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The Impact of Worksite Clinics on Teacher Healthcare Utilization and Cost, Self-reported Health Status, and Student Academic Achievement growth in a Public School District

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Abstract

Objective: To examine the impact of worksite clinics on healthcare utilization and cost, self-reported health status, and student achievement growth in a public school district.

Methods: We used insurance claims, health risk assessment, and student achievement growth data for active teachers during 2007-2015. A difference-in-differences approach was applied to measure the impact of worksite clinics.

Results: Compared to using a community-based clinic as the usual source of primary care, using a worksite clinic was associated with significantly lower inpatient admissions (53 vs. 31 per 1,000 teacher years), annual healthcare cost ($5,043 vs. $4,298 in 2016 US dollars, a difference of $62 per teacher per month), and annual absent work hours (63 vs. 61). No significant differences were detected in self-reported health status or student achievement growth.

Conclusions: Worksite clinics reduce teacher healthcare cost and absenteeism.

Key words: worksite clinics, healthcare cost, utilization, absenteeism, student academic achievement growth, public school

INTRODUCTION

The ever-escalating cost of healthcare has put considerable pressure on employers in the past several decades. In 2015, the US national health expenditure increased by 5.8 percent and accounted for 17.8 percent of the economy; the total amount has reached $3.2 trillion, to which employers contributed $0.6 trillion.[1] Partly responding to the cost pressure, employers have adopted various worksite interventions such as programs to help employees stop smoking, lose body weight, improve diet and nutrition, or manage chronic medical conditions such as diabetes and asthma. A recent Kaiser Family Foundation employer survey showed that 81.3 percent of employers with 200 or more workers or 25.3 percent of smaller employers offered such programs in 2016.[2]

One relatively new phenomenon, the use of worksite primary care clinics has gained momentum in recent years. Traditionally, employers offer worksite clinics on occupational health and minor acute care, which dates back to the 1860s in railroad and mining companies.[3] Many employers, however, have moved beyond occupational health and started providing a full range of primary care services.[4] As of 2016, 10.3 percent of employers with 200 or more workers offered primary care services through worksite clinics, whereas only 1.6 percent did so in employers with less than 200 workers. For large employers with 1,000 or more workers, the prevalence of worksite primary care clinics increased from 15.6 percent in 2009 to 23.2 percent in 2016.[2]

There are three operational models for worksite clinics. Employers can hire a third-party worksite clinic vendor to operate a clinic which is the most common, employ clinical staff directly and self-manage a clinic, or outsource the operation to a local healthcare provider.[5] The scope of services delivered by worksite clinics depends on an employer's specific needs but they typically offer health promotion and primary care, in addition to occupationally related care.

Most clinics are staffed by nurse practitioners and some have physicians or even part-time specialists.[5]

The expectation is that offering primary care services at the worksite can help employers contain healthcare cost, improve employee productivity, and attract qualified employees.[5] By improving access to primary care, employers hope to see improved prevention and compliance to the management of chronic medical conditions that may lead to lower cost of downstream care, and decreased specialist care that often costs much more than primary care. Getting care at the worksite could potentially lead to less time away from work, fewer unattended health problems, and therefore increase productivity.

The literature on worksite clinics is relatively sparse whereas other worksite interventions have been studied extensively. Worksite programs managing lifestyles such as physical activity and smoking have not been shown to reduce healthcare costs, but those focused on chronic conditions such as diabetes can generate sizable returns on investment for employers.[6-10] Prior studies have demonstrated that worksite clinics reduced hospital admissions and emergency department (ER) visits[11,12] and improved medication adherence[13] but did not reduce total healthcare cost. Conover et al. examined the total cost and utilization in a large employer with a worksite health clinic in place since 1996 and found no significant differences in total healthcare cost between major (non-casual) clinic users and non-users.[14] Leveraging a natural comparison in a large multi-state employer which established a worksite clinic in California but not in Texas, Chen used a difference-in-differences approach to examine the patterns of healthcare utilization and total healthcare cost, and demonstrated that among employees using the clinic, they shifted services from external providers to the clinic.[15] However, clinic users increased their overall utilization as well and resulted in an increase in total healthcare cost. No prior studies have

examined the association between worksite clinics and employee self-reported health status or productivity.

By leveraging the longitudinal data for the years 2007-2015 from a large urban public school district, our study aims to assess the impact of worksite clinics on teacher healthcare utilization such as hospital admissions and ER visits, total healthcare cost, self-reported health status, and productivity. The major benefits of having worksite clinics include its convenience and familiarity with the setting. Providing primary care to teachers at or near schools may enable teachers without a usual source of primary care to have one and facilitate the usage of primary care and preventive care among teachers with a usual source of primary care in the community outside of the schools. Improved access to primary care is associated with better access to preventive care and better control of chronic conditions, which may lead to lower usage of ER and inpatient services and, as a result, lower total healthcare cost and improved health. The convenience associated with worksite clinics presumably is to reduce the absence from work due to travel to and back from a healthcare provider. Students are influenced greatly by teaching quality and better teacher health may be associated with improved student achievement growth, an objective measure of teacher productivity. Therefore, we hypothesize that worksite clinics are associated with reduced healthcare utilization and cost, improved teacher self-reported health status, lower teacher absenteeism, and higher teacher productivity as measured by student achievement growth.

Our study contributes to the literature in several important ways. To our knowledge, this is the first study to rigorously examine the causal relationship between worksite clinics, healthcare utilization and cost, teacher health, and student achievement growth in a public school district. The data allow us to measure intermediate outcomes of productivity such as teacher self-reported

health status and absenteeism. In addition, we are able to measure employee productivity in a meaningful and accurate way. We use an objective measure of teacher "value-added," which is derived from the growth in the teacher's students' standardized test scores and is used by the state's Department of Education to evaluate individual teacher performance. Although teaching is a white-collar service occupation, teaching is unusual in that objective measures of individual productivity can be calculated based on student achievement growth. Therefore, this is a unique opportunity to investigate the effect of worksite health interventions on productivity, which could have implications on the valuation of these interventions by employers in all sectors.

METHODS

Study setting

The school district includes the entire county containing a major city in a southern US state. During the 2015–2016 school year, the school district had 120 schools in the system, nearly 6,000 teachers, and over 80,000 students. Because of concern that some schools in the system had difficulty keeping quality teachers and concern about poor student academic performance, the school district worked with an academic medical center to establish five worksite (school-based) clinics in 2009 to improve teacher access to care and ensure that every teacher can reach a worksite clinic within 15 minutes of driving from the school in which they work. The school district considers the engagement with a school-based clinic the first and an important step to manage and improve health outcomes, and as a result, to improve teacher productivity.

The worksite clinics are run by family nurse practitioners and provide primary care for all teachers and their dependents. A supervising physician is on call to the nurse practitioners for clinical questions and does not see patients in this setting. She is required by the state law to

review 20 percent of each nurse practitioner's medical charts as well as any charts with a narcotic prescribed by a nurse practitioner. No copayments are required for worksite clinic visits and in most cases, teachers can get same-day appointments with little wait time; a copayment of about $30 is required for a primary care visit to a community-based clinic. All teachers, regardless where they seek primary care, have access to the same network of specialists and hospitals. The worksite clinics staff a referral specialist who coordinates all the referrals to specialists or hospitals, and the clinics have a special relationship with a large academic healthcare system that offers tertiary care. As illustrated in Figure 1, the number of primary care visits increased rapidly initially, from 109 visits in January 2009 to 1,006 visits in June of the same year, then gradually increased over time, varying in recent years between 1,258 in February 2015 and 2,735 in June 2016.

In addition to offering primary care for all teachers, four health management programs were also introduced since 2009 to help patients with diabetes, cardiovascular diseases, respiratory conditions (asthma and chronic obstructive pulmonary conditions), and overweight or obesity. Program participants work with a nurse practitioner and a health coach to manage their conditions. The program for overweight or obesity was outsourced to outside vendors.

Prior to 2014, health insurance coverage was the same across all teachers except for those who participated in one of the four health management programs. To incentivize eligible teachers to participate in these programs, the school district waived co-payments for all generic medications needed to treat the conditions if program participants could satisfy the pre-set requirements that varied across the conditions under management. For example, a teacher with asthma would receive a personalized asthma control plan, health education materials, health coaching, free office visits, and lab tests at the onsite clinics, assistance with smoking cessation, a peak flow

meter, and spacers for inhalers—all of which come with no co-payments or deductibles. But in return, participants were required to adhere to the asthma control plan, follow up with a clinician at a worksite clinic regularly, and stop smoking within one year of enrollment. The four health management programs existed during the whole study period but starting in 2014, in addition to the presence of an indicated chronic condition, the eligibility for a health management program was conditional on the completion of a health risk assessment survey (HRA).

In 2014, there were two types of health benefits plans: the Plus Plan and the Basic Plan, with the former having a lower annual deductible and lower copayments for physician visits and prescription drugs. All teachers who complete the HRA were eligible for the Plus health plan; the rest of teachers would be in the basic health plan. In 2015, in order to enroll into the Plus health plan, teachers were required to complete both the HRA and a biometric screening. If a teacher leaves the school district in the middle of a school year, she is eligible for insurance coverage for up to one and a half months, depending on when her employment terminates. Other than the health benefits, during the study period, the school district offered dental and vision benefits, hearing loss screening, an Employee Assistance Program that provides free counseling on stress, financial problems, and other personal or family issues, and 10 sick days and 3 personal days per year.

Study population and data sources

Our analysis includes all the active teachers at the school district during the study period, the 2007–2015 school years, for which the data are available, excluding teacher years during which a teacher was retired, had non-continuous employment, or worked less than 85 percent of a full-time equivalent (a full-time teacher works 1,507.5 hours a year), i.e., one and a half months absent from a 10-month school year. This ensures teachers were eligible for health insurance

benefits offered by the school district and therefore their healthcare utilization and cost are reflected by the available medical and prescription claims. The utilization of clinics comes from the claims data as well. Health management program eligibility and participation data are available for the years 2009-2013 for diabetes, cardiovascular diseases, and respiratory conditions, but not for overweight or obesity, which was outsourced to vendors. Due to the changes in the enrollment criteria, we were not able to obtain health management program eligibility and participation data for the years 2014-2015.

Similarly, for the whole study period, we have the absence data for all active teachers and student achievement growth data for about 40 percent of active teachers, who taught a subject in a grade that has a state assessment (i.e., a standardized test). These include mathematics and reading in grades 4–8 and many high school subjects that require statewide standardized end-of-course exams. Although students take standardized state assessments in grade 3, the productivity measure requires a baseline assessment and therefore cannot be created for third grade teachers.

The HRA data is only available for the years 2012-2015 and about 70 percent of teachers completed an HRA each year after the initial year of 2012. HRA is an online questionnaire that collects self-reported information about overall health status, satisfaction with the life and the job, stress level, health behaviors, self-reported medical conditions. In order to investigate the association of distance with school-based clinic use, we measured the physical driving distance between each school and the closest clinic through the Google map application.

Measures

Intervention: An individual is considered a participant of the intervention for a specific year if her primary care visits to worksite clinics accounted for the largest number of all primary care

visits in that year and at least one third or more, or if she participated in one of the health management programs. These two conditions reflect the intensity of involvement with the worksite clinics. As described in the Analytic Approach section below, these two interventions were analyzed separately. A participant in the first intervention means the teacher was attributed to a worksite clinic, whereas a participant in the second intervention means the teacher was enrolled in one of the health management programs. The former measures whether an individual uses a worksite clinic as the usual source of primary care; if so, that individual is considered having a clinic primary care provider (PCP). When two or more PCPs had at least a third of the visits and they all had the same number of visits, the attributed PCP was determined by the most recent visit. Our approach excludes the casual users of clinics from the intervention group. It is conceivable that one has to receive a fair amount of services from a worksite clinic before we are able to attribute the changes in outcomes to the clinic. A secondary analysis was conducted by using a continuous variable, i.e., percent primary care physician visits to a worksite clinic, to capture the intensity of involvement.

Healthcare utilization and cost: Healthcare utilization was measured using several different metrics: hospital admissions, ER visits, and primary care visits. Total healthcare cost measures the overall utilization of resources in dollar terms. Specifically, it was calculated as the summation of allowed payments that include both payments from insurers and patients. All the cost outcomes were truncated at 99th percentile to reduce the impact of outliers. Both utilization and cost were annualized for teacher years during which a teacher was newly hired. All costs were inflated to 2016 U.S. dollars using the medical care component of the Consumer Price Index.[16]

Self-reported Health status: For selected years (2012-2015), we examined self-reported health status, including self-reported physical health status and the level of stress and anxiety. Both measures come from the HRA questionnaire, derived from "How would you describe your overall physical health?" and "How often do you feel tense, anxious, or depressed?" respectively. The physical status was rated on a 5-point scale: excellent, very good, good, fair, and poor, whereas the stress and anxiety level was measured as the frequency of being tense, anxious, or depressed: often, sometimes, rarely, and never. We selected these two items for self-reported health status because they best reflect physical and mental health status among all the questions.

Teacher absenteeism: Employee absenteeism is costly because it disrupts work schedules. In particular, teacher absenteeism causes direct costs in hiring substitutes, but more importantly it removes the teacher from the classroom, leading to less student learning. Since teachers do not often work for the whole year, we measured absence due to sickness or injuries as the fraction of all paid hours for an employee during the year.

Student achievement growth: An annual value-added measure was calculated for each teacher—a measure of productivity based on the achievement growth in the topic of instruction of the teacher's students during the year. As a valid measure of teacher performance, it does not require further adjustments for student characteristics.[17] It is commonly used as a performance measure for teachers and as a way to measure the impact of programs and policies designed to improve teaching performance. Performance measures for individual teachers typically average their value-added over several years. We prefer a measure that reflects each year's productivity, so we used the value-added from each individual year.

Analytic approach

Given that we have 2007–2015 data and the worksite interventions were implemented in 2009, for the main analysis, we applied a quasi-experimental (difference-in-differences) study design to assess the impact of worksite clinics on teacher healthcare utilization and cost, self-reported health status, and productivity. That is, we examined participating teachers who received the intervention—having a clinic PCP—and non-participating teachers who did not receive the intervention. Prior to the interventions, all teachers had either a community PCP or no PCP. Since teachers without a PCP had little healthcare utilization, it is not appropriate to compare them to teachers using a clinic PCP. We used "no PCP" as a covariate in multivariate models but present the results by comparing users of clinic PCPs and community PCPs. Participation in the health management programs was analyzed separately because only 34 percent of teachers had conditions that made them eligible for these programs. The outcomes of interest before and after the implementation of interventions were compared between health management program participants and non-participants. In the analysis, we required that all teachers who received the interventions had at least one year of data prior to the time of intervention, or one baseline year, and that all teachers who never received interventions during the study period had at least two years of data.

To ensure a more robust causal inference, we applied teacher-level fixed effects, which control for various characteristics at the teacher and school level that did not change over time, e.g., teacher race and gender. All models control for the calendar year effect using an indicator for each of the years, which accounts for changes over time in outcomes common to all teachers but unrelated to clinic use. Since both teacher-level fixed effects and calendar years are included in the models, our approach effectively differences out teacher-specific and time-specific factors,

leaving the use of clinic as the usual source of primary care, which is specific to each person and each year, to capture the impact of worksite clinics on outcomes.[18] That is, the coefficient of having a clinic PCP or participating in a health program in effect is a difference-in-differences estimate.

For the continuous outcomes including healthcare cost, teacher absenteeism, and student achievement growth, we used linear regressions for longitudinal data where the correlation between observations within teacher was incorporated. Since healthcare cost is highly skewed to the right, we took the difference between the current year cost and that of the first year available in the data and treated this difference as the outcome, which has a distribution close to normal. For count variables including the number of hospital admissions and ER visits, we used a negative binomial regression model.

Two health status outcomes are categorical variables, self-reported health status and the level of stress and anxiety, which were dichotomized as "excellent or very good self-reported physical health status" and "often or sometimes having tension or anxiety." We used linear probability models because fixed effect logistic models did not converge. Since the two self-reported health status variables are for the years 2012-2015 only and thus no data are available prior to the establishment of clinics in 2009, the impact of worksite clinics is identified through the new participants in 2013-2015. That is, we treated teachers who had a clinic PCP in the current year, 2013-2015, but not in the prior year as participating teachers whereas those who had no clinic PCP in both years as non-participating teachers.

To facilitate the interpretation of multivariate analysis results, we generated marginal effects of the interventions. We held all the covariates at their means except the key variable of interests and predicted the outcomes. For example, to generate marginal effects on total healthcare cost, we used the whole analytic sample, replaced the clinic PCP indicator with one and the no PCP indicator with zero, held other covariates at their means, and generated the expected outcome under the intervention; and we did the same when replacing the clinic PCP indicator to zero for the expected outcome if there were no intervention. For healthcare utilization, due to the inability to generate marginal effects using count regression models directly because of teacher-level fixed effects, we used unadjusted utilization rates for teachers using community PCPs (or non-health management program participants) and multiplied them by the incidence rate ratios derived from regression coefficients to calculate adjusted rates for teachers using clinic PCPs (or health management program participants).

We conducted several other secondary analyses. First, we applied propensity scores as weights in the regressions to see if the results would change, where the weight is the inverse of the predicted probability (or one minus the predicted probability) of ever having a clinic PCP for those receiving the intervention (or those never having a clinic PCP). The purpose is to balance two groups to minimize potential selection. The propensity score was generated via a logistic regression, in which ever having a clinic PCP during the study period is the outcome and the covariates include teacher characteristics: gender, race, and baseline values of variables including age, Charlson Comorbidity Index, diagnosed conditions, healthcare utilization and cost, use of community PCP, distance to the nearest school clinic, number of years of data available, and a series of indicators for calendar years. We tried the propensity score matching approach, but we were not able to successfully match a non-participant for more than 20 percent

of participating teachers, meaning the two groups are balanced in all covariates in the propensity regression. The inability to match a majority of participants reduces our statistical power dramatically. We therefore opted to use the propensity score weighting approach.

We also considered using the driving distance between a school and the nearest clinic as an instrumental variable to account for the assignment of treatment, i.e., having a clinic PCP.[19] The instrumental variable approach would give us a consistent impact estimate if the instrument is correlated with having a clinic PCP. That is, if teachers are more likely to have a clinic PCP when it is closer rather than farther from their work location and if the instrument does not have an impact on the outcome other than through its impact on having a clinic PCP. The driving distance to the nearest clinic varies from zero (at the same school) to 19.5 miles, with a median of 4.4 miles. Among the teachers at a school co-located with a clinic, 39 percent had a clinic PCP in a year (71 percent in at least one year during the study period), but there was no difference in the utilization of clinic PCPs in other teachers, about 30 percent of whom had a clinic PCP in a year (about 62 percent in at least one year during the study period) regardless of distance. Unfortunately, the teachers working at a school with a clinic accounted for only five percent of all teachers, which greatly reduced the power of using driving distance as an instrumental variable. We therefore did not conduct an instrumental variable analysis.

Second, instead of using a clinic PCP to represent the intervention, we used a continuous variable, percent of primary care visits at worksite clinics as the independent variable of interest. Although the way we attributed a teacher to a PCP in our primary analysis is commonly done in the medical literature, it is somewhat arbitrary. Using a continuous variable could test the robustness of our conclusions.

Third, due to the differences between teachers who had a community PCP and those who had no PCP prior to the interventions, we conducted the analysis for each of the two subgroups separately. Compared to teachers without a PCP, teachers with a community PCP were often sicker and had more healthcare utilization. Since the relationship with healthcare providers differed between teachers with and without a community PCP, the probability of switching to a clinic PCP after the establishment of worksite clinics would likely be very different between the two subgroups. The no-PCP subgroup consists of teachers without a community PCP prior to the interventions, whereas the community-PCP subgroup had a community PCP at least in one year prior to the interventions.

Lastly, because only about one third of teachers were eligible for health management programs, we consider this a secondary analysis. We used similar analytic approaches—difference in differences—to examine the impact of participation in health management programs on various outcomes. Since the eligibility of obesity program is not available in the data, our analysis only included teachers eligible for diabetes, cardiovascular diseases, and respiratory conditions.

RESULTS

Sample characteristics

There were 7,677 unique teachers and 38,328 teacher years in the data after excluding post-retirement teacher years or those who worked less than 85 percent of a full-time equivalent. Further exclusion of clinic PCP users who did not have data prior to receiving interventions and those non-clinic PCP users who did not have two or more years of data led to an analytic sample of 5,208 unique teachers and 32,770 teacher years. Using similar exclusion criteria, the analytic

sample for health management programs included 1,981 unique teachers and 11,723 teacher years.

In the analytic sample, teachers with a school-based clinic PCP increased from 24 percent in the 2009-2010 school year to 37 percent in the 2015-2016 school year, teachers attributed to a community-based PCP decreased from 50 percent 43 percent, and those without a PCP decreased from 25 percent to 21 percent. As illustrated in Table 1, longitudinally speaking, 3,306 or 58 percent had a clinic PCP in at least one school year during the study period, 1,937 or 37 percent had a community PCP only, and only 235 or 5 percent teachers never had any PCPs. At baseline, compared to teachers with a community PCP only, those who ever had a clinic PCP were slightly younger, had a lower Charlson Comorbidity Index, were more likely to have musculoskeletal diseases, cancer, and asthma but less likely to have migraine, had fewer primary care visits but more inpatient admissions, a larger proportion of primary care visits to a school clinic, lower healthcare cost, and a larger number of absent work days. In contrast, teachers who never had any PCP were youngest and healthiest, were most likely to have migraine, but had lowest healthcare utilization and cost as well as absence. (See Appendix Table A1 and A2, http://links.lww.com/JOM/A456 for baseline teacher characteristics by subsample and non-mutually exclusive grouping, respectively)

Among the teachers eligible for diabetes, cardiovascular disease, or respiratory disease health management programs, compared to non-participants at baseline, participants were slightly older (46 years vs. 44 years), more likely to be female and black teachers, had a higher prevalence of musculoskeletal disease and migraine, but were less likely to have depression (Appendix Table A3, http://links.lww.com/JOM/A456). Overall, participants had a higher Charlson Comorbidity

Index (1.17 vs. 1.05). Program participants also had higher healthcare utilization and cost and more absent work days.

Multivariate analysis results

Main analysis

Figure 2 shows that, after adjusting for teacher characteristics, in comparison to teachers using a community-based PCP, teachers having a school-based clinic PCP have significantly fewer inpatient admissions (53 vs. 31 per 1,000 teacher years) and primary care visits (2,756 vs. 1,637 per 1,000 teacher years). As illustrated in Figure 3, having a school-based clinic PCP also have significantly lower annual total healthcare cost by $745 ($5,043 vs. $4,298, a difference of $62 per teacher per month), primarily driven by lower hospital inpatient costs ($776 vs. $417), hospital outpatient costs ($873 vs. $707), and prescription costs ($1,422 vs. $1,320). The multivariate regression results are presented in Appendix Table A5, http://links.lww.com/JOM/A456.

However, no significant differences in two self-reported health status measures—having tension or anxiety (56.9 vs. 56.1 percent) and self-reported physical health status (71.6 vs. 70.4 percent)—were detected (Figure 4). Having a school-based clinic PCP leads to lower annual absence work hours by 1.6 hours (63.1 vs. 61.5) (Figure 5). Compared to a median value-added teacher without a PCP, teachers with a community PCP or a clinic PCP had higher value-added (53.3 percentile and 54.2 percentile, respectively), but the small difference between the two groups is not statistically significant.

Secondary analysis

Propensity score regression shows that teachers who were female or were younger, or had a race other than white or black were more likely to have a school clinic PCP (Appendix Table A4, http://links.lww.com/JOM/A456). Sicker teachers, as measured by Charlson Comorbidity Index, were more likely to have a school clinic PCP but the opposite is true for those with migraines, hypertension, depression, or cancer. Teachers with more ER visits at baseline had a greater chance of having a clinic PCP but not among those with more primary care visits at baseline. Distance does matter, with shorter distance being associated with having a clinic PCP. The longer a teacher's tenure with the school district, the more likely she had a clinic PCP.

Applying propensity scores as weights in the regressions did not change the main conclusions, as shown in Appendix Table A6, http://links.lww.com/JOM/A456. The effect sizes of using a clinic PCP are similar. For example, the coefficient of use of a clinic PCP for the number of primary care visits is very close (-0.521 vs. -0.518); so is the coefficient for total cost (-745 vs. -697). For this reason, we present unweighted results as the main analysis.

Using the percentage of primary care visits to school clinics as the continuous independent variable in the analysis did not change the main conclusions either (Appendix Table A7, http://links.lww.com/JOM/A456). Interestingly, the magnitude of effect sizes for various outcomes generated by increasing the percentage from zero to 100 percent is often smaller but very close to that of having a clinic PCP vs. a community PCP.

By breaking down the sample into two subsamples: those without a PCP and those with a community PCP at baseline, we found some differential impacts of using a clinic PCP between the two subsamples (Appendix Table A8 and A9, http://links.lww.com/JOM/A456). The

difference in inpatient admissions associated with the use of clinic PCP was larger among teachers without a PCP at baseline (45 vs. 19 per 1,000 teacher years). In contrast, the difference in the number of primary care visits was smaller in those without a PCP at baseline (1,010 vs. 1,104 per 1,000 teacher years) (Appendix Figure A1, http://links.lww.com/JOM/A456). The difference in total cost due to the use of clinic PCP in teachers without a PCP at baseline was larger ($877 vs. $783) (Appendix Figure A2, http://links.lww.com/JOM/A456). No significant differences were found for the two self-reported health status measures, absent work hours, or student achievement growth score in either subsample (Appendix Figure A3 and A4, http://links.lww.com/JOM/A456).

We did not find an impact of health management program participation on various outcomes except a significant $295 increase in prescription drug cost (Appendix Table A10, http://links.lww.com/JOM/A456). The total cost was $110 higher among participants but not statistically significant.

DISCUSSION

Using the data from a large urban public school district, we assessed the association between school-based clinics and teacher healthcare utilization and cost, self-reported health status, absenteeism, and job performance, which, to our knowledge, is the first such study. Our analysis showed that using a school-based clinic PCP was significantly associated with lower healthcare utilization, cost, and teacher absenteeism, but not with health status or job performance. The results on healthcare utilization and cost, but not absenteeism, are robust to several secondary analyses.

Our results are mostly consistent with what was expected because the primary contribution of worksite clinics is the convenience they offer to employees. When getting sick or needing preventive care, an employee does not have to go to a community-based clinic to get care. And because it is often co-located with or very near the workplace, worksite clinics may facilitate the relationship building between employees and clinic-based providers. In theory, we expect to observe increases in primary care but decreases in ER visits, inpatient admissions, and healthcare costs. We observed significant reductions in inpatient admissions and healthcare costs. The ER reduction was significant only in teachers with a community-based PCP at baseline.

We were puzzled by a significant decrease rather than an increase in primary care visits. A study by Chen did show an increase primary care visits.[15] Though without any evidence, a potential explanation is that care at school-based clinics is more timely and has better quality in comparison to community-based clinics so that despite the reduction in primary care visits, the costly events such as ER visits and inpatient admissions as well as total cost decreased. This is plausible because all school clinics were staffed by family nurse practitioners, who often provide patients a different care model that emphasizes whole-person care from that of physicians,[20] and teachers can often get same-day appointments and have almost zero wait time.

Our findings, however, are different from those of some prior studies on worksite clinics in a non-school setting. Studies by Tao et al. and Stroo et al. showed that worksite clinics were associated with reductions in hospital inpatient admissions and ER visits,[11,12] which is consistent with our results, but the study by Chen resulted in an increase in utilization among users of clinics.[15] In terms of healthcare cost, no significant differences were detected by Conover and colleagues,[14] but total healthcare costs increased in the study by Chen,[15] which was primarily driven by the increase among employees with modest healthcare utilizations prior to clinic use.

The difference in study design may be the reason that our results differ from those of prior studies. Two of the prior studies were comparing one organization with clinics to another without,[12,15] whereas the study by Stroo et al. and our study compared users of clinics to non-users within the same organization.[11] It is unclear which study design is better. On the one hand, employees are more comparable if they are within the same organization; on the other, comparing users to non-users within the same organization is more likely subject to selection, meaning users of clinics are self-selected so that they are different from non-clinic users.

No significant self-reported health status changes were observed in our analysis and we posit that a change in self-reported health status may take more than establishing worksite clinics. It is conceivable that improving access to primary care could easily impact healthcare utilization, but improving self-reported health status may require additional interventions. The first metric, the frequency a teacher perceives anxiety, tension, or depression, may be influenced by job-related issues and personal life problems, in addition to medical care. Similarly, lifestyle practices such as exercise and nutrition as well as personal life may affect the second metric, self-reported physical health status on a 5-point scale. Health management program participants, but not others using clinics, were eligible for services provided health coaches. Nonetheless, we did not find significant changes in the two self-reported health status metrics in program participants. As a matter of fact, the school district started offering lifestyle coaching and stress management services to all teachers in 2016, beyond the period covered by our analysis. Future analysis of the school district data may generate much-needed evidence.

Not surprisingly, improved access to primary care through school-based clinics is associated with reductions in teacher absenteeism. Such an observation may be explained by the avoidance of traveling outside schools to receive care or the reduction in travel time. Five percent of

teachers have access to an onsite school clinic and the rest of the teachers are able to drive to the nearest school clinic within 15 minutes. According to the school district management, there is almost no wait time at a school clinic. In addition, the school district currently requires teachers to take at least half a day off to allow a substitute teacher in the classroom. If such a policy were changed so that teachers can take time off in smaller increments such as lunch or planning time to receive care, the effect of school clinics would likely be larger than what we observe. It is possible that teacher absenteeism was reduced by improved health. Our measure of teacher absenteeism is more granular and more objective than our measures of health status, which suggests that this explanation is possible even though we did not find an impact of clinics on health status metrics. Nonetheless, more research is warranted as the reduction in teacher absenteeism is not statistically significant at 0.05 level in the two subsamples, which could be due to smaller sample size.

Our hypothesis that establishing school-based clinics would lead to improvement in student achievement growth is not supported by our data. Teaching, as a white-collar service occupation, is unusual in that objective measures of individual productivity can be calculated based on student achievement growth. We expected school clinics to improve teacher self-reported health status, which would, in turn, improve teaching quality and student achievement growth. The fact that we did not find an impact on self-reported health status does not suggest student achievement growth is not associated with teacher health. Given the limited data on teacher health in our data, future studies are warranted.

Distance does matter in access to care as demonstrated in the use of a school-based clinic PCP and it has implications on whether employers should have onsite or near-site clinics. On average, nearly 40 percent of teachers in a school with a clinic were attributed to a school-based PCP in a year, compared to 30 percent in the rest of the teachers. That is, there is little difference in utilizing a school clinic PCP based on distance among the teachers in schools without a clinic. Once a teacher gets in a car and drives to a clinic, it does not matter much whether the driving distance is one mile or 5 miles. These data have two implications. First, onsite clinics are preferred because utilization of clinics would be better than near-site clinics. Second, if onsite clinics are not available, employers have flexibility in setting up near-site clinics in terms of the geographic distribution as long as it takes a reasonable amount of time to travel.

There are several limitations of our study. The greatest challenge we had is to conduct a fair comparison between school clinic users and non-users when teachers self-selected school clinic use. We addressed this partly by using a difference-in-differences approach that uses the same individual as her own control and partly by conducting a multivariate analysis weighted by the propensity of using a school clinic during the study period. The results of the weighted multivariate analysis were very similar to the unweighted analysis. But propensity scores only capture the observed teacher characteristics and there is still a possibility that we missed some important unobservable factor that influences both the use of a school-based clinic PCP and the outcomes. In addition, we have data on self-reported health status only for the years 2012-2015 with no data prior to the establishment of the clinics. The two self-reported health status metrics may not be sufficiently granular or sensitive to capture the changes over time as they are self-reported. Also, our estimates reflect the average effect of being attributed to a clinic PCP on various outcomes; we did not estimate cumulative effect of having a clinic PCP for multiple

years since less than 20 percent of teachers had a clinic PCP for more than three years. And the potential self-selection effect is much harder to control for. Lastly, there is a large variation from year to year in the value-added performance measure for each teacher due to changes in tests and in student factors. This large variation makes it harder to detect an impact of an intervention.

Employers with worksite clinics expect to see lower healthcare utilization and cost and teacher absenteeism. In this regard, such a claim is supported by our data. Certainly, more research is needed to confirm our study findings on healthcare utilization and cost and measure the impact of worksite clinics on productivity measures other than teacher absenteeism. It will also be interesting to see whether similar findings hold when school clinics are open to students as well as residents in the nearby community.

Figure 1.

2009-2015 Trends in Worksite Primary Care Visits

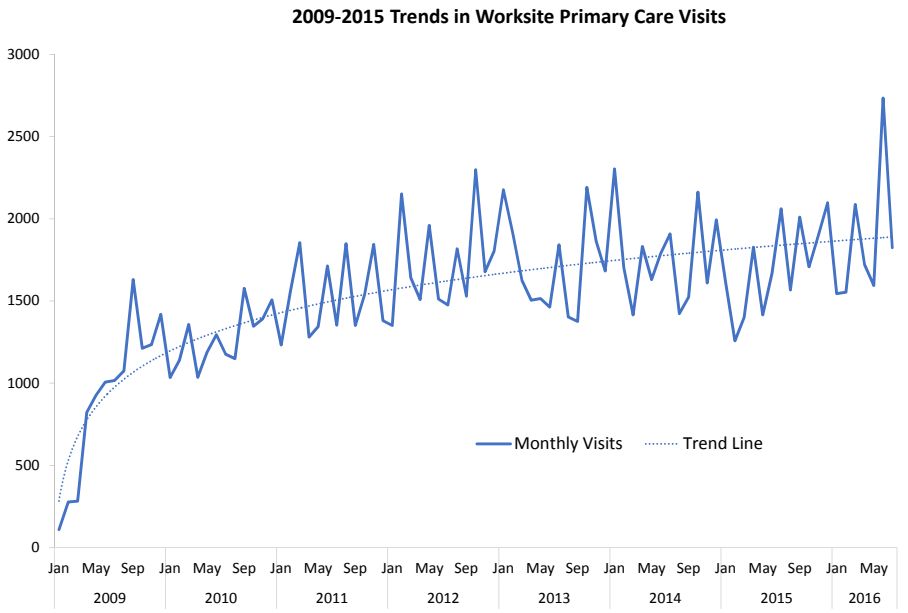
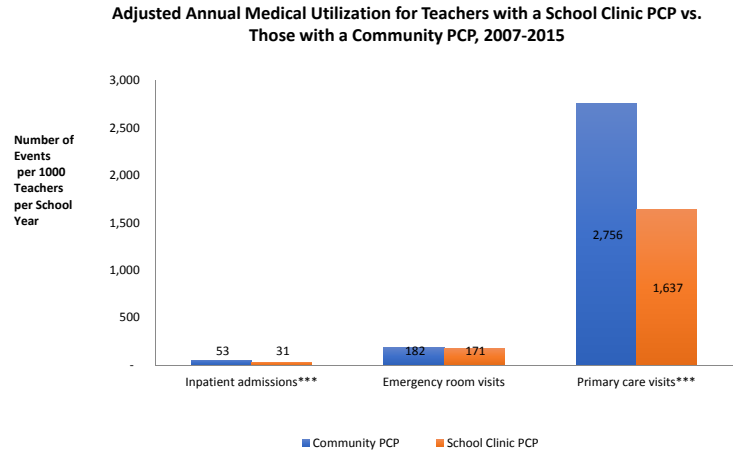


Figure 2.

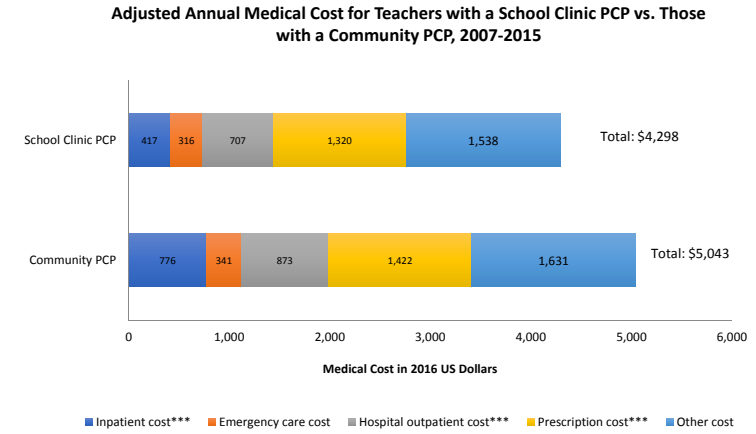
Adjusted Annual Medical Utilization for Teachers with a School Clinic PCP vs. Those with a Community PCP, 2007-2015



RAND Analysis of MNPS/CHS data. PCP: Primary care provider. * p<0.05, ** p<0.01, *** p<0.001.

Figure 3.

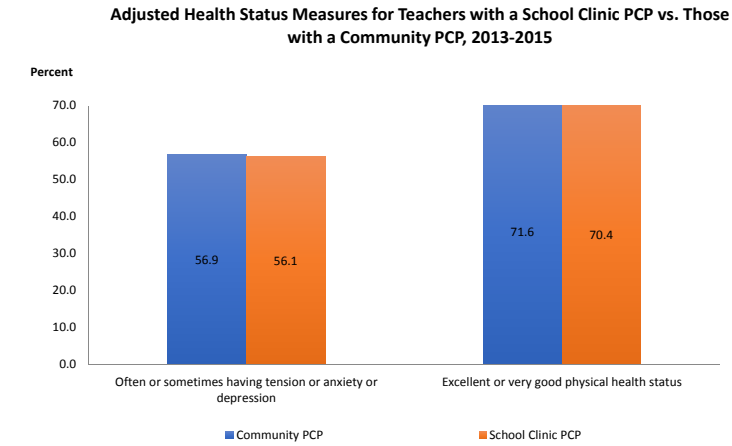
Adjusted Annual Medical Cost for Teachers with a School Clinic PCP vs. Those with a Community PCP, 2007-2015



RAND Analysis of MNPS/CHS data. PCP: Primary care provider. * p<0.05, ** p<0.01, *** p<0.001.

Figure 4.

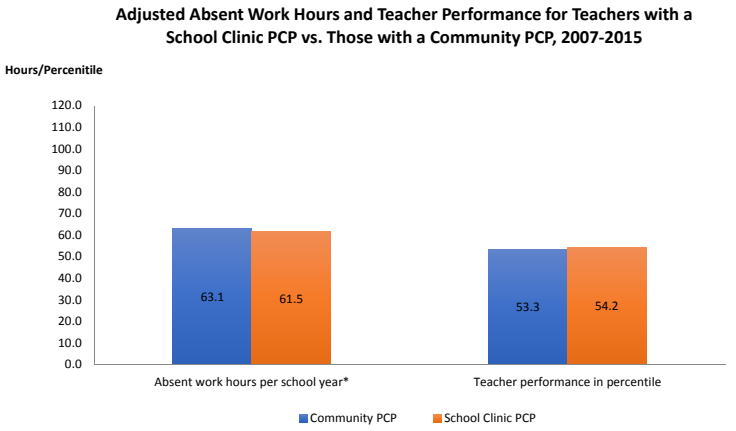
Adjusted Health Status Measures for Teachers with a School Clinic PCP vs. Those with a Community PCP, 2013-2015



RAND Analysis of MNPS/CHS data. PCP: Primary care provider. None of the measures is statistically significant at the 0.05 level.

Figure 5.

Adjusted Absent Work Hours and Teacher Performance for Teachers with a School Clinic PCP vs. Those with a Community PCP, 2007-2015



RAND Analysis of MNPS/CHS data. PCP: Primary care provider. Teacher performance is measured as the difference between a teacher with the indicated type of PCP and a similar teacher without a PCP who has median value added. * p<0.05, ** p<0.01, *** p<0.001.

Table 1. Teacher Baseline Characteristics by Primary Care Usage Status

Characteristics	Teachers ever having a school-based clinic PCP	Teachers having a community-based PCP only	Teachers never having a PCP	P value
Data and sample size				
Number of teachers, n	3,036	1,937	235	N/A
Number of baseline teacher years, n	8,080	1,937	235	N/A
Number of all teacher years, n	21,254	10,700	816	N/A
Demographics				
Age in years, mean (SD)	40.17(10.93)	40.93(12.26)	33.46(11.43)	0.000
Female, %	79.62	75.48	61.70	0.000
Race, %				
White	69.59	71.97	73.19	0.071
Black	28.81	26.85	23.40	0.054
Other	1.56	1.08	2.55	0.120
Diagnosed chronic conditions				
Charlson Comorbidity Index, mean (SD)	1.12(1.15)	1.39(1.25)	1.00(0.63)	0.000
Stroke, %	0.47	0.26	0.43	0.439

Characteristics	Teachers ever having a school-based clinic PCP	Teachers having a community-based PCP only	Teachers never having a PCP	P value
Peripheral vascular disease, %	0.21	0.31	0.43	0.595
Peptic ulcer, %	0.07	0.05	0.00	0.869
Musculoskeletal disease, %	23.12	14.20	2.98	0.000
Migraine, %	1.97	2.63	5.53	0.000
Liver disease, %	0.66	0.67	0.00	0.458
Hypertension, %	3.07	3.30	0.43	0.052
HIV, %	0.14	0.21	0.43	0.446
Heart failure, %	0.17	0.15	0.00	0.806
Diabetes, %	1.03	0.88	0.43	0.568
Depression, %	2.36	3.25	2.13	0.076
Coronary artery disease, %	0.41	0.36	0.00	0.597
COPD, %	0.99	0.88	0.00	0.285
Chronic kidney disease, %	0.04	0.00	0.00	0.66

Characteristics	Teachers ever having a school-based clinic PCP	Teachers having a community-based PCP only	Teachers never having a PCP	P value
				8
Cancer, %	6.29	3.61	0.85	0.000
Asthma, %	2.08	1.55	0.00	0.029
Self-reported health status (2012-2015)				
Excellent or very good physical health status, %	47.16	43.75	46.49	0.007
Often or sometimes having tension or anxiety, %	42.14	34.06	33.33	0.297
Annual healthcare utilization and costs				
Inpatient admissions/1000 teachers, mean (SD)	42.95(225.90)	33.04(210.60)	8.51(92.06)	0.017
Emergency room visits/1000 teachers, mean (SD)	150.40(456.10)	145.60(468.50)	80.85(342.60)	0.068
Primary care visits/1000 teachers, mean (SD)	1,636.00(1,933.00)	2,031.00(2,380.00)	0.00(0.00)	0.000
Percent primary care school clinic visits, mean (SD)	2.88(11.65)	1.01(6.55)	0.00(0.00)	0.000
Inpatient cost per teacher, mean (SD)	635(3,221)	533(2,975)	105(1,141)	0.021
Hospital ER cost per teacher, mean (SD)	116(552)	122(552)	147(748)	0.651

Characteristics	Teachers ever having a school-based clinic PCP	Teachers having a community-based PCP only	Teachers never having a PCP	P value
Hospital outpatient cost per teacher, mean (SD)	725(1,971)	758(2,169)	83(551)	0.000
Prescription cost per teacher, mean (SD)	1,188(2,311)	1,398(2,491)	269(1,281)	0.000
Other cost per teacher, mean (SD)	1,608(3,016)	1,726(3,458)	359(1,816)	0.000
Total cost per teacher, mean (SD)	4,272(7,142)	4,536(7,478)	963(3,581)	0.000
Productivity				
Absence work hours per year, mean (SD)	58.42(48.56)	53.85(47.47)	40.66(32.73)	0.000
Student achievement growth score, mean (SD)	0.06(2.78)	-0.01(2.99)	-0.12(2.80)	0.810

Note: PCP: primary care physician; SD: standard deviation; HIV: human immunodeficiency virus; COPD: chronic obstructive pulmonary disease. Baseline was defined as the data years prior to the intervention for teachers using school clinic PCPs and the first data year for teachers with community PCPs only or no PCPs. For descriptive purposes, we classified teachers into three groups as shown in the table. Teachers who ever had school PCPs could also have community PCPs for some years or had no PCPs for other years, whereas teachers using community PCPs could have some years without a PCP. In the multivariate analyses, we used a

time varying indicator for the PCP status: clinic PCP, community PCP, or no PCP. P-value is for a test of the null hypothesis that all three groups are equal.

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