increases in services, but this finding nevertheless indicates that the impact of service provision is not just statistically significant but also potentially sizable. Even a change from no services to just two—one of the most common levels of provision in this study—predicts students' odds of course failure will decrease almost 9 percent. These results indicate that school-based health services can play a positive role in improving academic outcomes, but that they do not broadly reduce racial disparities in academic course failure.

It is important to acknowledge that these are broad effects that in essence examine a student's general exposure to health services by attending a school that does (versus does not) have them at various levels. This is an effect of school context, which I hypothesized would influence academic outcomes by providing better access to health services, an overall school

environment with more awareness of and commitment to student health, and thus healthier students better situated to learn. Whether students actually received services on campus would measure the impact of services more directly; to the extent that variables measuring receipt of services are available in Add Health, they cover a smaller range of services and fewer respondents. If this analysis proves possible, it would serve as a useful check on the robustness of the results in the present analysis, since the theoretical link suggests that if services matter at all, the effect should be greater for students who actually access them than for the entire student body which merely has the potential to access them (and may also benefit from a healthier environment). These two analyses would involve different treatment of the data. In the present case, the independent variable of school level health service provision can *only* vary at the school level; an analysis incorporating students' receipt of services could evaluate between-school variation in service provision net of within-school variation in students' receipt of services.

Student background characteristics, particularly those expressing socioeconomic status such as income, parental education, and family structure, typically are associated with educational achievement; the significant effects of these variables found in this study are by no means surprising. It is somewhat startling, however, that relatively few of the school-level measures of advantage and disadvantage prove to be significantly influential. None of the measures of teacher experience or credentials or school-wide instructional programming or test score performance made a difference at the school level. It may be due to these variables being imprecise measures of academic quality (a point I return to below). It also could be a result of the small amount of variance in course failure between schools. Perhaps no matter how disadvantaged a school environment is and low achieving its student body is, schools and their teachers may be loathe to pile low grades on students who already have many other troubles in

their lives. Describing a common situation in schools that take on service provision in addition to their educational mission, Powell, Farrar, and Cohen (1985) note the remarks of a school administrator who "explained that 'teachers today are more humanistic in their approach with kids… A lot of them don't have an ironclad set of standards on achievement.'… they realized that 'more and more kids have twenty things to deal with as well as school, and they'll take that into account'" (p. 60). Research on grading practices supports this account; Howley, Kusimo, and Parrott (2001) describe teachers' practice of grading students—particularly those of minority race and low socioeconomic status—based on their effort and compliant behavior in addition to their achievement, resulting in students from low-SES schools receiving grades that reflect an inflated level of achievement. This practice suggests that a measure other than course failure may more accurately represent academic achievement, especially in the context of examining variations by race, a point to which I return below.

School characteristics may warrant further exploration, particularly with regard to the types of schools that offer services and the achievement levels of the students who attend these schools. It is reasonable to suspect that the school environments in which high levels of services exist may be substantively different from school environments in which service provision is low, either in terms of the strength of their academic offerings or the type of students they serve. To examine this potential for selection bias, I performed analyses comparing schools offering no services, a low level, a medium level, and a high level of services along a variety of school characteristics. These analyses generally indicated few systematic differences in the types of schools that had different levels of service provision. There was no "typical" school profile for any particular service level (results of these comparisons can be seen in appendix tables A1-A6). There were only a few cases in which significant differences emerged between school

characteristics and level of service provision. As one example, we might worry that schools that implement high service levels might do so because they perceive their students to be very unhealthy. There was little evidence to support this conclusion. In my comparisons, the only "student health" characteristic that varied systematically by service provision level was whether the school was above the median (among sample schools) on the percent of students missing school frequently due to a health or emotional problem (a variable I discuss more below)—and in this instance, the difference seems to be between low and medium provision schools on the one hand and no and high provision schools on the other (the results of these "student health" comparisons can be seen in Table A6).

A few other instances of significant differences in school-by-service level comparisons related to school quality; this was extra motivation to control for certain variables, specifically school size, percent of students in the college preparatory or academic track, and percent of teachers with at least a Master's degree. That the latter two did not emerge as significant predictors of course failure (nor did their effects change when service provision was added) and the inclusion of many school characteristics as controls in the model should limit some concerns that the school environments are substantively different. However, as mentioned above, the measures of school academic quality are rougher than I would prefer. With Add Health data I cannot measure the intensity of academic press, the quality of instruction, or other features that more specifically assess the academic environment. To the extent that the quality of the academic program schools provide is independent from their basic features, the types of students they serve, and the "quality" measures that I include, my specification omits a significant factor influencing students' achievement. However, I may eventually be able to append additional Add Health data on the curricula offered and academic rigor of students' courses. I am able to

measure other aspects of a student's educational experience or outcomes that may reflect academic performance better than failing a course does, thus helping me to achieve a better model; below I discuss these measures as well as other potential changes to the model that I may explore in the future. Another limitation of my measures as they stand is that the quality of the health services provided may differ in some way, even among schools providing the same number of services; unfortunately, quality is not an aspect of the school's provision that I am able to assess.

One substantial limitation to this study is that students are not randomly assigned to schools nor are schools randomly assigned their level of service provision, which is why inspecting for systematic relationships was crucial. While this is an important limitation, the level of educational manipulation that would be involved in such a randomization situation would be impossible in data of this scale. Although random assignment might give us useful information about service provision in particular case studies, one advantage of this study is that it draws on nationally representative data in an attempt to identify the role of health service provision in student achievement at a much broader level than current studies accomplish. Furthermore, though a more quasi-experimental design might be advantageous, my analysis takes into account numerous characteristics of schools and students. Though a limitation of such large-scale survey data may be a lack of specificity (e.g. not knowing the quality of the services provided), Add Health data cover an extensive amount of information. If a well-specified model is achieved, it should calm some objections regarding selection issues that plague questions about the specific reforms a school may undertake.

That none of the covariates—at the student or school level—help to explain girls' significantly lower odds of failure suggests that their academic experiences are significantly

different enough from those of boys to warrant further attention and perhaps separate analyses. In future iterations of this project, I plan to either stratify the sample by sex and perform separate analyses for boys and girls or include sex interactions. Additionally, I believe it will be worthwhile to also stratify the sample or interact by the two state policy variables. Although there are no significant main effects of these variables in the analysis presented here, it is plausible that, for example, providing many services in a policy environment in which the state funds school-based health centers is qualitatively different from providing that level of services in a state that does not; likewise, schools that offer very few services may look qualitatively different in policy environments that require schools to provide nurses as compared to policy environments that do not.

Additional analyses may help to elucidate a fuller picture of the relationship between school-based service provision and academic outcomes. The service provision variable can be tweaked in substantive ways that are worth exploring. For example, measuring the effect of specific individual services, or subsets of services (e.g. preventive health services) might provide evidence of whether specific offerings are driving observed relationships. The present study suggests that Needham et al.'s (2004) focus solely on the school's provision of non-athletic physicals is too limited when examining the relationship of school-based services and academic course failure. The relationship tested here more accurately gets at the school service provision environment—whether it is "service-heavy" or "service-light"—rather than at a service geared toward helping a specific adolescent health issue.

Perhaps most importantly, Add Health contains other measures of students' educational outcomes. As noted above, examining the impact of service provision on course failure allows for comparisons to previous work—my conclusions contradict those implied by Needham et al.

(2004)—but it risks mis-measuring performance if actual achievement is of differential importance for the grades of students from some racial and class backgrounds (Howley et al. 2001). Other measures of educational outcomes might offer better dependent variables in an examination of this relationship. After the respondents finished high school, Add Health collected transcript data from their schools, which provide a measure of cumulative high school GPA for a subset of the original sample. GPA measured across the high school years probably reflects academic performance more accurately and reliably than failing one or more courses in a particular term, making this a useful variable to examine in further tests of the role of school health services. Furthermore, the frequency of school absences due to health problems provides a more proximate measure of adolescent outcomes that school health service provision theoretically should influence—it captures something relevant to student learning, prior to achievement; thus, in future work I will explore this as a dependent variable as well.

This study should not be the last word on the role of school-based health service provision for academic outcomes. Indeed, I view this study as part of a larger project, as evidenced by the numerous alternative analyses I plan to pursue. But the analyses presented here shed some light on this issue, even as they invite further investigations. This study examined the negative educational outcome of course failure. Theoretically, it makes sense that if a student is sick and misses class or cannot concentrate in class due to a health problem, his opportunity to learn the course material will be hampered, and he may be more likely to receive a low grade. If he were to receive healthcare attention on school premises rather than having to stay home or remain in pain or discomfort, it stands to reason that this should mitigate the negative effects on his grades. The results provide evidence consistent with this idea. In the final model, school-based health service provision is positively related to academic outcomes. Increases in services

are associated with lower odds of failing a core academic course, but the service effect does not appear to differ substantially by race. Thus, this study demonstrates that providing health services on school campus is associated with educational benefits, but not broad reductions in racial/ethnic achievement disparities. However, providing services at school could influence achievement gaps if service interventions were targeted at students of color—particularly African Americans and Hispanics, who on average have lower achievement than whites. The positive effect of service provision across all race groups suggests that offering services on site is one way that schools can intervene to enhance the learning opportunities of students who are experiencing academic trouble. This interesting and intriguing result as well as the other significant findings in the analysis presented suggest that there are fruitful ways to further explore this issue and these data to gain a more full understanding of the complex role school-based services play in students' academic lives.

References

Armor, David J. 2008. "Can NCLB Close Achievement Gaps?" In *No Child Left Behind and the Reduction of the Achievement Gap: Sociological Perspectives on Federal Educational Policy* by Alan R. Sadovnik, Jennifer A. O'Day, George W. Bohrnstedt, & Kathryn M. Borman (eds.). New York: Routledge, p. 323-342.

Brener, Nancy D., Lani Wheeler, Linda C. Wolfe, Mary Vernon-Smiley, & Linda Caldart-Olson. 2007. "Health Services: Results From the School Health Policies and Programs Study 2006." *Journal of School Health* 77(8): 464-485.

Brindis, Claire D., Jonathan Klein, John Schlitt, John Santelli, Linda Juszczak, & Robert J. Nystrom. 2003. "School-Based Health Centers: Accessibility and Accountability." *Journal of Adolescent Health* 32(Supplemental): 98-107.

Chantala, Kim. 2006. *Guidelines for Analyzing Add Health Data*. Carolina Population Center, University of North Carolina at Chapel Hill. Updated October 1, 2006. Available online at http://www.cpc.unc.edu/projects/addhealth/data/using/guides.

Cohen, David K., Karen Gates, Joshua Glazer, Simona Goldin, & Donald Peurach. Forthcoming. *School Improvement by Design*.

Coleman, James S. 1990. *Equality and Achievement in Education*. Boulder, Colorado: Westview Press.

Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York. 1966. *Equality of Educational Opportunity*. Washington DC: U.S. Government Printing Office.

Coleman, James S., Thomas Hoffer, & Sally Kilgore. 1982. *High School Achievement: Public, Catholic, and Private Schools Compared.* New York: Basic Books.

Conley, Dalton & Neil G. Bennett. 2000. "Is Biology Destiny? Birth Weight and Life Chances." *American Sociological Review* 65(June): 458-467.

CREDO. 2009. "Multiple Choice: Charter School Performance in 16 States." Report from the Center for Research on Education Outcomes (CREDO), Stanford University, June 2009.

Crosnoe, Robert. 2006. "Health and the Education of Children from Racial/Ethnic Minority and Immigrant Families." *Journal of Health and Social Behavior* 47(1): 77-93.

Currie, Janet. 2005. "Health Disparities and Gaps in School Readiness." *The Future of Children* 15(1): 117-138.

Darling-Hammond, Linda, Deborah J. Holtzman, Su Jin Gatlin, & Julain Vasquez Heilig. 2005. "Does Teacher Preparation Matter? Evidence about Teacher Certification, Teach for America, and Teacher Effectiveness." *Education Policy Analysis Archives* 13(42).

Decker, Paul T., Daniel P. Mayer, & Steven Glazerman. 2004. "The Effects of Teach for America on Students: Findings from a National Evaluation." Princeton, NJ: Mathematica Policy Research, Inc. MPR Reference No.: 8792-750.

Dilley, Julia. 2009. *Research Review: School-Based Health Interventions and Academic Achievement*. Healthy Students, Successful Students Partnership Committee. Washington State Board of Health, Washington State Office of Superintendent of Public Instruction, Washington State Department of Health.

Dryfoos, Joy G. 1995. "Full Service Schools: Revolution or Fad?" *Journal of Research on Adolescence* 5(2) 147-172.

Elder, Jr., Glen H. 1998. "The Life Course as Developmental Theory." *Child Development* 69(1): 1-12.

Fothergill, Kate & Elisa Ballard. 1998. "The School-Linked Health Center: A Promising Model of Community-Based Care for Adolescents." *Journal of Adolescent Health* 23(1): 29-38.

Gamoran, Adam. 1987. "The Stratification of High School Learning Opportunities." *Sociology of Education* 60(3): 135-155.

Geierstanger, Sara P. & Gorette Amaral. 2005. "School-Based Health Centers and Academic Performance: What is the Intersection?" April 2004 Meeting Proceedings. White Paper. Washington, DC: National Assembly on School-Based Health Care.

Geierstanger, Sara Peterson, Gorette Amaral, Mona Mansour, & Susan Russell Walters. 2004. "School-Based Health Centers and Academic Performance: Research, Challenges, and Recommendations." *Journal of School Health* 74(9): 347-352.

Gustafson, Elaine M. 2005. "History and Overview of School-Based Health Centers in the US." *Nursing Clinics of North America* 40: 595-606.

Haas, Steven A. 2006. "Health Selection and the Process of Social Stratification: The Effect of Childhood Health on Socioeconomic Attainment." *Journal of Health and Social Behavior* 47(December): 339-354.

Haas, Steven A. & Fosse, Nathan Edward. 2008. "Health and the Education Attainment of Adolescents: Evidence from the NLSY97." *Journal of Health and Social Behavior* 49(June): 178-192.

Hallinan, Maureen T. 2001. "Sociological Perspectives on Black-White Inequalities in American Schooling." *Sociology of Education* Extra Issue 2001: 50-70.

Hallinan, Maureen T. 1988. "Equality of Educational Opportunity." *Annual Review of Sociology* 14: 249-268.

Hanushek, Eric A. 1994. "Money Might Matter Somewhere: A Response to Hedges, Laine, and Greenwald." *Educational Researcher* 23(4): 5-8.

Hanushek, Eric A. 1989. "The impact of differential expenditures on school performance." *Educational Researcher* 18(4): 45-51.

Hedges, Larry V., Richard D. Laine, & Rob Greenwald. 1994. "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes." *Educational Researcher* 23(3): 5-14.

Howley, Aimee, Patricia S. Kusimo, & Laurel Parrott. 2001. "Grading and the Ethos of Effort." *Learning Environments Research* 3: 229-246.

Juszczak, Linda, Paul Melinkovich, & David Kaplan. 2003. "Use of Health and Mental Health Services by Adolescents Across Multiple Delivery Sites." *Journal of Adolescent Health* 32(Supplemental): 108-118.

Kao, Grace, and Jennifer S. Thompson. 2003. "Racial and Ethnic Stratification in Educational Achievement and Attainment." *Annual Review of Sociology* 29: 417-442.

Kaplan, David W., B. Ned Calonge, Bruce P. Guernsey, & Maureen B. Hanrahan. 1998. "Managed Care and School-Based Health Centers: Use of Health Services." *Archives of Pediatrics and Adolescent Medicine* 152(January): 25-33.

Kisker, Ellen E. & Randall S. Brown. 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.

Krueger, Alan B. 1999. "Experimental Estimates of Education Production Functions." *The Quarterly Journal of Economics* 114(2): 497-532.

Lear, Julia G. 2002. "Schools and Adolescent Health: Strengthening Services and Improving Outcomes." *Journal of Adolescent Health* 31(6S): 310-320.

Lee, Valerie E. 2000. "Using Hierarchical Linear Modeling to Study Social Contexts: The Case of School Effects." *Educational Psychologist* 35(2): 125-141.

Maughan, Erin. 2003. "The Impact of School Nursing on School Performance: A Research Synthesis." *The Journal of School Nursing* 19(3): 163-171.

McCord, Marcella T., Jonathan D. Klein, Jane M. Foy, & Kate Fothergill. 1993. "School-Based Clinic Use and School Performance." *Journal of Adolescent Health* 14(2): 91-98.

"Multiple Imputation Using ICE." 2009. Stata Library. UCLA: Academic Technology Services, Statistical Consulting Group. Available online at: https://www.ats.ucla.edu/stat/Stata/library/ice.htm.

Murray, Nancy G., Barbar J. Low, Christine Hollis, Alan W. Cross, & Sally M. Davis. 2007. "Coordinated School Health Programs and Academic Achievement: A Systematic Review of the Literature." *The Journal of School Health* 77(9): 589-600.

Needham, Belinda L., Robert Crosnoe, & Chandra Muller. 2004. "Academic Failure in Secondary School: The Inter-Related Role of Health Problems and Educational Context." *Social Problems* 51(4): 569-586.

Novello, Antonia C., Christopher DeGraw, & Dushanka V. Kleinman. 1992. "Healthy Children Ready to Learn: An Essential Collaboration Between Health and Education." *Public Health Reports* 107(1): 3-15.

Oakes, Jeannie. 2005. *Keeping Track: How Schools Structure Inequality* 2nd ed. New Haven: Yale University Press.

Payne, Kevin J. & Bruce J. Biddle. 1999. "Poor School Funding, Child Poverty, and Mathematics Achievement." *Educational Researcher* 28(6): 4-13.

Politzer, Robert M., Jean Yoon, Leiyu Shi, Ronda G. Hughes, Jerrilynn Regan, & Marilyn H. Gaston. 2001. "Inequality in America: The Contribution of Health Centers in Reducing and Eliminating Disparities in Access to Care." *Medical Care Research and Review* 58(2): 234-248.

Powell, Arthur G., Eleanor Farrar, & David K. Cohen. 1985. *The Shopping Mall High School: Winners and Losers in the Educational Marketplace*. Boston: Houghton Mifflin Company.

Rosas, Scott, Jane Case, & Linda Tholstrup. 2009. "A Retrospective Examination of the Relationship Between Implementation Quality of the Coordinated School Health Program Model and School-Level Academic Indicators Over Time." *Journal of School Health* 79(3): 108-115.

Ross, Catherine E. & Chia-Ling Wu. 1995. "The Links Between Education and Health." *American Sociological Review* 60(5): 719-745.

Rowen, Brian P., Richard J. Correnti, Robert J. Miller, & Eric M. Camburn. 1999. "School Improvement by Design: Lessons from a Study of Comprehensive School Reform Programs." In Sykes, Gary, Barbara Schneider, David N. Plank, & Timothy G. Ford. *Handbook of Education Policy Research*. New York: Routledge.

Silberberg, Mina & Joel C. Cantor. 2008. "Making the Case for School-Based Health: Where Do We Stand?" *Journal of Health Politics, Policy, and Law* 33(1): 3-37.

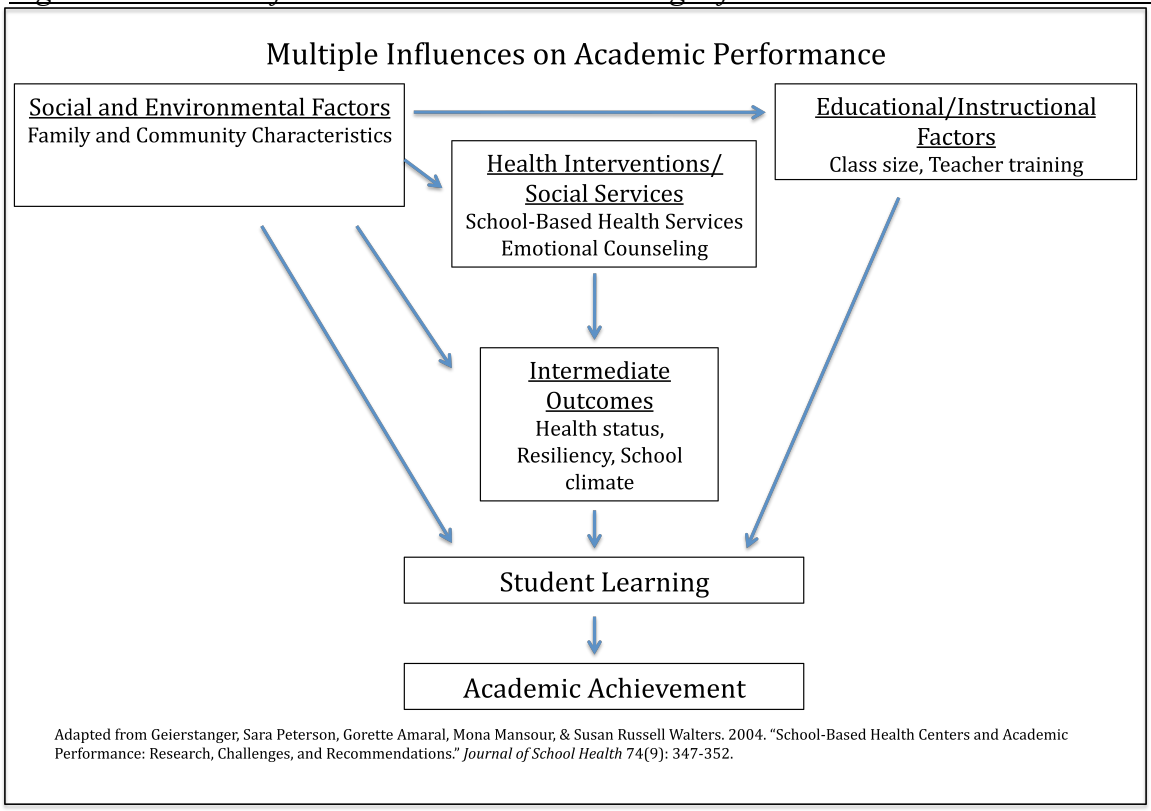
Symons, Cynthia Wolford, Bethann Cinelli, Tammy C. James, & Patti Groff. 1997. "Bridging Study Health Risks and Academic Achievement Through Comprehensive School Health Programs." *Journal of School Health* 67(6): 220-227.

Wenglinsky, Harold. 1997. "How Money Matters: The Effect of School District Spending on Academic Achievement." *Sociology of Education* 70(3): 221-237.

West, Brady T., Kathleen B. Welch, & Andrzej T. Galecki. 2007. *Linear Mixed Models: A Practical Guide Using Statistical Software*. Boca Raton, FL: Chapman & Hall/CRC.

Woodworth, Katrina R., Jane L. David, Roneeta Guha, Haiwen Wang, & Alejandra Lopez-Torkos. 2008. "San Francisco Bay Area KIPP Schools: A Study of Early Implementation and Achievement, Final Report." Center for Education Policy, SRI International.

Figure 1. The Role of School Health Services Among Influences on Academic Achievement



Adapted from Geierstanger, Sara Peterson, Gorette Amaral, Mona Mansour, & Susan Russell Walters. 2004. "School-Based Health Centers and Academic Performance: Research, Challenges, and Recommendations." *Journal of School Health* 74(9): 347-352.

Table 1: School Health Services Offered by Sample Schools

Type of Health Service	Number of Add Health Schools Providing Service (n = 129)
Treatment for Minor Illnesses and Injury	76
Emotional Counseling	73
Drug Abuse Program	53
Athletic Physical	52
Alcohol Abuse Program	50
Non-athletic Physical	21
Nutrition/Weight Loss Program	19
Rape Counseling	15
Immunizations	11
Diagnostic Screenings	11
Physical Violence Program	11
Family Planning Counseling	11
STD Treatment	4
Prenatal/Postpartum Health Care	4
Family Planning Services	3

Figure 2. The distribution of service provision among Add Health Schools

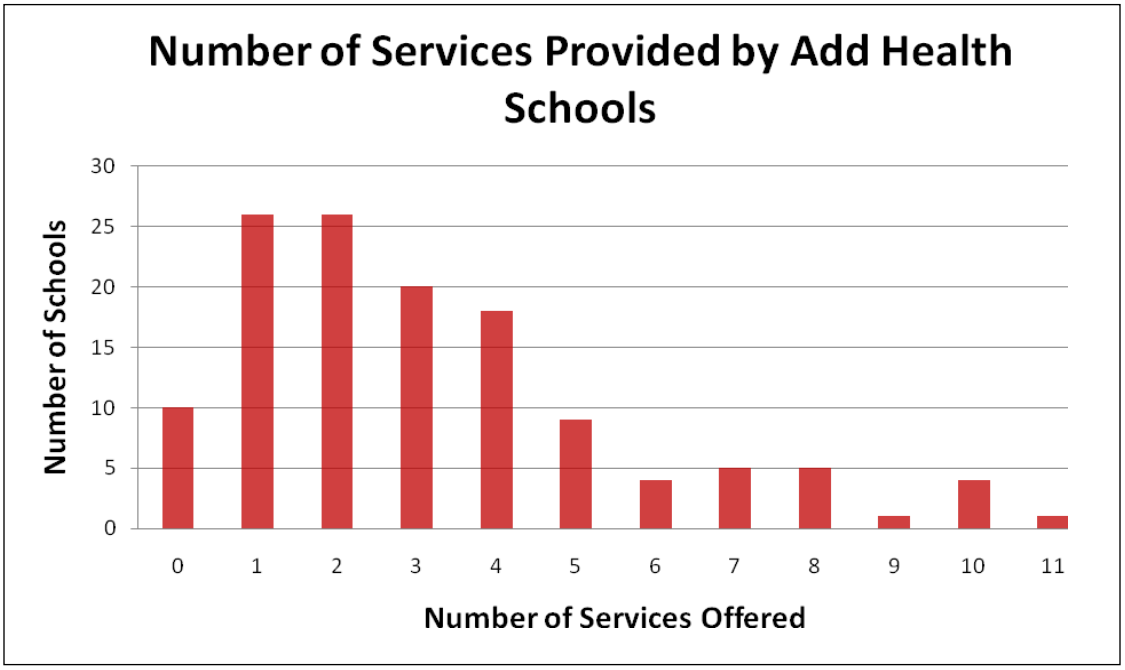


Table 2: Descriptive Characteristics of Students in Analysis

	Sample % or Average (n = 18,008 adolescents)
Demographic Characteristics	
Female	50.9%
Race/Ethnicity	
White	52.1%†
Black	22.6%
Hispanic	17.9%
Asian	7.5%
Born in U.S.	88.6%
Language spoken at home	
Spanish	8.4%
Other (non-English)	3.4%
Single-parent Family	29.7%
Family Income (in $1,000s)	45.0
Parent's Education	
Less than high school	12.6%
High school or equivalent	25.7%
Post-high school education, but no college degree	30.5%
College degree or higher	31.2%
Educational Characteristics	
Grade Level	
7th	13.1%
8th	13.0%
9th	17.5%
10th	19.6%
11th	19.5%
12th	17.3%
Received special education services in the past 12 months	9.5%
Received parent help on a school project in the past 4 weeks	18.9%
Academic Achievement	
Course failure (any D or F in a core academic subject)	38.5%

†Note: These percentages are based on the final sample, which excludes American Indians/Native Americans and other race adolescents. Percentages that do not add to 100% are the result of rounding error.

Table 3: Descriptive Characteristics of Schools in Analysis

	Sample % (n = 129 schools)
School Size	
Small (1 – 400)	23.3%
Medium (410 – 1000)	45.7%
Large (1001+)	31.0%
School Type	
Public	91.5%
Private	8.5%
Urbanicity	
Urban	31.0%
Suburban	54.3%
Rural	14.7%
Region	
West	21.7%
Midwest	22.5%
South	41.9%
Northeast	14.0%
Average Daily Attendance	
95% or more	42.6%
85 to 94%	51.2%
85% or less	6.2%
Mean % of students testing one or more grades below grade level	21.7%
Mean % of students in an academic or college preparatory program	39.9%
Mean % of teachers at school new this year	10.4%
Mean % of teachers at school 5+ years	63.1%
Mean % of teachers with a Master's degree or higher	48.3%
Mean % of students eligible for free or reduced-price lunch	27.1%
Mean % of student body that is black	19.6%
Mean % of student body that is Hispanic	16.9%
Mean % of student body living in a female-headed household	19.2%
Mean % of student body with at least one college-educated parent	50.9%
Mean % of student body with at least one parent in a professional/managerial/technical occupation	38.1%
State policy requiring schools to offer health nurse services	43.4%
State policy funding school-based health centers (SBHCs)	74.8%

Note: Percentages that do not add to 100% are the result of rounding error.

Table 4: Odds Ratios from Multilevel Regression Models of School-Based Health Service Provision on Academic Course Failure

	Model 1 Unconditional Model	**Model 2** Level 1 Race Effects Only	**Model 3** Student Controls Only	**Model 4** Student and School Controls Only	**Model 5** Full Model with Key IV	**Model 6** Full Model with Key IV + Race Interactions
Intercept	0.470***	0.416***	0.762	1.124	1.215	1.206
	(0.090)	(0.107)	(0.264)	(0.548)	(0.550)	(0.546)
Student Level						
Female			0.670***	0.668***	0.668***	0.668***
			(0.063)	(0.064)	(0.064)	(0.064)
Hispanic		1.827***	1.575**	1.578**	1.579**	1.656*
		(0.125)	(0.131)	(0.132)	(0.131)	(0.193)
* Health Service Provision (slope)						0.988
						(0.039)
Black		1.449**	1.131	1.127	1.118	0.914
		(0.117)	(0.117)	(0.135)	(0.135)	(0.205)
* Health Service Provision (slope)						1.069
						(0.044)
Asian		0.562	0.726	0.741	0.743	0.718
		(0.315)	(0.284)	(0.279)	(0.277)	(0.404)
* Health Service Provision (slope)						1.009
						(0.064)
U.S. Born			1.161	1.158	1.157	1.156
			(0.182)	(0.182)	(0.182)	(0.184)
Language spoken at home (ref: English)						
Spanish			0.921	0.937	0.939	0.945
			(0.182)	(0.186)	(0.185)	(0.187)
Other			0.532*	0.535*	0.537*	0.540*
			(0.295)	(0.295)	(0.294)	(0.292)
Family Income (log of income, in $1,000s)			0.857**	0.861**	0.861**	0.861**
			(0.050)	(0.051)	(0.051)	(0.050)
Single-parent Family			1.343***	1.344***	1.344***	1.343***
			(0.086)	(0.086)	(0.086)	(0.086)
Parent's Education (ref: less than high school)						
High school or equivalent			0.853	0.853	0.852	0.852
			(0.124)	(0.125)	(0.125)	(0.125)
Post-HS, no college degree			0.760*	0.765*	0.764*	0.764*
			(0.121)	(0.122)	(0.123)	(0.123)
College degree or higher			0.450***	0.456***	0.456***	0.455***
			(0.148)	(0.150)	(0.150)	(0.151)
Grade Level (ref: 7th grade)						
8th grade			1.111	1.104	1.105	1.105
			(0.114)	(0.115)	(0.115)	(0.114)
9th grade			1.888***	1.831***	1.833***	1.838***
			(0.144)	(0.151)	(0.151)	(0.151)
10th grade			1.705***	1.654**	1.655**	1.659**
			(0.153)	(0.162)	(0.163)	(0.163)
11th grade			1.753**	1.701**	1.702**	1.706**
			(0.165)	(0.175)	(0.175)	(0.175)
12th grade			1.520*	1.471*	1.473*	1.476*
			(0.164)	(0.177)	(0.177)	(0.177)
Received Special Education			2.002***	1.991***	1.991***	1.992***
			(0.105)	(0.107)	(0.107)	(0.107)
Parent helped on a school project			0.731**	0.730**	0.730**	0.730**
			(0.111)	(0.112)	(0.112)	(0.112)

School Level

Health Service Provision					0.972	0.955*
					(0.019)	(0.022)
Size – Medium (401 – 1000)				1.441**	1.433**	1.429**
				(0.128)	(0.126)	(0.126)
Size – Large (1000+)				2.092***	2.169***	2.210***
				(0.210)	(0.216)	(0.211)
Type – Public				1.101	1.101	1.119
				(0.204)	(0.206)	(0.205)
Location – Urban				1.066	1.062	1.054
				(0.137)	(0.141)	(0.136)
Location – Rural				0.779	0.787	0.782
				(0.155)	(0.154)	(0.153)
Region – West				1.968***	1.992***	2.006***
				(0.172)	(0.172)	(0.172)
Region – Midwest				1.452*	1.427*	1.390
				(0.172)	(0.167)	(0.166)
Region – Northeast				1.185	1.238	1.234
				(0.193)	(0.193)	(0.192)
Average Daily Attendance				0.981	0.978	0.987
				(0.059)	(0.058)	(0.060)
% of students testing below grade level				0.999	0.999	0.998
				(0.003)	(0.003)	(0.003)
% of students in academic or college preparatory instructional program				1.003	1.003	1.003
				(0.002)	(0.002)	(0.002)
% of teachers new this year				1.005	1.005	1.005
				(0.004)	(0.003)	(0.003)
% of teachers at school 5+ years				0.998	0.998	0.999
				(0.002)	(0.002)	(0.002)
% of teachers with a Master's degree or higher				0.999	1.000	1.000
				(0.002)	(0.002)	(0.002)
% of students eligible for free or reduced-price lunch				1.014***	1.014***	1.015***
				(0.004)	(0.003)	(0.004)
% black				0.997	0.997	0.998
				(0.004)	(0.004)	(0.004)
% Hispanic				0.984***	0.984***	0.983***
				(0.004)	(0.004)	(0.004)
% female-headed household				0.996	0.995	0.994
				(0.010)	(0.010)	(0.010)
% with college-educated parent				1.001	1.001	1.000
				(0.007)	(0.007)	(0.007)
% percent with parent in professional, managerial, technical occupation				0.977*	0.975*	0.976*
				(0.010)	(0.010)	(0.010)
State policy – Nurse services				1.094	1.076	1.087
				(0.117)	(0.114)	(0.116)
State policy – funding for SBHCs				0.904	0.930	0.949
				(0.133)	(0.131)	(0.131)
Variance Components						
Tau – Intercept	0.3724***	0.5058***	0.2977***	0.1803***	0.1744***	0.1738***
Tau – Hispanic		0.1605**	0.1064**	0.1093**	0.0990**	0.0877**
Tau – Black		0.1172**	0.1426***	0.1410***	0.1355***	0.1153***
Tau – Asian		0.4948*	0.2058	0.2275	0.2024	0.2018

Note: All models show odds ratios and standard errors in parentheses. Results are from unit-specific models with robust standard errors. Sample n = 18,008 students and n = 129 schools.
* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Appendix

Results in the following school-by-service level comparisons should be interpreted with some caution because weighted tabulations do not allow the explicit option to account for small expected cell counts, which occurred in a few cases.

Table A1: School Characteristics by Level of Service Provision: Basic School Characteristics

	Urbanicity			School Size		
Level of Service Provision	**Urban** weighted % (sample n = 129 schools)	**Suburban** weighted % (sample n = 129 schools)	**Rural** weighted % (sample n = 129 schools)	**Small** (1 – 400) weighted % (sample n = 129 schools)	**Medium** (401 – 1000) weighted % (sample n = 129 schools)	**Large** (1000+) weighted % (sample n = 129 schools)
None (0 services)	14.3%	68.3%	17.4%	31.3%	55.3%	13.4%
Low (1-2 services)	27.1%	59.1%	13.7%	72.4%	21.4%	6.2%
Medium (3-5 services)	14.8%	61.2%	24.0%	52.8%	38.5%	8.8%
High (6-11 services)	24.2%	49.6%	26.2%	29.1%	38.2%	32.7%
Total	22.1%	59.4%	18.5%	59.3%	30.6%	10.2%

Table A2: School Characteristics by Level of Service Provision: Basic School Characteristics

	Region				School Type	
Level of Service Provision	**West** weighted % (sample n = 129 schools)	**Midwest** weighted % (sample n = 129 schools)	**South** weighted % (sample n = 129 schools)	**Northeast** weighted % (sample n = 129 schools)	**Public** weighted % (sample n = 129 schools)	**Private** weighted % (sample n = 129 schools)
None (0 services)	4.5%	49.5%	46.1%	0%	100.0%	0%
Low (1-2 services)	7.5%	49.5%	31.8%	11.5%	79.1%	20.9%
Medium (3-5 services)	32.7%	23.4%	27.2%	16.7%	81.3%	18.7%
High (6-11 services)	7.1%	25.3%	39.0%	28.5%	100.0%	0%
Total	15.4%	38.5%	31.2%	14.3%	83.1%	16.9%

Note: Percentages are computed on the sample of Add Health schools with valid student weights using school weights that adjust for the complex survey sampling design of the Add Health study.

Table A3: School Characteristics by Level of Service Provision: Indicators of School Advantage/Disadvantage

	Percent of schools where…			
	… average daily attendance is under 85%	… over 20%† of students are testing 1+ grades below grade level	… over 40%† of students are in academic or college prep track*	… over 23%† of students are eligible for free or reduced-price lunch
Level of Service Provision	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)
None (0 services)	13.6%	67.2%	37.4%	61.1%
Low (1-2 services)	6.5%	35.2%	26.4%	45.2%
Medium (3-5 services)	9.0%	43.9%	64.4%	48.1%
High (6-11 services)	36.3%	19.0%	29.5%	29.6%
Total	10.7%	38.1%	39.6%	46.2%

Table A4: School Characteristics by Level of Service Provision: Indicators of School Advantage/Disadvantage

	Percent of schools where…		
	… over 7%† of teachers at school are new this year	… over 70%† of teachers at school have worked there 5+ years	… over 50%† of teachers at school have a Master's degree or higher**
Level of Service Provision	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)
None (0 services)	32.9%	44.6%	74.0%
Low (1-2 services)	57.8%	59.0%	23.1%
Medium (3-5 services)	56.7%	34.3%	43.1%
High (6-11 services)	16.8%	85.1%	78.9%
Total	51.6%	52.9%	38.2%

Note: Percentages are computed on the sample of Add Health schools with valid student weights using school weights that adjust for the complex survey sampling design of the Add Health study.
†This percentage of students marks the median among schools.
* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, for a Rao-Scott adjusted chi-square test (may not correct for small cell sizes).

Table A5: School Characteristics by Level of Service Provision: School Composition (Student) Characteristics

	Percent of schools where…			
	…over 50% of students are black	…over 75%† of students are white	…over 50%† of students have a college-educated parent	…over 18%† of students live in female-headed HHs
Level of Service Provision	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)
None (0 services)	7.4%	63.1%	28.7%	81.2%
Low (1-2 services)	8.4%	62.8%	43.8%	43.4%
Medium (3-5 services)	16.5%	69.7%	49.4%	37.5%
High (6-11 services)	24.6%	60.6%	30.6%	41.8%
Total	12.6%	64.8%	43.4%	43.5%

Table A6: School Characteristics by Level of Service Provision: School Composition (Student) Characteristics

	Percent of schools where…		
	…over 7%† of students rate their health as fair or poor	…over 53%† of students have had a routine physical exam in the past year	…over 5%† of students missed school once a week or more in past month due to a health or emotional problem*
Level of Service Provision	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)	weighted % (sample n = 129 schools)
None (0 services)	71.3%	55.5%	59.6%
Low (1-2 services)	35.0%	65.2%	20.2%
Medium (3-5 services)	37.0%	50.7%	36.3%
High (6-11 services)	60.0%	65.7%	65.6%
Total	40.3%	60.0%	32.3%

Note: Percentages are computed on the sample of Add Health schools with valid student weights using school weights that adjust for the complex survey sampling design of the Add Health study.
†This percentage of students marks the median among schools.
* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, for a Rao-Scott adjusted chi-square test (may not correct for small cell sizes).