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**PATIENT-CENTERED MEDICAL HOME ADOPTION IN SCHOOL-BASED HEALTH CENTERS**

by

**Abbey Gregg**

A DISSERTATION

Presented to the Faculty of  
the University of Nebraska Graduate College  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy

Health Services Research, Administration & Policy  
Graduate Program

Under the Supervision of Professor Li-Wu Chen

University of Nebraska Medical Center  
Omaha, Nebraska

May, 2017

Supervisory Committee:

Li-Wu Chen, MHSA, PhD

Jungyoon Kim, PhD

Hyo Jung Tak, PhD

Melissa Tibbitts, PhD

Hongmei Wang, PhD

Nizar Wehbi, MD, MPH, MBA

## PATIENT-CENTERED MEDICAL HOME IMPLEMENTATION IN SCHOOL-BASED HEALTH CENTERS

Abbey Gregg, PhD

University of Nebraska, 2017

Supervisor: Li-Wu Chen, MHSA, PhD

### **Abstract**

The Patient-Centered Medical Home (PCMH) is promoted as a primary care delivery design that can improve health care quality and patient outcomes while controlling health care costs. To achieve PCMH recognition, primary care providers must implement practice-level changes in order to deliver care that is comprehensive, coordinated, accessible, high quality, and whole-person oriented. This practice transformation requires advanced use of health information technology, staff investment in quality improvement and care coordination, and significant investments of both financial and human resources to support these activities. As a safety-net provider, school-based health centers (SBHCs) serve vulnerable children that typically experience barriers to having a medical home. It is critical for SBHCs to keep pace with delivery reform so that the health care disparities seen in children served by SBHCs are not exacerbated. However, characteristics of SBHCs such as their limited finances and small staff size could restrict their ability to implement expensive care delivery changes.

The purpose of this research is to apply organization behavioral theories and adoption of innovation theory to understand the factors associated with adoption of individual PCMH attributes, higher levels of PCMH capacity, and formal recognition as a PCMH in SBHCs. This research addressed the extent to which resource dependency theory and institutional theory can be used to explain PCMH adoption in SBHCs. The first study involved mapping PCMH attributes available in a SBHC national-level secondary data source to recognized PCMH definitions. These attributes underwent factor analysis to create an index that could measure SBHC PCMH capacity. The second study examined the associations

between various measures of PCMH capacity and individual PCMH attributes with measures of the SBHC's internal munificence, environmental complexity, and external isomorphic pressures. The third study examined the associations between formal PCMH recognition and the measures of the SBHC's internal munificence, environmental complexity, and external isomorphic pressures. The results of these three studies were synthesized to describe how both the SBHC's internal and external environmental characteristics are associated with various aspects of the overall PCMH adoption process.

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**LIST OF ABBREVIATIONS**

AAP	American Academy of Pediatrics
ACA	Affordable Care Act
CHC	community health center
EHR	electronic health record
EMR	electronic medical record
FQHC	federally qualified health center
FTE	full-time equivalent
HIT	health information technology
HRSA	Health Resources and Services Administration
LHD	local health department
NCQA	National Committee for Quality Assurance
PCMH	patient-centered medical home
PCP	primary care provider
RUCA	Rural Urban Commuting Area Codes
SBHA	The School-Based Health Alliance
SBHC	school-based health center
SES	socioeconomic status

## CHAPTER 1: INTRODUCTION

### The Patient-Centered Medical Home

#### History and Definition

The medical home concept is currently promoted for use in both adult and pediatric primary care settings, but it was first defined by the American Academy of Pediatrics (AAP) in 1967 for use by pediatricians caring for children with special health care needs.<sup>1,2</sup> The AAP was concerned with incomplete medical records that resulted from poor communication and coordination between the patient's multiple providers.<sup>3</sup> A "medical home", a central location for a child's complete medical records, was needed to improve the care delivered to children with complex needs. In 1992, the AAP released an official policy statement that expanded the definition to a vision of primary care that was more prevention-oriented, continuous, and responsive to the individual needs of all children and adolescents.<sup>4</sup> Another official policy statement a decade later added that medical homes should offer family-centered care and provide care coordination services.<sup>5</sup>

In 2001, the Institute of Medicine released a report calling for improvements in the health care quality in the United States.<sup>6</sup> In their report, the IOM specifically mentions that healthcare redesign should focus on primary care and should incorporate meaningful innovations such as payment reform, health information technology (HIT), and professional training on best practices. Per the IOM, the safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity were six areas that should be focused on when redesigning primary care. The IOM's report specifically mentioned many aspects of the medical home, as previously defined by AAP, as being critical to the future of the health care system. In 2007, the AAP, American Academy of Family Physicians, American College of Physicians, and the American Osteopathic Association issued a joint statement that defined the medical home principles from the perspective of primary care providers.<sup>7</sup> The seven principles of the patient-centered medical home (PCMH) defined by these four primary care provider organizations are:

- *“Personal physician* - each patient has an ongoing relationship with a personal physician trained to provide first contact, continuous and comprehensive care.
- *Physician directed medical practice* – the personal physician leads a team of individuals at the practice level who collectively take responsibility for the ongoing care of patients.
- *Whole person orientation* – the personal physician is responsible for providing for all the patient’s health care needs or taking responsibility for appropriately arranging care with other qualified professionals. This includes care for all stages of life; acute care; chronic care; preventive services; and end of life care.
- *Care is coordinated and/or integrated* across all elements of the complex health care system (e.g., subspecialty care, hospitals, home health agencies, nursing homes) and the patient’s community (e.g., family, public and private community- based services). Care is facilitated by registries, information technology, health information exchange and other means to assure that patients get the indicated care when and where they need and want it in a culturally and linguistically appropriate manner.
- Quality and safety are hallmarks of the medical home.
- *Enhanced access* to care is available through systems such as open scheduling, expanded hours and new options for communication between patients, their personal physician, and practice staff.
- *Payment* appropriately recognizes the added value provided to patients who have a patient-centered medical home.”<sup>7</sup>

After the release of the seven joint principles, programs designed to support and measure the PCMH model were created by both the public and private sector. National PCMH recognition and accreditation programs were created by the Accreditation Association for Ambulatory Health Care (AAAHC), National Committee for Quality Assurance (NCQA), The Joint Commission, and URAC. The

federal government also initiated programs to promote adoption of the medical home model. The Affordable Care Act (ACA) included the Medicaid Health Home State Plan Option, which provided enhanced federal funding and technical assistance to help states implement comprehensive care coordination in their Medicaid programs. As of November 2016, 20 states and the District of Columbia were participating in the Medicaid Health Home option.<sup>8</sup> The ACA also authorized the Federally Qualified Health Center (FQHC) Advanced Primary Care Practice Demonstration which provided enhanced Medicare care coordination payments and technical assistance to 434 FQHC participants.<sup>9</sup> As a part of the project, FQHCs were expected to achieve Level 3 NCQA PCMH certification, which is the certification level representing the highest PCMH capability as measured by NCQA.

There is not one standardized measurement of the medical home model across all public and private payer initiatives, but NCQA's assessment has become the most common PCMH standard used in medical home demonstrations.<sup>10</sup> The NCQA assesses six standards from the clinic's perspective: (1) patient-centered access, (2) team-based care, (3) population health management, (4) care management and support, (5) care coordination and care transition, and (6) performance measurement and quality improvement.<sup>11</sup> PCMH recognition occurs at the practice-level and more than 60,000 medical providers work in over 12,000 practices that are NCQA PCMH recognized.<sup>12</sup> An estimated 30% of U.S. physicians practice in clinics that could meet various PCMH program requirements and among these physicians, 43% believe the PCMH model is positively impacting care quality.<sup>13</sup> Of nurse practitioners and physician assistants participating in medical homes, 63% report a positive opinion of the medical home model.<sup>13</sup>

### **Review of the Evidence**

Evaluations of the PCMH model have provided some promising results about its potential to improve patient outcomes, reduce health care expenditure, and improve overall quality of care. PCMH activities have been examined in a variety of settings, including both large and small primary care offices, federally qualified health centers, rural and urban clinics, integrated delivery systems like the

Veteran's Health Administration, and in patient panels from both private and public insurance groups. Additionally, studies of the PCMH model have been conducted on both adult and pediatric populations. Most pediatric studies evaluate PCMH implementation in children with special health care needs, the original population which inspired the model.

Many different measurements of "medical homeness" are used in evaluation studies, from self-report of PCMH status by clinicians to administration of PCMH survey tools to providers, and medical home composite scores created using secondary data.<sup>14-18</sup> The extreme heterogeneity in clinic settings, patient populations studied, outcomes evaluated, and medical home definitions have resulted in mixed findings about the effectiveness of the PCMH model. Despite these methodological limitations, there are broadly positive associations between the PCMH model and desirable clinical and utilization outcomes. The results of PCMH evaluation studies on health care quality and outcomes, cost, and utilization, with an emphasis on results in pediatric populations when possible, will be discussed in further detail.

#### Quality and Health Outcomes

The medical home (operationalized by the National Survey of Children's Health definition), is associated with better parental assessment of child health and increased healthy behaviors in children without special health care needs.<sup>14</sup> Using the Medical Expenditure Panel Survey (MEPS) definition, children with medical homes have increased odds of receiving health screenings, guidance from their providers about oral health, diet, exercise, and injury prevention, and have higher parent reported ratings of care quality.<sup>15,19</sup> Pediatric practices that are NCQA PCMH recognized score higher on parent assessments of child development and prevention care.<sup>20</sup> For children with special health care needs, a pediatric population that requires more interaction with the health care system, medical homes increase the odds of having greater use of primary care office visits.<sup>21</sup> In asthmatic children, having a medical home is also associated with better performance on several pediatric quality measures, less unmet health care needs, and reductions in school absences.<sup>22</sup> Medical homes have also been

associated with improved academic outcomes for Latino children from low-income families.<sup>23</sup> In safety-net clinics, the PCMH model has also improved use of preventive services for adolescent populations, but the effect varies based on patient sociodemographic characteristics.<sup>24</sup> Adolescents' self-report of patient-centered care is associated with better global health status, receiving higher care quality, and less unmet need for care.<sup>17,25</sup>

Although full implementation of the PCMH model leads to higher improvements in care quality for children, even partial implementation of the model improves use of preventive care, demonstrating that the medical home is not an "all or nothing" concept.<sup>20,26</sup> Patients that report having *accessible* and *patient-centered communication* with their providers also report higher care quality.<sup>27</sup> Other studies using multi-component definitions of medical homes have found associations with medical home subscale scores and patient outcomes. For example, while overall PCMH score was not associated with any pediatric patient experience, high *quality improvement* scores were positively related and high *care management* scores were negatively related with patient experience.<sup>28</sup>

Not all studies report significant benefits of the PCMH model. For example, some care quality gains in Medicaid PCMH programs have only been modest or produced mixed results.<sup>29</sup> In a randomized controlled trial with PCMH intervention practices, only two of eleven quality indicators and one of ten efficiency indicators improved in the intervention group.<sup>30</sup> In another study, having a medical home did not improve developmental screening disparities between Non-Hispanic White and black children, and did not improve receipt of mental health services.<sup>22</sup>

### Utilization

For children without special health care needs, the medical home (defined by the National Survey of Children's Health operationalized definition), is associated with increased use of preventive visits and decreases in both outpatient and emergency department visits.<sup>14</sup> The association between emergency department visits and the medical home was strongest for children aged 6-11 years, and the

association with outpatient sick visits was stronger in adolescents.<sup>14</sup> Using the MEPS definition of a medical home, positive healthcare utilization patterns have also been found.<sup>19,31</sup> Another study examining the parent's report of a medical home also found it decreases emergency room use.<sup>18</sup> However, this same study also used a medical home definition obtained by surveying the provider and found that individual domains of the medical home score, but not the overall medical home score itself, were associated with lower health care utilization rates.<sup>18</sup> Others have found that *comprehensive of care* and *afterhours care* were associated with improvements in health care utilization, but *care coordination* increased use of outpatient and emergency department visits.<sup>32,33</sup> Another study that assessed multiple levels of medical homeness found that it was not associated with improving well-child visits, but that practices with the highest PCMH levels might reduce avoidable emergency department use in publicly insured children.<sup>34</sup>

### Cost

The Patient-Centered Primary Care Collaborative has found that cost savings occur in PCMH initiatives led by Medicaid programs, private insurers, and integrated health systems.<sup>35</sup> Annual median costs for children in the Colorado PCMH program were \$1,129 less than children not enrolled in a PCMH practice, and the North Carolina Medicaid medical home program was estimated to have saved \$574 million over a 5 year time span due to a decreases in hospitalizations and emergency department visits.<sup>29,35</sup> A comprehensive primary care program with elements similar to the PCMH model (eg care coordination, team-based care, and chronic disease management) was estimated to have saved a regional insurance company \$77.7 million in inpatient care costs over a decade for children with chronic conditions.<sup>36</sup> For children with special health care needs, receiving the PCMH component of *care coordination* decreases out-of-pocket medical costs, especially for children with public insurance.<sup>37</sup> Patients with providers that offer *afterhours care* also have lower total health expenditures.<sup>38</sup>



Some evaluation studies have found no significant cost-savings in PCMH programs, despite modest improvements in care quality.<sup>30</sup> Cost savings do not happen immediately; however, three years of an insurance company led PCMH program resulted in a small decrease in their expenditures by 2.8%, with the greatest reduction happening in patients with chronic conditions.<sup>39</sup> Additionally, PCMH implementation may have different effects on the potential cost savings for adults and children. PCMH pediatric populations may have higher costs of care than adults because of the use of more preventive services.<sup>26</sup> Children with medical homes have higher use of outpatient visits, prescription drugs, and dental services, but have similar total expenditure costs to children without medical homes.<sup>31</sup> Therefore, pediatric PCMH interventions may not immediately result in cost savings. While significant cost savings are not always found in evaluations of small-scale PCMH interventions, scaling up the interventions to involve more physicians and patients could result in significant savings over time.<sup>30</sup> Additionally, cost savings may not occur with only partial PCMH implementation.<sup>26</sup>

## **School-Based Health Centers**

### **History**

School-based health centers have their roots in one of the most successful public health experiments, the initiation of a school nursing program in New York during the 1900s to combat childhood infectious diseases.<sup>40</sup> During this time period, nearly 20% of children died before reaching their 5<sup>th</sup> birthday, mostly due to infectious diseases, and most New York school children needed medical attention.<sup>41</sup> After failing to see progress containing disease epidemics by simply excluding sick children from school, nurses were brought into schools to treat ill students. Because of poverty, a poor understanding of infectious disease prevention, and a general lack of access to health care, these students would have otherwise remained sick and spread the disease to others.<sup>40</sup> Child health and school attendance improved after the introduction of school-based nursing, and school nurses became responsible for infectious disease control, health education, and referring students to community

providers.<sup>42</sup> An advanced practice school nursing program was started at the University of Colorado in 1970, and the idea that the school was an ideal setting to provide comprehensive primary care services, especially to children without connections to community-based providers, became more widely accepted.<sup>43</sup> After The Education for All Handicapped Children Act, which integrated handicapped children into regular classrooms passed in 1974, advanced nursing expertise was needed in school settings to help manage the new range and scope of student health conditions present in schools.<sup>44</sup>

The expansion of the SBHC model was spurred on by The Robert Wood Johnson Foundation in the 1980s-1990s through various initiatives that worked to expand health care access for children and to encourage individual states to implement policies aimed at improving the financial sustainability of the SBHC model.<sup>45,46</sup> Today, an estimated 2,135 SBHCs provide care to 2.3 million children and adolescents.<sup>47</sup> According to the School Based Health Alliance, SBHCs are predominantly located in low-income settings that include racial and ethnic minority-majority schools. Though exact services vary based on the needs of the students and the community they serve, most SBHCs offer a combination of primary care, behavioral health, and other specialty care, like nutrition or oral health services.

SBHCs are designed to overcome transportation, time, and financial barriers that may prevent children from receiving needed health care services. The onsite provision of services at school is convenient because children are mandated to be present, but also affordable because most SBHCs accept Medicaid or sliding fee scale payments. Both children and parents avoid missing school and work when visits to a medical provider are needed, and the SBHCs' physical location allows them to combine clinical care with public health activities and environmental supports. This provides a substantially different type of care from what is normally given at other clinic sites in the community, in part because the patients served by the SBHC are united by the relationships they have with each other and the school staff.<sup>48</sup> Because the SBHCs can see children in a natural setting, there may be increased opportunities for follow-up visits needed to manage chronic conditions, better adherence in completing

treatments or immunization series that require multiple visits, and more occasions to observe the child or adolescent for potential health problems.

### **Review of the Evidence**

While high mortality rates from infectious diseases are no longer the primary health threat to U.S. school children, socioeconomic factors and the structure of our health care system still result in poor child health outcomes compared to other developed countries.<sup>49</sup> Barriers that prevent individuals from accessing health care have been termed “voltage drops”<sup>50</sup>. “Voltage drops” for children occur when there are health insurance limitations, financial cost-sharing burdens, and reduced access to high quality primary care and specialty services.<sup>51</sup> SBHCs are specifically designed to overcome these “voltage drops” and are one response to the national imperative that every child needs to have access to high quality primary care.<sup>49</sup>

One in five U.S. children live in poverty, and children are the age group in the U.S. most likely to be living at or below the poverty line.<sup>52</sup> Compared to Non-Hispanic Whites, both Hispanics and Blacks experience significantly higher rates of poverty.<sup>52</sup> Race and poverty are intertwined and racial differences in poverty are an important contributor to health disparities.<sup>53</sup> Though not exclusive to schools with high poverty and/or high racial and ethnic minority student representation, SBHCs are predominantly located in schools that fit this description.<sup>47</sup> Children of color and those living in poverty experience worse health than their non-Hispanic white and higher socioeconomic status (SES) peers. For example, children from lower SES backgrounds, with public health insurance, and of racial and ethnic minority groups have significantly lower rates of adherence to The American Academy of Pediatrics’ (AAP) Well Child screening recommendations (AAP).<sup>54</sup> Well child screenings include opportunities for parents to discuss concerns with their medical provider while receiving age appropriate preventive and diagnostic services, such as immunizations, growth and development assessments, and health education. With lower rates of receiving recommended preventive services, it is not surprising that low

income and children of some racial/ethnic groups have higher rates of asthma, obesity, behavioral problems, unmet health needs, emergency department use, and unmet specialty care needs.<sup>55-57</sup>

Multiple evaluation studies have demonstrated the impact on the health outcomes of children and adolescents served by SBHCs. By having accessible and affordable primary care services offered at the school, SBHCs increase use of preventive services, such as health maintenance visits and age appropriate screenings.<sup>58,59</sup> Adolescents and children may miss key immunizations for a variety of reasons, including changes in insurance coverage or switching providers. SBHCs typically provide affordable (sometimes free) immunizations in a setting ideally situated for implementing an immunization tracking and recall system.<sup>60</sup> Children in schools with SBHCs are also “captive audiences”, and higher completion rates for immunization series in SBHC children may be explained by their ability to easily see their provider for the multiple visits required by some vaccinations.<sup>58,60</sup>

Asthma is the most frequent inpatient diagnosis for children age one and older, and asthmatic students with access to a SBHC have fewer activity limitations, emergency department visits, hospitalizations, and lower health care costs.<sup>59,61-63</sup> SBHCs’ success with helping asthmatic patients may be because of their use of team-based approaches to combat illness. For example, a child with asthma may receive treatment and counseling from a health care provider, but also may benefit from social workers that help the family identify asthma triggers in the home.<sup>44</sup> SBHCs are also positively associated with improvements in mental and behavioral health conditions. Preschoolers with access to an SBHC have better emotional health as reported by their parents, and adolescents are more likely to access mental health services.<sup>64,65</sup> Among students with mental health problems, SBHC patients have significantly lower mental health and overall health costs.<sup>65</sup>

Overall, parents and students report high satisfaction with the care they receive at SBHCs. Students using SBHCs describe good quality of care and report that discussions with providers are respectful, understandable, confidential, and include topics such as sexual health, contraceptives, diet,

and nutrition.<sup>66,67</sup> Compared to non-SBHC users, students who use SBHC services engage in more positive health behaviors and are more satisfied with their health.<sup>68</sup> In one study, parents reported being happier with the care received at SBHCs than at other hospital and community-based clinics.<sup>69</sup> SBHCs have also shown potential in the public health battle against obesity. Programs run by SBHCs have been shown to decrease student body mass index and increase healthy behaviors.<sup>48,68</sup>

Better management of chronic conditions, like asthma, or prevention of conditions is a key factor in reducing health care expenditures. Several evaluation studies have demonstrated SBHCs' ability to decrease emergency department use in their student patient population, which will reduce costs for both patients and their insurance companies.<sup>58,59,61,69</sup> A Community Guide systematic review of economic evaluations of SBHCs concluded that use of SBHCs results in significant savings to society, patients, and Medicaid programs.<sup>70</sup> From the Medicaid perspective, SBHCs visits saved Medicaid anywhere from \$30-\$969 per SBHC visit, and \$46-\$1,166 per SBHC user with variation depending on the type of services offered at the SBHC.<sup>70</sup>

There is also some evidence that SBHCs positively affect educational outcomes. Health problems are frequently the cause of absenteeism, which disproportionately affects low-income and minority children, and puts them at risk for falling behind academically.<sup>71</sup> Just like in the 1900s with infectious diseases, adding school health services can reduce school exclusions due to illness.<sup>72</sup> SBHC users have also reported higher levels of school connectedness and more effort put towards college preparation.<sup>73,74</sup> The Community Guide recommends SBHCs in low-income communities due to evidence of their ability to positively impact students' grades, grade promotion, and high school graduation rates.<sup>75</sup> By improving the educational outcomes for low-income children, SBHCs also tackle the issue of education being a social determinant of health and potentially reduce future health disparities caused by low educational attainment.<sup>76</sup> In both evaluations of the health and academic outcomes of SBHCs, there were some studies that did not find significantly positive results. Inconsistent findings about the

benefits of SBHCs may be caused by their actual inability to improve health outcomes or due to well-known methodological problems in the SBHC evaluation literature caused by small sample sizes, selection bias of where children attend school and if they use the SBHC, and by the heterogeneity of populations, services, and outcomes studied.<sup>77</sup>

### **Medical Home Potential**

The AAP recommends that every child should have a medical home because they can reduce health care expenditures, increase quality of care, improve health outcomes, decrease unmet medical needs, and improve patient satisfaction in pediatric populations.<sup>78</sup> The AAP currently recommends SBHCs as both potential independent medical homes and collaborative partners for other pediatric medical home practices.<sup>79</sup> Given that “the national imperative to eliminate social disparities in health will not be achieved without concerted attention to childhood, because the largest disparities are initiated and perpetuated through childhood circumstances”, it is critical to improve the quality of health care for children in every setting they receive it.<sup>49</sup> Recognizing the importance of improving health care services for children as part of a larger strategy to improve our nation’s health, the ACA designated \$200 million towards supporting the improvement and expansion of services at SBHCs and the number of SBHCs grew 20% between 2010 and 2014.<sup>80,81</sup>

SBHCs are innately compatible with several components of the medical home model, such as being promotive of patient-centered care that is accessible and culturally sensitive.<sup>82</sup> According to both adolescents and parents, the care they receive at their SBHC meets the AAP’s definition of a medical home.<sup>83</sup> SBHCs have already demonstrated their willingness to collaborate with other health care providers to meet PCMH objectives of coordinated care, as most SBHCs are sponsored by other health care organizations, and some are participants in innovative programs like school-based telehealth programs that connects students to community providers from the convenience of the school setting.<sup>84</sup>

There are several valid concerns raised about SBHCs' ability to become full-fledged medical homes. First, many SBHCs only operate when school is in session, limiting children's access to care during summer and holiday vacations; however, SBHCs can overcome this obstacle by partnering with their sponsoring organization or another community health care organization to provide afterhours coverage.<sup>82</sup> Secondly, SBHCs are small clinic operations and the medical home literature has demonstrated significant challenges to PCMH adoption in small primary care settings.<sup>85-88</sup> Small practices may have fewer resources (e.g. financial, technical, human) that impede their practice transformation, but these barriers can be overcome by accessing external practice supports offered by PCMH programs.<sup>89</sup>

Thirdly, SBHCs operate on shoe string budgets and face financial sustainability issues due to their mission to provide care for all children.<sup>82</sup> Funding issues may constrain SBHC's ability to implement expensive elements of the PCMH model, such as quality improvement activities and purchase of HIT, let alone pay for national PCMH accreditation fees. Currently, quality improvement activities are quite limited in SBHCs, but this could improve through participation in state Medicaid PCMH initiatives that offer external consultants on best practices.<sup>90,91</sup> In fact, SBHCs could opt to only pursue medical home designation through Medicaid or a local insurance provider, receive transformation support as a part of these programs, and avoid the costs of NCQA or other national-level certification programs. Participation in the Medicaid EHR Incentive Program for meaningful use could also be used to pay for some of the HIT costs and simultaneously meet many NCQA PCMH standards.<sup>92,93</sup>

Finally, SBHCs are safety-net providers primarily located in low SES areas, have a large proportion of racial and ethnic minority students, and are usually based in schools that include adolescents. The medical home literature has demonstrated that these factors are associated with decreased PCMH capacity at the practice level and medical home access disparities at the patient level. Multiple studies have demonstrated that racial and ethnic minority children are less likely to have a

medical home or to receive care that is aligned with specific components of the PCMH model.<sup>94-98</sup> Even in safety-net clinics, lower PCMH capacity is associated with patient race/ethnicity.<sup>99,100</sup> Home and neighborhood characteristics, in addition to other sociodemographic characteristics such as income and lack of private health insurance, are also associated with decreased medical home access.<sup>23,94-97,101,102</sup> Medical home disparities have also been found to exist between young children and adolescents.<sup>22,97</sup> However, there is evidence that despite the practice transformation challenges faced by safety-net providers, they can offer care consistent with the PCMH model and achieve PCMH recognition.

27,85,99,100,103

### **Theoretical Basis for the Study**

This dissertation examines variations in the adoption of the PCMH model as functions of an SBHC's internal resources, patient characteristics, and environmental pressures. The PCMH model may be considered as an innovation; in fact, the PCMH model consists of several unique innovations, such as HIT, care coordination, and team-based care.<sup>104</sup> Because adoption of innovations is determined in part by features of the innovations themselves, multiple PCMH adoption outcomes are modelled: (1) individual PCMH components, (2) overall PCMH capacity, and (3) recognition as a PCMH. My approach allows for identification of SBHC characteristics (i.e. internal resources, patient characteristics, environmental pressures) that are associated with individual elements of the PCMH model, adoption of multiple PCMH components, and more advanced transformation into a full-fledged PCMH. Aspects of diffusion of innovations theory, resource dependency theory, and institutional theory will be used in this dissertation to examine medical home adoption in SBHCs.

An innovation is "an idea, practice, or object that is perceived as new".<sup>105</sup> While the medical home concept has existed in different iterations for decades, the push for the medical home to become the standard for primary care is recent. An interesting feature of the PCMH as an innovation is the lack of defined boundaries between its individual components. Per Rogers' diffusion of innovation theory,



the individual components of the medical home model could be described as technology clusters. They are distinguishable yet closely interrelated, so experience with one component can influence the adopter's perception of other PCMH components.

Features of the PCMH model and its individual components, from the SBHC's perspective, influence their decision to adopt the model. The most important attributes of the innovation are its relative advantage over other options, compatibility with needs and values, complexity, trialability, and observability.<sup>105</sup> With the conflicting evidence on the effectiveness of the PCMH at improving quality, outcomes, and cost, SBHCs may be uncertain about the benefits of adopting the medical home model. SBHCs may be more likely to adopt specific PCMH components that they believe will be more effective for them, are easier to implement, and can demonstrate measurable positive results. Over time, adoption of enough successful PCMH components may lead to overall PCMH model implementation.

Resource dependency theory, institutional theory, and diffusion of innovations theory all place importance on the social system's impact on the organization's decision-making process. From a resource dependency perspective, SBHCs may choose to pursue the medical home model if they feel it will enhance their ability to obtain resources needed for their survival, such as enhanced payments from insurance providers or the ability to attract more patients to their practice. The adoption of innovations is a proactive decision made in the best interests of the organization to enhance its ability to survive and decrease its interdependence on other organizations.<sup>106</sup> Diffusion of innovations and institutional theory take a slightly different approach to the role of the social system in the innovation adoption process. These theories posit that actors in powerful positions influence the adoption decision process of organizations lower in their social structure. For example, larger systems that an SBHC is a part of, like their state Medicaid program or managed care organizations, may influence PCMH adoption by creating baseline performance or infrastructure requirements for providers in their network. Diffusion of innovations would describe this influence as a system norm that establishes expected behavior of its

members, and institutional theory might explain this behavior as coercive isomorphism because the SBHC is dependent upon optimal payment arrangements with Medicaid and managed care.<sup>107</sup> According to institutional theory, SBHCs that are sponsored by organizations that are favorable to the PCMH model may also experience normative isomorphism and will adopt PCMH components that are viewed favorably by their sponsoring organization.<sup>107</sup> Adopting the PCMH model may legitimize the SBHC and establish it as a high-quality provider of primary care, thus ensuring its ongoing relationship with insurance programs and its sponsoring organization. While the motivation for change is explained slightly differently in each theory (e.g. strategic survival choice opposed to behavioral expectations), all three are complementary to each other. Each theory recognizes that adoption happens because of interorganizational dependence and influence of powerful external organizations, and organizations adopt innovation to maintain or improve their status quo.

Both resource dependency theory and institutional theory have been used independently and in combination to explain the adoption of innovations in health care settings.<sup>108-114</sup> Categorization of key internal and external organizational variables fluctuates between these articles based on the organizational setting and perspectives of the researchers, as does the significance of the associations of the theories' tenets with the measured organizational outcome.<sup>115-117</sup> Based on my understanding of the PCMH model, SBHC setting, and similarities between the organizational and adoption of innovation theories, I have defined three sets of variables that I propose will explain SBHCs' adoption of the PCMH care model (Table 1). My definition of the variable categories may differ slightly from the original theories due to the theoretical pluralism and unique research perspective of SBHCs as medical homes.

Table 1. Categorization of Internal and External Environmental Variables

<b>Munificence</b>	<b>Isomorphic Pressure</b>	<b>Complexity</b>
Total Funding Sources	Sponsorship	Patients Served
HRSA Capital Funding	Managed Care	Student Ages
Billing Revenue	State Medicaid PCMH Initiative	Other Patient
PCP FTE		Sociodemographics
All Staff FTE		(race/ethnicity, poverty, rurality)
Staffing Model		

Munificence (the amount of resources available in the internal environment)

- Total number of funding sources: Organizations with more funding resources are less dependent on individual funding sources for survival and the combination of multiple funding streams improves the sustainability of the SBHC model.<sup>82,118</sup>
- HRSA SBHC Capital Funding: This grant provided funding to SBHCs to build or renovate new clinics and to allow for the purchase of HIT. This funding source improves the resources available to the SBHC.
- Billing revenue: Higher billing revenues provide a financial cushion to the SBHC during times of uncertainty. Higher revenue would allow the SBHC to adopt expensive PCMH components, like advanced HIT, or to invest staff time in intensive activities, such as quality improvement.
- Primary care provider (PCP) full-time equivalents (FTE), all staff FTE, and comprehensiveness of staffing model: Larger organizations have more slack resources and can adopt new innovations with less risk of failure.<sup>119</sup>

Isomorphic Pressure (forces that lead to homogenization of organizations)<sup>107</sup>

- Sponsorship: SBHCs may experience three different types of isomorphic pressures from their sponsoring organization. Coercive isomorphism may occur because the SBHC depends on their sponsor, normative isomorphism may occur because the SBHC shares the same values as their sponsor, or SBHCs may undergo mimetic isomorphism and model themselves after their sponsoring organization.<sup>107</sup>
- Participation in Managed Care: Managed care organizations may have regulations and expectations that coerce the SBHC into adopting new innovations to keep or improve their managed care payments.

- State Medicaid PCMH Initiatives: SBHCs in states that have Medicaid PCMH programs may experience coercive and normative isomorphic effects, which lead them to adopt PCMH innovations.

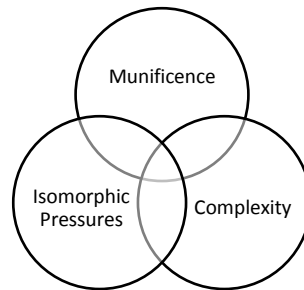
Complexity (characteristics of the environment mostly out of the organization's control that may lead to uncertainty about benefits of innovation, decrease or increase the munificence of the organization, or influence the level of isomorphic pressures felt by the organization)

- Patients served: SBHCs that choose to see patients besides just their students may do so to increase their patient volume and billing revenue; however, this choice introduces patients into their setting that are outside of their school "network" (different ages of patients, possibly more types of insurance providers, individuals that are not as connected to the SBHC and may not seek care continuously).
- Age of patient: The care provided for young children and adolescents must be age-appropriate and based on the needs of the patient during different developmental stages. SBHCs that are based in schools that include adolescents opposed to those based in schools with only young children may adopt different PCMH components that are more reflective of their patient's needs. Medical home disparities have also been documented between children and adolescents.<sup>22,97</sup>
- Race and ethnicity: Multiple studies have demonstrated that racial and ethnic minority children are less likely to have a medical home or to receive care that is aligned with specific components of the PCMH model.<sup>94-98</sup>
- Poverty: Income is related to the child's home environment, neighborhood characteristics, and health insurance, which are all associated with decreased medical home access.<sup>23,94-97,101,102</sup>

- Rurality: The rurality of an SBHC's environment may limit its ability to adopt practice changes and influence the specific PCMH components that are perceived to be most beneficial to the organization and its patients.<sup>120,121</sup>

For clarity and simplicity purposes, I will consistently assign SBHC variables to being representative of either munificence, complexity, or isomorphic pressure. However, I recognize that the boundaries between these variables are not always clear, they are sometimes interdependent, and that a case could be made for some variables to be categorized differently (Figure 1). For example, the complexity of the patient population may influence the munificence of the SBHC in either a positive or a negative way. It is plausible that SBHCs with many low-income children are more likely to be a Medicaid managed care preferred provider to maximize their billing potential.<sup>82</sup> Managed care organizations and Medicaid PCMH programs may offer external care coordinators or PCMH facilitators to SBHCs, which could also be viewed as a valuable *resource*.<sup>89</sup> I have previously explained that insurance providers and sponsoring organizations may *pressure* an SBHC to adopt the medical home model. However, it is also possible that sponsoring organizations, such as FQHCs that have taken part in the FQHC PCMH demonstration projects, have in-depth knowledge of and experience with the PCMH certification process that could be viewed as a crucial *resource*. Therefore, sponsoring organizations, state Medicaid PCMH initiatives, and managed care organizations may increase the technical *resources (munificence)* available to the SBHCs in addition to providing *pressure* to change. Alternatively, having many patients from low-income families that are not eligible for Medicaid and may have difficulty paying for services, which may happen in SBHCs based in schools with large populations of undocumented immigrants, could decrease the *munificence* of the SBHC.

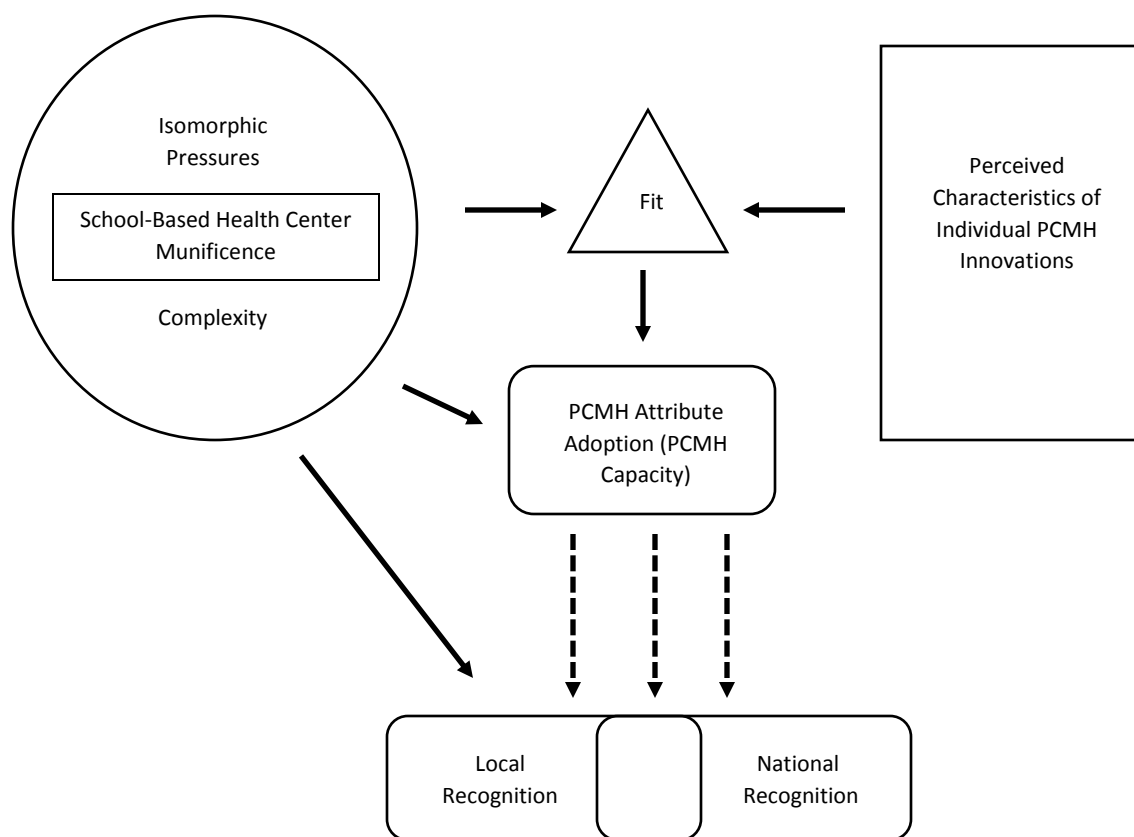
Figure 1. Overlap Between Internal and External Environmental Variables



### Conceptual Framework

Using elements of diffusion of innovations theory, resource dependency theory, and institutional theory, the following conceptual framework was developed to study the adoption of the medical home model in SBHCs (Figure 2). Adoption of individual PCMH components will occur when there is a fit between the perceived characteristics of the PCMH component and the SBHC's internal and external environment. Adoption of individual PCMH components may or may not lead to financial benefits or patient outcome improvements for the SBHC. The uncertainty about the return-on-investment will influence SBHCs to adopt PCMH components that match the values and expectations of their partner organizations, their patients' needs, and most importantly that they can afford to implement. Because SBHCs must undergo this component adoption cycle multiple times to achieve formal PCMH recognition and cost is one of the most frequently cited PCMH barriers,<sup>88,122</sup> the SBHC's internal resources will be the limiting factor to higher PCMH capacity and PCMH recognition. Although there is overlap between PCMH recognition programs, the individual PCMH components that are adopted by the SBHC determine their ability to be recognized through a local program or through a national PCMH program.

Figure 2. Conceptual Framework of PCMH Adoption



### Unique Contribution, Specific Aims, and Research Questions

The next three chapters of this dissertation apply the previously described conceptual framework to the adoption of individual PCMH components, overall PCMH capacity, and achievement of formal PCMH recognition in SBHCs. A national-level survey of SBHCs was used as the data source for this analysis, which is important because the limited studies on patient-centered care in SBHCs have been conducted as small case studies. To measure individual PCMH component adoption and PCMH capacity, structural attributes of the medical home model were identified through mapping the SBHC survey questions to both the NCQA and the Joint Principles definitions of a PCMH. The process of developing the SBHC PCMH Index is described in Chapter 2, Article 1: “Measuring Medical Home Attributes in School-Based Health Centers”. Chapter 3, Article 2: “Medical Home Performance in School-Based Health Centers” applies the conceptual framework to assess the association between (1) SBHC characteristics

and individual PCMH component adoption, and (2) SBHC characteristics and PCMH capacity. Chapter 4, Article 3: “Correlates of Patient-Centered Medical Home Recognition in School-Based Health Centers” uses the framework to explain possible facilitators of formal medical home recognition. This dissertation attempts to identify the current readiness of SBHCs to be medical homes, understand how medical home adoption can be supported in SBHCs, and identify if SBHCs can offer patient-centered care to pediatric populations that typically experience disparities in access to medical homes. The specific aims of the three individual articles, along with their associated research questions, are listed below.

Article 1: Identifying Patient-Centered Medical Home Attributes in School-Based Health Centers

*Specific Aim 1: Identify individual PCMH attributes and describe overall PCMH capacity in SBHCs.*

Question 1.1: Are there specific PCMH components that are adopted consistently in SBHCs?

Question 1.2: Are there specific PCMH components that have low incidence of adoption in SBHCs?

Question 1.3: Is there evidence of PCMH adoption disparities by SBHCs that serve different student populations?

Article 2: Patient-Centered Medical Home Capacity in School-Based Health Centers

*Specific Aim 2: Identify SBHC characteristics that are associated with the adoption of individual PCMH components and overall PCMH capacity score.*

Question 2.1: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with overall PCMH capacity?

Question 2.2: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with adoption of specific PCMH components?

Question 2.3: Between the three types of variables, is there one group that appears to be more strongly associated with overall PCMH capacity and adoption of specific PCMH components?



Question 2.3: Controlling for other characteristics of the SBHC, is there evidence of PCMH adoption disparities by SBHCs that serve different student populations?

Article 3: Correlates of Patient-Centered Medical Home Recognition in School-Based Health Centers

*Specific Aim 3: Compare the SBHC characteristics associated with different PCMH recognition outcomes.*

Question 3.1: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with formal PCMH recognition?

Question 3.2: Does how you define formal PCMH recognition affect associations between the recognition outcome and the SBHC characteristics?

Question 3.3: Is there evidence of disparities in formal PCMH recognition achievement by SBHCs that serve different student populations?

## CHAPTER 2: IDENTIFYING PATIENT-CENTERED MEDICAL HOME ATTRIBUTES IN SCHOOL-BASED HEALTH CENTERS

### Abstract

**Purpose:** SBHCs have been suggested as potential medical homes, yet minimal attention has been paid to measuring their progress towards implementing the PCMH model. Most SBHCs are based in schools with adolescents, an age group that is known to be lacking access to medical homes. The purposes of this article were to (1) develop an Index to measure PCMH attributes in SBHCs, (2) use the SBHC PCMH Index to compare PCMH capacity between PCMH certified and non-PCMH SBHCs, and (3) examine differences in SBHC PCMH Index scores between SBHCs based in schools with and without adolescents.

**Methods:** The 2013-2014 National Census of School-Based Health Centers was used as the primary data source for this analysis. The SBHC PCMH Index was created by mapping questions from the Census to PCMH elements in the National Committee for Quality Assurance's (NCQA) PCMH 2014 Standards and Guidelines and the Joint Principles of the Patient-Centered Medical Home. Exploratory factor analysis was used to identify relationships between the selected PCMH attributes. PCMH capacity was compared between SBHCs with different PCMH recognition status and by the primary student age group served by the SBHC.

**Results:** A total of 6 PCMH dimensions were identified through exploratory factor analysis. These dimensions were collapsed into two domains of Care Quality and Comprehensive Care. SBHCs recognized as PCMHs had significantly higher scores in the total Index, in both domains, and four of the six dimensions. There were no differences in total Index, domain, or dimension scores between SBHCs based in schools with just children and those that also included adolescents, but there were differences in the adoption of specific PCMH attributes.

**Conclusions:** The SBHC PCMH Index is the first known attempt to measure the presence of PCMH attributes in a national survey of SBHCs. While not a comprehensive measurement of all PCMH

elements, the SBHC PCMH Index is a valid and reliable scale for measuring the PCMH construct in SBHCs. SBHCs based in schools with just children and those with adolescents scored similarly on the overall Index, but analysis of the individual Index items shows their respective strengths and weaknesses in PCMH transformation.

## Introduction

The concept of the medical home has evolved dramatically since 1967 when the AAP used the term to describe a physical location of a child's complete medical record.<sup>2</sup> In 2002, the AAP expanded their definition of a medical home to a service model for both pediatric and adult populations that provides accessible, continuous, comprehensive, family-centered, coordinated, compassionate, and culturally effective care. The Joint Principles of the Patient-Centered Medical Home published in 2007 by the AAP, American Academy of Family Physicians, the American College of Physicians, and the American Osteopathic Association also states that PCMHs should have high standards for quality and safety, and that payment to PCMH providers should reflect the additional work and value provided to their patients.<sup>7</sup>

Over half (57.9%) of U.S. children aged 1 to 17 years receive care from a medical home and these children are less likely to have unmet medical needs.<sup>123</sup> Evidence supporting the PCMH model of care as a way to improve quality and health outcomes while reducing costs is somewhat mixed; however, studies in pediatric populations have found associations between features of medical homes and desirable health care utilizations (e.g. emergency department use, preventable hospitalizations, and preventive health visits).<sup>14,18,34</sup> Children with medical homes have also been found to receive higher quality of care and have better health outcomes than children without medical homes.<sup>22,124</sup> Parents of children with medical homes also report higher levels of satisfaction and positive experiences.<sup>125</sup>

Despite research showing associations between the PCMH model and desirable outcomes, most primary care practices treating children would not qualify for the lowest level of PCMH certification offered by the NCQA, which is the most widely used standard for medical home programs.<sup>126,127</sup> Among pediatric providers, higher medical home infrastructure scores are seen in larger practices and in practices with moderate levels of Medicaid patients.<sup>126</sup> Multiple studies have also demonstrated significant disparities in access to pediatric medical homes by patient characteristics. Children from

higher income families and those with private health insurance are more likely to have medical homes.<sup>94,96,123</sup> Significant disparities have also been seen in racial and ethnic minority children and in children who live in less safe, less socially cohesive neighborhoods.<sup>94,98,123</sup>

Most SBHCs serve majority racial minority schools and are designed to address socioeconomic barriers to accessing health care. SBHCs care for children that traditionally are less underserved by medical homes, and the SBHCs' ability to meet PCMH standards like the NCQA's remains unclear.<sup>47</sup> Every child should have a medical home and many national and state-level initiatives have developed to expand the PCMH model.<sup>128</sup> This movement towards greater PCMH adoption is especially important for SBHCs because racial and ethnic disparities in access to care and use of preventive services have been found to decrease when minorities have access to a medical home.<sup>129</sup>

Efforts to promote the PCMH model in SBHCs will require information about the individual PCMH attributes currently used in SBHCs. As a safety-net provider that primarily focuses on pediatric populations, SBHCs may have unique features that promote or inhibit the adoption of specific components of the medical home. Previous research has not evaluated differences in PCMH attribute implementation between PCMH certified and non-certified SBHCs. Due to costs associated with receiving national PCMH recognition, some SBHC providers not eligible for PCMH payment incentives may choose not to seek formal certification but may still implement PCMH processes.

Additionally, differences in PCMH adoption and implementation between adolescent-serving SBHCs and those based in schools with only young children has not been studied. This is a large gap in the research because most SBHCs serve adolescents, yet older children are less likely to have a medical home.<sup>47,123</sup> This research addressed these underexplored areas in the literature and the specific objectives of this study were to: (1) use data from a previously administered survey to develop an index to measure PCMH attributes in SBHCs, (2) use the SBHC PCMH Index to compare the presence of PCMH

attributes between PCMH certified and non-PCMH SBHCs, and (3) examine differences in SBHC PCMH Index scores between SBHCs based in schools with and without adolescents.

## **Methods**

### Study Participants and Data Collection

Data used in this study is from the 2013-2014 National Census of School-Based Health Centers. The School-Based Health Alliance (SBHA) completes this triennial national survey of all known SBHCs and includes questions about the SBHC's organizational characteristics, population served, services offered, policies and procedures, and PCMH certification. The survey is completed by the person most knowledgeable about the clinical care provided in the SBHC. Survey respondents are asked to complete a survey for each fixed SBHC site, so there are responses for each individual SBHC operated by the same sponsoring organization. More detailed information about the School-Based Health Alliance Census methodology can be found elsewhere.<sup>47</sup> Of the 2,315 known SBHCs in the United States, 1,900 responded to the 2013-2014 Census. Of these 1,900 respondent SBHCs, only 1,507 provide primary care services and reported their PCMH status, which was needed to assess validity of the SBHC PCMH Index. The Index was developed and validated using complete case analysis, leaving 1,218 SBHCs as the final sample size.

### Instrument Development and Content Validity

The SBHC PCMH Index was created by identifying questions from the SBHA's 2013-2014 Census that were related to PCMH elements in the NCQA's PCMH 2014 Standards and Guidelines and the Joint Principles of the Patient-Centered Medical Home statement.<sup>7,11</sup> Appendix A lists the questions from the SBHA Census that were selected for initial inclusion into the SBHC PCMH Index and the corresponding section of the NCQA or Joint Principles that is related to the SBHC survey item. Two questions in the index only apply to clinics serving adolescents (e.g. depression screening and substance abuse) and are not included in calculating the Index score for SBHCs located in schools without adolescents.

All items on the index were measured dichotomously as “yes” or “no”. For Census questions where respondents were asked to choose from a variety of answers, the responses that were coded as “yes” for the Index are listed in Appendix A below the actual Census question. A SBHC would need to only answer one of the options positively to receive a score of “yes” on the Index; for example, an SBHC that allows either students or parents/guardians to participate in health center committees, advisory council, or Board would be scored as a “yes”. There is one exception to this scoring rule: the Index item assessing if the SBHC provides structured health education requires the respondent to positively respond to two of the three health education topics listed to be scored as a “yes” for this item.

#### Scale Reliability and Dimensionality

Exploratory factor analysis using a tetrachoric correlations matrix was used to identify the underlying relationship between the PCMH attributes measured in the Index. Principal factors method with orthogonal varimax rotation were used to conduct the factor analysis. Four items were excluded from the final Index due to low correlation with other variables and poor factor loading scores. Factor analysis and scale reliability rests were conducted for both the adolescent Index (18 questions) and the child Index (16 questions). Factors more strongly correlated with each other were grouped into two domains, Care Quality and Comprehensive Care. The reliability of the SBHC PCMH Index was then assessed by measuring the internal consistency of the multiple Index domains, dimensions, and the internal consistency of the overall scale using Cronbach’s alpha.<sup>130</sup> A minimum alpha score of 0.7 is usually recommended for use in assessing scale reliability.<sup>131</sup>

#### Analysis of SBHC PCMH Index Score

To calculate the Index scores, each question could receive a value of either 0 (“no”) or 1 (“yes”). The adolescent Index had a possible total 18 points and the child Index had a possible total 16 points due to question differences in the Comprehensive Care domain. So the scores on the adolescent and child Index can be analyzed together, scoring for each dimension is calculated as the percent of total

points received. The scaled domain scores are calculated by averaging the mean scaled scores on each dimension and the overall scaled Index score is calculated by averaging the scaled scores for each domain. This scoring method assumes an equal weight to each PCMH dimension and prevents higher/lower scores on the overall Index due to performance in one dimension with more/less questions. The mean total Index, Care Quality domain, and Comprehensive Care domain scores were then compared across PCMH status and student age categories using two sample t-tests. The presence of each PCMH attribute in the Index was also compared across PCMH status and student age categories.

### SBHC Characteristics

SBHCs were split into those based in schools that only have prekindergarten through fifth grade and those that serve at least one grade of sixth or above. This categorization splits the schools into those with only young children and those that have adolescents in their student population. SBHCs were also categorized by their PCMH status. SBHCs that reported NCQA, Joint Commission, and other types of state or insurance provider PCMH recognition were considered PCMH certified.

## **Results**

### Instrument Validity and Reliability

A total of six PCMH dimensions were identified through exploratory factor analysis (Table 2). Factor analysis initially yielded seven dimensions with eigenvalues above 1, but only item “SBHC has a prearranged source of afterhours care” loaded on to the seventh dimension. Only six factors were retained after reviewing the scree plot and because the afterhours item loaded moderately strongly (eigenvalue of 0.31) onto factor five. The factor analysis for the Index including the two adolescent questions is shown in Table 2, and similar factor loadings were found for the child Index excluding these questions. Two PCMH domains were created based on the correlations between the identified dimensions. Each domain had a Cronbach’s alpha score that met minimum requirements for scale



reliability (Table 3). The overall SBHC PCMH Index had Cronbach's alpha scores of 0.77 and 0.74 for the adolescent and child Indexes respectively, and cleared the generally accepted threshold of 0.7.

Table 2. Results of Factor Analysis for Adolescent SBHC PCMH Index

Domains and Items	Rotated Factor Loadings					
	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>	6 <sup>f</sup>
<b>Care Quality</b>						
SBHC uses an EHR/EMR	0.01	<b>0.92</b>	0.08	0.09	0.08	0.14
SBHC uses electronic prescribing	-0.02	<b>0.89</b>	-0.23	-0.03	0.09	0.17
SBHC has achieved either Stage 1 or Stage 2 of Meaningful Use	-0.09	<b>0.85</b>	-0.04	0.18	0.17	0.06
SBHC has a prearranged source of afterhours care	0.10	0.12	0.09	0.12	<b>0.31</b>	0.15
SBHC collects any data for quality improvement	0.26	0.11	0.12	0.24	<b>0.76</b>	0.11
SBHC reviews claims data as part of a quality assurance system	-0.06	0.41	0.24	0.38	<b>0.45</b>	0.22
SBHC uses measures of patient satisfaction as part of a quality assurance system	-0.01	0.22	0.20	-0.06	<b>0.85</b>	0.18
SBHC receives supplemental payments for meeting performance standards	0.22	0.51	0.08	-0.01	0.16	<b>0.73</b>
SBHC receives monthly or annual capitated payments for care coordination	0.03	0.15	0.01	0.09	0.14	<b>0.90</b>
<b>Comprehensive Care</b>						
Students and parents/guardians participate in committees, advisory council, or Board	0.27	-0.11	<b>0.83</b>	0.03	0.23	0.34
Students and parents/guardians participate in the design of health services	0.11	-0.05	<b>0.92</b>	0.15	0.09	-0.16
Health assessment includes age and gender appropriate immunizations and screenings	<b>0.96</b>	0.01	0.00	0.09	0.13	-0.01
Health assessment includes family/social/cultural characteristics	<b>0.96</b>	-0.01	0.15	0.19	0.00	0.08
Health assessment includes behaviors affecting health	<b>0.96</b>	-0.01	0.15	0.19	0.00	0.08
Health assessment includes depression screening (adolescents)	<b>0.81</b>	-0.15	0.16	0.20	0.04	0.08
Health assessment includes mental health/substance use history (adolescents)	<b>0.64</b>	0.14	0.06	0.20	0.13	0.02
SBHC offers chronic disease management	0.40	0.13	-0.03	<b>0.85</b>	0.07	0.08
SBHC provides health education classes	0.41	0.08	0.37	<b>0.79</b>	0.05	0.00
<b>Variance % (Total Variance Explained 80.81%)</b>	<b>24.30%</b>	<b>16.62%</b>	<b>10.72%</b>	<b>9.95%</b>	<b>9.91%</b>	<b>9.30%</b>

<sup>a</sup> Comprehensive Assessment

<sup>b</sup> Health Information Technology

<sup>c</sup> Patient-Centered

<sup>d</sup> Care Management

<sup>e</sup> Access and Quality

<sup>f</sup> Payment

Table 3. Internal Consistency Reliability for Overall Index, Domains, and Dimensions (n = 1,218)

Domains and Dimensions	Alpha Within Domain	Alpha Within Dimension
Care Quality	0.70	
Health Information Technology		0.71
Access and Quality		0.63
Payment		0.63
Comprehensive Care	0.81 <sup>a</sup> , 0.80	
Comprehensive Assessment		0.89 <sup>a</sup> , 0.96
Patient-centered		0.64
Care Management		0.71
Overall Index alpha values: 0.77 <sup>a</sup> , 0.74		

<sup>a</sup> Alpha for the adolescent Index

### Analysis of SBHC PCMH Index Score

Table 4 shows the total points possible, the point ranges, mean points, and scaled score for the overall Index, both domains, and each dimension identified in factor analysis. Scores are reported for both the adolescent and child versions of the Index. On average, SBHCs received a 64% on the scaled Index. SBHCs scored highest in the dimensions of Care Management (95%), Access and Quality (87%), and Comprehensive Assessment (72%). The lowest dimension scores were in Payment (17%) and Patient-Centered (45%).

Table 4. Mean Scores for Overall SBHC PCMH Index, Domains, and Dimensions (n = 1,218)

Domains and Dimensions	Total Points Possible	Point Range	Mean Points	Scaled Score
Care Quality	9	0 – 9	5.83	57%
Health Information Technology	3	0 – 3	2.04	68%
Access and Quality	4	0 – 4	3.46	87%
Payment	2	0 – 2	0.33	17%
Comprehensive Care	9 <sup>a</sup> , 7	0 – 9 <sup>a</sup> , 0 – 7	6.43 <sup>a</sup> , 4.88	71%
Comprehensive Assessment	5 <sup>a</sup> , 3	0 – 5 <sup>a</sup> , 0 – 3	3.62 <sup>a</sup> , 2.07	72%
Patient-Centered	2	0 – 2	0.91	45%
Care Management	2	0 – 2	1.90	95%
Overall Index Score	100%	1 – 18 <sup>a</sup> , 1 – 16	12.26 <sup>a</sup> , 10.71	64%

<sup>a</sup> Score for the adolescent Index

Table 5 shows the scaled scores for SBHCs on the Index by their PCMH recognition status. In two-sample t-test analysis, SBHCs recognized as PCMHs had significantly higher scores in the total Index, in both domains, and four of the six dimensions. This finding helps establish construct validity, as SBHCs that are PCMHs should score higher on a scale measuring PCMH attributes. There were no differences in total Index, domain, or dimension scores between SBHCs based in schools with just children and those that also included adolescents.

Table 5. Scaled Scores for Overall SBHC PCMH Index and Domains by PCMH Status (n = 1,218)

Domains and Dimensions	Ages Served by School			PCMH Status		
	Just Children (n=190)	Includes Adolescents (n=1,028)	P-value	Not PCMH (n=830)	Any PCMH (n=388)	P-value
Care Quality	57%	57%	0.98	54%	64%	< 0.001
HIT	68%	68%	0.76	68%	69%	0.84
Access and Quality	89%	86%	0.18	82%	97%	< 0.001
Payment	15%	17%	0.56	13%	25%	< 0.001
Comprehensive Care	70%	71%	0.57	68%	76%	< 0.001
Comprehensive Assessment	69%	72%	0.30	70%	77%	0.003
Patient-Centered	47%	45%	0.52	41%	55%	< 0.001
Care Management	93%	96%	0.14	95%	96%	0.35
Overall Index Score	64%	64%	0.70	61%	70%	< 0.001

Note: Bold values are significant at  $p < 0.05$

The percentage of SBHCs that had each PCMH attribute is reported in Table 6 and there was wide variation in the use of each PCMH attributes in the SBHCs. The most frequently reported PCMH attributes were offering health education classes (96%), offering chronic disease management (95%), collecting any data for quality improvement (93%), using measures of patient satisfaction as part of a quality assurance system (89%), and use of an EHR/EMR (86%). The PCMH attributes in the Payment dimension were rarely implemented, with only 19% of SBHCs receiving supplemental payments for meeting performance standards and only 8% receiving capitated payments for care coordination. While there was no difference in scores on the Index by age of school population, there were significant differences in use of specific PCMH attributes. SBHCs based in schools with only young children reported greater use of EHR/EMRs (94% vs 84%,  $p < 0.001$ ), receipt of capitated payments for care coordination (16% vs 7%,  $p < 0.001$ ), and more participation of patients and parents/guardians in design of the SBHC services (42% vs 33%,  $p < 0.012$ ). However, SBHCs based in schools with adolescents reported greater achievement of EHR Meaningful Use (50% vs 38%,  $p = 0.003$ ) and more provision of health education classes (97% vs 92%,  $p = 0.002$ ).

Table 6. Prevalence of PCMH Attribute by SBHC Characteristics (n = 1,218)

Domains and Attributes	All SBHCs	Ages Served by School			PCMH Status		
	(n=1,218)	Just Children (n=190)	Includes Adolescents (n=1,028)	P-value	Not PCMH (n=830)	Any PCMH (n=388)	P-value
<b>Care Quality</b>							
SBHC uses an EHR/EMR	86%	94%	84%	< 0.01	80%	98%	< 0.01
SBHC uses electronic prescribing	71%	71%	72%	0.79	73%	68%	0.04
SBHC has achieved either Stage 1 or Stage 2 of Meaningful Use	48%	38%	50%	0.003	51%	40%	< 0.01
SBHC has a prearranged source of afterhours care	80%	85%	79%	0.05	72%	97%	< 0.01
SBHC collects any data for quality improvement	93%	95%	93%	0.33	90%	100%	< 0.01
SBHC reviews claims data as part of a quality assurance system	84%	88%	84%	0.09	78%	97%	< 0.01
SBHC uses measures of patient satisfaction as part of a quality assurance system	89%	86%	90%	0.19	86%	96%	< 0.01
SBHC receives supplemental payments for meeting performance standards	19%	17%	19%	0.42	17%	24%	0.004
SBHC receives monthly or annual capitated payments for care coordination	8%	16%	7%	< 0.01	8%	10%	0.09
<b>Comprehensive Care</b>							
Students and parents/guardians participate in committees, advisory council, or Board	56%	52%	57%	0.19	52%	65%	< 0.01
Students and parents/guardians participate in the design of health services	34%	42%	33%	0.012	30%	44%	< 0.01
Health assessment includes age and gender appropriate immunizations and screenings	62%	65%	62%	0.47	60%	69%	0.002
Health assessment includes family/social/cultural characteristics	74%	72%	74%	0.48	72%	77%	0.046
Health assessment includes behaviors affecting health	74%	72%	74%	0.48	72%	77%	0.046
Health assessment includes depression screening (adolescents)	--	--	83%	--	(n=731) 80%	(n=297) 92%	< 0.01
Health assessment includes mental health/substance use history (adolescents)	--	--	69%	--	(n=731) 66%	(n=297) 76%	0.001
SBHC offers chronic disease management	95%	95%	95%	0.77	94%	97%	0.01
SBHC provides health education classes	96%	92%	97%	0.002	96%	95%	0.30
<b>Dropped Attributes</b>							
Open summer vacation and holidays	16%	17%	16%	0.79	17%	13%	0.19
Assists with Medicaid enrollment	99%	99%	98%	0.60	98%	100%	0.003
Care coordinator on staff	12%	18%	11%	0.004	11%	12%	0.64
Behavioral health provider onsite	40%	35%	41%	0.27	37%	44%	0.07

Note: bold values significant at P &lt; 0.05

## Discussion

Using factor analysis, attributes of the PCMH model of care were grouped into six dimensions and two domains to create the SBHC PCMH Index. The analyses in this study demonstrated reliability and evidence of content and construct validity for the SBHC PCMH Index. The overall Index score, both domains, and half of the dimensions met the 0.7 alpha requirement for scale reliability.<sup>131</sup> The alpha scores of the overall Index and Index components may be underestimated because both the domains and the Index are multi-dimensional.<sup>132,133</sup> The multi-dimensionality of the PCMH scale is to be expected as even one of the simpler definitions of a PCMH from the Agency for Healthcare Research and Quality contains five separate but related components: (1) comprehensive care, (2) patient-centered care, (3) coordinated care, (4) accessible services, and (5) quality and safety.<sup>1</sup>

There were significant Index score differences between SBHCs that were and were not PCMH recognized, which demonstrated that the SBHC PCMH Index accurately reflects attributes associated with the PCMH model. SBHCs that had received recognition as a PCMH scored significantly higher on the overall Index score, both domains, and four of the six dimensions, demonstrating convergent construct validity between the SBHC PCMH Index and PCMH status. However, there were no significant differences on the dimension scores of Health Information Technology and Care Management by SBHC PCMH designation. In the Care Management dimension, there was high overall implementation by all SBHCs of both PCMH attributes of chronic disease management (95%) and health education classes (95%). SBHCs with PCMH recognition were significantly associated with offering chronic disease management (97% vs. 94%,  $p = 0.01$ ), but no difference was found with offering health education classes. The insignificant difference on this attribute and high overall level of attribute implementation demonstrates that SBHCs do quite well on offering health education to their patients, most

likely due to their non-traditional setting which might facilitate group or classroom opportunities for health education.

The Health Information Technology dimension contained three attributes and for each attribute, there was a significant difference in use by PCMH designation. SBHCs with any PCMH designation reported greater use of EHR/EMRs, but were less likely to use electronic prescribing or to have achieved Meaningful Use attestation. This somewhat contradictory finding can be explained by looking at the type of PCMH designation the SBHC achieved (analysis not shown); in both attribute cases, the SBHCs with national PCMH recognition had the highest scores and SBHCs with state or local PCMH designation reported lower use than SBHCs without any type of PCMH designation. This finding might reflect significant differences between the requirements of different PCMH programs, with state or local PCMH programs requiring less sophisticated use of HIT. The NCQA PCMH certification heavily emphasizes HIT use as critical for practice transformation and incorporates Meaningful Use language in its scoring, but does not require EHRs for PCMH certification.<sup>134</sup> The HIT and patient-data emphasis of the NCQA program was initially criticized for seemingly undervaluing other elements of the PCMH model, but enhanced use of EHRs may lead to the PCMH's goal of better care quality.<sup>135,136</sup> Care quality improvements in PCMH settings are possible even without EHR use, but improvements are enabled by HIT.<sup>137</sup> While beyond the scope of this research, further efforts should evaluate if different EHR requirements between PCMH certification programs may explain why some clinics adopting the PCMH model have not seen significant improvements in their quality of care.

Overall, SBHCs are doing well with implementing certain elements of the PCMH model. On the SBHC PCMH Index, SBHCs scored highest in the Care Management and Access and Quality dimensions. The lowest scores were in the Patient-Centered and Payment dimensions. Compared to a study of NCQA PCMH certified primary care clinics that used a different scale to

measure PCMH capacity, SBHCs had higher scores in patient care management, quality improvement, and expanded access. Only 52.8% of the NCQA PCMH clinics received a full NCQA score on afterhours coverage, but 80% of all SBHCs and 97% of PCMH SBHCs reported having a prearranged source of afterhours care.<sup>138</sup> Enhanced access to care is an important element of the PCMH model and is associated with higher quality of care.<sup>27,139</sup> Compared to the practices in the other study, SBHCs had a lower use of e-prescribing and most likely lower implementation of more advanced HIT reflected by low Meaningful Use attestation.<sup>138</sup>

On average, pediatric clinics only scored 38% on a NCQA-based PCMH scoring tool.<sup>126</sup> This is much lower than the average score of 68% achieved by SBHCs on the SBHC PCMH Index; however, similar scoring trends such as lower scores with HIT and high use of health education were seen in the NCQA-based study and with the SBHC PCMH Index.<sup>126</sup> While there are comparability issues between these studies due to differences in scoring the PCMH elements, it does provide some evidence of areas where SBHCs are performing well and where they may need additional support. One dimension that SBHCs performed quite poorly on in the SBHC PCMH Index is participation in the payment practices supportive of PCMH. Only 19% received supplemental payments for meeting performance standards and 8% received capitated payments for care coordination. Financial incentives are a primary driver of PCMH transformation in small primary care practices and safety-net clinics, so additional efforts to include SBHCs in insurance payment reform initiatives may be needed to increase adoption of the medical home model.<sup>140,141</sup>

The Index scores did not significantly differ between SBHCs based in schools with and without adolescents, which is dissimilar to previous research that found older children were less likely to have a medical home.<sup>123</sup> Nevertheless, there were significant differences in the use of specific PCMH attributes between SBHCs based in schools with these different student



populations. Most SBHCs are in schools with adolescents, and these SBHCs had lower use of EHR/EMRs, receipt of capitated payments for care coordination, and less participation of patients and parents/guardians in design of the SBHC services. The low use of paid care coordination activities and participation of parents/guardians in design of the SBHC services may be related; previous research has found that physicians are less likely than parents to identify a need for care coordination.<sup>142</sup> Without parents/guardian participation in service design, SBHC administrators may underestimate the need for care coordination services. Care coordination services may be especially needed in SBHC settings where children and their families may have language barriers, inadequate health insurance, and lower income levels that make navigating the health care system difficult. In SBHCs with adolescents, care coordinators can play an important role in planning for transitioning the child to adult health care providers, which can be a difficulty and time consuming process.<sup>143</sup>

Overall, 48% of SBHCs achieved Meaningful Use, higher than the national pediatrician Meaningful Use participation rate of less than 20%.<sup>144</sup> Pediatrician participation in Meaningful Use is hindered by many providers not meeting the eligibility threshold of 20% of encounters being with Medicaid patients. Program eligibility may not be a problem for SBHCs because a high percent of their patient population has Medicaid coverage.<sup>144</sup> However, Meaningful Use incentives and most national quality measurements are more aligned with improving care in adult populations and may not reflect the unique medical needs of children and adolescents.<sup>144</sup><sup>146</sup> Meaningful Use attestation may have been higher in adolescent-serving SBHCs because the Meaningful Use criteria may be more relevant for providers treating older children. Given the importance of EHRs for achieving PCMH practice transformation and the high costs of purchasing EHRs, it is important that the programs incentivizing advanced EHR use are applicable for pediatric providers.

Health education was offered more in adolescent-serving SBHCs, a similar finding to other research that found school health education becomes more comprehensive as grade level increases.<sup>147</sup> This may be because older children are perceived to have a greater ability to be active participants in managing their own health. However, health education and promotion programs designed for young children have been successful in improving their knowledge and health outcomes in several areas, such as asthma, dental health, and nutrition.<sup>148-150</sup> Even though health education offering was high in all SBHCs, there is still some room for SBHCs serving young children to improve their health promotion activities.

The SBHC PCMH Index is the first known attempt to measure the presence of PCMH attributes in a national survey of SBHCs. The SBHC PCMH Index met scale reliability and validity requirements, but there are some limitations to this research. The SBHC PCMH is not an exhaustive scoring scale that represents all the PCMH elements that a primary care practice should implement to meet NCQA or Joint Principles PCMH standards. The initial Index included more questions that attempted to measure NCQA PCMH attributes, but these questions measuring elements of care coordination, patient-centered access, and team-based care were dropped during factor analysis. Care coordination is an important element of the PCMH model and is associated with improvements in health care utilization and patient satisfaction.<sup>36,151</sup> Despite its importance to the PCMH model, this element is only measured in the SBHC PCMH Index by the question asking if the SBHC receives capitated payments for care coordination. The SBHA Census does include a question asking if the SBHC has a care coordinator, but this was dropped from the final Index due to poor loading in factor analysis and insignificant correlation with other Index items. The item's poor performance on factor analysis might be explained by the overall limited use of care coordinators; only 8% of all SBHCs and 10% of PCMH recognized SBHCs reported having a care coordinator. Due to their small staff sizes, SBHCs may instead rely

on nurses to handle care coordination activities instead of hiring dedicated care coordinators. The SBHA census question does not capture if other staff members perform care coordination duties, so the use of care coordination by SBHCs was probably underestimated by the question asking about having a care coordinator on staff.

The final SBHC PCMH Index also dropped a Census question picked to represent a “must-pass” PCMH element per the NCQA, providing same-day appointments. Attempts to address this item in the Index were unsuccessful as the questions asking SBHCs about how many days per week they were open and if they were open during holidays and summer vacation were dropped due to insignificant associations with PCMH status and weak loading during factor analysis. Only 14% of PCMH recognized SBHCs were open five days a week and when the school was closed. This indicates that many SBHCs are partnering with their sponsoring organization or another outside clinic to provide same-day appointments to their patients when the SBHC is closed instead of extending their own clinic hours. Also, the question if the SBHC helps their patients with enrollment in public health insurance had a poor correlation with other Index items because almost 99% of SBHCs do this regardless of their PCMH status. It was not possible to measure other NCQA PCMH elements such as care continuity, medication management, test and referral tracking, and culturally appropriate care using the SBHC Census questions. However, primary care practices that have a high prevalence of minorities and economically disadvantaged patients are more likely than other practices to offer interpreters, multilingual clinicians, and multi-functional EHR systems.<sup>152</sup> So while these elements are not represented in this Index, SBHCs may be doing well in these components of the PCMH model.

### **Implications and Contributions**

The SBHC PCMH Index is the first known attempt to measure the presence of PCMH attributes in a national survey of SBHCs. While not a comprehensive measurement of all PCMH

elements, the SBHC PCMH Index can be used to measure the PCMH construct in SBHCs. SBHCs based in schools with just young children and those with adolescents scored similarly on the overall Index, but analysis of the individual Index items shows their respective strengths and weaknesses in specific elements of the PCMH model. The Index also identified specific areas where all SBHCs could improve their service delivery. The lowest scores on the Index were found in the dimensions of Payment and Patient-Centered. State Medicaid programs and private insurance companies should make additional efforts to involve SBHCs in their value-based payment programs and SBHCs should improve their internal processes to better involve patients in the design of services offered by the SBHC.

### CHAPTER 3: PATIENT-CENTERED MEDICAL HOME CAPACITY IN SCHOOL-BASED HEALTH CENTERS

#### **Abstract**

**Purpose:** Both high levels of overall PCMH capacity and implementation of specific PCMH components are associated with better quality of care and health care utilization in pediatric populations. SBHCs have been suggested as potential medical homes, but may experience challenges implementing the PCMH model. It is currently unknown if there are variations in medical home adoption among different types of SBHCs. Therefore, the purpose of this study was to examine the associations between both internal and external environmental characteristics with SBHC's overall PCMH capacity and adoption of individual PCMH components.

**Methods:** The 2013-2014 National Census of School-Based Health Centers was the primary data source for this analysis. The SBHC PCMH Index was used to determine PCMH capacity scores used as outcomes in the linear regression models. Individual PCMH attributes in the SBHC PCMH Index were used as outcomes in the logistic regression models.

**Results:** The mean PCMH capacity score for all SBHCs was 68.59%, with higher scores in the Comprehensive Care domain compared to the Care Quality domain. Managed care arrangements, state Medicaid PCMH initiatives, funding sources, and patient billing activity were all positively associated with overall PCMH capacity. Student race/ethnicity and SBHC sponsoring organization (e.g. school system and "other") were negatively associated with overall PCMH capacity. SBHC characteristics were also independently associated with individual PCMH components, with different relationships seen between specific component and SBHC characteristics. Overall, SBHCs excel at offering health education and chronic disease management components of the PCMH model, but need to improve participation in PCMH payment reforms and involving patient stakeholders in the design of SBHC services.

**Conclusions:** The analysis resulted in findings that can be used by SBHC practitioners and medical home initiatives to improve PCMH adoption. The internal and external SBHC characteristics that are associated with high overall PCMH capacity are not all necessarily the same factors associated with better odds of offering individual PCMH attributes. This provides evidence that PCMH implementation happens differently, even in similar settings like school health centers. Depending on if the goal is high PCMH capacity or adoption of specific PCMH attributes, different factors may act as facilitators or barriers to success.

## Introduction

The PCMH model is promoted as a needed redesign of the U.S. primary care system, yet it is unclear how the primary principles of the PCMH model should be implemented.<sup>153</sup> Specific components of the medical home model have been suggested to be responsible for causing desirable improvements in health outcomes, health care utilization, and quality of care.<sup>27,32</sup> Partial implementation of the PCMH model has some independent benefits on care quality and cost, and substantial implementation of most PCMH elements may not be needed to improve care.<sup>26</sup> Thus, it is important to measure implementation of PCMH elements, not just overall designation as a medical home, when studying the medical home concept.

Despite several tools created to measure overall medical home capacity and implementation of specific PCMH elements, there is no widely accepted valid tool available for use with most primary care practices.<sup>153</sup> It is important to measure PCMH capacity in different primary care settings because the medical home is not implemented identically in every setting. Medical homes should reflect the needs of the patients and medical home programs set up by state-level initiatives also reflect the state's unique needs and priorities.<sup>154</sup> For pediatric populations, the existing PCMH surveys differ in the PCMH principles they measure and therefore measure different types of PCMH capacity.<sup>155</sup> It has been suggested that measurement of PCMH capacity in SBHCs, safety-net providers that predominantly serve children and adolescents, will be insufficient if tools designed for other primary care practices are used.<sup>156</sup>

This study addresses the need for measuring PCMH capacity in SBHCs by using the SBHC PCMH Index. The SBHC PCMH Index consists of 16 questions for SBHCs based in schools with only younger children and 18 questions for SBHCs in schools with adolescents. The additional two questions include adolescent specific questions related to screening for depression and

substance abuse. This Index measures the presence of structural components of the PCMH model in the dimensions of Health Information technology, Access and Quality, Payment, Comprehensive Assessments, Patient-Centeredness, and Care Management based on PCMH standards as defined by the NCQA and the Joint Principles from the AAP, American Academy of Family Physicians, American College of Physicians, and the American Osteopathic Association.<sup>7,11</sup> The use of this tool allows for the examination of the associations between SBHC characteristics and individual attributes of the PCMH model and overall Index score.

The purpose of this study was to examine the associations between both internal and external environmental characteristics on SBHC's PCMH capacity. Using both resource dependency theory and institutional theory as guiding frameworks, the overall hypothesis for this study was that SBHCs with greater internal munificence and more external isomorphic pressures will have superior PCMH capacity. The influence of munificence, defined in this study as greater availability of financial and/or human resources, was predicted to be positively associated with the implementation of PCMH elements that are more expensive or require more technical knowledge to implement. Specifically, SBHCs with more staff (i.e. greater number of primary care providers, more comprehensive staffing model, greater total number of staff) and better financial sustainability (i.e. higher levels of billing covering their expenses, greater number of funding sources, receipt of HRSA SBHC Capital funding) will have higher levels of capacity in the areas of HIT adoption and quality improvement activities.

External isomorphic pressures, represented in this study by the presence of a state Medicaid PCMH initiative and participation in managed care arrangements are expected to be positively associated with overall greater PCMH capacity. Financial incentives are a main driver of PCMH implementation and a key component of the medical home per the Joint Principles, so it is predicted that SBHCs in states with Medicaid PCMH initiatives and in managed care



arrangements will be more likely to receive PCMH elements of financial payments for performance and care coordination. To improve their care outcomes to qualify for receipt of performance payments, SBHCs may adopt process improvements that are also attributes of the PCMH model. The sponsoring organization for the SBHC may also influence the adoption of PCMH components. Because FQHCs/CHCs are the most prominent sponsor type of SBHCs and have generally been receptive to the PCMH model, SBHCs sponsored by FQHCs/CHCs are predicted to have higher levels of PCMH capacity. FQHCs have benefitted from national demonstration projects to improve their ability to become medical homes, so their sponsorship is expected to have a positive, dispersed effect on many components of PCMH implementation.

This study categorizes features of the patient population served by the SBHC as environmental complexity and predicts that SBHCs will offer specific PCMH attributes that are compatible with addressing the needs of their patient population. Environmental complexity is represented by variables categorizing the patient age, rurality, race/ethnicity, poverty level, and if the SBHC sees patients beyond just students. Schools' decisions to offer specific health services are associated with student age, community socioeconomic status, and the impact of the health problem on the school.<sup>157</sup> It has also been found that rurality, student race, student health conditions, and student's health insurance status influence students referral to and use of SBHCs.<sup>158</sup> Additionally, seeing patients beyond their students may add to the complexity of services offered at the SBHC because the expanded patient population may bring with it more variety of health needs across the lifespan.

## **Methods**

### Data Source

The 2013-2014 National Census of School-Based Health Centers conducted by the SBHA was used as the primary data source for this analysis. The SBHA has conducted the triennial

national survey of SBHCs since 1998 and uses an online survey to collect data about SBHC demographics, staffing, services, financing, and clinical policies.<sup>47</sup> The SBHA maintains a database of all known SBHCs in the United States and regularly updates it by working with state affiliates, SBHC funders, and SBHA members to identify new SBHCs and closed SBHCs. Before launching the census, contact information for representatives of each SBHC are verified and within three months of census launch, all SBHCs that have not completed the census are contacted to verify the SBHC's information and to encourage census completion.

### Study Sample

Of the 2,315 known SBHCs in the United States, 1,900 responded to the 2013-2014 Census. Of these 1,900 respondent SBHCs, 1,507 provide primary care and could potentially serve as a medical home for their patients. Complete case analysis was used and after removing survey responses missing information on variables of interest, 1,026 SBHCs were included in the final sample for this study. Before dropping incomplete observations, missing data patterns were examined. With the high number of variables used in the SBHC PCMH Index and as independent variables in the regression analysis, only 69% of the 1,507 cases were complete. The variables indicating if a SBHC was designated as a managed care preferred provider and if they used claims data in their quality assurance programs were singularly responsible for 7% and 5% of the missing data, respectively. Little's test for assessing the missing completely at random assumption using the "mcartest" command in Stata provided no evidence against the missing completely at random assumption.<sup>159</sup> Of the remaining 57 missing data patterns, over 90% of the patterns individually accounted for  $\leq 1\%$  of the missing data.

### Dependent Variables

The SBHC PCMH Index was used to determine the total PCMH capacity score and the Care Quality and Comprehensive Care domain scores used as outcomes in the linear regression

models. Individual PCMH attributes in the SBHC PCMH Index were used as outcomes in the logistic regression models.

### Independent Variables

*Munificence:* The total number of reported hours worked weekly by physicians, nurse practitioners, and physician assistants was divided by 40 hours to calculate the mean PCP FTEs. The FTEs for all staff members of the SBHC was also modeled as a continuous variable. The staffing model of the health center categorizes the type of providers on staff at the SBHC into those that have (1) just PCPs and behavioral health staff, (2) PCPs and other staff (e.g. dietician, optometrist, dentist), and (3) clinics that offer PCPs, behavioral health, and other providers. The percent of total SBHC operational expenses covered by patient billing was categorized into quartiles. The total number of funding sources received by the SBHC and if they received HRSA SBHC Capital funding was also included in the model.

*Complexity:* SBHCs were also split into those based in schools that only have prekindergarten through fifth grade and those that serve at least one grade of sixth or above. This categorization splits the schools into those with only young children and those that have adolescents in their student population. SBHCs were also differentiated into those that only see students as patients and those that also treat non-students. The percent of children in the school that were non-Hispanic white and a proxy measure for student poverty, eligibility for free or reduced price lunch, were also modelled as continuous variables. Children from families with incomes between 130% and 185% percent of the FPL are eligible for reduced price meals and children from families with incomes at or below 130% FPL are eligible for free meals.<sup>160</sup> Medicaid and the CHIP program cover children up to 200% FPL in 49 states, so eligibility for free or reduced lunch is a good indicator of Medicaid or CHIP eligibility.<sup>161</sup> Zip code RUCA

approximation was used to categorize SBHC location into urban, large rural, small rural, and isolated areas.<sup>162</sup>

*Isomorphic Pressures:* The sponsoring organizations were divided into 5 categories: FQHCs/CHCs, hospitals, LHDs, school systems, and other (e.g. non-profit, behavioral health agency, or university). SBHCs were also categorized by the presence of state-level Medicaid PCMH Initiatives and if they were designated as a managed care preferred provider.<sup>163</sup>

### Analysis

The prevalence of each SBHC characteristic was first examined for the entire sample and then bivariate analyses with the Index scores and the SBHC characteristics were conducted using simple linear regression. Multivariate linear regression on the Index scores and multivariate logistic regression on each PCMH attribute were also completed to control for the effects of various SBHC characteristics on the total PCMH score and implementation of specific elements of the medical home. Survey respondents are nested within sponsoring organizations and by state. Regression analysis with clustering on the state where the SBHC is located was used to adjust for the correlated nature of the data.<sup>164</sup> Cluster characteristics, such as a small number of SBHC respondents in some states and many sponsoring organizations that only oversee one SBHC, would cause bias in multi-level modelling.<sup>165,166</sup> The data were analyzed using STATA software, version 14 (Stata- Corp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

### **Results**

Most SBHCs have less than or equal to one full-time primary care provider on staff (88%) and use a staffing model that includes primary care, behavioral health, and one other specialty (57%) (Table 7). They are predominantly located in urban areas (83%) and are based in schools with adolescents (87%). Half are designated as managed care preferred providers and over half

(62%) are in states with Medicaid PCMH initiatives and serve patient populations beyond just their students (57%).

Table 7. Description of SBHCs (n = 1,026)

SBHC Characteristics	Number of SBHCs (%)
<b>Munificence</b>	
Practice Size: PCP FTE <= 1	903 (88%)
Staffing Model: All 3	588 (57%)
Primary care & other	272 (27%)
Primary care & behavioral	166 (16%)
Billing Covers Expenses: < 5%	248 (24%)
>= 5% & < 26.4%	265 (26%)
>= 26.5% & < 50%	151 (15%)
>= 50%	362 (35%)
HRSA Capital Funding: Yes	288 (28%)
Number of Funding Sources	Mean = 3, Median = 3
Staff FTE	Mean = 2, Median = 1.75
<b>Complexity</b>	
Location: Urban	848 (83%)
Large rural	88 (9%)
Small rural	45 (4%)
Isolated	45 (4%)
School: Includes adolescents	888 (87%)
Patients Served: More than students	585 (57%)
% Students Non-Hispanic White	Mean = 33%, Median = 23%
% Students Eligible for Free Lunch	Mean = 70%, Median = 73%
<b>Isomorphic Pressure</b>	
Sponsor: FQHC/CHC	412 (40%)
Local health department	99 (10%)
Hospital	214 (21%)
School system	141 (14%)
Other	160 (15%)
Managed Care Preferred Provider: Yes	516 (50%)
State Medicaid PCMH Initiative: Yes	636 (62%)

The overall mean Index score obtained by SBHCs was 68.6% (Table 8). Of the two domains, SBHCs scored the highest in Comprehensive Care (71.46%) compared to Care Quality (57.40%). In the Care Quality domain, the lowest mean score was in Payment (17.11%) and the highest mean score was in Access and Quality (86.89%). In the Comprehensive Care domain, the lowest score was in Patient-Centered (45.32%) and the highest score was in Care Management (95.27%).

Table 8. Mean Percentile Scores on the SBHC PCMH Index (n = 1,026)

	Mean %	Standard Error	95% Confidence Interval	
<b>Total Index Score</b>	68.59	1.73	65.11	72.07
<b>Care Quality Domain</b>	57.40	2.43	52.51	62.28
HIT	68.19	3.89	60.36	76.03
Access and Quality	86.89	1.55	83.78	90.01
Payment	17.11	4.12	8.81	25.40
<b>Comprehensive Care Domain</b>	71.46	2.06	67.31	75.60
Comprehensive Assessment	73.78	3.47	66.78	80.77
Patient-Centered	45.32	3.55	38.17	52.47
Care Management	95.27	1.22	92.82	97.72

Note: Clustering of standard errors on the state of SBHC location

In linear regression only adjusting for clustering at the state level, nine SBHC variables were significantly associated with the total Index score (Table 9). SBHCs with higher levels of billing covering their operational expenses, a higher number of funding sources, more staff FTEs, the most comprehensive staffing model, and HRSA Capital funding had larger total Index scores. SBHCs with more non-Hispanic white students, in managed care arrangements, and in a state with Medicaid PCMH capacity also had total higher Index scores. FQHC/CHC sponsored SBHCs only had higher total Index scores compared to LHDs, but they scored higher than all other groups in the Care Quality domain. However, school system sponsored SBHCs performed better than FQHCs/CHCs on the Comprehensive Care domain.

Table 9. SBHC PCMH Index Scores by SBHC Characteristics (n = 1,026)

	Coefficient in Bivariate Analysis		
	Total Score	Care Quality	Comp. Care
<b>Munificence</b>			
Practice Size: PCP FTE > 1	0.77	0.65	0.89
Staffing Model: All 3 (reference)			
Primary care & other	<b>-14.77</b>	-3.50	<b>-26.03</b>
Primary care & behavioral	<b>-6.61</b>	-3.52	<b>-9.70</b>
Billing Covers Expenses: < 5% (reference)			
>= 5% & < 26.4%	6.60	<b>9.95</b>	3.25
>= 26.5% & < 50%	<b>12.95</b>	<b>20.47</b>	5.43
>= 50%	<b>11.88</b>	<b>25.71</b>	-1.98
HRSA Capital Funding: Yes	<b>9.76</b>	5.23	14.29
Number of Funding Sources	<b>2.47</b>	<b>3.07</b>	1.85
Staff FTE	<b>1.89</b>	<b>3.07</b>	0.71
<b>Complexity</b>			
Location: Urban			
Large rural	2.07	3.38	0.76
Small rural	5.38	9.04	1.72
Isolated	9.60	14.22	4.98
School: Includes adolescents	-0.59	0.22	-1.40
Patients Served: More than students	-0.70	1.69	-3.10
% Students Non-Hispanic White	<b>0.09</b>	0.1	0.07
% Students Eligible for Free Lunch	-0.04	0.003	-0.08
<b>Isomorphic Pressure</b>			
Sponsor: FQHC/CHC (reference)			
Local health department	<b>-9.95</b>	<b>-24.58</b>	4.69
Hospital	-4.00	<b>-12.99</b>	5.00
School system	-0.82	<b>-21.51</b>	<b>22.38</b>
Other	<b>-10.14</b>	<b>-24.02</b>	1.22
Managed Care Preferred Provider: Yes	<b>10.67</b>	<b>13.03</b>	8.31
State Medicaid PCMH Initiative: Yes	<b>9.13</b>	<b>12.50</b>	5.77

Note: Values in bold are significant at  $p < 0.05$

After controlling for internal and external environmental characteristics in multiple linear regression, eight variables remained significantly associated with total Index score (Table 10). The munificence variables (i.e. staffing model, billing, HRSA grant, number of funding sources) and isomorphic pressure variables (i.e. sponsorship, managed care, and state Medicaid PCMH initiative) were associated with higher total Index score, usually through higher scores in the Care Quality domain. A higher percent of non-Hispanic white students was also associated with a higher total score and Care Quality score. For each significant association identified in the adjusted model, the effect of the significant variables on the Index score was attenuated compared to the simple linear regression model.

Table 10. SBHC PCMH Index Scores Adjusted by SBHC Characteristics (n = 1,026)

	Coefficient in Adjusted Analysis		
	Total Score	Care Quality	Comp. Care
<b>Munificence</b>			
Practice Size: PCP FTE > 1	-0.57	-3.21	2.05
Staffing Model: All 3 (reference)			
Primary care & other	<b>-9.30</b>	-0.47	<b>-18.14</b>
Primary care & behavioral	-3.17	-0.21	-6.13
Billing Covers Expenses: < 5% (reference)			
>= 5% & < 26.4%	4.23	<b>7.02</b>	1.43
>= 26.5% & < 50%	<b>7.19</b>	<b>12.33</b>	2.05
>= 50%	5.22	<b>12.74</b>	-2.31
HRSA Capital Funding: Yes	<b>4.42</b>	-0.54	<b>9.37</b>
Number of funding sources	<b>1.79</b>	<b>2.67</b>	0.92
Staff FTE	1.18	<b>1.64</b>	0.71
<b>Complexity</b>			
Location: Urban (reference)			
Large rural	2.42	3.66	1.18
Small rural	0.20	1.75	-1.35
Isolated	4.94	6.40	3.48
School: Includes adolescents	-0.90	-1.88	0.08
Patients Served: More than students	-0.39	2.72	-3.50
% Students Non-Hispanic White	<b>0.06</b>	<b>0.07</b>	0.05
% Students Eligible for Free Lunch	-0.001	0.05	-0.05
<b>Isomorphic Pressure</b>			
Sponsor: FQHC/CHC (reference)			
Local health department	<b>-5.98</b>	<b>-14.59</b>	2.64
Hospital	-3.26	-9.43	2.89
School System	3.46	<b>-11.82</b>	<b>18.73</b>
Other	-4.06	<b>-12.75</b>	4.62
Managed Care Preferred Provider: Yes	<b>6.72</b>	<b>8.50</b>	4.94
State Medicaid PCMH Initiative: Yes	<b>6.84</b>	<b>7.09</b>	6.60

Note: Values in bold are significant at  $p < 0.05$

Because each domain score is made up of three averaged dimension scores, adjusted regression analysis was completed for each dimension score to get more detailed information about the differences in domain scores (Table 11). Every Index dimension was significantly associated with at least one munificence variable. SBHCs without the most comprehensive staffing model scored worse on Comprehensive Assessment and higher billing levels was associated with increased Access and Quality scores. Greater HIT achievement was seen in the highest billing level, and higher Payment dimension scores were associated with greater number of funding sources and larger staff size. Three of the complexity variables had a significant association with one domain. All three isomorphic pressure variables had significant associations with various dimension scores. All associations agreed with the hypothesis, except for the



relationship between sponsorship and the Patient-Centered dimension. School systems and “other” sponsoring organizations scored higher than FQHC/CHC sponsored SBHCs.

Table 11. Dimension Scores Adjusted by SBHC Characteristics (n = 1,026)

	Coefficient in Adjusted Analysis					
	Care Quality			Comprehensive Care		
	HIT	Access & Quality	Payment	Comp. Assessment	Patient-Centered	Care Management
<b>Munificence</b>						
Practice Size: PCP FTE > 1	-3.44	-1.05	-5.13	7.35	-3.62	<b>2.44</b>
Staffing Model: All 3 (ref.)						
Primary care & other	8.66	-6.57	-3.49	<b>-23.84</b>	<b>-23.93</b>	<b>-6.65</b>
Primary care & behavioral	-2.09	1.35	0.11	<b>-12.40</b>	-6.29	0.29
Billing Covers Expenses: < 5% (ref.)						
>= 5% & < 26.4%	8.55	<b>11.87</b>	0.65	-2.68	4.59	2.40
>= 26.5% & < 50%	15.79	<b>15.11</b>	6.10	10.87	-7.21	2.50
>= 50%	<b>18.62</b>	<b>10.75</b>	8.85	0.26	-7.07	-0.11
HRSA Capital Funding: Yes	-7.52	<b>9.17</b>	-3.27	<b>14.45</b>	10.63	3.03
Number of Funding Sources	1.54	1.57	<b>4.89</b>	0.28	1.65	0.84
Staff FTE	2.28	0.14	<b>2.51</b>	0.19	1.20	0.75
<b>Complexity</b>						
Location: Urban (ref.)						
Large rural	5.28	-1.83	7.53	1.00	0.71	1.83
Small rural	1.44	0.12	3.68	-11.42	9.69	-2.32
Isolated	1.30	3.49	14.41	-13.41	<b>24.40</b>	-0.54
School: Includes adolescents	-2.77	1.55	-4.43	0.31	-3.22	3.14
Patients Served: More than students	4.67	0.09	3.42	<b>-10.96</b>	3.43	-2.97
% Students Non-Hispanic White	0.07	0.02	0.11	0.07	-0.01	<b>0.09</b>
% Students Eligible for Free Lunch	0.17	0.03	-0.05	-0.04	-0.20	0.08
<b>Isomorphic Pressure</b>						
Sponsor: FQHC/CHC (ref.)						
Local health department	<b>-24.67</b>	-7.50	-11.60	4.74	5.19	-2.00
Hospital	-11.58	<b>-12.66</b>	-4.04	9.18	6.56	-7.07
School system	<b>-20.72</b>	-4.02	-10.71	15.64	<b>39.81</b>	0.73
Other	-16.34	-14.85	-7.07	2.37	<b>14.76</b>	-3.26
Managed Care Provider: Yes	4.50	<b>8.12</b>	<b>12.89</b>	4.26	8.64	1.91
State Medicaid PCMH Initiative: Yes	11.37	-2.71	<b>12.62</b>	8.85	10.33	0.56

Note: Values in bold are significant at  $p < 0.05$

To fully understand the relationship between the SBHC characteristics and medical home implementation, each PCMH attribute from the SBHC PCMH Index was evaluated as a dependent variable in multiple logistic regression (Tables 12-14). Tables 12-14 each show the results of multiple logistic regression between individual PCMH components from two dimensions and SBHC characteristics. For individual PCMH components in the dimensions of HIT and Payment, there were significant associations with all three types of variables (Table 12). For example, SBHCs with higher billing were not more likely to have EHRs, but had higher odds of

more advanced use of HIT. Odds of electronic prescribing also increased with the percent of white students. Managed care SBHCs and those in states with state Medicaid PCMH initiatives had greater odds of electronic prescribing.

More funding sources and more staff increased the odds of both Payment attributes, and higher levels of billing also increased the odds of receiving supplemental performance payments. Two of the three rural categories had higher odds of receiving care coordination payments compared to urban SBHCs. SBHCs based in schools with adolescents were less likely to receive care coordination payments, as were SBHCs in schools with higher poverty levels. Managed care SBHCs and those in states with state Medicaid PCMH initiatives had of receiving performance payments and care coordination payments. FQHC/CHC sponsored SBHCs performed better than at least one other sponsor type in every attribute except for receipt of performance payments.

Table 12. Odds Ratios for PCMH Attributes in the HIT and Payment Dimensions (n = 1,026)

	Odds Ratio in Adjusted Analysis				
	Health Information Technology			Payment	
	EHR	Electronic Prescribing	Meaningful Use	Performance Payments	Care Coordination
<b>Munificence</b>					
Practice Size: PCP FTE > 1	0.37	1.68	0.91	0.64	0.59
Staffing Model: All 3 (reference)					
Primary care & other	2.29	<b>2.93</b>	1.47	0.59	0.69
Primary care & behavioral	0.73	0.53	1.43	0.64	<b>2.13</b>
Billing Covers Expenses: < 5% (reference)					
>= 5% & < 26.4%	1.43	1.89	1.58	3.26	0.76
>= 26.5% & < 50%	3.94	<b>4.33</b>	1.70	3.12	2.02
>= 50%	2.96	<b>12.10</b>	<b>2.28</b>	<b>5.21</b>	1.77
HRSA Capital Funding: Yes	<b>8.55</b>	0.47	<b>0.29</b>	0.56	1.60
Number of Funding Sources	1.05	0.98	1.18	<b>1.47</b>	<b>1.46</b>
Staff FTE	1.33	1.31	1.20	<b>1.37</b>	<b>1.17</b>
<b>Complexity</b>					
Location: Urban (reference)					
Large rural	1.52	1.18	1.48	1.50	<b>3.70</b>
Small rural	1.16	1.49	1.06	0.78	2.65
Isolated	0.68	0.78	1.60	1.41	<b>4.91</b>
School: Includes adolescents	0.54	0.67	0.91	0.66	<b>0.53</b>
Patients Served: More than students	1.53	1.50	1.23	1.46	1.09
% Students Non-Hispanic White	1.01	<b>1.01</b>	1.00	<b>1.01</b>	1.00
% Students Eligible for Free Lunch	1.01	1.01	1.01	1.00	<b>0.99</b>
<b>Isomorphic Pressure</b>					
Sponsor: FQHC/CHC (reference)					
Local health department	<b>0.25</b>	<b>0.15</b>	<b>0.33</b>	0.34	<b>0.06</b>
Hospital	0.54	0.39	<b>0.30</b>	1.21	<b>0.41</b>
School system	0.95	<b>0.04</b>	0.32	0.62	-∞
Other	0.45	0.20	0.39	0.64	<b>0.37</b>
Managed Care Preferred Provider: Yes	2.79	<b>2.48</b>	0.75	<b>2.91</b>	<b>3.48</b>
State Medicaid PCMH Initiative: Yes	2.43	<b>3.70</b>	1.65	<b>4.07</b>	<b>4.22</b>

Note: Values in bold are significant at  $p < 0.05$

SBHCs without a behavioral staff provider underperformed in both attributes of Patient-Centered care, but only had lower odds of one Access and Quality attribute, using measures of patient satisfaction in their quality improvement processes (Table 13). SBHCs with higher billing were more likely to use claims data in their quality improvement activities, as were SBHCs receiving HRSA Capital funding. SBHCs located in the most rural, isolated areas and those in states with Medicaid PCMH initiatives had higher odds of involving patients and parents/guardians in the design of health services. School systems and “other” sponsoring agencies outperformed the other groups at involving patients and parents/guardians in the design of health services offered at the SBHC. Compared to FQHCs/CHCs, all other sponsor

groups had lower odds of providing afterhours care and collecting patient data for quality improvement. SBHCs designated as managed care preferred providers had higher odds of offering afterhours care.

Table 13. Odds Ratios for PCMH Attributes in the Patient-Centered and Access and Quality Dimensions (n = 1,026)

	Odds Ratio in Adjusted Analysis					
	Patient-Centered		Access and Quality			
	Advisory Role	Design	Afterhours Care	QI Data	Claims Data	Patient Satisfaction
<b>Munificence</b>						
Practice Size: PCP FTE > 1	0.67	1.09	1.50	1.47	0.34	1.70
Staffing Model: All 3 (reference)						
Primary care & other	<b>0.21</b>	<b>0.38</b>	0.62	0.32	0.95	<b>0.34</b>
Primary care & behavioral	0.89	<b>0.57</b>	1.36	1.58	1.25	0.72
Billing Covers Expenses: < 5% (reference)						
>= 5% & < 26.4%	1.51	1.03	0.99	<b>5.44</b>	<b>12.33</b>	1.12
>= 26.5% & < 50%	1.10	<b>0.37</b>	<b>3.11</b>	4.52	<b>14.62</b>	2.10
>= 50%	0.61	0.80	1.27	0.95	<b>8.89</b>	1.74
HRSA Capital Funding: Yes	1.75	2.01	<b>14.61</b>	+∞	<b>58.30</b>	1.59
Number of Funding Sources	1.14	1.04	1.20	1.01	1.15	1.35
Staff FTE	1.14	1.01	1.26	1.19	1.02	1.05
<b>Complexity</b>						
Location: Urban (reference)						
Large rural	0.78	1.45	0.95	0.67	1.66	0.60
Small rural	2.34	1.24	2.89	0.82	0.89	0.92
Isolated	2.46	<b>4.94</b>	1.14	1.85	2.18	2.48
School: Includes adolescents	0.82	0.80	1.31	1.49	1.09	1.81
Patients Served: More than students	1.02	1.41	0.70	1.06	1.49	1.97
% Students Non-Hispanic White	1.01	0.99	1.00	0.99	1.00	1.00
% Students Eligible for Free Lunch	0.99	0.99	1.00	0.99	1.00	1.00
<b>Isomorphic Pressure</b>						
Sponsor: FQHC/CHC (reference)						
Local health department	1.18	1.64	<b>0.07</b>	<b>0.04</b>	0.74	1.85
Hospital	1.21	1.80	<b>0.05</b>	<b>0.04</b>	0.40	0.52
School system	5.73	<b>14.60</b>	<b>0.08</b>	<b>0.02</b>	0.38	0.96
Other	<b>1.87</b>	<b>2.86</b>	<b>0.15</b>	<b>0.01</b>	<b>0.27</b>	0.58
Managed Care Preferred Provider: Yes	1.58	1.67	<b>3.63</b>	1.96	1.06	1.90
State Medicaid PCMH Initiative: Yes	1.63	<b>2.15</b>	0.94	2.16	0.61	1.17

Note: Values in bold are significant at p < 0.05

SBHCs with more than one primary care provider had greater odds of offering chronic disease management and using a tool to guide age and gender appropriate screenings (Table 14). SBHCs without the most comprehensive staffing model had consistently lower odds ratios for all the Comprehensive Care attributes, except for depression screening. Those with a behavioral health staff member on site were just as likely to screen for depression as the most

comprehensively staffed SBHCs. One billing level (third quartile) was positively associated with using a tool for screening for social factors and health behaviors that affect health. SBHCs with HRSA funding had greater odds of offering chronic disease management and using a tool to screen for drug use. For complexity variables, as rurality and the diversity of the patient population increased, the odds of several Comprehensive Assessment attributes decreased. The results for the sponsorship variable were mixed compared to the predicted direction: hospitals performed better than FQHCs/CHCs on four of the five Comprehensive Assessment attributes, and school systems outperformed FQHCs/CHCs on using a tool for age and gender appropriate screenings.

Table 14. Odds Ratios for PCMH Attributes in the Care Management and Comprehensive Care Dimensions (n = 1,026)

	Odds Ratio in Adjusted Analysis						
	Care Management		Comprehensive Assessment				
	Chronic Disease	Health Education	Age/Gender	Social Factors	Health Behaviors	Depression (adolescents)	Drug Use (adolescents)
<b>Munificence</b>							
PCP FTE > 1	<b>9.02</b>	0.66	<b>2.09</b>	1.62	1.62	1.06	1.14
Staffing: All 3 (ref)							
PCP & other	0.46	<b>0.12</b>	<b>0.34</b>	<b>0.24</b>	<b>0.24</b>	<b>0.32</b>	<b>0.22</b>
PCP & behav.	0.73	0.49	<b>0.44</b>	<b>0.31</b>	<b>0.31</b>	0.74	<b>0.52</b>
< 5% Billing							
>= 5%	1.21	1.48	0.81	0.87	0.87	0.55	0.76
>= 26.5%	2.70	1.62	1.83	<b>3.13</b>	<b>3.13</b>	1.01	2.08
>= 50%	0.92	0.71	1.09	0.95	0.95	0.41	1.03
HRSA Capital Funding	<b>7.38</b>	1.37	2.06	2.30	2.30	2.48	<b>5.59</b>
Number of Funding	0.94	1.52	0.97	1.06	1.06	1.12	0.94
Staff FTE	1.22	1.39	0.92	1.03	1.03	1.17	1.14
<b>Complexity</b>							
Location: Urban (ref)							
Large rural	1.07	1.82	1.19	1.01	1.01	0.72	0.80
Small rural	0.37	0.98	0.60	<b>0.35</b>	<b>0.35</b>	0.36	0.85
Isolated	0.45	1.41	0.45	<b>0.30</b>	<b>0.30</b>	0.69	0.54
School: Includes adolescents	1.82	3.05	0.76	1.17	1.17	—	—
Serves > students	0.71	0.69	<b>0.52</b>	<b>0.50</b>	<b>0.50</b>	0.51	0.56
% Non-Hispanic White	<b>1.02</b>	1.02	1.01	1.01	1.01	1.00	1.00
% Eligible for Free Lunch	1.02	1.01	1.00	1.00	1.00	1.00	1.00
<b>Isomorphic Pressure</b>							
Sponsor: FQHC (ref)							
LHD	0.28	+∞	1.20	1.38	1.38	0.35	1.98
Hospital	0.21	0.23	<b>2.12</b>	<b>2.08</b>	<b>2.08</b>	<b>0.25</b>	<b>2.76</b>
School system	0.50	1.42	<b>5.06</b>	3.89	3.89	0.31	2.81
Other	<b>0.29</b>	0.88	1.71	1.48	1.48	<b>0.13</b>	1.69
Managed Care Preferred	1.56	1.18	1.41	1.41	1.41	0.89	1.20
State Medicaid PCMH	1.66	1.26	1.61	<b>2.29</b>	<b>2.29</b>	1.36	1.55

Note: Values in bold are significant at p &lt; 0.05

## Discussion

The purpose of this study was to examine the associations between both internal and external environmental (munificence, complexity, and isomorphic pressure) SBHC characteristics with PCMH capacity. PCMH capacity was evaluated at multiple levels: the overall score on the SBHC PCMH Index, Index domain and dimension scores, and of individual PCMH attributes. The analysis resulted in findings that can be used by SBHC practitioners and medical home initiatives to improve PCMH adoption. There were significant differences in the PCMH capacity score and adoption of PCMH attributes by SBHC characteristics. Overall, SBHCs performed best in the Comprehensive Care domain due to high scores in Care Management and Comprehensive Assessment dimensions. SBHCs scored 95% in the Care Management dimension, indicating very high offerings of chronic disease management and health education classes. However, SBHCs only scored 17% in the Payment dimension. SBHCs that do not receive enhanced payments may have difficulties sustaining and expanding their implementation of the medical home model.

The mean cost of applying for NCQA's highest level of PCMH recognition has been estimated at \$13,700 per primary care provider FTE, which does not include the additional expenses of ongoing costs for staff and supplies.<sup>167</sup> Other estimates of the actual implementation costs of PCMH elements range from \$7,691 - \$9,658 per primary care provider FTE per month.<sup>168</sup> Increased PCMH capacity is also associated with higher health center operating costs due to PCMH activities related to advanced EHR use and quality improvement activities.<sup>169</sup> Given the high costs of PCMH implementation, it was expected that most of the munificence variables would be associated with increased overall Index scores and higher odds of use for more expensive PCMH attributes. These anticipated findings were mostly confirmed in this analysis. SBHCs with greater billing revenue had higher scores in the HIT dimension and the Access and Quality dimension. Higher billing was associated with greater electronic prescribing and more Meaningful Use achievement. Electronic prescribing is one component of the

Meaningful Use incentive payments that requires prescribers to transmit 40% of allowable prescriptions using EHR technology.<sup>170</sup> Substantial investments of planning time and the ongoing transformation of work processes are required for the successful adoption of electronic prescribing.<sup>171</sup> A recent systematic review of the challenges of PCMH transformation cited difficulties of implementing meaningful use of EHR systems, including electronic prescribing, as a key barrier to the medical home model due to unanticipated difficulties integrating the EHR system into the clinician's work processes, and the significant required investments of time, effort, and resources.<sup>122</sup>

The comprehensiveness of the staffing model on PCMH attribute adoption had mixed findings. SBHCs with at least three different provider specialty types were better at offering more Comprehensive Assessments, health education classes, and incorporating patients/parents/guardians into the design of health services. However, SBHCs without a behavioral health provider and without another specialty provider (not including behavioral health) were more likely to offer electronic prescribing and receive care coordination payments, respectively. As both activities are expensive, probably more so than the use of screening tools and involving stakeholders in the design of services, SBHCs may make a strategic choice to forego hiring specialists in order to pursue other PCMH elements.

Both Payment dimension attributes were significantly associated with munificence variables. Though participating in performance payment programs may potentially increase a provider's revenue, it requires significant investments to demonstrate that the practice is meeting performance standards. One study has found that implementation of pay-for-performance programs costs \$1,000 - \$11,100 per full-time clinician, and annual maintenance costs ranged from around \$100 - \$4,300 per clinician, with the highest costs being seen in small provider clinics.<sup>172</sup> These costs include non-personnel costs and personnel time associated with data capture, collecting, and reporting, so it makes sense that greater billing revenue, greater number of overall funding sources, and larger staff size are associated with increased odds of receiving performance payments. In pediatric practices, providers operating in



solo/small provider clinics and providers caring for high percentage of publicly insured patients more frequently reported staffing insufficiencies as a primary barrier to implementing care coordination services.<sup>173</sup> In this analysis, both number of funding sources and larger overall staff size were associated with higher odds of receiving care coordination payments.

This analysis did not find much evidence to support that environmental complexity, as measured by patient-level variables, is significantly associated with overall PCMH capacity in SBHCs. By their very design, SBHCs are placed in complex environments. PCMH access disparities typically seen in adolescents and in children without private health insurance may be addressed by seeking care at SBHCs. However, this study did find that an increasing percent of non-Hispanic white students at the school was associated with higher PCMH capacity, which is contrary to other research that did not find significant relationships between a practice's racial/ethnicity practice mix and PCMH processes.<sup>85,87,174</sup> In this study, race was related to higher odds of electronic prescribing, supplemental payments for performance, and chronic disease management. As electronic prescribing is an advanced function of EHRs, disparities in EHR adoption and greater financial barriers to adoption experienced by providers serving minority patients may explain this finding.<sup>175,176</sup> Although EHR implementation by patient race/ethnicity was insignificant in this study, advanced EHR modules such as electronic prescribing may be used less with minority populations due to its additional costs. Also, providers with more minority patients have experienced worse quality outcomes in pay-for-performance programs, which usually include chronic disease management measures, so SBHCs with higher amounts of minority patients may choose to opt-out of performance-based payment schemes.<sup>177,178</sup> While the magnitude of the race effect on PCMH capacity was small, this does translate into a large PCMH capacity difference between schools that are predominantly non-Hispanic white and those that are minority majority schools.

The study findings do provide evidence of isomorphic effects on PCMH capacity, but the effects were not as widespread across the various domains and dimensions as anticipated. Both managed care

arrangements and Medicaid state PCMH Initiatives were associated with increased odds of electronic prescribing, supplemental performance payments, and care coordination payments. All three of these PCMH attributes serve the interests of managed care and Medicaid, which explains why these insurance programs are associated with these PCMH attributes. Along with benefits for the patients and providers, electronic prescribing can lower costs for insurers due to better adherence to formulary prescribing and reduction in adverse drug effects.<sup>179</sup> The increased payments to small clinics gives up-front financial support needed for practices to adopt other elements of the PCMH model, so payment reform is the foundation upon which practice transformation can be built.<sup>180</sup>

However, neither managed care or State Medicaid initiatives were associated with any attributes from the Access and Quality dimension or the Care Management dimension. SBHCs in states with Medicaid PCMH initiatives did have higher odds of screening for social factors and health behaviors that would negatively affect health and for involving patients/parents/guardians in the design of health services. Implementation of validated screening tools in pediatric populations has been found to improve detection of behavioral and developmental concerns and referral to community resources.<sup>181,182</sup> Child development screening is sometimes actually required of Medicaid providers because of its benefits in assisting in early identification of problems in young children.<sup>183</sup> Given the success of implementing screening tools for age appropriate developmental behaviors in pediatric populations and the known association between health and social factors, it makes sense that managed care and Medicaid would also promote increased use of screening tools which will promote cost-saving preventive services.

SBHCs sponsored by FQHCs/CHCs only performed better in two dimensions: HIT and Access and Quality. It was hypothesized that FQHC/CHC sponsored organizations would outperform other sponsoring agencies because of greater technical knowledge of the PCMH certification process. The Affordable Care Act's FQHC Advanced Primary Care Practice Demonstration, which ended in 2013,

provided financial and technical assistance to 434 FQHCs to help them become NCQA PCMH recognized.<sup>9</sup> This program provided various levels of technical support to FQHCs and previous research has demonstrated the helpfulness of external support for PCMH adoption.<sup>184</sup> It was expected that SBHCs sponsored by nationally certified FQHCs would receive support, encouragement, and pressure to adopt PCMH innovations, leading to widespread increased PCMH capacity. This pressure to adopt the PCMH model may partially explain why FQHC SBHCs performed better in the HIT and Access and Quality dimensions, two areas that are highly emphasized in the NCQA program. However, these associations may also be explained by resource dependency theory. Greater technical support of advanced HIT use, knowledge of quality improvement processes, and availability to provide afterhours care when the SBHC is closed could be considered resources that increase the munificence of the SBHC. Because FQHC/CHC sponsorship was only positively associated with PCMH dimensions that require more financial and staff investment and was negatively associated with less expensive PCMH attributes (e.g. patients and parents/guardians participating in SBHC advisory boards and participating in design of health services), there is inconclusive evidence that FQHC/CHC sponsorship results in pressure for their SBHCs to implement the complete medical home model. Although, it does appear that SBHC sponsorship influences adoption of specific PCMH attributes that the sponsor has experience implementing themselves. This can also be seen in school system sponsored SBHCs which performed better at involving patients/parents/guardians in the SBHC activities. Schools have experience and processes in place for involving parents in their activities, such as through parent teacher associations, and may find it easier to include parents and students in their SBHC activities.

### **Implications and Contributions**

This study is the first to describe the effects of various internal and external environmental variables on PCMH capacity in SBHCs. SBHCs typically perform well in using tools to provide Comprehensive Assessments of their patients' needs, but have very low levels of participation in PCMH

payment reforms. Because adoption of most PCMH attributes require significant investments of time or money, special PCMH payments are needed to sustain and grow PCMH implementation. SBHCs, which are small clinics with limited staffing, may need external support to develop their infrastructure in order to participate in these enhanced payment programs. This study also found that SBHCs with higher munificence and greater isomorphic pressure had better PCMH capacity and were more likely to implement specific elements of the medical home model. Among SBHCs, differences in rurality, student age, and family income had minimal effects on PCMH adoption, but lower levels of PCMH capacity were seen in schools with more minority students.

## CHAPTER 4: CORRELATES OF PATIENT-CENTERED MEDICAL HOME RECOGNITION IN SCHOOL-BASED HEALTH CENTERS

### Abstract

**Purpose:** The patient-centered medical home model (PCMH) of care is promoted as a way to improve access to care, health care outcomes, and control costs. The organizational, environmental, and patient characteristics associated with school-based health centers (SBHCs) obtaining PCMH recognition is currently unknown. Resource dependency theory and institutional theory were used to explore the predictors of PCMH recognition in SBHCs.

**Methods:** The 2013-2014 National Census of School-Based Health Centers was used as the primary data source for this analysis. Multivariable logistic regression controlling for organizational, environmental, and patient characteristics representative of munificence, environmental complexity, and isomorphic pressures was used to assess the odds of a SBHC obtaining (1) any type of PCMH recognition, and (2) of obtaining national PCMH recognition.

**Results:** Only 29% (n = 346) of SBHCs had received any type of recognition as a PCMH and 17% (n = 203) reported receiving national-level recognition. After controlling for covariates and the clustered nature of the data, SBHCs that were managed care preferred providers, received Health Resources and Services Administration SBHC Capital Funding, and were based in schools without adolescents had greater odds of both types of PCMH recognition outcomes. Increased revenue from patient billing, more staff FTEs, and the type of sponsoring agency is also associated with national PCMH recognition.

**Conclusions:** These findings reflect that a high capacity of financial and staff resources are needed for national-level PCMH recognition and that the cost and quality goals of managed care are supportive of PCMH implementation. Additionally, SBHCs based in schools that include adolescents were less likely to have both levels of PCMH recognition and efforts should be made to increase medical home activity in these SBHCs. There were differences in significant associations between the two PCMH recognition

outcomes, indicating that the definition of a medical home is important to consider when evaluating organizational characteristics associated with the PCMH model.

## Introduction

The ACA encourages implementation of PCMHs through a variety of primary care transformation demonstrations and PCMH use in pediatric populations has been shown to reduce health care expenditures, increase quality of care, improve health outcomes, decrease unmet medical needs, and improve patient satisfaction.<sup>78,185</sup> The PCMH concept was pioneered by the AAP because this delivery system provides comprehensive primary care that is accessible, coordinated, culturally sensitive, and reflective of the unique needs of the patient.<sup>2</sup> Medical practices may choose to pursue PCMH certification or recognition from a national-level organization, such as the NCQA, Joint Commission, URAC, or the Accreditation Association of Ambulatory Health Care (AAAHC). PCMH designation is also available through participation in state-level PCMH initiatives and demonstration projects that involve Medicaid agencies and/or private insurance companies. At least half of all state Medicaid programs have payment structures for PCMHs that include care management fees, performance-based payments, or up-front implementation costs.<sup>163</sup>

Though widely heralded as a promising model to improve the primary health care system, there is still inconclusive evidence about the PCMH model's effect on clinical and cost outcomes, partly due to the wide variety of standards that exist between different PCMH certifying organizations.<sup>186</sup> The inability of PCMH practices to fully deliver on improving quality while reducing costs of care may also be caused by the insufficient changes to how primary care providers are reimbursed for delivering care in a PCMH setting.<sup>187</sup> If payment changes to providers are inadequate, the costs of redesigning care delivery (e.g. hiring more staff or purchasing health information technology) and costs associated with applying for national PCMH certification may be barriers to fully adopting this model of care.

The time demands of implementing practice changes and health information technology challenges are also limiting capabilities to many primary care providers. PCMH adoption is influenced by incentives that support practice changes, the provider's relationship to other health care organizations,

and the financial and technical resources available to the practice to support change.<sup>184,188</sup> Primary care practices that receive health information technical support or assistance with reporting performance measurements have fewer barriers to delivering patient-centered care.<sup>188</sup> Also, larger practices and providers with more connections to other healthcare organizations are more likely to deliver elements of the PCMH model of care.<sup>86,88</sup> Beyond financial and technical assistance, the motivation of the practice to become PCMH certified is also important and practices that see being a PCMH as a benefit to both themselves and their patients adopt more components of PCMH delivery than practices that see pursuit of being a PCMH as an external imposed requirement.<sup>184</sup> In safety-net health clinics, staff turnover due to the challenges of providing care for high-needs patients and lack of financial support for implementing PCMH functions have been found to be barriers to PCMH transformation.<sup>189</sup>

SBHCs are safety-net health clinics co-located with a school that are designed to overcome transportation, time, language, and financial barriers that may prevent children from receiving needed health care services. Evaluation studies of SBHCs have demonstrated their ability to improve the health and educational outcomes of their patients, and SBHCs are promoted by the Community Preventive Services Task Force as an evidence-based program.<sup>75</sup> SBHCs have been found to increase their students' access to primary care services, reduce their emergency department use, improve immunization rates, and decrease exclusion from school due to immunization non-compliance.<sup>58-60,64,66,69,190,191</sup> Recognizing the importance of improving health care services for children as part of a larger strategy to improve our nation's health, the ACA designated \$200 million towards supporting the improvement and expansion of services at SBHCs through the HRSA SBHC Capital program and the number of SBHCs grew by 20% between 2010 and 2014.<sup>47,81</sup> SBHCs have been suggested as a possible setting for PCMH implementation, but may encounter challenges offering this model of continuous and comprehensive care because many SBHCs are only open when school is in session.<sup>82,83</sup> SBHCs also rely heavily on grant funding and see many uninsured patients, so many not be able to afford the health information



technology or staffing needed to be a PCMH. SBHCs sponsored by larger health care organizations that can see patients when the SBHC is not open and provide technical and technological support may be able to implement elements of the PCMH model.<sup>82</sup>

The purpose of this study is to describe SBHC characteristics associated with different types of PCMH recognition. This study is the first to examine formal PCMH certification using national data from SBHCs and adds to the growing literature studying PCMH implementation in small practices and in safety-net providers. To advance implementation of the medical home concept, more research is needed to understand what influences practices to seek different types of PCMH recognition. Using concepts from both resource dependency theory and institutional theory, the overall hypothesis for this study was that SBHCs with greater internal munificence and more external isomorphic pressures will be more likely to achieve PCMH certification. The influence of munificence, defined in this study as greater availability of financial and/or human resources, was predicted to be positively associated with PCMH recognition because undergoing practice transformations require significant investments of time, staff, and money. External isomorphic pressures, represented in this study by the presence of a state Medicaid PCMH initiative, SBHC participation in managed care arrangements, and specific sponsoring organizations (e.g. FQHCs/CHCs) will be positively associated with increased odds of PCMH recognition. Additionally, this study controls for features of the patient population, defined as environmental complexity, that are known or suspected to be associated with medical home disparities. Environmental complexity is represented by variables categorizing the patient age, rurality, race/ethnicity, poverty level, and if the SBHC sees patients beyond just students. Patient age influences utilization patterns in SBHCs and may in part dictate a practice's ability or motivation to implement change in delivery of services.<sup>158</sup> Rural clinics are thought to experience significant difficulties to obtaining PCMH recognition, and it has also been found that Non-Hispanic White children and children from families with higher incomes are also more likely to have a medical home than their counterparts.<sup>22,192</sup> Seeing patients

beyond their students may add to complexity because the expanded patient population may bring with it more variety of health needs across the lifespan.

## **Methods**

### *Data Source*

The 2013-2014 National Census of School-Based Health Centers conducted by the SBHA was used as the primary data source for this analysis. The SBHA has conducted the triennial national survey of SBHCs since 1998 and uses an online survey to collect data about SBHC demographics, staffing, services, financing, and clinical policies.<sup>47</sup> The SBHA maintains a database of all known SBHCs in the United States and regularly updates it by working with state affiliates, SBHC funders, and SBHA members to identify new SBHCs and closed SBHCs. Before launching the census, contact information for representatives of each SBHC are verified and within three months of census launch, all SBHCs that have not completed the census are contacted to verify the SBHC's information and to encourage census completion.

### *Study Sample*

Of the 2,315 known SBHCs in the United States, 1,900 responded to the 2013-2014 Census. Of these 1,900 respondent SBHCs, 1,507 provide primary care and reported their PCMH status. After removing observations missing responses on other key variables, 1,212 SBHCs were included in the final sample for this study.

### *Dependent Variables*

Two binary outcome variables were generated that indicate: (1) if a SBHC has received any type of PCMH recognition, and (2) if they received PCMH recognition from a national organization (i.e. NCQA, Joint Commission, or AAAHC). Other national-level PCMH certification programs are available, but were not reported by any SBHC.

### *Independent Variables*

Munificence: The total number of reported hours worked weekly by physicians, nurse practitioners, and physician assistants was divided by 40 hours to calculate the mean PCP FTE. The FTE for all staff members of the SBHC was also modeled as a continuous variable. The staffing model of the health center categorizes the type of providers on staff at the SBHC into those that have (1) just PCPs and behavioral health staff, (2) PCPs and other staff (e.g. dietician, optometrist, dentist), and (3) clinics that offer PCPs, behavioral health, and other providers. The percent of total SBHC operational expenses covered by patient billing was categorized into quartiles. The total number of funding sources received by the SBHC and if they received HRSA SBHC Capital funding was also included in the model.

Complexity: SBHCs were also split into those based in schools that only have prekindergarten through fifth grade and those that serve at least one grade of sixth or above. This categorization splits the schools into those with only young children and those that have adolescents in their student population. SBHCs were also differentiated into those that only see students as patients and those that also treat non-students. Race/ethnicity and a proxy measure for student poverty, eligibility for free or reduced price lunch, were also included. Children from families with incomes between 130% and 185% percent of the federal poverty level (FPL) are eligible for reduced price meals and children from families with incomes at or below 130% FPL are eligible for free meals.<sup>160</sup> Medicaid and the Children's Health Insurance Program (CHIP) cover children up to 200% FPL in 49 states, so eligibility for free or reduced lunch is a good indicator of Medicaid or CHIP eligibility.<sup>161</sup> Zip code RUCA (rural-urban commuting areas) approximation was used to categorize SBHC location into urban, large rural, small rural, and isolated areas.<sup>162</sup>

Isomorphic Pressures: The sponsoring organizations were divided into 5 categories: FQHCs/CHCs, hospitals, LHDs, school systems, and other (e.g. non-profit, behavioral health agency, or

university). SBHCs were also categorized by the presence of state-level Medicaid PCMH Initiatives and if they were designated as a managed care preferred provider.<sup>163</sup>

### *Analysis*

The prevalence of each SBHC characteristic was first examined for the entire sample and then bivariate analyses by both PCMH outcome variables were conducted using chi-square tests and two-tailed t-tests. The relationship between both PCMH recognition outcomes and SBHC characteristics were analyzed using multivariable logistic regression. Survey respondents are nested within sponsoring organizations and by state. Logistic regression with clustering on the state where the SBHC is located was used to adjust for correlated nature of the data.<sup>164</sup> Cluster characteristics, such as a small number of SBHC respondents in some states and many sponsoring organizations that only oversee one SBHC, would cause bias in multi-level modelling.<sup>165,166</sup> Generalized estimating equations were also ruled out due to biased estimates with binary outcome variables in models with 50 small, unbalanced clusters.<sup>193</sup> The data were analyzed using STATA software, version 14 (Stata- Corp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

### **Results**

The characteristics of the SBHCs in this study sample are shown in Table 15. Most (71%) of SBHCs are not recognized as a PCMH, but 12% and 17% have received local and national certification, respectively. The majority have  $\leq 1$  PCP FTE on staff (88%), have a staffing model of at least three different specialties of health care providers (56%), are in urban areas (83%), and are in schools with adolescents (87%). Clinical health care organizations, such as FQHC/CHCs (39%) and hospitals (21%), represent most sponsoring organizations. Half (50%) are designated as managed care preferred providers/medical homes and 62% are in states with Medicaid PCMH initiatives. The SBHCs serve a racially and ethnically diverse student population with a mean value of 33% of the student population at

SBHC sites identified as Non-Hispanic White. A majority (70%) of students also qualify for reduced price or free lunch.

Table 15. Descriptive Statistics of SBHCs (n=1,212)

Variable	Number of SBHCs (%)
Type of PCMH Recognition: None	866 (71%)
State or Other Non-National Program	143 (12%)
National Program	203 (17%)
<b>Munificence</b>	
Practice Size: PCP FTE <= 1	1,061 (88%)
PCP FTE > 1	151 (12%)
Staffing Model: Primary Care & Behavioral Only	201 (17%)
Primary Care & Other (No Behavioral)	332 (27%)
Primary Care, Behavioral, and Other	679 (56%)
Billing Covers Operation Expenses: < 5%	296 (24%)
>= 5% & < 25%	255 (21%)
>= 25% & < 50%	244 (20%)
>= 50%	417 (34%)
HRSA Capital Funding: No or Unknown	893 (74%)
Yes	319 (26%)
Number of Funding Sources	Mean = 2.90, Median = 3.00
Staff FTEs	Mean = 2.08, Median = 1.80
<b>Complexity</b>	
Location: Urban	1,010 (83%)
Large rural	92 (8%)
Small rural	55 (5%)
Isolated	55 (5%)
School: Prekindergarten – 5 <sup>th</sup> Grade	157 (13%)
At least 1 Grade 6 <sup>th</sup> and Above	1,055 (87%)
Patients Served: Just Students	524 (43%)
More than Students	688 (57%)
Percent of Students Non-Hispanic White	Mean = 33%, Median = 21%
Percent of Students Eligible for Free Lunch	Mean = 70%, Median = 75%
<b>Isomorphic Pressure</b>	
Sponsor: FQHC/CHC	475 (39%)
Local Health Department	112 (9%)
Hospital	255 (21%)
School System	163 (13%)
Other	163 (13%)
Managed Care Preferred Provider: No	606 (50%)
Yes	606 (50%)
State Medicaid PCMH Initiative: No	466 (38%)
Yes	746 (62%)

Note: Percent values in categories may not add up to 100% due to rounding

In bivariate analysis, every munificence variable was associated with at least one of the PCMH outcomes. Any PCMH recognition was higher in clinics with <= 1 PCP FTE, but a larger overall staff size was associated with national PCMH recognition (Table 16). Clinics receiving HRSA SBHC Capital funding, with a greater number of funding sources, and higher levels of billing covering their operating expenses were associated with receipt of both PCMH outcomes. Of the complexity variables, both school grades

and seeing patients beyond students were significantly associated with receipt of any PCMH recognition. Both PCMH outcomes were associated with rurality. All three isomorphic pressure variables were associated with both PCMH outcomes. SBHCs sponsored by FQHCs/CHCs, in managed care arrangements, and in states with Medicaid PCMH initiatives had greater incidence of PCMH recognition at both levels.

Table 16. SBHC Characteristics by PCMH Recognition Outcomes (n=1,212)

	Any PCMH	P-value	National PCMH	P-value
<b>Munificence</b>				
Practice Size: PCP FTE <= 1	30%	<b>&lt; 0.01</b>	17%	0.59
PCP FTE > 1	18%		15%	
Staffing Model: Primary Care & Behavioral	20%	<b>0.01</b>	13%	<b>&lt; 0.001</b>
Primary Care & Other	29%		24%	
Primary Care, Behavioral, & Other	31%		18%	
Billing Covers Expenses: < 5%	33%	<b>&lt; 0.001</b>	2%	<b>&lt; 0.001</b>
>= 5% & < 25%	12%		6%	
>= 25% & < 50%	30%		18%	
>= 50%	34%		33%	
HRSA Capital Funding: No/Unknown	17%	<b>&lt; 0.001</b>	12%	<b>&lt; 0.001</b>
Yes	61%		30%	
Number of Funding Sources	3.22	<b>&lt; 0.001</b>	3.24	<b>&lt; 0.001</b>
Staff FTEs	2.12	0.58	2.52	<b>&lt; 0.001</b>
<b>Complexity</b>				
Location: Urban	30%	<b>&lt; 0.001</b>	17%	<b>0.04</b>
Large rural	13%		7%	
Small rural	24%		22%	
Isolated	31%		18%	
School: PreK – 5 <sup>th</sup> Grade	46%	<b>&lt; 0.001</b>	21%	0.13
At least 1 Grade 6 <sup>th</sup> and Above	26%		16%	
Patients Served: Just Students	18%	<b>&lt; 0.001</b>	16%	0.37
More than Students	36%		18%	
% Students Non-Hispanic White	33%	0.06	32%	0.63
% Students Eligible for Free Lunch	70%	0.55	69%	0.39
<b>Isomorphic Pressure</b>				
Sponsor: FQHC/CHC	36%	<b>&lt; 0.001</b>	31%	<b>&lt; 0.001</b>
Local Health Department	4%		2%	
Hospital	16%		15%	
School System	58%		7%	
Other	17%		1%	
Managed Care Preferred Provider: No	9%	<b>&lt; 0.001</b>	7%	<b>&lt; 0.001</b>
Yes	48%		27%	
State Medicaid PCMH Initiative: No	35%	<b>&lt; 0.001</b>	13%	<b>0.01</b>
Yes	25%		19%	

Note: Bold values are significant at the p < 0.05 level.

In multiple logistic regression models accounting for the clustering of SBHCs within states, several munificence variables were significant in both models (Table 17). Receipt of HRSA funding and not having a behavioral health provider on staff increased the odds of both levels of PCMH attainment.

The highest billing level and larger staff size both increased the odds of national PCMH recognition. For SBHCs in schools with adolescents, the odds of attaining both PCMH outcomes were significantly lower. Compared to those in urban areas, large rural SBHCs were less likely to receive national PCMH recognition. As the poverty level increased at a school, the odds of the SBHC receiving any PCMH recognition decreased. The effects of the isomorphic variables were attenuated in the adjusted models, with only participation in managed care arrangements increasing the odds of both PCMH outcomes.

Table 17. Adjusted Odds Ratios for Any PCMH Recognition and National PCMH Recognition (n=1,212)

	Any PCMH Model		National PCMH Model	
	Odds Ratio	P-value	Odds Ratio	P-value
<b>Munificence</b>				
Practice Size: PCP FTE <= 1 (ref.)				
PCP FTE > 1	0.47	0.05	0.54	0.19
Staffing Model: Primary Care & Behavioral	0.96	0.92	2.13	0.06
Primary Care & Other	1.93	<b>0.02</b>	3.25	<b>&lt; 0.0001</b>
Primary Care, Behavioral, & Other (ref.)				
Billing Covers Expenses: < 5% (ref.)				
>= 5% & < 25%	0.73	0.41	2.66	0.24
>= 25% & < 50%	1.68	0.23	4.93	0.12
>= 50%	1.24	0.57	6.47	<b>&lt; 0.05</b>
HRSA Capital Funding: No/Unknown (ref.)				
Yes	4.48	<b>&lt; 0.0001</b>	3.05	<b>&lt; 0.0001</b>
Number of Funding Sources	1.09	0.27	1.03	0.76
Staff FTEs	1.05	0.38	1.11	<b>0.04</b>
<b>Complexity</b>				
Rural: Urban (ref.)				
Large rural	0.51	0.36	0.23	<b>&lt; 0.01</b>
Small rural	0.86	0.79	0.94	0.91
Isolated	1.35	0.31	0.77	0.49
School: PreK – 5 <sup>th</sup> Grade (ref.)				
At least 1 Grade 6 <sup>th</sup> and Above	0.45	<b>0.001</b>	0.55	<b>0.03</b>
Patients Served: Just Students (ref.)				
More than Students	1.65	0.07	1.20	0.57
% Students Non-Hispanic White	0.99	0.15	0.99	0.44
% Students Eligible for Free Lunch	0.99	<b>0.04</b>	0.99	0.15
<b>Isomorphic Pressure</b>				
Sponsor: FQHC/CHC (reference)				
Local Health Department	0.49	0.31	0.22	0.06
Hospital	0.38	0.23	0.45	0.32
School System	3.08	0.10	0.08	0.07
Other	0.89	0.78	0.30	<b>0.03</b>
Managed Care Preferred Provider: No (ref.)				
Yes	7.67	<b>&lt; 0.0001</b>	3.89	<b>&lt; 0.0001</b>
State Medicaid PCMH Initiative: No (ref.)				
Yes	1.81	0.12	1.59	0.32

Note: Bold values are significant at the p < 0.05 level.

## Discussion

This study found that both the SBHCs' internal and external environmental variables were independently associated with the PCMH outcomes. Any PCMH recognition was less likely for SBHCs located in schools with increasing amounts of low-income students, similar to previous research that found low-income patients are less likely to have a medical home.<sup>22</sup> Student race/ethnicity was not significant in the adjusted models or bivariate analysis. This is a different finding than prior research conducted using patient-level data that found Non-Hispanic White patients are more likely to be served by PCMHs.<sup>22</sup> This discrepancy may be because SBHCs' intentions are to specifically address health care access disparities that may be related to issues such as race/ethnicity.

SBHCs that covered more of their operational expenses through patient billing had greater odds of being nationally PCMH recognized. Given prior research showing cost as a barrier to PCMH implementation and the need for reliable funding to support PCMH adoption, it is most likely that SBHCs with low billing revenue cannot afford to seek PCMH recognition.<sup>189</sup> The low billing revenue may be caused by seeing a high number of uninsured patients, who then in turn may miss out on the possible benefits of receiving care from a PCMH. Billing revenue was not significant in the any type of PCMH model and this most likely reflects that is more expensive to obtain national-level PCMH recognition than state or local recognition as a PCMH.

This study revealed an association between SBHC sponsor type and national PCMH recognition. FQHC/CHCs are the most common sponsor of SBHCs and were significantly more likely to be nationally recognized than SBHCs sponsored by "other" groups. While not meeting the  $P < 0.05$  cutoff, LHD (OR = 0.22,  $p = 0.06$ ) and school system sponsored (OR = 0.08,  $p = 0.07$ ) SBHCs were also less likely to have national-level recognition. There are several possible explanations for FQHCs/CHCs increased odds of national PCMH recognition. For example, FQHCs are required to have patient-majority governing boards and practices incorporating patient feedback are more likely to deliver patient-centered care.<sup>86</sup> FQHC



sponsored SBHCs may also have been more likely to be nationally certified due to transformation facilitation occurring at the FQHC level. In addition to the costs associated with practice changes needed for PCMH adoption, receiving NCQA or Joint Commission PCMH recognition requires significant time and personnel investment to demonstrate how PCMH requirements are met by the practice. The ACA's FQHC Advanced Primary Care Practice Demonstration, which ended in 2013, provided financial and technical assistance to 434 FQHCs to help them become NCQA PCMH recognized.<sup>9</sup> Previous research has demonstrated the helpfulness of external support for PCMH adoption and nationally certified FQHCs may have been able to provide technical assistance and support to SBHCs they sponsor.<sup>184</sup>

Compared to the other sponsoring organizations, FQHCs/CHCs and hospitals can probably provide several different types of PCMH support to their SBHCs. FQHCs/CHCs and hospitals may also be able to provide after-hours appointments to patients when the SBHC is closed to meet PCMH requirements for enhanced access. FQHCs/CHCs and hospitals will most likely have more expertise with health information technology, billing, and reporting clinical performance measures. Using advanced health information technology was a significant barrier to seeking PCMH implementation in prior research, and may be a limiting factor for SBHCs sponsored by health departments, school systems, and non-profits.<sup>86,189</sup>

SBHCs that were recognized as managed care preferred providers/medical homes had greater odds of both PCMH outcomes. This is not surprising for several reasons. Managed care organizations frequently offer incentive payments to contracted providers that control the costs of treating their patients. The managed care organizations' emphasis on coordinated care and preventative services may be supportive of adoption of some PCMH elements.<sup>194</sup> Additionally, approximately 80% of Medicaid enrollees receive most of their care through managed care arrangements.<sup>195</sup> As a high proportion of their patients are Medicaid enrolled or eligible, SBHCs that do not participate in managed care contracts may not be sufficiently reimbursed for services provided to Medicaid clients.<sup>82</sup> If the SBHC is not a

managed care preferred provider, patients may also choose to seek care outside the SBHC, which decreases the population of insured patients seen by the SBHC. As SBHCs serve many students without health insurance, billing revenue from insured students is needed to maintain financial sustainability.<sup>82</sup> The number of funding sources for services at the SBHC was not associated with either PCMH outcome. With the high costs of seeking PCMH certification, at least at the national level, it was expected that SBHCs with more diversified funding sources might have better practice reserve to fund transformation efforts. Lack of financial support for PCMH initiatives is a major barrier in safety-net clinics, but so is funding stream continuity with grants only supporting activities for limited periods of time.<sup>189</sup> With the limited duration of grant funding or constraints on how the money is used, the number of funding sources does not seem to be critical to seeking formal PCMH designation. More stable and ongoing financial resources, such as from patient billing revenue, may be more supportive of sustained practice change.

SBHCs that received HRSA SBHC Capital funding had significantly higher odds of any type of PCMH recognition and of national-level PCMH recognition. The HRSA SBHC Capital grants were intended to improve and expand services at SBHCs, but were not designated for any specific PCMH component or for SBHCs to seek PCMH recognition.<sup>81</sup> The primary use of these grant funds was to renovate or build new facilities for SBHCs. Due to the cross-sectional nature of the data used in this study, it is not possible to know if receipt of federal funding for facility costs freed up SBHC resources to invest in PCMH implementation, or if progressive SBHCs that had already adopted the PCMH model of care were more likely to receive HRSA funding. New physical spaces for the SBHC may also improve workflow and better accommodate delivering health care in the team-based environment required by the PCMH model.

It was somewhat surprising that SBHCs without a behavioral health provider on staff had greater odds of PCMH recognition. The integration of behavioral health services into primary care and providing care for all the patient's healthcare needs are components of the PCMH model. As previously discussed,

SBHCs are generally small with limited budgets. SBHCs that choose to not hire a behavioral health provider may still meet NCQA PCMH requirements by demonstrating how care is coordinated between primary care and behavioral health.<sup>93</sup> By not having a behavioral health provider on staff and instead coordinating care with a behavioral health provider that may be a part of the school system or out in the community, SBHCs may be able to save money that can be used to implement other required PCMH elements.

SBHCs in states with Medicaid PCMH Initiatives were not more likely to receive either type of PCMH designation. Prior research has also found that state-level characteristics/policies are not associated with children's access to medical homes.<sup>96</sup> In this analysis, PCMH initiatives must have been in place by June 2012, and the SBHA Census survey was administered in 2013. It may take several years for the state PCMH Initiatives to produce tangible results, and analysis of later years of SBHA Census data may be a better predictor of the effects of the state programs.<sup>196</sup>

Finally, SBHCs located in schools with adolescent students had lower odds of receiving both PCMH outcomes. Early PCMH initiatives focused on mothers and children so Medicaid and local initiatives may have targeted providers treating young children for inclusion into their PCMH programs.<sup>163</sup> In addition to the basic primary care offered by most SBHCs, SBHCs treating adolescents may also offer sexual and reproductive health services and health promotion activities targeting drug and alcohol use, intimate partner violence, suicide, and general violence (e.g. guns, gangs, fighting).<sup>47</sup> The variety of services needed in an SBHC that sees adolescents, especially for health promotion activities which are generally not billable to insurance providers, may limit the ability of these SBHCs to pursue formal PCMH recognition.

SBHCs are frequently the main source of care for a large percentage of their adolescent patients, especially when the adolescent is uninsured.<sup>83</sup> If the PCMH model is indeed a facilitator of better quality care, it is concerning that this model is less likely to be used since most SBHCs are based in schools with

adolescents. Adolescence is a key time frame when high-risk behaviors (i.e. smoking and alcohol use) that cause adult morbidity begin and the PCMH care model could improve adolescent and subsequently adult health.<sup>197</sup> It is important to consider that there was no difference between SBHCs in schools with adolescents and those with only young children in the national PCMH model. The findings from this study may just reflect that SBHCs with adolescents are not targeted for local PCMH programs, but could still achieve national PCMH recognition. It is also currently unclear if there are differences in patient health and cost outcomes amongst the different PCMH programs.<sup>186</sup>

This study had a few limitations. First, the cross-sectional study design does not allow for causality inferences. Second, the survey responses came from a single person within each SBHC and PCMH recognition status was not independently validated by the study authors. Additionally, the outcome measures of any PCMH recognition and national-level PCMH recognition most likely do not fully capture PCMH implementation.<sup>198</sup> Assessing these two outcomes separately recognizes that there are possibly differences in levels of PCMH functionality in a clinic that has received any type of PCMH designation compared to those with national recognition; however, these two outcomes are not mutually exclusive. Many PCMH programs use NCQA accreditation standards, so an SBHC could receive both types of PCMH designation, but have only reported one type in the Census. This violation of independence between the outcomes prevented use of multinomial regression which could have provided more precise estimates of the effects of SBHC characteristics on different types of PCMH recognition. Finally, the 2013-2014 Census had responses from 82% of all known SBHCs and can be considered broadly representative of SBHCs. The Census does not weight respondents or provide information about non-respondents, therefore the results may not be nationally representative of all SBHCs.

## Implications and Contributions

Despite limitations such as small practice size and limited funding, SBHCs can achieve formal PCMH recognition. Several organizational characteristics of the SBHCs were found to be associated with the different types of PCMH recognition. SBHCs that covered higher amounts of their operational expenses through patient billing revenue, that received HRSA SBHC funding, had larger staff sizes, and participated in managed care arrangements were the most likely to receive national-level PCMH recognition. These findings reflect that a high capacity of financial and staff resources (munificence) are needed for national-level PCMH recognition and that the cost and quality goals of managed care (isomorphic pressure) are supportive of PCMH implementation. Additionally, SBHCs based in schools that include adolescents (complexity) were less likely to have both levels of PCMH recognition and efforts should be made to increase medical home activity in these SBHCs. In comparing the two models, there were differences in significant associations between the PCMH outcomes and the munificence, complexity, and isomorphic pressure variables. While further research needs to determine if state-level or national-level PCMH programs are comparable in producing desired patient outcomes, it is important to recognize that different factors may influence providers' ability to seek one type of recognition over the other.

## CHAPTER 5: DISCUSSION

### Summary and Synthesis

The purpose of this dissertation was to apply organization behavioral theories and adoption of innovation theory to understand the factors associated with adoption of individual PCMH attributes, higher levels of PCMH capacity, and formal recognition as a PCMH in SBHCs. First, the SBHC PCMH Index was created using factor analysis and was used to identify individual PCMH attribute adoption and PCMH capacity in SBHCs. A conceptual framework using elements of resource dependency theory, institutional theory, and diffusion of innovations theory guided the design of the last two studies that evaluated PCMH capacity and PCMH recognition as a product of SBHC environmental characteristics. The extent to which these two studies supported the conceptual framework will be addressed along with a discussion of how the findings from all three studies answer the research questions posed in the Introduction.

### *Research Questions*

#### Article 1: Identifying Patient-Centered Medical Home Attributes in School-Based Health Centers

#### **Specific Aim 1: Identify individual PCMH attributes and describe overall PCMH capacity in SBHCs.**

#### *Question 1.1: Are there specific PCMH components that are adopted consistently in SBHCs?*

Consistent adoption will be defined as at least 50% of SBHCs reported use of the attribute as measured using the SBHC PCMH Index. In the adolescent version of the Index, 14 of 18 attributes were adopted in over half of the SBHCs. These commonly adopted attributes were: using an EHR, using electronic prescribing, having afterhours care, collecting data for quality improvement, using measures of patient satisfaction in the quality assurance system, having students or parents/guardians participate in advisory roles, offering comprehensive health assessments (all five components), offering chronic disease management, and providing health education classes. Of these 14 attributes, only electronic

prescribing and health education were not positively significantly associated with receipt of formal PCMH recognition.

*Question 1.2: Are there specific PCMH components that have low incidence of adoption in SBHCs?*

Four PCMH attributes were not frequently adopted by SBHCs. Only 34% allowed student and parent/guardians to participate in the design of health services, 8% received care coordination payments, 19% received supplemental payments for care coordination, and less than half (48%) have achieved either Stage 1 or Stage 2 of Meaningful Use attestation.

*Question 1.3: Is there evidence of PCMH adoption disparities by SBHCs that serve different student populations?*

In Article 1, the SBHCs' overall PCMH capacity and adoption of individual PCMH components was compared between those based in schools with only young children and those in schools that include adolescents. These two types of SBHCs had the exact same score on the overall Index (64%) and there were no significant differences in domain or dimension scores. However, adoption of specific PCMH components differed between these two groups. SBHCs based in schools with only young children reported greater use of EHR/EMRs (94% vs 84%,  $p < 0.001$ ), receipt of capitated payments for care coordination (16% vs 7%,  $p < 0.001$ ), and more participation of patients and parents/guardians in design of the SBHC services (42% vs 33%,  $p < 0.012$ ). However, SBHCs based in schools with adolescents reported greater achievement of EHR Meaningful Use (50% vs 38%,  $p = 0.003$ ) and more provision of health education classes (97% vs 92%,  $p = 0.002$ ).

## Article 2: Patient-Centered Medical Home Capacity in School-Based Health Centers

**Specific Aim 2: Identify SBHC characteristics that are associated with the adoption of individual PCMH components and overall PCMH capacity score.**

*Question 2.1: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with overall PCMH capacity?*

As can be seen in Table 18, there were eight significant associations between SBHC variables and total PCMH capacity score. SBHCs without a behavioural staff member (compared to the most comprehensive staffing model) and those sponsored by an LHD (compared to FQHCs/CHCs) had lower capacity scores. SBHCs that received HRSA funding, had more funding sources, were managed care preferred providers, were in states with Medicaid PCMH initiatives, and with more non-Hispanic White students had higher PCMH capacity. Only the third billing quartile had higher PCMH capacity, which is like previous findings that moderate levels of organizational slack are positively related to performance and innovation adoption, and that low and high slack hurt innovation.<sup>119</sup>

Table 18. Comparison of Associations of SBHC Characteristics with PCMH Capacity and PCMH Recognition

SBHC Characteristics	Total PCMH Capacity	Any PCMH Recognition	National PCMH Recognition
<b>Munificence</b>			
Practice Size: PCP FTE > 1	NS	NS	NS
Staffing Model: Primary Care & Behavioral	NS	NS	NS
Primary Care & Other	$\beta = -9.39$	OR = 1.93	OR = 3.25
Billing Covers Expenses: $\geq 5\%$ & $< 25\%$	NS	NS	NS
$\geq 25\%$ & $< 50\%$	$\beta = 7.19$	NS	NS
$\geq 50\%$	NS	NS	OR = 6.47
HRSA Capital Funding: Yes	$\beta = 4.42$	OR = 4.48	OR = 3.05
Number of Funding Sources	$\beta = 1.79$	NS	NS
Staff FTEs	NS	NS	OR = 1.11
<b>Complexity</b>			
Rural: Large rural	NS	NS	OR = 0.23
Small rural	NS	NS	NS
Isolated	NS	NS	NS
Primary Age Served: Includes adolescents	NS	OR = 0.45	OR = 0.55
Patients Served: More than students	NS	NS	NS
% Students Non-Hispanic White	$\beta = 0.06$	NS	NS
% Students Eligible for Free Lunch	NS	OR = 0.99	NS
<b>Isomorphic Pressure</b>			
Sponsor: LHD	$\beta = -5.98$	NS	NS
Hospital	NS	NS	NS
School System	NS	NS	NS
Other	NS	NS	NS
Managed Care Preferred Provider: Yes	$\beta = 6.72$	OR = 7.67	OR = 3.89
State Medicaid PCMH Initiative: Yes	$\beta = 6.84$	NS	NS



*Question 2.2: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with adoption of specific PCMH attributes?*

All three types of SBHC characteristics were differently associated with individual PCMH attributes. Tables 19-21 show the direction of the association between each SBHC characteristic and each PCMH attribute. For categorical variables, the direction of the significant association is based upon the odds ratio in comparison to the reference group. Higher billing levels was positively associated with six different PCMH attributes in the Care Quality domain, but only with two attributes in the Comprehensive Care domain (Table 19). This makes sense because “health information technology implementation can require a diverse array of resources (e.g., time, money, process reconfiguration, consultants) while nontechnology related activities may require fewer or readily available resources.”<sup>199</sup>

Table 19. Relationship between PCMH Attributes and Munificence Variables

PCMH Attribute	Munificence Variables								
	PCP FTEs > 1	PCP & Other	PCP & Bhvl	2 <sup>nd</sup> Billing	3 <sup>rd</sup> Billing	4 <sup>th</sup> Billing	HRSA Grant	Number of Funds	Staff FTEs
<b>Care Quality</b>									
EHR/EMR							↑		
Electronic prescribing		↑			↑	↑			
Meaningful Use						↑	↓		
Afterhours care					↑		↑		
Quality improvement data				↑					
Claims data				↑	↑	↑	↑		
Patient satisfaction		↓							
Performance payments						↑		↑	↑
Care coordination payments			↑					↑	↑
<b>Comprehensive Care</b>									
Students/parents/guardians on Board		↓							
Students/parents/guardians design		↓	↓						
Age & gender appropriate screenings	↑	↓	↓						
Social factors		↓	↓		↑				
Health behaviors		↓	↓		↑				
Depression screening		↓							
Substance abuse		↓	↓				↑		
Chronic disease management	↑						↑		
Health education classes		↓							

The complexity variables did not have very many significant associations with adoption of individual PCMH attributes (Table 20). The attribute with the most variation among the complexity variables was care coordination payments. Two of the rural categories were more likely to receive care coordination payments, but SBHCs based in schools with adolescents and those with more low-income students had lower odds of care coordination payments. SBHCs with fewer minorities students had greater odds of electronic prescribing, receiving performance payments, and of offering chronic disease management. SBHCs that see patients beyond just their students had lower odds of offering three components of comprehensive health assessments. SBHCs in two rural categories also had lower odds of using a standardized tool to screen for social factors and health behaviors. Only one attribute, care coordination payments, differed by the age of students primarily served by the SBHC. SBHCs based in schools with only young children were more likely to receive care coordination payments, which may reflect a fit between the complexity variable and the PCMH attribute. Younger children, whom are less able to manage their care independently and communicate their needs to multiple health care providers, may have a higher need for care coordination services.

Table 20. Relationship between PCMH Attributes and Complexity Variables

PCMH Attribute	Complexity Variables						
	Large Rural	Small Rural	Isolated	Adolescents	More than students	% N.H. White	% Free Lunch
<b>Care Quality</b>							
EHR/EMR							
Electronic prescribing						↑	
Meaningful Use							
Afterhours care							
Quality improvement data							
Claims data							
Patient satisfaction							
Performance payments						↑	
Care coordination payments	↑		↑	↓			↓
<b>Comprehensive Care</b>							
Students/parents/guardians on Board							
Students/parents/guardians design			↑				
Age & gender appropriate screenings					↓		
Social factors		↓	↓		↓		
Health behaviors		↓	↓		↓		
Depression screening				--			
Substance abuse				--			
Chronic disease management						↑	
Health education classes							

The sponsoring organization worked to both increase and decrease odds of adoption of PCMH attributes (Table 21). FQHCs/CHCs had higher adoption odds of many Care Quality attributes compared to the other sponsoring organizations, especially in the afterhours care, collection of quality improvement data attributes, and receipt of care coordination payments. However, several sponsoring organizations outperformed FQHCs/CHCs in Comprehensive Care attributes. Hospitals had higher odds of four of the five comprehensive assessment screenings, and LHDs had higher odds of offering health education classes. Compared to FQHCs/CHCs, school sponsored SBHCs had higher odds of engaging students and parents/guardians in the design of health services. SBHCS designated as managed care preferred providers and in states with Medicaid PCMH initiatives were more likely to have several attributes, such as care coordination payments, performance payments, and electronic prescribing.

Within the isomorphic pressure variables, there are several examples of fit between the PCMH attribute and the external organization. For example, LHDs having higher odds of health education is a good example of a sponsoring organization adopting an attribute that fits their strengths and values. School sponsored SBHCs may have stronger relationships with established parent and student committees at the schools which allows them to easily recruit students and parents/guardians to participate in the design of the SBHC services. For both managed care and state Medicaid PCMH initiatives, payment reforms are what enable changes in and rewards providers who are successful, while also meeting quality and costs goals from the payer perspectives.

Table 21. Relationship between PCMH Attributes and Isomorphic Pressure Variables

PCMH Attribute	Isomorphic Pressure Variables					
	LHD	Hospital	School	Other	Managed Care	State Medicaid PCMH
<b>Care Quality</b>						
EHR/EMR	↓					
Electronic prescribing	↓		↓		↑	↑
Meaningful Use	↓	↓				
Afterhours care	↓	↓	↓	↓	↑	
Quality improvement data	↓	↓	↓	↓		
Claims data			↓			
Patient satisfaction						
Performance payments					↑	↑
Care coordination payments	↓	↓	↓	↓	↑	↑
<b>Comprehensive Care</b>						
Students/parents/guardians on Board				↑		
Students/parents/guardians design			↑	↑		
Age & gender appropriate screenings		↑	↑			
Social factors		↑				↑
Health behaviors		↑				↑
Depression screening		↓		↓		
Substance abuse		↑				
Chronic disease management				↓		
Health education classes	↑					

*Question 2.3: Between the three types of variables, is there one group that appears to be more strongly associated with overall PCMH capacity and adoption of specific PCMH components?*

The munificence variables were frequently associated with increased PCMH capacity and many Care Quality attributes. Complexity had minimal effect on PCMH capacity, but was associated with a few specific PCMH attributes. Isomorphic pressure variables were associated with PCMH capacity and several individual PCMH attributes. To generalize, munificence is associated more with individual PCMH attributes that require resource investments of time, money, staff while non-technology PCMH attributes may be more associated with isomorphic pressure variables. The exception to this generalization is the pressure variable of FQHC/CHC sponsorship which was associated with HIT attributes; FQHC/CHC sponsorship may also be representative of a munificence variable due to the resources (e.g. HIT support, experience in the FQHC PCMH demonstration projects) available to SBHCs they sponsor.

*Question 2.3: Controlling for other characteristics of the SBHC, is there evidence of PCMH adoption disparities by SBHCs that serve different student populations?*

SBHCs with more non-Hispanic white students had a higher total PCMH capacity score. This is because three attributes (e.g. electronic prescribing, performance payments, and chronic disease management) had lower odds of adoption as the percent of racial and ethnic minority students increased. While overall capacity was not significantly associated with any other complexity variable, several complexity variables were associated with individual PCMH attributes. SBHCs seeing patients beyond students had lower odds of using standardized screening tools for social factors, health behaviors, and age and gender appropriate screenings. Some rural SBHCs had lower odds of using screening tools for social factors and health behaviors, but had higher odds of receiving care coordination payments. Both adolescent serving SBHCs and those with more low-income students had lower odds of care coordination payments.

### Article 3: Correlates of Patient-Centered Medical Home Recognition in School-Based Health Centers

**Specific Aim 3: Compare the SBHC characteristics associated with different PCMH recognition outcomes.**

*Question 3.1: Are the internal munificence, patient population complexity, and external isomorphic pressure variables associated with formal PCMH recognition?*

As can be seen in Table 18, there were many significant associations between SBHC characteristics and both definitions of formal PCMH recognition. Consistent across both models, being a managed care preferred provider, being based in a school without adolescents, receiving HRSA funding, and having a staffing model that consists of primary care and other specialty (not behavioral health) were associated with increased odds of PCMH recognition.

*Question 3.2: Does how you define formal PCMH recognition affect associations between the recognition outcome and the SBHC characteristics?*

Some associations between SBHC characteristic variables and the outcome changed depending upon how formal PCMH recognition was defined. For example, more staff and the highest quartile of billing were associated with national PCMH recognition, but was not associated with receipt of any type of PCMH recognition. SBHCs in large rural areas were less likely to receive national PCMH recognition, but was not associated with receipt of any type of PCMH recognition. Poverty was negatively associated with any PCMH recognition, but not national PCMH recognition.

*Question 3.3: Is there evidence of disparities in formal PCMH recognition achievement by SBHCs that serve different student populations?*

For both PCMH outcomes, SBHCs located in schools without adolescents had greater odds of formal recognition. This finding is like previous research showing that older children are less likely to receive care from medical homes. As described in the last section, both poverty and one rurality category were each negatively associated with one of the PCMH outcomes.

## Implications

The SBHC PCMH Index described in the first article presented in this dissertation is the first known attempt to measure the presence of PCMH attributes in SBHCs at a national level. While not a comprehensive measurement of all PCMH elements, the SBHC PCMH Index can be used to measure the progress of PCMH adoption in SBHCs. The Index identified specific areas where all SBHCs could improve their service delivery. The lowest scores on the Index were found in the dimensions of Payment and Patient-Centered. State Medicaid programs and private insurance companies should make additional efforts to involve SBHCs in their value-based payment programs because financial incentives are generally needed for small practices to achieve PCMH recognition.<sup>140</sup> Additionally, SBHCs should improve their internal processes to better involve patients in the design of services offered by the SBHC. This area of improvement could be considered a low-hanging fruit that all SBHCs should be able to achieve because both school and “other” sponsored SBHCs had higher odds of involving students and parents/guardians in the design of SBHC services. However, the traditional health care provider sponsors like FQHCs/CHCs, hospitals, and LHDs may initially overlook this area of the PCMH model and instead choose to adopt PCMH attributes more directly related to providing a health care service.

Besides exploring the effects of munificence and isomorphic pressures on PCMH adoption, this dissertation had a secondary research agenda of seeing if patient complexity (i.e. patient groups associated with lower access to medical homes) was associated with PCMH adoption. SBHCs are designed to overcome access to care disparities for underserved children. Among SBHCs, differences in rurality, student age, and family income had minimal effects on PCMH adoption, but lower levels of PCMH capacity were seen in schools with more minority students. SBHCs are primarily located in minority majority schools, yet the SBHCs serving more non-Hispanic white students are better medical homes per the measurements used in this dissertation. More research is needed here to understand the

relationship between race and PCMH in a medical setting intended for minority students and how to best support these SBHCs in adopting PCMH innovations.

Despite limitations such as small practice size and limited funding, SBHCs can achieve formal PCMH recognition. However, SBHCs that covered higher amounts of their operational expenses through patient billing revenue, that received HRSA SBHC funding, had larger staff sizes, and participated in managed care arrangements were the most likely to receive national-level PCMH recognition. These findings reflect that a high capacity of financial and staff resources (munificence) are needed for national-level PCMH recognition and that the cost and quality goals of managed care (isomorphic pressure) are supportive of PCMH implementation. When possible, SBHCs should participate in managed care and regulations at the state level should be supportive of this arrangement. If national-level PCMH recognition is superior to local PCMH programs, SBHCs may need additional external supports and possibly modified application processes in order to achieve national PCMH recognition. Additionally, SBHCs based in schools that include adolescents were less likely to have both levels of PCMH recognition and efforts should be made to increase medical home activity in these SBHCs as older children are the primary recipients of care at SBHCs.

Throughout this dissertation, it was evident that how PCMH was defined affected the association between organizational characteristics and the outcome variable. When researchers, policymakers, and PCMH program administrators evaluate PCMH programs, they would be best served to look at the different levels of medical-homeness. Medical home programs administrators need to understand that the relationships between PCMH capacity and adoption of specific PCMH attributes may not be the same. Similarly, evaluations of PCMH programs need to consider the type of PCMH recognition received as there are external and internal organization characteristics differently associated with both PCMH recognition types.



## Limitations

There are several limitations to the previously described research. The National Census of School-Based Health Centers conducted by the SBHA was chosen as the data source because it is the only national-level survey specific to SBHCs; however, there are some disadvantages to using this data source. The SBHA administers the survey to every known SBHC and has a high response rate, but does not report information about non-respondents or use non-response weighting. Some variables of interest, such as if the SBHC is designated as a managed care preferred provider and receives supplemental performance payments, included many missing values. After evaluation of the missing data patterns, data was assumed to be missing completely at random and complete case analysis was used in all analyses (Table 22). Across the SBHC subpopulation samples used in different analyses throughout this dissertation, there did not appear to be missing data problems that would limit the generalizability of these findings to all SBHCs. However, both item non-response and unit non-response could have been a source of bias.

Table 22. Comparison of Article Study Populations

SBHC Characteristics	Primary Care Providing SBHCs (n = 1,506*)	Article 1 (n = 1,218**)	Article 2 (n = 1,026)	Article 3 (n = 1,212)
<b>PCMH Status:</b> None	1,062 (71%)	830 (68%)	716 (70%)	866 (71%)
State or Local Recognition	171 (11%)	150 (12%)	129 (13%)	143 (12%)
National Recognition	273 (18%)	238 (20%)	181 (18%)	203 (17%)
<b>Munificence</b>				
Practice Size: PCP FTE <= 1	1,288 (86%)	1,054 (87%)	903 (88%)	1,061 (88%)
Staffing Model: All 3	802 (53%)	660 (54%)	588 (57%)	679 (56%)
Primary care & other	440 (29%)	348 (29%)	272 (27%)	332 (27%)
Primary care & behavioral	264 (18%)	210 (17%)	166 (16%)	201 (17%)
Billing Covers Expenses: < 5%	358 (24%)	285 (24%)	248 (24%)	296 (24%)
>= 5% & < 25%	302 (20%)	319 (26%)	208 (20%)	255 (21%)
>= 25% & < 50%	284 (19%)	163 (13%)	208 (20%)	244 (20%)
>= 50%	542 (36%)	444 (37%)	362 (35%)	417 (34%)
HRSA Capital Funding: Yes	373 (25%)	323 (27%)	288 (28%)	319 (26%)
Number of Funding Sources	Mean = 2.82, Median = 3	Mean = 2.85, Median = 3	Mean = 3, Median = 3	Mean = 2.90, Median = 3
Staff FTE	Mean = 2.08, Median 1.80	Mean 2.04, Median 1.75	Mean = 2, Median = 1.75	Mean = 2.08, Median = 1.80
<b>Complexity</b>				
Location: Urban	1,236 (82%)	989 (81%)	848 (83%)	1,010 (83%)
Large rural	123 (8%)	113 (9%)	88 (9%)	92 (8%)
Small rural	75 (5%)	60 (5%)	45 (4%)	55 (5%)
Isolated	67 (5%)	53 (4%)	45 (4%)	55 (5%)
School: Includes adolescents	1,255 (83%)	1,028 (84%)	888 (87%)	1,055 (87%)
Patients Served: More than students	804 (53%)	647 (53%)	585 (57%)	688 (57%)
% Students Non-Hispanic White	Mean = 33%, Median = 21%	Mean = 33%, Median = 23%	Mean = 33%, Median = 23%	Mean = 33%, Median = 21%
% Students Eligible for Free Lunch	Mean = 71%, Median = 75%	Mean = 71%, Median = 75%	Mean = 70%, Median = 73%	Mean = 70%, Median = 75%
<b>Isomorphic Pressure</b>				
Sponsor: FQHC/CHC	624 (41%)	511 (42%)	412 (40%)	475 (39%)
Local health department	126 (8%)	111 (9%)	99 (10%)	112 (9%)
Hospital	292 (19%)	237 (19%)	214 (21%)	255 (21%)
School system	194 (13%)	156 (13%)	141 (14%)	163 (13%)
Other	270 (18%)	203 (17%)	160 (15%)	163 (13%)
Managed Care Preferred Provider: Yes	657 (51%)	557 (50%)	516 (50%)	606 (50%)
State Medicaid PCMH Initiative: Yes	934 (62%)	778 (64%)	636 (62%)	746 (62%)

\*This is the sample of all primary care SBHCs that reported their PCMH status. Not all SBHC characteristic variables have 100% response rate.

\*\* This is the sample of all primary care SBHCs that reported their PCMH status and had complete responses to variables used in factor analysis. Not all SBHC characteristic variables have 100% response rate.

While the SBHA Census has been conducted since 1998, the questions asked have changed over time and only a limited number of variables key to this research were asked in comparable manners between multiple years of data. By using a cross-sectional design and only one year of survey data, I am unable to make causal conclusions and am limited to only identifying significant associations. Longitudinal study designs are useful for studying the adoption of PCMH attributes and changes in PCMH capacity over time, and use of future years of SBHA Census data may be insightful for studying the growth of the PCMH model in SBHCs.<sup>199</sup>

Analyses using resource dependency theory and institutional theory traditionally include measures of the external environment at the metropolitan statistical area or county-level to explain organizational behavior. The National Census of School-Based Health Centers dataset does include each SBHC's address and I had planned to use a geographic information systems (GIS) mapping software to identify the county and census tract where the SBHC was located. Then additional environmental variables frequently applied in research guided by resource dependency theory, such as health care provider supply or community measures of poverty, could have been included in my analysis. However, several hundred SBHCs returned addresses that could not be mapped due to invalid and incomplete addresses submitted by the survey respondent. Most of these invalid GIS addresses self-identified as being "rural" and inspection of their addresses revealed that many SBHCs provided a P.O. box address instead of a physical address. Exclusion of these SBHCs would have reduced the overall sample size and especially decreased the number of rural SBHCs included in the analysis.

Without GIS information, variables representing the SBHCs' external environment could not be included. By design SBHCs are in medically underserved areas with high poverty rates so their external environment should be similar, so there may not be enough variation in their external environment to explain PCMH adoption. Influence of rurality on PCMH adoption was

considered an important element of this study so accuracy of the rurality information was critical. Because it was unknown what criteria SBHCs used to self-identify their rurality, this Census variable was not used. Instead, zip code RUCA approximations developed by the WWAMI Rural Health Research Center were used to identify the rurality of the SBHC using their zip code from the Census data. The zip code approximation method does not use commuting data to classify location and is based only on the Census tract codes; however, there is a 92.9% match between zip code approximation RUCAs and census tract RUCAs.<sup>162</sup>

There are also limitations to my research because of how I defined PCMH capacity and PCMH recognition. The SBHC PCMH Index presented in Chapter 2, Article 1: “Identifying Medical Home Attributes in School-Based Health Centers” was developed by mapping SBHC Census questions to both the NCQA and Joint Principles definitions of a medical home. Although this Index demonstrated reliability and evidence of construct validity, it is not a comprehensive measure of all PCMH components. The Index only measures presence of a structure or process related to the PCMH model, not actual proficiency in use of the PCMH attribute. The two separately modelled outcomes of “any PCMH recognition” and “national PCMH recognition” were used in Chapter 4, Article 3: “Correlates of Patient-Centered Medical Home Recognition in School-Based Health Centers” because receipt of state-level and national-level PCMH recognition are not mutually exclusive. In fact, national PCMH standards from NCQA are frequently required for state-level PCMH programs. Therefore, SBHCs with national PCMH recognition may also have state-level recognition. However, all SBHCs only provided one response to the question of “Has your health center been recognized as a patient-centered medical home by any of the following (select all that apply)?”. The uncertainty about the distinctions between the PCMH recognition levels achieved by SBHCs prevented use of a

multinomial logistic model that could have provided clearer answers on how SBHC characteristics influence receipt of state-level recognition compared to national-level.

Finally, the sparsely populated and uneven clusters in my data prevented me from using multi-level modeling to account for the two levels of correlation present in my data: (1) sponsoring organization clusters, and (2) state-level clusters. I clustered my standard errors at the state-level because it was the highest level of aggregation, but this does result in loss of information and possible ecological fallacy.

### **Future Research**

This dissertation provided insight into the medical home adoption processes at SBHCs and identified possible facilitators of individual PCMH components, higher PCMH capacity, and formal PCMH recognition. However, this research has led me to ask more questions about how to improve medical home adoption in SBHCs. Time is an important component of innovation adoption, and analysis of future years of SBHC Census data will be insightful to see if the presence of state Medicaid PCMH will increase PCMH capacity. Also, SBHCs with HRSA SBHC Capital funding had higher odds of having EHRs, possibly because they used grant funding to purchase HIT, but were less likely to have received Meaningful Use attestation. It would be interesting to see how long it takes new HIT purchasers to catch up with other SBHCs in use of advanced HIT capabilities. Policymakers and practitioners need to be aware of the time it takes to transform a practice so that PCMH efforts are not abandoned too soon due to lack of positive results or delays in the transformation process.<sup>85</sup> Additionally, the intent of the HRSA SBHC Capital Funding was not to increase PCMH adoption, but to provide funding for expansion/improvement of existing SBHCs' physical location or for the purchase of some types of medical equipment or HIT. The HRSA SBHC Capital Funding was the first and only federal funding dedicated to SBHCs and it expired in 2013. Multi-year analysis of the impact of HRSA Capital

Funding could be used to demonstrate if this federal funding had significant and positive unintended effects on grant recipients' practice transformation towards the PCMH model. This information is necessary for SBHC advocates and could provide factual support for ongoing federal support of SBHC programs.

Innovation adoption decisions happen at both the organization and individual within an organization level.<sup>200</sup> The medical home literature has demonstrated that individuals within clinics are important to initiating and sustaining practice transformation.<sup>88,189</sup> An individual's understanding of the PCMH transformation process, motivations for undergoing change, and belief in their capability to successfully manage adopting new processes are important elements of the PCMH adoption process.<sup>184</sup> There are several qualitative analytic approaches that could be used in future research to better understand PCMH adoption in SBHCs. Positive deviant analysis with SBHCs that have been successful with PCMH implementation could provide information on the organization leadership and SBHC staff relationships that are supportive of practice transformation. To undertake a significant practice transformation, SBHCs would need to be knowledgeable about the PCMH process and feel confident about their ability to succeed. Social network analysis could also provide insight on the information and resource sharing between SBHCs and their external partners that leads to adoption of the PCMH model.

In the PCMH literature, the significance of the quality and cost improvements caused by PCMH implementation is still under debate. This uncertainty about exact PCMH quality and cost benefits is in part caused by the difficulties of controlling for different practice settings and the multiple definitions of a PCMH. Studying PCMH adoption in SBHCs addresses the issue of different practice settings and my dissertation demonstrated that it is possible to look at PCMH adoption from multiple perspectives using national-level SBHC data. Recently, the School-Based Health Alliance launched the School Health Services National Quality Initiative to collect the first

standardized performance measures from SBHCS in order to describe the quality of care given at SBHCs on a national level.<sup>201</sup> This quality data, in combination with information from the SBHC Census survey, could be used to evaluate health care quality: (1) at different levels of PCMH capacity, (2) with specific PCMH components, (3) between non-PCMH recognized and PCMH SBHCs, and (4) between nationally recognized PCMHs and state/insurance provider PCMHs. As baseline quality may influence a SBHC's decision to pursue the medical home model, a propensity score approach could be used to adjust for initial quality differences during estimation of the effect of PCMH transformation on clinical quality outcomes.

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**APPENDIX A. PCMH ATTRIBUTES FROM THE SBHA 2013-2014 CENSUS**

SBHA Census Question(s)	PCMH Attribute	Attribute Source	Included in Final Index
Does the health center have a prearranged source of after-hours care?	Providing routine and urgent-care appointments outside regular business hours.	NCQA PCMH 1: Patient-Centered Access Joint Principles: Enhanced Access	Yes
1) During the 2013-14 school year, indicate how many days per week the health center was open. 2) During the 2013-14 school year, indicate if the health center was open during school vacations/holiday breaks and during summer months?	Providing same-day appointments for routine and urgent care.	NCQA PCMH 1: Patient-Centered Access Joint Principles: Enhanced Access	No
How does your health center assist in enrolling children/families in Medicaid or CHIP? Answer options: enrollment completed onsite at health center, assistance completing forms provided by health center, or referred to enrollment site outside of health center	The practice gives uninsured patients information about obtaining coverage.	NCQA PCMH 2: Team-Based Care	No
Staff types that serve as members of the health center staff, even those employed by other agencies. Answer options used: care coordinator, case manager	Training and assigning members of the care team to coordinate care for individual patients.	NCQA PCMH 2: Team-Based Care Joint Principles: Care is Coordinated and/or Integrated	No
Other than as patients, do students and parents/guardians participate in health center committees, advisory council, or Board? Answer options used: students, parent/guardians	Involving patients/families/caregivers in quality improvement activities or on the practice's advisory council.	NCQA PCMH 2: Team-Based Care Joint Principles: Quality and Safety	Yes
Other than as patients, do students and parents/guardians participate in the design of health services? Answer option used: students, parent/guardians	Care is facilitated by... means to assure that patients get the indicated care when and where they need and want it in a culturally and linguistically appropriate manner.	Joint Principles: Care is Coordinated and/or Integrated	Yes
Offer chronic disease management individually to child/adolescent or with groups of children/adolescents in the clinic or classroom?	Training and assigning members of the care team to support patients/families/caregivers in self-management, self-efficacy and behavior change.	NCQA PCMH 2: Team-Based Care	Yes

SBHA Census Question(s)	PCMH Attribute	Attribute Source	Included in Final Index
Indicate whether the health center uses any of the following: Answer option used: electronic health/medical record (EHR/EMR)?	The practice uses an electronic system to record patient information, including capturing information for factors 1–13 as structured (searchable) data for more than 80 percent of its patients.	NCQA PCMH 3: Population Health Management  Joint Principles: Care is Coordinated and/or Integrated	Yes
Does the health center use any of the following risk assessment screening tools? Answer options used: Bright Futures, Guidelines for Adolescent Preventive Services (GAPS)	Comprehensive health assessment includes age- and gender appropriate immunizations and screenings.	NCQA PCMH 3: Population Health Management  Joint Principles: Quality and Safety	Yes
Does the health center use any of the following risk assessment screening tools? Answer options used: Bright Futures, GAPS, Rapid Assessment for Adolescent Preventive Services (RAAPS), H.E.A.D.S.S	Comprehensive health assessment includes family/social/cultural characteristics.	NCQA PCMH 3: Population Health Management  Joint Principles: Quality and Safety	Yes
Does the health center use any of the following risk assessment screening tools? Answer options used: Bright Futures, GAPS, RAAPS, H.E.A.D.S.S.	Comprehensive health assessment includes behaviors affecting health.	NCQA PCMH 3: Population Health Management  Joint Principles: Quality and Safety	Yes
Does the health center use any of the following risk assessment screening tools? Answer options used: GAPS, RAAPS, H.E.A.D.S.S., Patient Health Questionnaire (PHQ7, PHQ9, or PHQ15)	Comprehensive health assessment includes depression screening for adults and adolescents using a standardized tool (adolescents only)	NCQA PCMH 3: Population Health Management  Joint Principles: Quality and Safety	Yes
Does the health center use any of the following risk assessment screening tools? Answer options used: GAPS, H.E.A.D.S.S., RAAPS, CRAFFT	Comprehensive health assessment includes mental health/substance use history of patient and family. (adolescents only)	NCQA PCMH 3: Population Health Management  Joint Principles: Quality and Safety	Yes
Indicate whether the health center uses any of the following: Answer option used: electronic prescribing	Use electronic prescribing	NCQA PCMH 4: Care Management and Support  Joint Principles: Quality and Safety	Yes

SBHA Census Question(s)	PCMH Attribute	Attribute Source	Included in Final Index
<p>Indicate which of the following prevention/education activities are provided by the health center staff (either individually or in groups)</p> <p>1) Tobacco, alcohol, drug use, and/or highly caffeinated beverages prevention</p> <p>2) Healthy eating/active living/weight management</p> <p>3) Emotional health and well-being (social/emotional learning, stress management, hopefulness)</p>	<p>Offers or refers patients to structured health education programs, such as group classes and peer support</p>	<p>NCQA PCMH 4: Care Management and Support</p>	<p>Yes</p>
<p>Whether or not the SBHC has any behavioral health providers on staff (onsite or telehealth).</p>	<p>Integrates behavioral healthcare providers within the practice site</p>	<p>NCQA PCMH 5: Care Coordination and Care Transitions</p> <p>Joint Principles: Care is Coordinated and/or Integrated</p>	<p>No</p>
<p>Does the health center collect any data for quality improvement (i.e., % clients with BMI assessment; % clients with complete immunizations)?</p>	<p>2 Immunization measures, 2 preventative care measures, 3 chronic or acute care measures</p>	<p>NCQA PCMH 6: Performance Measurement and Quality Improvement</p> <p>Joint Principles: Quality and Safety</p>	<p>Yes</p>
<p>Indicate which of the following components of a quality assurance system are used by the health center: Answer option used: Review of claims data</p>	<p>At least two utilization measures affecting health care costs.</p>	<p>NCQA PCMH 6: Performance Measurement and Quality Improvement</p> <p>Joint Principles: Quality and Safety</p>	<p>Yes</p>
<p>Indicate which of the following components of a quality assurance system are used by the health center: Answer option used: Measures of patient satisfaction</p>	<p>At least annually, the practice obtains feedback from patients/families on their experiences with the practice and their care.</p>	<p>NCQA PCMH 6: Performance Measurement and Quality Improvement</p> <p>Joint Principles: Quality and Safety</p>	<p>Yes</p>

SBHA Census Question(s)	PCMH Attribute	Attribute Source	Included in Final Index
What types of insurance payments does the health center receive? Answer option used: Monthly or annual capitated payments for care coordination	(Payment structure) should pay for services associated with coordination of care both within a given practice and between consultants, ancillary providers, and community resources.	Joint Principles: Payment	Yes
What types of insurance payments does the health center receive? Answer option used: Supplemental payments for meeting performance standards	(Payment structure) should allow for additional payments for achieving measurable and continuous quality improvements.	Joint Principles: Payment	Yes
Has having an EHR/EMR allowed you to achieve any of the following stages of "meaningful use" as defined by the Centers for Medicare and Medicaid? Answer options used: Stage 1 or Stage 2	(Payment structure) should support adoption and use of health information technology for quality improvement.	Joint Principles: Payment  NCQA: many standards related to HIT	Yes