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Measuring the Impact of Recognized Patient-Centered Medical Homes (PCMH)

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A dissertation proposal submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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Abstract

MEASURING THE IMPACT OF RECOGNIZED PATIENT-CENTERED MEDICAL HOMES

By Rick A. Moore, Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Health Related Sciences at Virginia Commonwealth University.

Virginia Commonwealth University, 2015

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It has been estimated that by 2020 nearly one-third of all Americans (almost 160 million people) will have at least one chronic disease to manage and the cost of health care will consume over 20 percent of the GDP. The Obama Administration responded to this pending crisis by passing the Patient Protection and Affordable Care Act (PPACA) in 2010. This major legislation aims to instill patient-centered, accountable care into the health care delivery system. Specifically, the United States government is on a mission to reduce the utilization of expensive inpatient care, while increasing access to primary care for all Americans, thereby lowering the total cost of health care.

Primary care practices organized around the principles of the patient-centered medical home (PCMH) can better manage their patients, especially their patients with chronic conditions;

and become accountable for their care. In 2008, the National Committee for Quality Assurance (NCQA) released practice-level recognition standards based on the seven Joint Principles of the PCMH, to aid doctors seeking to transform their practices into effective patient-centered delivery systems.

The results of several published studies have touted the successes (e.g., reduced emergency department visits, reduced hospitalizations) of the PCMH model at individual practice sites. These localized successes demonstrated that the principle tenets of the PCMH model—care coordination, team-based care, population management—helped lower utilization of more expensive health care services within the specific practice settings evaluated. However, there has been no study to determine if these core tenets are having a broader impact on the health care delivery system within a community.

One hypothesized outcome of a health care system centered on the PCMH care model is better care coordination and more effective, whole-person care management across the continuum of health care; resulting in a more efficient system that can prevent avoidable hospitalizations.

This dissertation proposal seeks to understand if the increasing numbers (density) of recognized PCMH practices in communities affect avoidable hospitalizations related to ambulatory care sensitive conditions (ACSC), as measured by the AHRQ Composite Prevention Quality Indicators (PQI). The research has two purposes:

1. Establish constructs and hypotheses to measure the effect of the increasing numbers of NCQA-Recognized PCMH practices in communities (counties).
2. Using an outcomes-based measurement approach, investigate the relationship between growing densities of NCQA-Recognized PCMH practice doctors among all primary

care doctors (PCD) in a community and the associated impact on the utilization of inpatient care, specifically related to ACSCs, as measured by the AHRQ Composite PQIs.

The research is quasi-experimental in design and is based on a retrospective (2008–2011) analysis of existing data from the NCQA PCMH program, the AHRQ Composite PQI and the Centers for Medicare & Medicaid Services (CMS) National Provider Identification (NPI) databases. Analysis will link NCQA-Recognized PCMH practices (independent variable), AHRQ Risk Adjusted Composite PQIs (dependent variable), and the CMS NPI (total PCDs) on Federal Information Processing Standard (FIPS) identifiers across 114 state and county-level geographical areas in Vermont and North Carolina. The research will inform the following hypotheses:

1. Does the research literature support the measurement construct proposed in this study?
2. Communities with concentrations of recognized PCMH practices among primary care practices will have lower risk-adjusted avoidable hospital admission rates.
3. The use of technology and care coordination will have a greater predictive correlation on risk-adjusted avoidable hospital admission rates than other PCMH capabilities.

Chapter 1: Introduction

Overview

One of the central tenets of an effective patient-centered medical home (PCMH) is whole-person primary care management via team-based care coordination across the continuum of health care delivery. United States health reform efforts count on the widespread transformation of primary care around the core principles of the PCMH in an effort to break away from the fragmented fee-for-service (FFS) model and develop Accountable Care Organizations (ACO).

In 2010 the Patient Protection and Affordable Care Act (PPACA) was passed, with the major goals of increasing access to affordable ambulatory primary care and reducing the prevalence of chronic disease and subsequent utilization of expensive inpatient care. The current care delivery model rewards doctors for using a volume-over-value delivery model that does not hold them accountable for the overall health of the patient. A paradigm shift toward an accountable care delivery model hinges on the effectiveness of the patient's entry point (primary care practices) into the larger health care system.

This research concentrates on two main aims:

1. Establish constructs and hypotheses to measure the impact of the increasing concentrations of NCQA-Recognized PCMH practices in communities (counties).

2. Investigate the relationship between growing densities of NCQA-Recognized PCMH practice doctors among total primary care doctors (PCD) in a community and the associated impact on the utilization of inpatient care, specifically related to ambulatory-sensitive conditions as measured by the AHRQ Composite Prevention Quality Indicators (PQI) … an outcomes-based measure.

Understanding the impact of these associations at the community level will help to inform policymakers on the effects and broader implications of the PCMH model and its impact on the goals of health care reform initiatives aimed at lowering overutilization of more costly inpatient care (bending the total cost of health care downward), while improving the overall health of citizens.

Background

In the 1960s, the concept of the patient medical home was introduced by the American Academy of Pediatrics (AAP) as a place where a care team would manage all aspects of a child's care. In the late 1990s, Ed Wagner and the McCall Institute evaluated the core functions of primary care practices that experienced better chronic disease outcomes. Their findings were published as the chronic care model (CCM). The success of the CCM findings spurred a renewed interest in the importance of well-managed primary care as a better care delivery model. In 2000, several primary care associations incorporated the CCM and the initial AAP model to jointly release the seven principles of the PCMH. The PCMH has at its core a team-based, whole-person approach at delivering complete care coordination across the health care continuum. It is believed that implementing the PCMH on a broad scale (nationally) will increase access to higher quality care and reduce total health care costs. Furthermore, it is hypothesized by some

inside health care industry experts that establishing ACOs is the pathway to successful health care reform.

The United States health care system is often heralded as one of the finest in the world when it comes to lifesaving or acute care intervention (Atlas, 2009); simultaneously, it has the dubious distinction of being the most expensive health care system in the world. Some claim the US health care delivery model does not function as a system at all, pointing to the prevalence of fragmentation and the perversely incentivized FFS payment model. On a per capita basis, the US is ranked among the lowest of all industrialized countries in most measures of health care outcome indicators. In particular, indicators of chronic disease (diabetes, obesity, asthma, heart disease) prevalence in the US are among the highest in the world. (Davis, Schoen, & Stremikis, 2010).

Chronic disease is well documented as the leading cause of total health care expenditures (Carpenter, 2008; Garrett & Martini, 2007; Scopelliti & Spinelli, 2011). As we age, we are more likely to become diagnosed with a chronic disease—by 2020, nearly one-third of all Americans (nearly 160 million) will have at least one chronic disease to manage (Bodenheimer, Chen, & Bennett, 2009). And it is estimated that by 2023, the aging American population will consume nearly 80 percent of the total health care dollars spent (Bodenheimer et al., 2009).

In addition to the increasing number of people reaching age 65 (Bodenheimer et al., 2009), millions more are already without adequate access to health care (Berwick, Nolan, & Whittington, 2008). Communities are unable to provide access to primary care for the expanding populations of the poor and the uninsured (Pear, 2011). Even though the US economy has been slow to recover from an economic recession that began in 2008, health care premiums have

continued to rise, and outpace inflation by a factor of four (Commins, 2010). These economic trends are unsustainable.

Purpose of the Study

The purpose of this research is to measure the impact of recognized PCMH practices on utilization of hospital care related to ambulatory care sensitive conditions (ACSC). According to several demonstration projects sponsored by various payers across the US, the PCMH model has been successfully demonstrated (within individual practice locations) to reduce hospital admissions and emergency room visits for a range of diseases (Averill et al., 2009; Dusheiko, Doran, Gravelle, Fullwood, & Roland, 2011; Gilfillan et al., 2010; Slowik, 2011; Wade, Furney, & Hall, 2009). But although results have been promising, they are potentially biased due to payment incentives; moreover, they are not generalizable across the fragmented care delivery system. More important, the studies focused primarily on the effectiveness of the individual practice with an assigned patient cohort. To date, studies do not demonstrate the aspects of the PCMH model that actually drive care coordination on a broader scale and result in improved population health outcomes and lower utilization of more expensive inpatient care within a community's health care continuum.

Other studies articulate the importance of the PCMH "neighbor," such as care coordination among specialists and hospitals, to effectively manage care across the continuum (Wade et al., 2009). We have yet to develop an outcomes-based approach to measuring the wider impact of the growing numbers of PCMH practices within geographic areas, and their numbers may now be sufficient to affect the health of the broader population, as envisioned by the chronic care model and desired by policymakers intent on reforming the state of health care in the country.

This study aims to build on prior research demonstrating that geographic areas with higher concentrations of PCDs experienced reduced utilization of hospital admissions (David Bradley & Thomas, 2010). This study will determine if communities with higher concentrations of PCMH-recognized PCDs experience a lower rate of risk-adjusted composite ACSC hospital admissions compared with communities with lower concentrations of PCMH-recognized PCDs. It is hypothesized that communities with higher PCMH-recognized concentrations will have lower avoidable hospital admissions, as measured by using AHRQ's risk-adjusted Composite PQIs.

Significance of the Study

The key construct of this proposed study is that better primary care (a subsystem of the overall health care system) that follows the Chronic Care Model (CCM), as measured by NCQA PCMH evaluation standards, leads to better population health and less use of more costly medical care, such as hospitalizations. Other studies have concluded that the best primary care delivery model is one that practices the PCMH principles, which are based on the CCM of team-based, whole-person, primary care (Clark, 1995; Gilfillan et al., 2010; Stange et al., 2010). The PCMH standards go much farther than the CCM in that they not only define the functions of the care delivery model, but also describe the necessary infrastructure that supports PCMH functions, such as patient registries and electronic communication (cyber infrastructure).

With the national interest to achieve the triple aim and the legislative action to reform the US health care system through ACOs and electronic health records (EHR), there is a significant need to monitor the success of these legislative reforms. Much of the anticipated rationale for moving forward with legislative initiatives was based on localized successes of PCMH demonstrations or pilot projects (e.g., within a health system, within a group practice), not on a

broad scale (communitywide). Thus, it is unclear how the localized successes will affect comprehensive implementations like ACOs or if meaningful use of EHRs will help achieve the intended national agenda of bending the cost curve downward while increasing access to care and improving quality of care: the triple aim.

Introduction to the Theoretical Framework

This study will employ the PCMH constructs from the perspective of the classical health services research effectiveness described by Aday, et al. (2004): effectiveness of the health care delivery system (quality measurement), as prescribed by Donabedian and Kane, can be divided into three compartments—structure, process and outcomes. This model supports research activities to determine the effectiveness of the PCMH as a subsystem of the US health care system as it relates to the General Systems Theory. It is a widely held belief that the effectiveness of a system is the degree to which improvements to the inputs into the system are attainable (Aday et al., 2004). The theoretical framework supports this study's research hypothesis as follows:

1. *Structure of effective primary care delivery*: PCMH is a team-based, whole-person approach to delivering primary care that is based in principle on the CCM and acts as a foundational subset of the larger US health care system.
2. *Processes of effective primary care delivery*: Interventions (PCMHs) manage wellness of enrolled patients to prevent avoidable hospital admissions.
3. *Outcomes of effective primary care delivery:* Increasing numbers of recognized PCMH practices can reduce preventable ACSC hospital admissions as defined and measured by the risk-adjusted AHRQ Composite PQIs.

This study intends to build on the General Systems science theory as applied to health care. In this context, the US health system has been defined as an incomplete system that operates in the zone of chaos (Janecka, 2009). General Systems Theory thinking postulates that laws (principles) governing biological open systems can be applied to systems of any form, as follows:

1. Parts (subsystems) that make up the system are interrelated
    - The primary care practice is the "subsystem," interrelated with the overall health care system
2. The health of the overall system is contingent on how well the subsystems perform
    - The overall performance of the health care system operates more efficiently if the subsystems (primary care) operate more efficiently
3. Open systems import and export material from and to the environment
    - Patients of primary care become patients of hospitals, and vice versa
4. Boundaries are permeable (materials can pass through)
    - Patients can access both hospitals and primary care practices
5. There is relative openness (the system can regulate permeability)
    - Primary care practices and hospitals can "regulate" (coordinate) care between and among each other for their patients

Building on Janecka's research, this study proposes to establish that outcome-based measures of ACSC risk-adjusted composite PQI rates are affected by increasing concentrations of well-structured primary care delivery subsystems: PCMHs. In this context, this study postulates that the effectiveness of the overall health care system, as measured by the outcomes

of hospital admission rates (AHRQ composite PQIs), is affected by the intervention of increased PCMH concentrations among PCDs within communities (Figure 1).

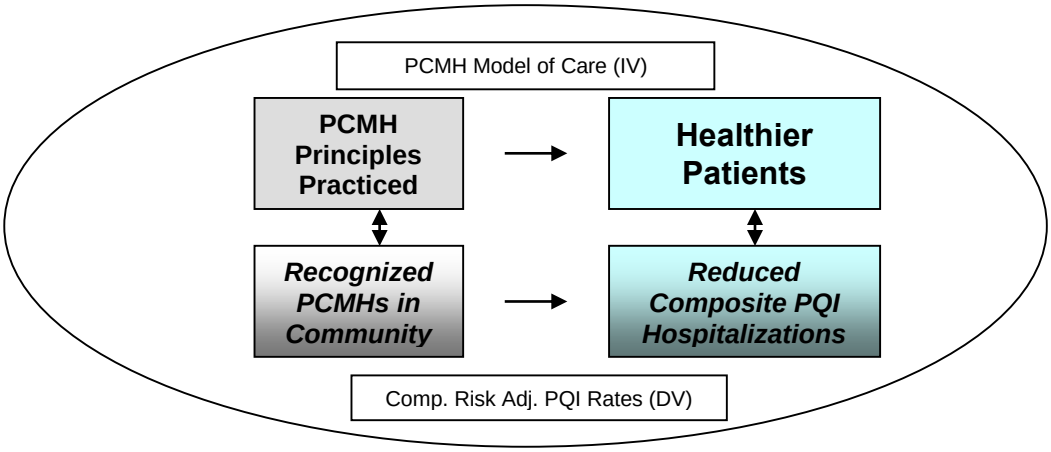


Figure 1: PCMH Intervention Framework

Summary of Data Sources

The dependent variables in this study are the Agency for Healthcare Research and Quality (AHRQ) Composite PQIs, which have been shown to be effective as an outcome measure of effective primary care's role in avoiding unnecessary hospital admissions. Each of the three composite PQIs (90 [Overall], 91 [Acute], and 92 [Chronic]) are based from the 13 individual disease-specific conditions PQIs. PQI 90 represents all 13 PQIs; whereas PQI 91 is an amalgam of the acute disease-specific conditions, and PQI 92 is an amalgam of the 10 chronic disease-specific conditions.

The independent variables for this study are the PCD concentrations, PCMH concentrations and the PCMH capability composites. The PCD concentrations or each county was developed from the CMS National Provider Identification (NPI) dataset for total doctors and the population demographics were taken from the population files within the AHRQ PQI

programming logic. This study utilized the AHRQ PQI SAS (Version 5, March 2015) programming logic to run the 2008 (pre) and 2011 (post) State Inpatient Data (SID) from Vermont and North Carolina. These data will be matched to the NCQA PCMH dataset and CMS NPI datasets based on the state/county FIPS identifiers.

The PCMH capabilities composites were derived from the 160 PCMH elements by grouping them into the 10 capabilities mapping established by the Center for Health System Change, a Meaningful Use (MU) composite based on a NCQA crosswalk mapping, and a Must-Pass (MP) composite based on the NCQA must-pass elements.

Chapter Summary and Overview of Remaining Chapters

The indicators are clear: the US health care system is producing increasingly unhealthy citizens at a much higher total cost per patient than any other industrialized country in the world. The value proposition (Total Quality/Total Cost = Total Value) is inversely proportionate from what it should be for the dollars invested in the system. Given that the US population is increasingly aging and that chronic disease prevalence will continue to grow at untenable levels, the US Legislative Branch enacted laws to shake up the fee-for-service (FFS) medical care system and promote a more accountable health system.

Unlike the current FFS model, where volume-over-value is the care delivery model driving the patient/provider interaction, an ACO is focused on value over volume. An ACO is a provider-led team of clinicians that accepts responsibility for the whole-person management of the patient population. It is postulated that an ACO can only be effective if the foundation of the subsystem of care (primary care) is organized in a team-based and patient-centered structure to deliver optimal care based on the CCM.

The NCQA PCMH Recognition program has evaluated ~4,800 primary care practices across the country. Some areas have higher densities (concentrations) of recognized practices than others. The intent of this paper is to study these communities with various recognized-PCMH practice concentrations and their impact, as measured by the outcome of hospital utilization related to chronic conditions. In addition, this study will evaluate functions in recognized PCMH practices to understand which of the 160 standards correlate to hospital utilization.

Chapter Two of this proposal will focus on establishing the validity of the proposed measurement constructs, based on prior research in the areas of General Systems Theory, Donabedian ’s quality improvement construct, the CCM, PCD concentration, PCMH concentration, and avoidable hospital admission rates.

Chapter Three will leverage the literature review results and apply them to a theoretical framework based on the hypothesis that primary care as a subsystem of the total health care system, when organized around the CCM as measured by the NCQA PCMH Recognition program, will positively impact (reduce) the communitywide utilization of inpatient care, particularly for patients with chronic conditions.

Chapter Four provides the details of the research methodology to test the theoretical constructs presented in Chapter Three.

Chapter Five provides the results of the statistical analysis described by the methodological approach in Chapter Four.

And finally, Chapter Six provides an assessment, implications, and conclusions supported by the statistical analysis and results from Chapter Five.

Chapter 2: Literature Review

Overview

Central tenets of an effective PCMH are care coordination and whole-person care management across the continuum of care. The intent of this proposal is to conduct a literature review to support the constructs of a model that will use a risk-adjusted outcome measure to evaluate the impact of PCMH concentrations among PCDs in various communities. The model will then be used to conduct a retrospective analysis of NCQA-Recognized PCMH practices and hospital admission rates for select chronic disease conditions in a community (using FIPS designations).

This study will inform the extent to which the PCMH model can determine differences in risk-adjusted ACSC chronic disease condition composite rates in various communities. Evaluation elements in the PPC-PCMH standards will also be reviewed for correlations with the risk-adjusted ACSC rates. Understanding the effect of these associations at the community level will inform policymakers about the effects and broader implications of the PCMH model's ability to bend the total cost of health care downward.

Background

Although much literature has been published regarding the success of the PCMH model in reducing costs in specific practice settings, within specific patient populations and for specific conditions, no study measures the impact of these localized phenomenon on a broader scale.

Health care reform has moved forward with major legislation that places effective primary care at the center of the path toward a more efficient system of care.

This study will research current literature for evidence to support a model that can demonstrate the effect of the primary care subsystem at the community level, to inform the national reform agenda.

General Systems Theory postulates that laws (principles) governing biological open systems can be applied to systems of any form, as follows:

1. Parts (subsystems) that make up the system are interrelated
2. The health of overall system is contingent on subsystem performance
3. Open systems import and export material from and to the environment
4. Boundaries are permeable (materials can pass through)
5. There is relative openness (the system can regulate permeability).

Building on Janecka's research, this study proposes to establish the effectiveness of primary care (as measured by the PCMH) as a subsystem of the overall US health care system (Figure 1). In this context, the vigor of the overall system is contingent on the PCMH functioning as a subsystem, as measured by the outcomes of risk-adjusted ACSC hospital admission rates in various communities.

Models of Primary Care Delivery

The chronic care model. In the late 1990s, via the MacColl Institute, Ed Wagner published his findings on interventions used to treat various chronically ill patients (Coleman, Austin, Brach, & Wagner, 2009). His review of interventions noted that four categories of practice changes led to the greatest improvements in health: increasing doctors' expertise and skill; educating and supporting patients; making care delivery more team based and planned; and

making better use of registry-based information systems (Coleman et al., 2009). These findings formed the basis of the CCM, whose overall goal is to enhance the patient/provider relationship through engagement that transforms patients into proactive participants in their health care. The CCM delivery of primary care requires physicians to manage the care of their patient population by leveraging patient registries and other clinical information systems to support a team-based practice.

Over a decade after the CCM, Coleman, et al. (2009) published findings on a literature review from more than 80 articles citing results of using one of the 6 areas of the CCM. "To be defined as CCM-based, an intervention had to integrate changes that involved most or all of the six areas of the model: self-management support, decision support, delivery system design, clinical information systems, health care organization, and community resources" (Coleman et al., 2009, p. 76). The evaluation concluded that chronic care was improved when one or more CCM areas were implemented; when higher-performing practices implemented multiple elements in an integrated delivery model, there were even stronger results of better outcomes—but results were inconclusive regarding the effect of CCM-based care on reducing the total cost of care.

It is well documented that patients with chronic disease conditions, particularly multiple chronic conditions, utilize more health care resources than patients with no chronic disease conditions (Bodenheimer et al., 2009; Garrett & Martini, 2007; Hamar et al., 2011; Lewis, 2009; Scopelliti & Spinelli, 2011). A study (Hamar et al., 2011) conducted in Germany on a senior population (>65) evaluated the effect on hospital admission rates when practices implemented a proactive chronic care management program for patients with chronic disease conditions. The

results of this study demonstrated a 6% *decrease* in overall admission rates for the control group, compared to an 18% *increase* in the uncontrolled group—a 24% difference.

Bodenheimer, et al., (2010) identified that the health care reform of 2009–2010 is poised to highlight the current shortage of PCDs in the US. They contend that the number of patients with complex chronic disease conditions, requiring more frequent visits and visit duration (time) from PCDs, is increasing. Although they conclude that the uneven geographic distribution of practitioners should be addressed by the government at a macro level, they also determined that several micro-level adjustments could achieve better access to care. They suggested micro-level changes to the primary care practice setting to align with the team-based CCM and PCMH delivery of care principles.

The patient-centered medical home. Although the PCMH concept was introduced by the American Academy of Pediatrics (AAP) more than 40 years ago, it recently became the nation's foundational health reform initiative. Four of the nation's premier primary care associations came together in 2007 to promulgate the seven joint principles of the PCMH (Stange et al., 2010):

1. Personal Physician: All patients know their personal physician.
2. Physician-Led: The physician leads a team-oriented practice; collectively, the team is responsible for the ongoing care of patients across the health care continuum.
3. Whole-Person Accountability: The personal physician is accountable for coordinating all of the patient's health care needs among and across the complete health care continuum.
4. Coordinated/Integrated Care: All elements of care are coordinated through the use of patient registries and other management structures to ensure that the patient navigates

the continuum of the health care system (e.g., specialty care, home care, inpatient care).

5. Quality and Safety: Practice performance is measured against clinical guidelines to ensure that the team uses evidence-based interventions for all patients.
6. Enhanced Access: Access to the practice team is improved through extended operating hours or digital access (e.g., e-mail), to facilitate the patient/provider relationship.
7. Payment: Practices are supported with fiscal incentives to promote value of care over volume of care (FFS model).

This study will build on research indicating that higher concentrations of PCDs in a geographic area may lower the utilization of more costly and preventable inpatient care; focusing on a model that will utilize risk-adjusted outcome measures specific to ACSCs. The research will extend the PCD concentration construct by examining primary care delivery functions (as measured by NCQA's PCMH Recognition results) to determine which aspects of the PCMH model have the greatest impact on reducing preventable ACSC hospital admissions.

The PPC-PCMH model incorporates the CCM principle domains and gives the industry a roadmap for transforming the primary care delivery structure and measuring the extent to which practices achieve optimal care delivery for their patient populations (Figure 2). Flottemesh, et al. (2011) used multivariate analysis to examine the impact of the PPC-PCMH on total cost of care. Using 2008 data, the research examined the relationship of 21 practices on total costs, against the practice's score on the PPC-PCMH Readiness Survey. Although the readiness scores reflected insignificant changes in total cost of care (outpatient and inpatient), higher functioning PCMHs (Level 3) showed significant decreases in cost, particularly among more complex (costly) patients (Flottemesch et al., 2011).

Chronic Care Model Domain	Elements of the PPC-RS
Health care organization	Individual feedback
	Performance measurement
	Formal quality improvement activities
Delivery system redesign	Advanced access
	Primary care teams
	Scheduling system for physician continuity
	Non-MD educator
	Nurse manager
	Previsit planning
	After visit follow-up
	Missed appointments follow-up
Clinical information systems	Disease registry
	Problem lists
	Medication lists
	Process flow sheets
	Checklists of tests or interventions
	Patient assessment questionnaire
	Clinical test tracking
	Referral tracking
	Electronic medical record
Decision Support	Clinical guidelines
	Clinical guidelines preventive services
	Clinician reminders for care
	Clinician reminders for preventive services
	Clinician reminders for risk assessments
	Clinician reminders for counseling
	Abnormal test alerts
	Abnormal test protocols
Self-Management Support	Patient reminders for care
	Patient reminders for preventive services
	Self-management plans and materials
	Self-management programs
	Individualized patient education
	Electronic patient communication
	Risk factor screening

Abbreviation: PPC-RS, physician practice connections®-readiness survey™.

Figure 2: The CCM Domain Measured by the PPC-PCMH Elements. Reprinted from "Relationship of Clinic Medical Home Scores to Health Care Costs," by T. J. Flottemesch, et al., 2005, *J Ambulatory Care Manage* Vol. 34, No. 1, pp. 78–89. Copyright 2011 by Wolters Kluwer Health Lippincott Williams & Wilkins. Reprinted with permission.

Gaps in Knowledge

The literature review (Table 1) indicates that when primary care is managed in a team-based, whole-person primary care setting (vs. practices that do not utilize PCMH principles), there is improvement in the quality of care and a reduction in the utilization of more expensive health care resources. The majority of the literature, however, is focused on the aspects of a single practice site location vs. the broader communitywide impact within the health care continuum; and the outcomes being measured were typically specific to a disease condition or fiscal incentive program.

Table 1: Literature Review Summary

Article	Intent/Approach	Results	Conclusions	Limitations
General Systems Theory: Health Care Delivery System				
"Is U.S. health care an appropriate system? A strategic perspective from systems science" (Janecka, 2009)	Comparative study using the general systems science theory against the US health care system.	The US health care system currently operates in the zone of chaos (an incomplete system).	If the US health care system complied with general systems science, it would improve its value creation for society as a whole.	This is a theoretical study lacking in concrete examples to demonstrate how the US health care system might evolve to achieve improved benefits.
Primary Care Practice (PCP)—Subsystem of Health Care Delivery System				
"Health Care Utilization and the Proportion of Primary Care Physicians" (Kravet et al., 2008)	A retrospective cross-sectional analysis with generalized estimating equations to determine if measures of health care utilization (inpatient admissions, outpatient visits, ED visits, surgeries) were associated with the proportion of PCDs to total physicians in metropolitan statistical areas. These relationships were consistent each year studied.	Higher proportions of PCDs were associated with significantly decreased utilization, with each 1% increase in proportion of PCDs associated with decreased yearly utilization for an average-sized metropolitan statistical area of 503 admissions, 2,968 ED visits and 512 surgeries.	Increased proportions of PCDs appear to be associated with significant decreases in measures of health care utilization across the 1990s.	Definition of primary care capabilities is generally assumed (primary care = preventive care); there are no defined standards or evaluations of primary care delivery practice effectiveness. The general assumption is that greater access to primary care of any capability will reduce hospitalizations.
"Re-examining the impact of the primary care physician workforce on	Re-examine the association between the proportion of PCDs and health care utilization rates in an area. This	Higher proportions of PCDs in the area's physician supply is associated with a decreased number of	There is some evidence that a higher concentration of PCDs is associated with a	It is unclear what factors caused the aggregation affect. This study looks at proportion of primary care

Table 1: Continued

Article	Intent/Approach	Results	Conclusions	Limitations
health care utilization rates"(Wright & Ricketts, 2010)	study focuses on health care utilization in the US using inpatient admissions, outpatient visits, ER visits and total (both inpatient and outpatient) surgeries as dependent variables in separate regressions. Several community-level control variables are also included.	inpatient admissions at the MSA level, but not at the county level, and a decreased number of ER visits at the county level, but not the MSA level. Outpatient visits and total surgeries are not associated with the proportion of PCDs.	decrease in health care utilization, but these findings depend on the level of aggregation. Investigators should be aware of the implications of aggregating data and acknowledge resultant limitations.	to specialty care without measuring impact on specific disease conditions (e.g., ACSCs).
Primary Care Practice (PCP)—Subsystem of Health Care Delivery System				
"Estimating a Reasonable Patient Panel Size for Primary Care Physicians With Team-Based Task Delegation" (Altschuler, Margolius, Bodenheimer, & Grumbach, 2012)	Growth of team-based primary care is growing. Study aimed to measure the extent of team panel size under different models of task delegation.	Under the various delegation models analyzed, the authors obtained results ranging from 1,300–1,900 patient panel sizes for the teams to adequately deliver preventive and chronic care services.	Under the different models, the authors concluded that the current primary care workforce could provide recommended preventive and chronic care services.	The authors cited that the average panel sizes in the US in 2009 were 2,300 on average, but no evidence of a range or geographic differences. The authors present and accept that current primary care practices only provide 55% of the recommended preventive and chronic care services. This study is based on a fictitious panel and not on actual performance of a given practice or practice model.
"Networks of primary and secondary care services: how to organise services so as to promote efficiency and quality in access while reducing costs" (Farinha, Duarte Oliveira, & de Sá, 2008)Duarte Oliveira, & de Sá, 2008)	Three simulations (using Simul8) modeled within a national health system (Portugal) to demonstrate the effect of various policy decisions on primary and secondary (e.g., hospitals, specialty care) networks of care utilization.	Scenario I simulated a 10% increase in demand for primary care services in a specific region of Portugal, indicating that the current system cannot sustain such an increase. Scenario 2 simulated a 50/50 ratio of primary to specialty care (currently at 37/63), resulting in the expected result of decreasing demand on specialty care. Scenario 3 simulated the closure and shift of ER services to primary care services, resulting in an unchanged demand in specialty care with an overall total decrease in cost of care by ~8%.	Using a simulation model is cost-effective to aid policymakers in devising more efficient use of resources that can nudge the health care system toward more appropriate uses of health care resources.	This simulation demonstrated the "system-ness" between the primary and secondary care networks (e.g., changes in one affect the other) and associated utilization/costs of each, but it did not address the quality of care (or health outcomes) of the simulated changes on the patient populations within modeled areas of care.

Table 1: Continued

Article	Intent/Approach	Results	Conclusions	Limitations
Chronic Care Model (CCM)				
"The Impact of Proactive Chronic Care Management on Hospital Admissions in a German Senior Population" (Hamar et al., 2011)	Determine if proactive CCM results in reduced hospital admissions.	A 6% reduction in hospital admissions within the control group vs. an 18% increase in the compare group.	Demonstrated that proactive CCM can reduce hospital admissions in older populations, especially those with multiple chronic conditions.	Target population (>65) limits the generalizability of results to other age groups with similar conditions. Regression to the mean is a cited concern, given the target population had several comorbidities. The evaluation of proactive care management was not assessed against a standard model (e.g., PCMH recognition)
"Translating the Chronic Care Model Into the Community" (Piatt et al., 2006)	To determine whether using the chronic care model (CCM) in an underserved community leads to improved clinical and behavioral outcomes for people with diabetes. This multilevel, cluster-design, randomized controlled trial examined the effectiveness of a CCM-based intervention in an underserved urban community.	A marked decline in HbA1c was observed in the CCM group but not in the other groups. The magnitude of the association remained strong after adjustment for clustering. The CCM group also showed improvement in HDL cholesterol, diabetes knowledge test scores, and empowerment scores.	These results suggest that implementing the CCM in the community is effective in improving clinical and behavioral outcomes in patients with diabetes.	This study focused on a specific chronic disease condition without consideration of co-morbidities or risk adjustments within a narrow population which limits generalizability of the results.
"Evidence On The Chronic Care Model In The New Millennium" (Coleman et al., 2009)	Retrospective lit review of articles published about the impacts of CCM care delivery on ambulatory health practice/system effectiveness.	In most studies, there was improvement in both international and U.S. based practices.	More research is needed on CCM cost-effectiveness, but these studies suggest that redesigning care using the CCM leads to improved patient care and better health outcomes.	Most of the studies reflected the results of highly performing practices without consideration of how other practices may perform using the CCM and limits the generalizability of the results.
"Improving Primary Care for Patients With Chronic Illness" (Bodenheimer, Wagner, & Grumbach, 2002)	This article reviews research evidence showing the extent to which the CCM can improve management of chronic conditions (using diabetes as an example) and reduce health care costs.	Thirty-two of 39 studies found that interventions based on CCM components improved at least 1 process or outcome measure for diabetic patients. Regarding whether chronic care model interventions can reduce costs, 18 of 27 studies concerned with 3 examples of chronic	Even though the CCM has the potential to improve care and reduce costs, several obstacles hinder its widespread adoption.	Unclear which aspects of the CCM were evaluated.

Table 1: Continued

Article	Intent/Approach	Results	Conclusions	Limitations
		conditions (congestive heart failure, asthma, diabetes) demonstrated reduced health care costs or lower use of health care services.		
Patient-Centered Medical Home (PCMH): Process and Structure				
"Practice Systems Are Associated With High-quality Care for Diabetes" (Solberg, Asche, Pawlson, Scholle, & Shih, 2008)	Determine if evidence of practice systems affected quality of care related to diabetes using the PPC-RS questions and scores.	Evidence suggests (correlated at 0.31 to 0.52 [P <.05]) that practice systems (as measured by the PPC-RS) can affect the quality of care for diabetes.	The PPC-RS tool (measuring structure/ process) suggests usefulness in guiding practices to attain quality improvement for patients with diabetes.	Focused on a specific disease across a cohort of 40 practices participating in a statewide quality improvement initiative. The PPC-RS was self-administered by each practice site participating.
"Relationship of Clinic Medical Home Scores to Health Care Costs" (Flottemesch et al., 2011)	Determine PCC-PCMH effects on total cost of care.	A reduction in costs was noted for higher performing PPC-PCMH practices among the most complex patients (>11 medications).	Results only suggest, given the limitations of the evaluation methodology. In addition, the patient sample population came from groups of high continuity of care with low fragmentation.	Practice sites included were assessed against a readiness assessment version of the PPC-PCMH and not recognized practices. In addition, all practice sites were part of one institution located in one geographic region.
"Illness Care: Findings From a National Study of Care Management Processes in Large Physician Practices" (Rittenhouse, Shortell, & Fisher, 2009)	Evaluate patient outcomes in the Demonstration Project (NDP) of practices' transition to PCMHs. Quasi-experimental design to assess differences between facilitated and self-directed practices	Facilitated practices adopted more NDP components than self-directed practices.	After two years, there was small improvement in condition-specific outcomes of care and no differences in patient-rated outcomes.	Focus on condition-specific outcomes of care that were not consistent among the practices electing to transform into PCMHs.
Patient-Centered Medical Home (PCMH): Process and Structure				
"Vermont Blueprint for Health" (*Vermont Blueprint for Health Report: 2013 Annual Report*, 2014)	Using its all payer claims database, VT evaluated the effectiveness of its statewide health services model, which is based on incentivizing primary care practices to transform into NCQA-Recognized PCMH practices. The quality of care was measured by using NCQA HEDIS performance measures.	Reduction in annual expenditures; a shift to more primary care utilization and less specialty care; reduction in hospital utilization and pharmacy services; increase in utilization of nonmedical services by Medicaid patients.	The PCMH model of care continues to be a more cost effective primary care delivery model than more traditional primary care delivery. Patients seen in PCMH-recognized practices were healthier, as measured by NCQA HEDIS rates, than patients seen in non-PCMH practices.	While this study is one of a few in the literature that analyzes cost and quality impact of PCMH practices, it is difficult to ascertain the impact that the additional support from the community health team (CHT) has on the state's success vs. the PCMH model of care alone.

Table 1: Continued

Article	Intent/Approach	Results	Conclusions	Limitations
"The Patient-Centered Medical Home: A Systematic Review" (Jackson et al., 2013)	Literature review of articles describing PCMH implementation and effect on patient and staff experiences, process of care and clinical and economic outcomes.	Mixed results from 19 comparative studies. There was a small positive effect on patient/staff experiences. Evidence of reduction in utilization of ED visits, but not in hospital admissions in older adults. No evidence of total cost savings.	Current evidence appears insufficient to determine effects on clinical and most economic outcomes, but the PCMH model holds promise for improving experiences of patients/staff; and potentially for improving care processes.	Given that there was no standard definition used for PCMH in this study, the results are severely limited, making evaluation across studies susceptible to bias selection in terms of comparisons/conclusions drawn.
"Total Cost of Care Lower among Medicare Fee-for-Service Beneficiaries Receiving Care from Patient-Centered Medical Homes" (van Hasselt, McCall, Keyes, Wensky, & Smith, 2014)	Compare cost to care for Medicare patients in practices that were PCMH recognized against practices that were not.	Results demonstrated that the cost of care and utilization of ER visits in PCMH practices was lower than practices not recognized (compare group).	This study provides additional evidence that the PCMH model of care may lower the total cost of care.	This study focused on Medicare patients only. It was also limited in determining the gross total cost savings vs. total net cost of care (cost to become PCMH and associated savings). There was evidence that more savings occurred for "sicker" patients, but no quality measures were evaluated to determine if health care quality is/was affected.
Ambulatory Care Sensitive Conditions (ACSC): AHRQ Preventable Quality Indicators (PQI)—Outcome Measure				
"Expanding the uses of AHRQ's prevention quality indicators: Validity from the clinician perspective" (Davies S.M., 2009)	Validate the appropriate uses of the AHRQ PQI Measures, via an expert clinical panel.	Not all the indicators received expert panel consensus for use as a comparison measure. The risk-adjusted composite (PQI) received consensus by the clinical expert panel to have comparability at the geographic/regional level.	The panel concluded that regional comparisons were more appropriate than facility comparisons. There was consensus that the PQIs were not appropriate for use as pay-for-performance standards on individual doctors.	Limited number of research studies using PQIs to measure system effectiveness. Use of PQIs as a measure of system effectiveness is supported, but not as a comparative measure for provider-level effectiveness of care or payment incentives.
"Trends in Potentially Preventable Hospital Admissions among Adults and Children, 2005–2010" (Torio, Elixhauser, & Andrews, 2013)	Analyze the AHRQ NIS dataset to determine trends in hospitalizations.	Overall, potentially preventable hospital (AHRQ PQIs) admissions for adults and children trended downward nationally for selected conditions monitored during the period analyzed (2005–2010), with greater decreases in the pediatric community (<18 years old).	The report provides no conclusions; this is not a study of potential associations or causality of why PQI rates declined overall or specifically to each condition. However, downward trends can signal possible improvement in the primary care delivery system.	This statistical brief provides descriptive data on the overall national trending of the AHRQ PQIs during the 5-year period observed. It is limited in its use because there are no rationale or probable conditions provided, which may have affected the downward trend.

There are mixed conclusions about the PCMH model's ability to realize actual savings or reduce health care utilization on a broader scale; therefore, this study intends to address the gap in the literature by focusing on the community-level effect of PCMH-recognized practices, as measured by the communitywide utilization of more expensive inpatient care related to ACSCs. This study will also address the impact of the PCMH delivery model capabilities, as measured by the points achieved on each NCQA Recognition program evaluation element that correlates to the measurement outcome of the AHRQ ACSC Risk-Adjusted Composite PQIs.

Chapter Summary

The literature provides several examples that the PCMH model of primary care has a positive effect on patient populations managed by general primary care practices, but there is inconclusive evidence that increasing numbers of PCMH practices in a community reduces the total cost of care and improves health, as suggested by the ACA legislation. Although the literature supports the hypothesis that practices organized around PCMH principles can affect cost reduction and quality of care, there has not been a study to establish if greater concentrations of PCMH practices provide better quality of population health than higher concentrations of PCDs alone.

Research indicates that higher concentrations of PCDs can help reduce utilization of ER and inpatient services, but studies did not indicate how PCDs functioned within their practices or if the reduction in hospitalizations where specific to disease conditions. This study intends to close the gap in understanding how the structure and processes within a primary care subsystem may have an impact on disease-specific conditions within community populations, as measured by the risk-adjusted AHRQ ACSC composite PQIs.

The results of this study will provide an outcomes-based model for policymakers and decision makers to measure the impact that healthcare reform legislation is having on a community-wide scale; and could serve to inform community leaders about the progress of the triple aim—whether its goals of increased access, reduced cost and improved quality of care are on track.

Chapter 3: Theoretical Framework

Introduction

The key theoretical assumption of this proposed study is that better primary care follows the chronic care model (CCM) and leads to better population health, less chronic disease and less use of costly medical care such as hospitalizations. Earlier studies concluded that coordinated primary care management of patient populations by specific practice location can reduce costs of care, particularly for patients with chronic disease conditions (David Bradley & Thomas, 2010; Dusheiko et al., 2011; Jaén et al., 2010; Liss et al., 2011).

Other studies concluded that the best care delivery model is defined and widely accepted as practicing the PCMH principles, which are fundamentally based on the CCM of team-based, whole-person primary care (Clark, 1995; Gilfillan et al., 2010; Stange et al., 2010). The PCMH standards go much farther than the CCM in that they not only define the functions of the care delivery model, but also include the necessary infrastructure that supports PCMH functions, such as patient registries and electronic communication.

Background

With the national interest to achieve the triple aim and the legislative action to reform the US health care system through ACOs and EHRs, there is a significant need to monitor the success of healthcare reform legislation on attaining the triple aim. Much of the anticipated rationale for moving forward with legislative initiatives was based on localized successes of

PCMH demonstrations or pilot projects (e.g., within a health system, within a group practice), not on a broad scale (communitywide). Thus, it is unclear how the localized successes will affect comprehensive implementations like ACOs, or if meaningful use of EHRs will help achieve the intended national agenda of bending the cost curve downward while increasing access to care and improving quality of care.

Therefore, the significance of this study is to highlight the progress of national health reform with regard to the PCMH model and use of EHR technologies.

This study will employ the PCMH constructs from the perspective of the classical health services research effectiveness described by Aday, et al. (2004), that effectiveness of the health care delivery system (quality measurement), as prescribed by Donabedian and Kane, can be divided into three compartments of structure, process and outcomes. This model supports research activities to determine the effectiveness of the PCMH as a subsystem of the US health care system as it relates to the General Systems Theory. It is a widely held belief that the effectiveness of a system is the degree to which improvements in the inputs to the system are attainable (Aday et al., 2004). The theoretical framework (structure, process, outcome) supports this study's research hypothesis as follows:

1. *The structure of the primary care delivery model (PCMH):* Team-based, whole-person approach to delivering care
2. *PCMH processes:* Interventions to manage wellness of enrolled patients to reduce chronic conditions
3. *Outcomes:* Reduced ACSC hospital admissions related to chronic conditions

General Systems Theory

This study intends to build on the General Systems Theory, as applied to health care. In this context, the US health system has been defined as an incomplete system that operates in the zone of chaos (Janecka, 2009). General Systems Theory thinking postulates that laws (principles) that govern biological open systems can be applied to systems of any form, as follows:

1. Parts (subsystems) that make up the system are interrelated
2. The overall health of the system is contingent on subsystem functioning
3. Open systems import and export material from and to the environment
4. Boundaries are permeable (materials can pass through)
5. Relative openness (system can regulate permeability)

Building on the research of Janecka and the General System Theory, this study proposes to establish the effectiveness of the PCMH as a subsystem of the overall US health system (Figure 4). In this context, the effectiveness of the overall health system is largely contingent on PCMH functioning as a subsystem. Effectiveness can be measured by the outcomes of hospital admission rates among ACSCs. The primary care subsystem can regulate the input (patients) to hospitals by keeping healthy patients healthy and sick patients (chronic conditions) better managed at home.

Health care delivery system. Shi and Singh (2008) describe US health care as a "kaleidoscope of financing, insurance, delivery, and payment mechanisms that remain unstandardized and loosely coordinated" (p. 4). Adding to this kaleidoscope of payment mechanisms are the capitalistic incentives of a complex, market-oriented system that attracts a variety of entrepreneurs seeking innovative ways to maximize profits. "A complex system exhibits several major characteristics: a large number of interacting parts; interactive complexity;

and self-organization" (Tan, Wen, & Awad, 2005, p. 3). Perrow's Framework of Complexity categorizes system (organization) complexity by its degree of "coupledness" (tightly or loosely) and interactivity (simple or complex). The more loosely coupled and highly interactive an organization is, the more highly complex it is (Tan et al.). Given that the US spends nearly twice as much per capita for its current health care system and produces far less healthy outcomes, as measured by the increasing numbers of patients with multiple chronic conditions, it is fair to conclude that the current system is ineffective and loosely coupled, with a high degree of complex interactivity among its various subsystems.

Subsystems of health care delivery. Although organizational entities within the US health care system vary in ownership type (e.g., for profit, not for profit), management structure (e.g., board of directors, board of trustees) and size and scope of services, each operates within its own boundaries as a hierarchical structure of units forming microsystems of care delivery. The American health care system's level of complexity is underscored by more than 10 million workers spread geographically among nearly 6,000 hospitals, more than 16,000 nursing homes, more than 4,000 mental health institutions and thousands of physician practices, all managed under a variety of organizational structures (Shi & Singh).

Based on the data, we can conclude that the US health care system has a variety of hierarchical entities that comprise highly interactive and loosely coupled (complex) microsystems (subsystems) operating on the basis of fiscal incentives that induce optimization of payment vs. optimization of health care. As such, a health care organization (HCO) functions as a complex adaptive system (CAS) composed of diverse agents (health care doctors) serving in various roles and exchanging information nonlinearly during the delivery of health care services (McDaniel, Lanham, & Anderson, 2009).

But several studies indicate a more effective health care delivery model—specifically, primary care—can result in better outcomes for patients and reduced total health care costs.

The Chronic Care Model

Over a decade after the Chronic Care Model (CCM) (Figure 3), Coleman, et al. (2009) published their findings of a literature review from more than 80 articles citing evidence of using one of the 6 areas of the CCM. "To be defined as CCM-based, an intervention had to integrate changes that involved most or all of the six areas of the model: self-management support, decision support, delivery system design, clinical information systems, health care organization, and community resources" (Coleman et al., 2009, p. 76). Their evaluation concluded that chronic care improved when one or more CCM areas were implemented—and when higher-performing practices implemented multiple elements in an integrated delivery model, there were even better outcomes—but results were inconclusive regarding the effect of CCM-based care on reducing the total cost of care.

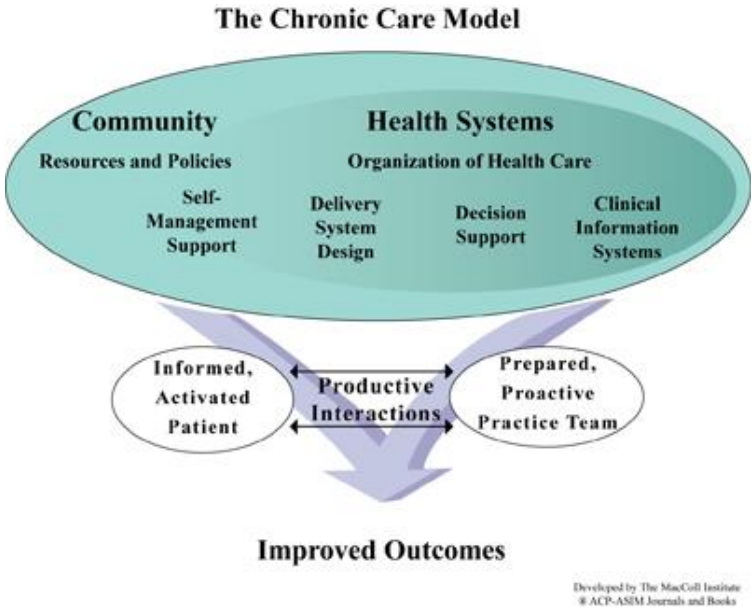


Figure 3: The Chronic Care Model (CCM). Reprinted from the Improving Chronic Illness Care Web site. Retrieved September 16, 2015, from http://www.improvingchroniccare.org. Copyright The MacColl Center. Reprinted with permission.

The patient-centered medical home. The PPC-PCMH model incorporates the CCM principle domains and gives the industry a roadmap for transforming and measuring the care delivery model. Four of the nation's premier primary care associations came together in 2007 to promulgate the seven joint principles of the PCMH (Stange et al., 2010):

The Physician Practice Connections—Patient-Centered Medical Home (PPC-PCMH) model incorporates the CCM principle domains and gives the industry a roadmap for transforming and measuring the care delivery model. Four of the nation's premier primary care associations came together in 2007 to promulgate the seven joint principles of the PCMH (Stange et al., 2010):

1. *Personal Physician*: All patients know their personal physician.
2. *Physician-Led*: The physician leads a team-oriented practice; collectively, the team is responsible for the ongoing care of patients across the health care continuum.
3. *Whole-Person Accountability*: The personal physician is accountable for coordinating all of the patient's health care needs among and across the complete health care continuum.
4. *Coordinated/Integrated Care*: All elements of care are coordinated through the use of patient registries and other management structures that ensure the patient navigates the continuum of the health care system (e.g., specialty care, home care, inpatient care).
5. *Quality and Safety*: Practice performance is measured against clinical guidelines to ensure that the team uses evidence-based interventions for all patients.

6. *Enhanced Access*: Access to the practice team is improved through extended operating hours or digital access (e.g., e-mail), to facilitate the patient/provider relationship.
7. *Payment*: Practices are supported with fiscal incentives to promote value of care over volume of care (FFS model).

Although the PPC-PCMH standards do not mandate the use of EHRs as "must-pass" elements to achieve PCMH recognition, the standards are closely aligned with the meaningful use of electronic health record technologies outlined in the Health Information Technology for Economic and Clinical Health (HITECH) Act.

The HITECH Act legislation—released in 2009 as part of the American Recovery and Reinvestment Act (ARRA)—is designed to energize the adoption and meaningful use of certified EHR systems (McLeod, 2009). Meaningful use (not just implementation) is defined in that legislation as an eligible provider's use of EHR system functionalities that demonstrate the following (Blumenthal, 2010):

1. Use of a certified EHR in a meaningful manner (e.g., e-prescribing)
2. Use of certified EHR technology for electronic exchange of health information to improve quality of health care
3. Use of certified EHR technology to submit clinical quality and other measures

By the end of 2011, the adoption of basic EHR technologies in the doctor's office had doubled (16% to 33%) as a result of the monetary incentives provided by the HITECH act (Hsiao & Hing, 2014). In addition to more practices having a basic EHR technology, there was a 15% increase (from 42% to 57%) in practices having any form of EHR technology to manage clinical care. Many practices that adopted EHR technologies during 2008–2011 were positioned to

achieve higher PCMH recognition scores, given that over 50% of the evaluation elements benefit from some form of cyber-infrastructure.

The HITECH meaningful use criteria and PCMH recognition standards are closely aligned. Twenty-one of the 26 MU program objectives can be measured by the NCQA PCMH Recognition program (Table 2). The 5 areas of the MU program not measured by PCMH

Table 2: Crosswalk Meaningful Use (Stage) 1 to PPC-PCMH Standards (2008)

Stage 1 Objectives Eligible Professionals (EP)	Stage 1 Measures	NCQA PPC-PCMH Standard	Degree of Alignment Comments	NCQA Recognition Evaluation Points Available
Use CPOE (computerized physician order entry)	For EPs, CPOE (computerized physician order entry) is used for at least 80% of all orders.	**PPC-PCMH 5: Electronic Prescribing, Element A** • Practice uses electronic Rx writer. • (100% = ≥75% of new prescriptions written in last 3 months written linked to patient information). • Practice uses electronic system.	**High** PCMH does not require transmittal.	**3**
Generate and transmit permissible prescriptions electronically (eRx)	At least 75% of all permissible prescriptions written by the EP are transmitted electronically using certified EHR technology.			
Maintain an up-to date problem list of current and active diagnoses based on ICD-9-CM or SNOMED CT®	At least 80% of all unique patients seen by the EP have at least one entry or an indication of none recorded as structured data.	**PPC-PCMH 2: Patient Tracking and Registry, Element A,** Practice uses electronic data to document current and past diagnoses (100% =12-18 items entered for 75% of patients)	**Medium** • ICD 9 or SNOMED not specified. • Factor 13, "Current and past diagnoses" not required.	**2**
Record demographics	At least 80% of all unique patients seen by the EP have demographics recorded as structured data.		**High**	
Check insurance eligibility electronically from public and private payers	Insurance eligibility checked electronically for at least 80% of all unique patients seen by the EP.		**Medium** Eligibility not necessarily checked electronically	
Maintain active medication list	At least 80% of all unique patients seen by the EP have at least one entry (or an indication of "none" if the patient is not currently prescribed any medication) recorded as structured data.	**PPC-PCMH 2: Patient Tracking and Registry Functions, Element D,** Practice uses paper or electronic charting tools, including prescribed medications.	**Medium** • Not required to be electronic. • Prescribed medications do not have to be one of the tools or care management.	**6**
Implement drug-drug, drug-allergy, drug formulary checks	The EP has enabled this functionality	**PPC 5: Electronic Prescribing, Elements B, C** • System has general and/or patient specific information and alerts at the point of care: drug-drug interactions, drug-	**High**	**5**

Table 2: Continued

Stage 1 Objectives Eligible Professionals (EP)	Stage 1 Measures	NCQA PPC-PCMH Standard	Degree of Alignment Comments	NCQA Recognition Evaluation Points Available
		disease interactions, drug-allergy alerts. (100% = 8 or more alerts) • Electronic system has generic and formulary checks. (100% = both checks)		
Report ambulatory quality measures to CMS or to state.	For 2011, provide aggregate numerator and denominator through attestation.	**PPC-PCMH 8: Performance Reporting and Improvement, Element F:** Practice reports performance electronically.	**High**	**1**
Incorporate clinical lab-test results into EHR as structured data.	At least 50% of all clinical lab tests ordered whose results are in a positive/ negative or numerical format are incorporated in certified EHR technology as structured data.	**PPC-PCMH 6: Test Tracking, Element B:** Practice uses electronic system to retrieve lab and imaging results.	**High** Lab tests not necessarily completed field	**6**
Implement 5 clinical decision support rules relevant to specialty or high clinical priority, including diagnostic test ordering, along with the ability to track compliance with those rules.	Implement 5 clinical decision support rules relevant to the clinical quality metrics the EP is responsible.	**PPC-PCMH 3: Care Management, Element A** Practice adopts and implements evidence-based guidelines for 3 important conditions (100% = Guidelines for 3 conditions)	**High** Each guideline will contain multiple decision support rules	**3**
Provide clinical summaries for patients for each office visit.	Clinical summaries are provided for at least 80% of all office visits	**PPC-PCMH 4: Self-Management Support, Element B:** Practice provides written care plan (100% = 3 of 7 activities for ≥75% of patients with 3 important conditions)	**Low** • Not necessarily electronic • Written care plan not necessarily required • Population measured is those with 3 important conditions	**4**
Record smoking status for patients 13 years old or older.	At least 80% of all unique patients 13 years old or older seen by the EP have "smoking status" recorded	**PPC-PCMH 3: Care Management, Element B** • Practice uses paper or electronic system for guideline-based reminders, including age appropriate risk factors (smoking) and counseling for smoking cessation (100% = reminders for all 4 situations)	**Medium** • Paper or electronic • Age-appropriate risk factors not necessarily required • PPC-PCMH 3, Element B	**4**
Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, and outreach.	Generate at least one report listing patients of the EP with a specific condition.	**PPC-PCMH 2: Patient Tracking and Registry, Element F:** Practice uses electronic information to generate lists of patients.	**High**	**3**
Send reminders to patients per patient preference for preventive/follow up care.	Reminder sent to at least 50% of all unique patients seen by the EP that are age 50 or over.			
Perform medication reconciliation at relevant encounters and each transition of care.	Perform medication reconciliation for at least 80% of relevant encounters and transitions of care.	**PPC-PCMH 3: Care Management, Element D:** Practice reviews medication lists with patients.	**Medium** • Not electronic • Important conditions (3)	**5**

Table 2: Continued

Stage 1 Objectives Eligible Professionals (EP)	Stage 1 Measures	NCQA PPC-PCMH Standard	Degree of Alignment Comments	NCQA Recognition Evaluation Points Available
Provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, allergies), upon request	At least 80% of all patients who request an electronic copy of their health information are provided it within 48 hours.	**PPC-PCMH 9: Advanced Electronic Communication, Element A:** Patients have access to interactive Web site to make appointments, request referrals, test results and prescription refills, see parts of medical record and import elements into PHR.	**High**	**1**
Provide patients with timely electronic access to their health information (including lab results, problem list, medication lists, allergies) within 96 hours of the information being available to the EP	At least 10% of all unique patients seen by the EP are provided timely electronic access to their health information.			
Submit claims electronically to public and private payers.	At least 80% of all claims filed electronically by the EP.	***Not in 2008 standards***	**None**	**None**
Capability to exchange key clinical information among doctors of care and patient authorized entities electronically	Performed at least one test of certified EHR technology's capacity to electronically exchange key clinical information.			
Capability to submit electronic data to immunization registries and actual submission where required and accepted	Performed at least one test of certified EHR technology's capacity to submit electronic data to immunization registries.			
Capability to provide electronic syndromic surveillance data to public health agencies and actual transmission according to applicable law and practice	Performed at least one test of certified EHR technology's capacity to provide electronic syndromic surveillance data to public health agencies.			
Protect electronic health information created or maintained by the certified EHR technology through the implementation of appropriate technical capabilities	Conduct or review a security risk analysis per 45 CFR 164.308 (a)(1) and implement security updates as necessary.			

evaluation are specific to the capability of the electronic system being implemented (e.g., system capability to submit claim, system capability on privacy/security) and are not directly related to the functional capabilities of delivering care.

The PCMH capability composites were formed by mapping specific PCMH elements to each of the capability categories and then averaging the points earned by each of the recognized practices within each FIPS area being evaluated.

AHRQ Preventable Quality Indicators (PQI)

For this study, the 16 AHRQ PQIs are used as outcome measures to ascertain the effect of PCMH-recognized primary care practices on managing the communitywide population of patients admitted for ACSCs. ACSC measures have been shown to be sensitive to the concentration of PCDs (Scopelliti & Spinelli, 2011; Slowik, 2011); however, a review of the literature indicates a gap in knowledge about which primary care practice models or functions of primary care delivery affect hospital utilization in a community. This study will expand on these validated AHRQ PQI measures as an indicator of primary care effectiveness among counties in Vermont and North Carolina.

In 2009, responding to the concern that quality measures can be used for provider pay-for-performance initiatives, AHRQ convened an expert panel to review the use of PQIs as comparative measures. The panel concluded that PQIs are effective when they compare health care system delivery performance at an area level (e.g., regional, health system), but not when they are used as individual provider-based comparative measures (Davies S.M., 2009). The intent of this study is to compare the health care delivery system as a "total system" of care networks in geographic areas (counties) within a state.

Two states were used in this study to control and limit the research scope, yet include sufficient measured communities to strengthen the study's statistical analysis and generalizability. To conduct comparative analysis with statistical validity, the AHRQ SAS PQI program requires the complete set of discharges from each hospital in a comparison/study.

Vermont has ~50K discharges for each year in the study and North Carolina has ~1.1M; each state represents sufficient numbers of PCMH-recognized practices, with varying concentrations among the counties for variation and statistical validity.

Delivery System Reform

In March 2010, President Obama signed the Patient Protection and Affordable Care Act (PPACA) into law, with the goals of widening access to care for 32 million uninsured Americans, creating a more healthy population and providing an affordable health care system to all Americans (Doherty, 2010). Several of its many provisions were aimed at key issues plaguing the current health care delivery system and its failure to achieve the triple aim of increased access, improved care and reduced costs. However, there is widespread debate about the potentially adverse economic consequences the provisions may have on individuals and communities, because PPACA fails to fundamentally reform the fragmentation and volume-over-value incentives that currently plague the system (Staff, 2010).

Some of PPACA's more controversial provisions are the mandate for individuals to purchase insurance coverage, the mandate for states to establish health insurance exchanges and the mandate for states to provide universal access to care (Staff, 2010). However, there is a provision to fund voluntary efforts that may offer incentives to health care delivery systems to reorganize into ACOs.

"An ACO is a provider-led organization whose mission is to manage the full continuum of care and be accountable for the overall costs and quality of care for a defined population" (Rittenhouse et al., 2009). The aim of the ACO concept is to reform financing and delivery of care into structures where there is shared responsibility and accountability for the total cost and quality of the care delivered. Shortell and Casalino (2007) introduced the concept of an

accountable care system that could take five forms, with variations of the degree of strengths among the seven core capabilities (Figure 4).

Accountable Care System Models	Core Capabilities: Redesign Care Processes	Teamwork	Care Coordination	Performance Accountability	Information Technology	Knowledge Management	Change Management
(1) Multi-Specialty Group Practice (MSGP)[a]	High	High	High	High	High	High	Medium
(2) Hospital Medical Staff Organization (HMSO)[b]	Medium	Medium	High	High	High	Low to Medium	Low to Medium
(3) Physician Hospital Organization (PHO)[c]	Medium	Medium	Medium	High	High	Medium	Medium
(4) Interdependent Provider Organization (IPO)[d]	Low	Low	Low to Medium	Medium	Low	Low	Low
(5) Health Plan Provider Organization / Network (HPPO/HPPN)[e]	Medium	Low to Medium	Low to Medium	Medium to High	Low to Medium	Low to Medium	Low to Medium

[a] 17-26 percent of practicing physicians in groups of 100 plus including institutionally based; 35 percent in groups of 20 plus
[b] Almost all 718,000 practicing physicians
[c] Estimated 37 percent of practicing physicians; see text
[d] 48% of office-based in solo or 2 person partnership; 89% in arrangements of 10 physicians or less; 38% members of IPA's
[e] 38% members of IPA's

Figure 4: Accountable Care System Models and Core Capabilities. Reprinted from the Policy Archive Web site. Retrieved September 17, 2015, from http://research.policyarchive.org. Copyright 2015 CGS and Policy Archive. Reprinted with permission.

The intent of recognizing the various forms of the ACO model is to enable the current fragmented delivery care system to form provider-led arrangements (e.g., group practice, hospital, health plan provider network) through which to coordinate all patient care. Although they are uniquely different models of care, each model must practice the core principles of the PCMH to a varying degree. Figure 4 illustrates each different ACO arrangement and the degree

(high, medium, low) to which each core capability has a concentration of PCMH-like core capability.

The importance of the ACO model to this research study is that the ACO model builds from the core concept of a well-coordinated primary care home for patients—the PCMH is the ACO's foundational building block. "The PCMH model emphasizes the creation of a strong primary care foundation for the health care system, and the ACO model emphasizes the alignment of incentives and accountability for doctors across the continuum of care" (Rittenhouse et al., 2009, p. 3).

In theory, the PCMH care delivery model should produce healthy patients and reduce the prevalence of chronic diseases; the ACO model rewards those outcomes with fiscal incentives. Some would argue that these models are no different from health maintenance organizations (HMO), in that they attempt to give the health care delivery system an incentive to manage care. Others contend that the difference between the failed insurance-led (HMO) attempts of the 1990s and the most recent attempts of today's PCMH/ACO model is that the latter are "provider-led" (Rittenhouse et al., 2009).

Arguments aside, legislative mandates make it clear that the government is moving forward with health care reform. An important aspect of this study is to inform policymakers of about a framework to measure the impact of the PCMH model of care at a community-wide level (Doherty, 2010).

If, after several years of transforming primary care around the principle PCMH tenets, there is no correlational effect on the utilization of inpatient care directly related to ambulatory sensitive care conditions, the probability that ACOs will be more effective than current delivery models is likely to be in jeopardy.

Although PPC-PCMH standards do not mandate the use of EHRs as must-pass elements to achieving PCMH recognition, the standards are strongly aligned with the meaningful use of electronic health record technologies, as outlined in the HITECH Act. Released in 2009 as part of the ARRA, it is designed to energize the adoption and meaningful use of certified EHR systems (McLeod, 2009). Meaningful use (not just implementation) is defined in that legislation as an eligible provider's use of EHR system functionalities that demonstrate the following (Blumenthal, 2010):

1. The use of a certified EHR in a meaningful manner (e.g., e-prescribing)
2. The use of certified EHR technology for electronic exchange of health information to improve quality of health care
3. The use of certified EHR technology to submit clinical quality and other measures

Conceptual Framework

Figure 1 illustrates how the various theories described in this chapter form the hypothesis of this research paper, beginning with the broader concept of the General Systems Theory, which postulates that the primary care setting is a subsystem of the US health care system, through the Donabedian theory of quality improvement (QI), whereby structure and processes used in the subsystem beget better health care outcomes.

With a focus on the primary care setting as a regulator of care within the total care continuum, the CCM defines a model of practice for primary care. It postulates that primary care practices should use a team-based, whole-person delivery of care construct to manage patient populations effectively to avoid the onset of chronic conditions, as well as to manage patients with chronic conditions efficiently. The NCQA PCMH standards are a tool for measuring a practice's delivery of care capabilities and use of cyber-infrastructure to transform into an

effective and efficient delivery model, as described by the CCM. The NCQA PCMH standards and elements define and further evaluate primary care team capabilities (Table 3 and Figure 5).

Table 3: Primary Care Capabilities Mapped to the PCMH Elements (2008 Version)

Percent of Elements	10 PCMH Capability Composites*	Element	Pts Avail**
46%	**1. Information Technology (IT):** 19 items on e-prescribing 18 items on electronic data system for patient demographic data 14 items on the use of email, e-communication, interactive Web site, electronic patient notification, e-care management support 11 items on electronic system for basic clinical data 8 items on electronic system for managing tests 7 items on electronic system for population management	5A# 5B# 5C# 2A# 9A# 9B 9C 2B 6B# 2F#	3 3 2 2 1 2 1 3 6 3 Total: 26
14%	**2. Condition Specific Care (CSC):** Care for three specific conditions that the practice identifies as important to their patient panel, e.g. including identifying those patients, use of condition specific guidelines, care management and self-management support.	2E^ 3A^ 3D# 4B^#	4 3 5 4 Total: 16
13%	**3. Coordination of Care (COC):** 1 item on scheduling visits to different doctors into 1 trip 4 items on referral-tracking 6 items on test tracking and follow-up 10 items assess information continuity across settings (e.g. care transitions)	 **1A^** 7A^ 6A^ 3E#	 4 4 7 5 Total: 20
9%	**4. Accessibility (ACC)**	**1A^** 1B^	4 5 Total: 9
5%	**5. Performance Reporting (RPT)**	8A^ 8C^ 8D	3 3 3 Total: 9
4%	**6. Clinical Data Tools (CDT)** such as problem lists and medication lists	2D^#	4
2%	**7. Use of Non-Physician Staff (NON)**	3C	3
2%	**8. Patient Experience (PXP) With Care** 1 item on access to care 1 item on physician communication 1 item on patient confidence in self-care 1 item on satisfaction with care	8B	3
1%	**9. Preventive Services (PVS)**	3B#	4
1%	**10. Patient Communication (PTC) Preferences**	4A	2

*Table adapted from concept mappings developed by the Center for Health System Change (O'Malley, Peikes, & Ginsburg, 2008). The term "items" refers to the underlying factors (questions) within each element of the NCQA evaluation tool.

**Points available do not total 100 because some elements not used in mapping—only 97% of elements mapped

^Must-Pass (MP) Elements

#Meaningful Use (MU) Elements ***(Note:** Some MU-related Elements 2C, 3A, 8F are displayed in MU crosswalk table – not this table above.)*

Scored PCMH Elements	Pts Avail	PCMH Capability Composites											
		MU	MP	IT	CSC	CoC	ACC	RPT	CDT	NoN	PXP	PVS	PTC
PCMH1*	9												
PCMH1_A	4		X			X	X						
PCMH1_B	5		X				X						
PCMH2*	21												
PCMH2_A	2	X		X									
PCMH2_B	3			X									
PCMH2_C	3	X											
PCMH2_D	6	X	X						X				
PCMH2_E	4		X		X								
PCMH2_F	3	X		X									
PCMH3*	20												
PCMH3_A	3	X	X		X								
PCMH3_B	4	X										X	
PCMH3_C	3									X			
PCMH3_D	5	X			X								
PCMH3_E	5	X				X							
PCMH4*	6												
PCMH4_A	2												X
PCMH4_B	4	X	X		X								
PCMH5*	8												
PCMH5_A	3	X		X									
PCMH5_B	3	X		X									
PCMH5_C	2	X		X									
PCMH6*	13												
PCMH6_A	7		X			X							
PCMH6_B	6	X		X									
PCMH7*	4												
PCMH7_A	4		X			X							
PCMH8*	15												
PCMH8_A	3		X					X					
PCMH8_B	3										X		
PCMH8_C	3		X					X					
PCMH8_D	3							X					
PCMH8_E	2												
PCMH8_F	1	X											
PCMH9*	4												
PCMH9_A	1	X		X									
PCMH9_B	2			X									
PCMH9_C	1			X									
Total Pts Avail	**100**	**51**	**43**	**26**	**16**	**20**	**9**	**9**	**6**	**3**	**3**	**4**	**2**

***=PCMH Standard Level (aggregations and sub score of each PCMH elemental category)**

Figure 5: PCMH Capability Composite Mapping to PCMH Elements

Study Hypotheses

The results of this study and each specific aim will advance our understating of the impact that PCMH-recognized practices have in their communities. This study will inform policymakers where we are in the journey to achieving the triple aim—increasing access to care, improving quality of care, reducing total cost of care—through propagation of PCMHs and meaningful use of EHRs.

Specific Aim 1, with its associated sub-aims, seeks to inform the hypothesis that delivery of primary care in communities (as defined by counties within a state) are affected by the increasing densities of recognized PCMH practices within communities. The structure- and process-based evaluation of the NCQA PCMH Recognition program is the basis for determining achievement of PCMH transformation at each PCD practice location. Each sub-aim of Specific Aim 1 looks at the relationships of PCD (Sub-Aim 1) and PCMH (Sum-Aim 2) densities on risk-adjusted PQI composite rates within communities.

Specific Aim 2 investigates the effect of various PCMH capabilities composites; composites derived from the scores that PCMH practices attained on their respective NCQA recognition. The MU and MP composite capabilities are evaluated via a correlation and regression analysis of the effect that each composite has on risk-adjusted PQI rates (Sub-Aim 1). Each of the 10 capability composites are evaluated as in a simple regression model to determine which of them predict the effect of the PCMH structure and process capabilities within communities (Sub-Aim 2).

Table 4 illustrates the mapping of each aim and hypothesis with each aim's independent variables (IV) and dependent variables (DV) of interest.

Table 4: Mapping Specific Aims/Hypothesis to Variables and Analysis

Aims/Hypothesis	Intervention: Independent Variable (IV)	Response: Dependent Variable (DV)	Analysis	Measurement Outcome
SPECIFIC AIM 1: Define a model to measure the community-level impact of recognized PCMHs.	Studies related to primary care structure and Recognized PCMHs	Studies related to ACSC AHRQ PQI rates	Literature Review	Literature supports model to measure PCMH impact using Composite PQIs
HYPOTHESIS (H1): Literature exists to support the proposed measurement framework.				
SPECIFIC AIM 2: Determine correlation of hospital admission rates for risk-adjusted ACSC Composite PQIs within a community when PCMH-recognized practices increase in number.				
SUB AIMS:				
1. Are risk-adjusted PQI rates affected by the ***PCD density*** among the 114 FIPS areas?	Concentration (ratio) of Primary Care Doctors (PCD) within a FIPS	Delta (2008-2011) and the 2011 AHRQ risk-adjusted PQI composite rates by FIPS Area and by Age (Table 5)	Multiple Regression	R-Square of the overall regression and p-value of each correlation and beta coefficient
2. Are risk-adjusted PQI rates affected by the ***PCMH density*** among the 114 FIPS areas?	Concentration (ratio) of Recognized PCMH Doctors among FIPS population			
HYPOTHESIS (H2): Communities with PCMH-recognized practice concentrations among PCP practices will have lower avoidable ambulatory care sensitive condition hospital admission rates.				
SPECIFIC AIM 3: Determine which attributes of PCMH-recognized practices correlate with ACSC risk-adjusted Composite PQIs.				
SUB-AIMS:				
1. Do the **10 PCMH capability composites (Table 3)** effect risk-adjusted PQI rates?	Average of the 10 PCMH Capabilities grouped PCMH practice element scores within a FIPS	Delta (2008-2011) and the 2011 AHRQ risk-adjusted PQI composite rates by FIPS Area and by Age (Table 5)	Multiple Regression	R-Square of the overall regression and p-value of each correlation and beta coefficient
2. Do **MU (Table 2) capability composites** effect risk-adjusted PQI rates?	Average of the MU-grouped PCMH practice element scores within a FIPS			
3. Do **MP (Table 3) capability composites** effect risk-adjusted PQI rates?	Average of the MP-grouped PCMH practice element scores within a FIPS			
HYPOTHESIS (H3): The use of EHR technologies and care coordination will affect avoidable ambulatory care sensitive condition hospital admission rates.				

Chapter Summary

This chapter presents the theoretical framework that will provide the majority of content for Specific Aim 1, defining a framework to measure the effect of the increasing concentration of PCMH-recognized primary care practices. Starting with the General Systems Theory, the research expands on the concept that various subsystems of primary care are central to the total health care system and can be organized optimally to improve the health of communities in which they operate, as measured by reduction in the utilization of more expensive inpatient care.

The research is also based on Donabedian QI framework theory that the CCM provides the structure, the PCMH recognition program provides the practice transformation (processes) and the AHRQ ACSC Composite PQIs provides the outcome used to measure the impact of the intervention (recognized PCMH practices).

Using these theories, the author established two main themes that will be analyzed in in Specific Aims 2 and 3. For Specific Aim 2, the author will focus on data analysis of the primary hypothesis that greater concentrations of recognized PCMHs will inform a decrease in utilization of inpatient care specific to the AHRQ ACSC risk-adjusted Composite PQIs. In addition to the primary aim, the author presents additional sub-aims to support the validity of the research design. In Specific Aim 3, the author will focus data analysis on determining which PCMH capabilities correlate with a reduction in the AHRQ ACSC risk-adjusted Composite PQIs.

The research results of the three Specific Aims will provide community planners, health care decision makers (e.g., purchasers, employers, health plans) and state/federal government with a framework for measuring health care reform efforts.

Chapter 4: Methodology

Introduction

The intent of this study is to measure the effect of PCMH-recognized practices on hospitalizations related to ambulatory care sensitive conditions within a community. The hospitalization of patients with ACSCs has been consistently used in research studies as a reliable and valid outcomes-based proxy of health care resource utilization where increased utilization results in an increased total cost of care (Berry-Millett, Bandara, & Bodenheimer, 2009; Bodenheimer, 2011; Bodenheimer et al., 2009; Gilfillan et al., 2010; Scopelliti & Spinelli, 2011). This quasi-experimental research intends to utilize the AHRQ state inpatient dataset (SID) and the AHRQ ACSC Risk-Adjusted Composite PQIs to measure the impact of the increasing concentration NCQA-recognized PCMH practices among the communities (counties) within the states of Vermont (VT) and North Carolina (NC). This study will measure 2008 PQI rates (pre) and compare them to 2011 PQI rates (post) within each of the 114 counties within VT and NC. Furthermore, the study will evaluate correlations of the PCMH elements against the PQI rates within each of the counties being analyzed to determine effect.

Research Design

The author will establish the theoretical constructs, Specific Aim 1, through literature review and subsequent identification of knowledge gaps, leading to the rationale for studying Specific Aims 2 and 3. The methodology for addressing Specific Aim 2 builds upon the

established research that primary care concentrations effect utilization of more expensive health care (e.g., hospitalizations). Kravet et al., (2008) conducted a retrospective cross-sectional analysis of area resource use files from the 1990s to establish the primary care geographic concentration construct. This study will adapt the concentration construct to establish and demonstrate the effect of PCMH-recognized provider concentrations among primary care practices. Assuming there is an association, the author infers that the current direction of health care reform is likely on the right course; however, a lack of association may be cause for a course correction. Either way, this study will inform policy makers, community planners, and health care decision makers if the PCMH model is impacting community-level inpatient utilization, which accounts for 35% of the total health care expenditure.

The evaluation of Specific Aims 2 and 3 begins with a descriptive analysis of the ~4,800 NCQA PCMH-recognized practice database by geographic area which will demonstrate which communities within Vermont and North Carolina have experienced the greatest concentration of PCMH-recognized practices over a three-year period (2008–2011). Because the NCQA PCMH recognition program began in 2008, it is the intent of this study to use 2008 as a baseline (pre-intervention) of PCMH recognized practices and the growth of PCMH recognized practices over a three-year period (2008-2011). An analysis of the NCQA PCMH recognition dataset will provide the number of recognized PCMHs, by zip code (grouped into FIPS), and by practice size (number of physicians) as of Dec 2011 (NCQA, 2011). In addition to the number of recognized practices and physicians within each community (FIPS area), the analysis will also provide a ratio of doctors-to-population per the overall population census within that community (FIPS).

This study utilizes all hospital discharges from two points in time (2008 and 2011) from the Vermont State Inpatient (SID) database. The 2008 and 2011 Vermont SID was obtained by

submitting an application to the AHRQ HCUP program administrator (HCUP, 2011). The author will utilize the AHRQ PQI SAS program on each year (2008/2011) of the Vermont and North Carolina SID files to determine risk-adjusted Composite PQIs for each of the 114 FIPS (by age category) within each state.

According to the Agency for Health care Research and Quality (AHRQ), chronic disease conditions account for nearly 35 percent of total US health care expenditures (HCUP, 2011). Several studies have indicated that by providing patients with chronic disease a designated primary care team that provides whole-person management (e.g., PCMH care), that the total costs of managing these patients can be reduced, primarily through the reduction of hospitalizations or readmissions as a result of those patients not properly managing their condition (Berry-Millett et al., 2009; Bodenheimer, 2011; Bodenheimer et al., 2009; Carpenter, 2008; Gilfillan et al., 2010; Scopelliti & Spinelli, 2011).

It is anticipated that the number of recognized physicians within a given community will provide increased access to PCMH care that could potentially affect the health of the population and their utilization of hospital services related to ambulatory care sensitive conditions (ACSCs). Based on this assumption, this study proposes to measure the correlation of the predictor variables in Table 3 on the expected hospitalization rates (response variable). A multiple linear regression analysis will be used to establish correlation of hospitalization among these disease conditions in communities with various concentrations of recognized PCMH practices.

After establishing PCD/Population and PCD/PCMH ratios for each of the communities (FIPS counties), the communities will be compared in 2008 and again in 2011 to determine any change and/or correlation with the AHRQ ACSC risk-adjusted Composite PQIs.

In 2008, on average across the US, the ratio of primary care doctors was 100 for every 100,000 people (1:1,000) in cities (urban communities) and 46 for every 100,000 people (1:2,174) in rural areas (Bodenheimer & Pham, 2010).

In addressing Specific Aim 3, the author intends to build upon work by the Center for Studying Health System Change (CSHSC) regarding their categorization/grouping of the NCQA PPC-PCMH evaluation standards (Table 5). As a result of their study, they released a policy perspective regarding the heavy reliance (nearly 50% of the 160 elements) that the NCQA PPC-PCMH evaluation program places on health information technology (cyber infrastructure), like electronic health record capabilities (O'Malley et al., 2008). The CSHSC study concluded that the PPC-PCMH evaluation criteria was heavily weighted on the information technology aspects and most practices would likely not be able to meet these evaluation elements. However, several studies conducted at individual practice sites have validated the importance of health information technology (HIT) and the cyber infrastructure necessary for an effective team-based, whole-person approach at delivering PCMH-based primary care (Finkelstein, Barr, Kothari, Nace, & Quinn, 2011; Hunt et al., 2009). The HITECH meaningful use criteria strongly support the construct that EHRs are a necessary infrastructure enabling the planned (PPACA) health care reform legislation.

In summary, the research methodology approach for Specific Aim 3 is to establish which of the PCMH capabilities impact the risk-adjusted PQI rates. As well, this study will establish a correlation coefficient equation that will predict the level of directional correlation the implementation/use of PCMH capabilities impact avoidable hospital admission rates.

The strengths of this research design are its simplicity, data availability, and relevance to the current environmental climate regarding the national agenda to assess the impact of the

PCMH model, EHR technology use, and the foreshadowing of the ACO model potential/success. The study design is appropriate for the level of assessment at a community-wide level. There are limitations in making an inferential conclusion that increasing PCMH recognition alone is the cause of declining ACSC hospital admission rates. The author would not anticipate such a literal and direct interpretation. There are other environmental factors that could also impact hospital admission rates. In particular, the United States has recently experienced one of the worst economic downturns in recent history. There is an attempt to control for such environmental factors by using admissions per 1,000. Although attempts to control extraneous variables/factors may not entirely negate effects on admission rates, the analysis will establish the degree to which variance is explained in the model. As a result of potentially confounding factors, the statistical analysis will be supported with significance testing to support the strength of the statistical relationships.

Research Design Validity

This is a quasi-experimental, quantitative research design that leverages existing secondary data. The strengths in this research design are its use of existing data sources and its reproducibility from the county to state level as an outcomes-based measurement framework.

The NCQA recognition data source will serve as the valid source of the intervention, independent variable (PCMH Recognition). In addition to using the existing data on PCMH recognitions and the validity of that measurement program, this study will leverage a tested and valid outcomes measurement dataset—the AHRQ Risk Adjusted Composite PQIs. As well, the accessibility of the data makes for a fiscally practical research design. However, there are threats to the internal and external validity of this study to consider.

Threats to Internal Validity

History. This study occurs between the years of 2008 (pre) and 2011 (post). During this time period, the country experienced an economic downturn. Such an economic shift would signal a probable downturn in healthcare utilization as more people are more likely to be without jobs and without healthcare insurance/access to care. As a result, a decrease in PQI rates could be impacted by this economic downturn. However, the economic event occurs across all FIPS, so the difference between the two measure points should be uniformly distributed.

Maturation. This study is susceptible to the threat that practices, although not recognized by NCQA, may be utilizing the PCMH concepts to manage their populations. Meaning, PQI rates may be affected by better primary care practices that are not recognized by NCQA as having transformed. As well, this study is based on the earliest version of the PCMH evaluation standards which have been changed two times since its introduction to account for noted weaknesses in how the standards were written/evaluated.

Testing. There is no knowledge of the actual practice "status". This study assumes that all practices in all counties were not practicing the PCMH principles. As indicated with the maturation threat to internal validity, the testing threat poses the challenge that none of the practices were "pre-tested" to determine actual practice "status" before the intervention of PCMH recognition.

Instrumentation. The validity/reliability of the PCMH recognition standards and the AHRQ PQI rates have been determined by each respective owner of the measurement tool. The strength of this study is in leveraging these existing measurement tools to test the research hypothesis.

There was a change in PCMH standards in 2011. So, this study only includes practices recognized on the 2008 NCQA standards. There is a possible threat in terms of instrumentation or construct validity of the PQI measures. Although the use of the PQI rate has been shown to be an effective measure of quality in terms of a population, there are no studies to date that attempt to tie PQI rates directly to the practice capability scores, or actual density of "practice type" by a recognition status. There is also the possibility that the outcome measurement (AHRQ PQI rates) may not necessarily be attributed to the specific actions of the recognized PCMH practices within the NCQA dataset (measurement/performance attribution). However, this research is testing the theory that the PCMH practice is a subsystem of the overall health care system and that changes to its delivery model extend into the community and can be measured by changes in the population's utilization of inpatient services related to their potentially preventable hospitalizations (ambulatory-specific). Based on prior research that an individual PCMH recognized practice did better on treating patients with specific disease conditions after the intervention of transforming into a PCMH, there is a reasonable expectation that increasing concentrations of these recognized practices would have a broader community-wide impact.

Statistical regression. There is a potential threat that the "floor effect" or "halo effect" may occur in terms of the practices that do or do not attempt NCQA recognition. For example, practices that may elect to become recognized may have already been practicing the PCMH principles, so that county would show smaller improvement (halo effect). There is also the possibility that a majority of practices in a county are performing very poorly and only a couple achieve NCQA recognition. Therefore, that county may appear to be performing poorly in relative comparison because the very poorly performing practices mask the improvements of the two practices that are NCQA recognized PCMHs (floor effect).

Selection of subjects. There is inherent selection bias in using the NCQA PCMH recognized practices because there is no randomized selection of which practices become recognized or not. As well, practices that decided to become recognized by NCQA may have already been "transformed" into PCMH practices prior to their formal recognition. However, prior research also indicates that practices often "think" they are practicing as a PCMH, only to be informed by the process of going through recognition that they find otherwise (Torda, Han, & Scholle, 2010).

Threats to External Validity

Population validity. This study uses all discharges in the entire state, so it includes the entire population within a state. It also uses all recognized practices within a state. So, this study is representative of all populations. In addition, this study uses data from two different states to ensure heterogeneity of the counties evaluated. This approach strengthens the design of this study.

Ecological validity. There is a strong degree of validity to which the results of this study are reproducible across counties within the 46 states participating in the AHRQ HCUP state inpatient data submission process.

- Interaction Effect of Testing. This study utilizes existing data (secondary data use), so there is no knowledge by the participants that "testing" of any sort is occurring.
- Interaction Effect of Selection Bias. This study is susceptible to this threat because there is no way to know if practices were already practicing PCMH principles prior to the study, and no way to determine if the practices in counties without recognized PCMHs are actually practicing the principles of PCMH.

- Reactive Effects of Experimental Testing. As with the interaction effect of testing, this study is not susceptible to the "Hawthorne Effect" because there is no knowledge of the practices that there is a study.
- Multiple Treatment Interference. This study is not susceptible to this potential threat to validity because the "treatment" is the achievement of PCMH recognition and the "subjects" are self-selecting to participate in the recognition program.

Data Sources

There are four primary data sources (and two derived from the four primary) used in this study to derive the variables of primary interest. Figure 6 illustrates the various data sources and how they are used to derive the variables used in this study.

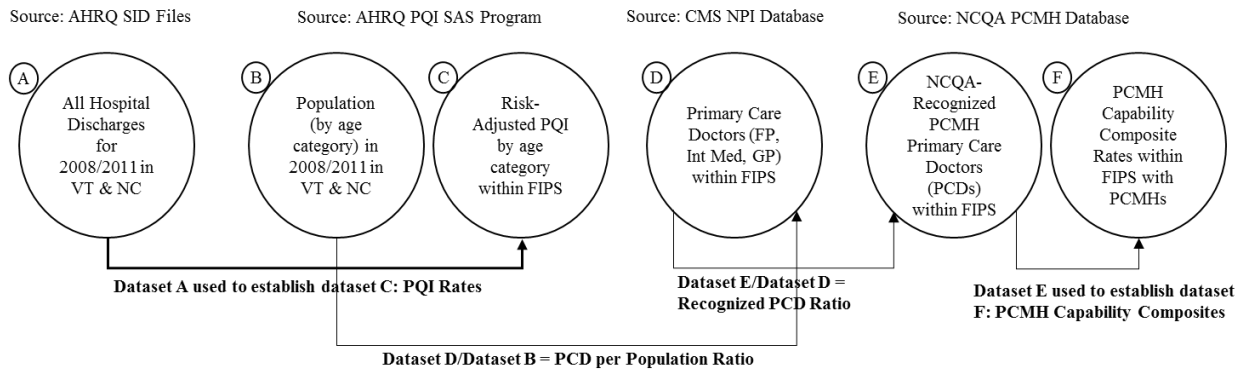


Figure 6: Datasets used in study

- *Data Source A*: State Inpatient Dataset (SID). The SID data files were obtained from the AHRQ HCUP Web site for each state (VT and NC) for each year, 2008 and 2011 (HCUP, 2011).
- *Data Source B*: Population by ages were provided by the AHRQ PQI SAS program that contains a population file to establish the PQI rates by FIPS, by age.

- *Data Source C*: The AHRQ risk-adjusted PQI rates were derived by processing the four SID files for each state (VT and NC) for each year, 2008 and 2011. (DV)
- *Data Source D*: The PCD ratio was derived from the CMS NPI dataset which provided the total primary care doctors with family practice (FP), internal medicine (Int Med), or general practice (GP) as their credential. The total population was then divided by the total primary care doctor within each FIPS to obtain the resultant PCD ratio. (IV)
- *Data Source E*: The PCMH ratio was derived from the total NCQA-recognized primary care doctors divided by the total PCDs (Source D) within a FIPS. (IV)
- *Data Source F*: The PCMH capability composites were derived from mapping each PCMH element to a defined practice capability and the scores of each practice within a given FIPS were averaged to obtain the PCMH capability composite for each FIPS area.

In 2000, the Agency for Health care Research and Quality (AHRQ) developed a population-based outcome measure of potentially preventable hospital admissions affected by the effectiveness of outpatient care. Based on over a decade of work, the Prevention Quality Indicators (PQIs) and have been shown to effectively demonstrate use as an outcome of ambulatory care sensitive conditions (ACSCs). Based on hospital discharge data, the PQIs consist of 13 individual disease conditions ranging from acute (e.g., urinary tract infection) to chronic conditions (e.g., diabetes).

For this study, the AHRQ Composite PQIs are used as an outcome measure to ascertain the impact of PCMH-recognized primary care practices in managing the community-wide population of patients admitted as a result of a preventable ambulatory care sensitive condition (ACSC). ACSC-related measures have been shown to be sensitive to the concentration of

primary care doctors (PCDs) (Scopelliti & Spinelli, 2011; Slowik, 2011); however, literature review indicates a gap in knowledge as to what primary care practice capabilities affect these ACSC hospital utilization rates within a community. Table 5 provides a complete listing of all 16 PQIs, including the composites (overall, acute, chronic) that are based on a grouping of the individual measures.

Table 5: AHRQ Prevention Quality Indicators (PQIs)

PQI	Title
PQI 01	Diabetes Short-Term Complications Admission Rate
PQI 02	Perforated Appendix Admission Rate
PQI 03	Diabetes Long-Term Complications Admission Rate
PQI 05	Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate
PQI 07	Hypertension Admission Rate
PQI 08	Heart Failure Admission Rate
PQI 10	Dehydration Admission Rate
PQI 11	Bacterial Pneumonia Admission Rate
PQI 12	Urinary Tract Infection Admission Rate
PQI 13	Angina Without Procedure Admission Rate
PQI 14	Uncontrolled Diabetes Admission Rate
PQI 15	Asthma in Younger Adults Admission Rate
PQI 16	Rate of Lower-Extremity Amputation Among Patients With Diabetes
PQI 90*	Overall Composite (PQI 1, 3, 5, 7, 8, 10, 11, 12, 13, 14, 15 and 16)
PQI 91*	Acute Composite (PQI 10, 11 and 12)
PQI 92*	Chronic Composite (PQI 1, 3, 5, 7, 8, 13, 14, 15 and 16)
*=PQI Composite rates used in this study	

In 2009, given the concern that quality measures may be used for provider-based pay for performance initiatives, AHRQ convened an expert panel to review the use of PQIs as comparative measures. The expert panels concluded that the PQIs are effective at comparing health care system delivery performance at an area level (regional, health system, etc.), but not as individual provider-based comparative measures or pay for performance (Davies S.M., 2009).

As of December 2014, NCQA had recognized nearly 4,800 primary care-based practices across the country as meeting the 2008 Physician Practice Connections Patient Centered Medical Home (PPC-PCMH) standards (NCQA, 2011) out of approximately 161,000 practice locations across the United States (Hing & Burt, 2007).

Based on the NCQA recognized PCMH practice data and the AHRQ Composite PQI patient population file, the author conducted a preliminary analysis (Table 3) of PCMH provider/patient ratios within select communities in the state of Vermont where PCMH-recognized practices exist.

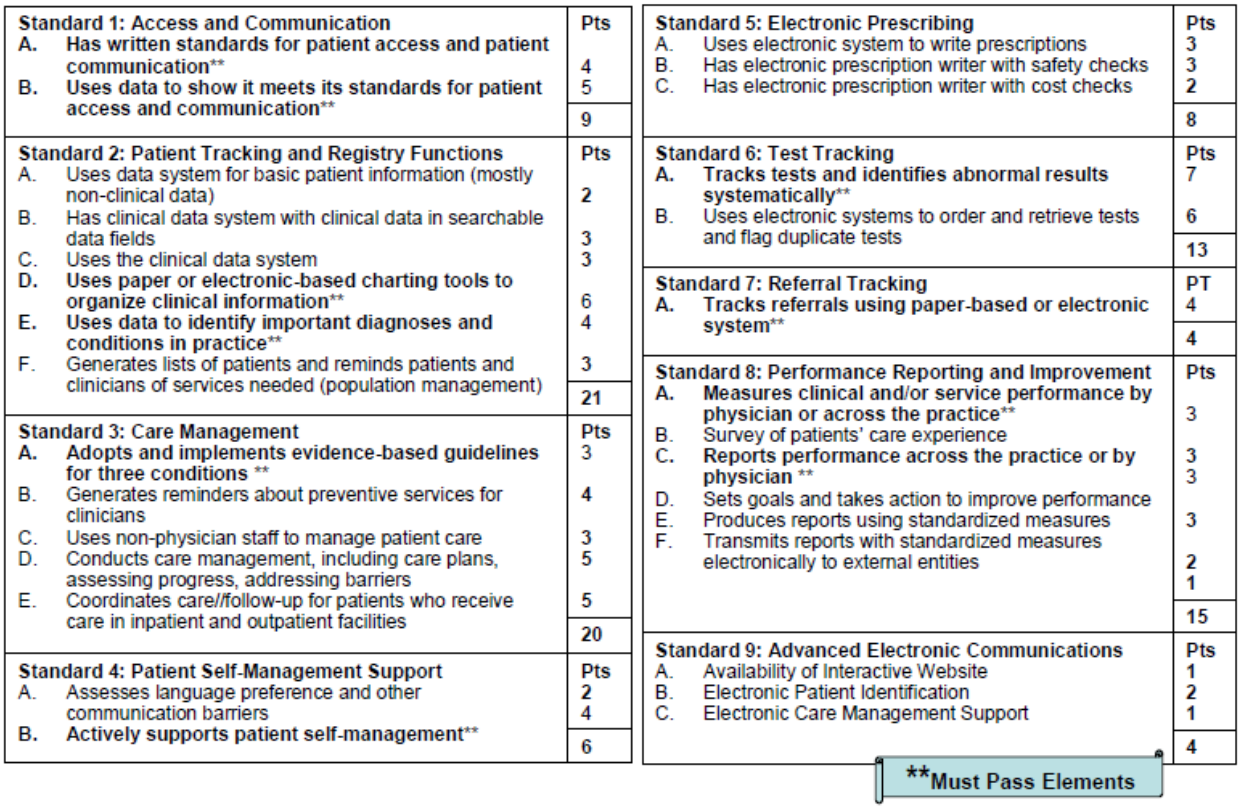
In order for a practice to be recognized by NCQA as a Patient-Centered Medical Home (PCMH), a primary care practice must meet several standards. Although there are only 10 must-pass elements of the PPC-PCMH standards, there are over 160 elements that a primary care practice can attain points.

There are 3 levels of "PCMH-ness" that a primary care practice can attain as a result of submitting their documentation for review by NCQA; however, the levels are not used as a variable in this study and only provided to understand how PCMH recognition is awarded:

- Level 1: 25–49 points and 50% of points on 5 of the 10 must-pass elements
- Level 2: 50–74 points and 50% of points on 10 of the 10 must-pass elements
- Level 3: ≥75 points and 50% of points on 10 of the 10 must-pass elements

The following descriptive data analysis is provided to confirm that there are enough geographic locations with varied provider/patient ratios from which to conduct the complete study. The areas selected for this observational study are based on the convenience of readily available data from the National Committee for Quality Assurance PCMH recognition database (NCQA, 2011), the Agency for Health care Research and Quality (AHRQ) Prevention Quality Indicators (Composite

PQI) database (HCUP, 2011), and the CMS National Provider Identifier datasets. According to a review of the NCQA PCMH dataset, there are approximately 1000 cities across the United States that have at least one PCMH recognized practice (Figure 7).



Standard 1: Access and Communication	Pts
A. Has written standards for patient access and patient communication**	4
B. Uses data to show it meets its standards for patient access and communication**	5
	9

Standard 2: Patient Tracking and Registry Functions	Pts
A. Uses data system for basic patient information (mostly non-clinical data)	2
B. Has clinical data system with clinical data in searchable data fields	3
C. Uses the clinical data system	3
D. Uses paper or electronic-based charting tools to organize clinical information**	6
E. Uses data to identify important diagnoses and conditions in practice**	4
F. Generates lists of patients and reminds patients and clinicians of services needed (population management)	3
	21

Standard 3: Care Management	Pts
A. Adopts and implements evidence-based guidelines for three conditions **	3
B. Generates reminders about preventive services for clinicians	4
C. Uses non-physician staff to manage patient care	3
D. Conducts care management, including care plans, assessing progress, addressing barriers	5
E. Coordinates care//follow-up for patients who receive care in inpatient and outpatient facilities	5
	20

Standard 4: Patient Self-Management Support	Pts
A. Assesses language preference and other communication barriers	2
B. Actively supports patient self-management**	4
	6

Standard 5: Electronic Prescribing	Pts
A. Uses electronic system to write prescriptions	3
B. Has electronic prescription writer with safety checks	3
C. Has electronic prescription writer with cost checks	2
	8

Standard 6: Test Tracking	Pts
A. Tracks tests and identifies abnormal results systematically**	7
B. Uses electronic systems to order and retrieve tests and flag duplicate tests	6
	13

Standard 7: Referral Tracking	PT
A. Tracks referrals using paper-based or electronic system**	4
	4

Standard 8: Performance Reporting and Improvement	Pts
A. Measures clinical and/or service performance by physician or across the practice**	3
B. Survey of patients' care experience	
C. Reports performance across the practice or by physician **	3 3
D. Sets goals and takes action to improve performance	
E. Produces reports using standardized measures	3
F. Transmits reports with standardized measures electronically to external entities	2 1
	15

Standard 9: Advanced Electronic Communications	Pts
A. Availability of Interactive Website	1
B. Electronic Patient Identification	2
C. Electronic Care Management Support	1
	4

**Must Pass Elements

Figure 7: NCQA PPC-PCMH Standards. Reprinted from the National Committee for Quality Assurance (NCQA) Web site. Retrieved September 17, 2015, from http://www.ncqa.org. Copyright NCQA. Reprinted with permission.

As of 2012, NCQA had recognized ~4,800 practices across the country as meeting the 2008 Physician Practice Connections Patient Centered Medical Home (PPC-PCMH) standards (NCQA, 2011). Based on this data, the author conducted a preliminary analysis of PCMH provider/patient ratios within select communities where PCMH-recognized practices exist. From this robust dataset, the author will be able to study a substantial number of PCMH-recognized

practices from which to understand the broader impact this delivery model is having within their respective communities.

Table 6 depicts provider-to-population and NCQA recognized provider ratios within Vermont to illustrate the variation of ratios (concentrations) within the counties (FIPS).

Table 6: PCMH Recognized Doctor-to-Population Ratios in Vermont

ST	FIPS	Total Docs	Rec Docs	Pop-2011	Rec Doc Den	Doc Den
VT	50017	9	9	23,093	1.00	2,566
VT	50021	36	17	49,518	0.47	1,376
VT	50015	8	8	19,266	1.00	2,408
VT	50005	21	21	24,347	1.00	1,159
VT	50003	22	12	29,546	0.55	1,343
VT	50009	3	3	5,154	1.00	1,718
VT	50001	16	16	29,051	1.00	1,816
VT	50025	18	6	35,706	0.33	1,984
VT	50023	46	33	47,456	0.72	1,032
VT	50007	194	73	124,795	0.38	643
VT	50027	54	24	45,985	0.44	852
VT	50019	12	10	21,663	0.83	1,805
VT	50013	0	0	5,608	0.00	5,608
VT	50011	15	8	36,812	0.53	2,454

Based on this data, the author conducted an analysis of PCMH provider/patient ratios within select communities where PCMH-recognized practices exist. From this robust dataset, the author will be able to study a substantial number of PCMH-recognized practices from which to understand the broader impact this delivery model is having within their respective communities.

Although the author does not have preliminary studies directly related to this research, a preliminary data analysis of the PCMH provider/patient ratios illustrates variance among the 14 FIPS areas within the state of Vermont. This descriptive analysis is provided to confirm that there exists varied provider/patient ratios and PCMH concentrations from which to conduct the complete study. The communities (FIPS areas) selected for this observational study are based on

the convenience of readily available data from the National Committee for Quality Assurance PCMH recognition database (NCQA, 2011), and the Agency for Health care Quality and Research Health care Cost and Utilization Project (HCUP) database (HCUP, 2011). According to a review of the NCQA PCMH dataset, there are approximately 1000 cities that have at least one PCMH recognized practice. Table 3 depicts the preliminary analysis of NCQA PCMH recognized provider-to-population ratios and PCMH/PCP concentrations (data pulled from the 2011 NCQA recognized PCMH directory). The preliminary analysis demonstrates there are representative practices from various geographic locations with various PCD/Population and PCMH/PCD concentration ratios. Table 6 illustrates the various PCMH-recognized/PCD and PCD/population ratios among the 14 communities (FIPS) within Vermont.

This study proposes a retrospective analysis of PCMH practice concentrations within communities; the intervention is the PCMH recognition. Several studies have conducted similar evaluations where there is an evaluation of the practice performance after PCMH-like transformation. Gilfillan and colleagues conducted a retrospective observational study using regression modeling of data from 11 interventional and 75 non-interventional (control group) practice sites where data was evaluated to determine effectiveness (quality, cost, access) of the practices pre/post intervention of the Proven Health Navigator (a model based on PCMH capabilities) transformation (2010). Their study found that the Proven Health Navigator (PHN) intervention resulted in a statistically significant drop in inpatient admissions (18% at $p<.01$) and a readmissions (36% at $p<.02$) over the control group that did not implement PHN (Gilfillan et al., 2010). This proposed study builds upon the work of Gilfillan and colleagues by conducting a retrospective observational study using multiple regression and ANOVA to determine the community-wide impact of PCMH-recognized practices on the hospital admission rates of select

chronic disease conditions. The intervention this research study is the concentration of recognized PCMH practices among PCDs within a community.

Secondary Data Use

The secondary data used for this analysis has the inherent limitations of not accounting for other variables that may or may not be affecting the hospitalization rates in the selected communities. Given this limitation, the information provided in these databases will be sufficient to imply associations between variables and not causality (Aday et al., 2004). This novel study design is based on the two perspective view of population and clinical system effectiveness of the health services research evaluation model. The effectiveness of population health outcomes and the PCMH-recognized clinical practice is represented by measuring hospital admissions based on the AHRQ ACSC Composite PQI rates. This novel approach is supported by numerous studies (as previously cited) validating the use of hospital admissions as a measure of system effectiveness and population health outcomes. The reliability of this measurement approach will be supported by the NCQA research staff review of the methodology and statistical analysis performed by an expertly trained statistician. It is anticipated that this study can be replicated and made generalizable to any community within the United States using this study design, data, and methodology.

Power Analysis

Using a freely available a-priori sample size calculator for multiple regression from the Internet (Lenth, 2006-9), it is estimated that to achieve statistical power of .8 using two (2) predictors (PCD and PCMH densities) and obtain a .05 probability level with medium effect size (.15) requires a minimum of 67 FIPS as an appropriate sample size for Specific Aim 2. For Specific Aim 3, the two sub-aims require different power analysis consideration. For Sub-Aim 1,

there are two predictors (PCD density and MU or MP composite capability scores); so, the same power analysis result of 67 FIPS is required in the sample size. However, Sub-Aim 2 of Specific Aim 3 uses 11 predictors (PCD density and the 10 PCMH capability composites); so, the effect size has to be adjusted to .35 to obtain a statistical power of .8 and a .05 probability level with a sample size of 59.

Variables and Measurement

The intent of measuring the variables of interest in this study is to determine if there is a correlation between the PCMH physician/population ratios within a community (FIPS) and the rate of hospitalization for the AHRQ ACSC risk-adjusted Composite PQI rates. Due to the sheer number of total regression models and resultant tests (300), the author did consider the need for a Bonferroni correction.

Aim 2 tests three composite PQIs and their deltas (2008-2011) for 5 times, summary-level plus 4 age-specific groups (total 15 times). There are only two predictors (PCD and PCMH density) and they are examined together. This study does include two analysis of the hypotheses in that it does look at all 114 FIPS in a model and then only the 67 FIPS with PCMHs. This additional analysis would be testing the same hypothesis twice; but again, they are stated as separate hypotheses where one is not tested as a result of the significance of the other.

Aim 3 tests the same DVs, but against the PCD density and 12 PCMH capability predictors. Again the study starts with separate hypotheses for the 15 DVs (3 PQIs (summary-level, plus 4 age-specific PQIs (3*4=12)) for a total of 15 DVs). For example, there is no relationship between PQI 90 for age category 1 and PCD plus PCMH categories for the 114 counties (FIPS).

The author determined there is no need for a Bonferroni correction, due to potential false positive correlations; in essence, this study asks 300 different research questions all independent of each other and does not test multivariate correlations of the IVs/DVs (Table 7).

Table 7: Study Variables

Variable Name	**Variable Type**	**Data Type**
Specific Aim 2		
Ratio of PCP Doctors/Population by FIPS	Predictor	Continuous
Ratio of PCMH/PCD Physicians by FIPS	Predictor	Continuous
AHRQ Risk Adjusted Composite PQIs by FIPS and by Age Category	Response	Continuous
Specific Aim 3		
Ratio of PCP Doctors/Population by FIPS	Predictor	Continuous
Average (by FIPS) Composite PCMH Capability Scores (10 Individual, MU, and MP)	Predictor	Continuous
AHRQ Risk Adjusted Composite PQIs by FIPS and by Age Category	Response	Continuous

Table 8 depicts the measurement outcomes established as a result of the analysis conducted to evaluate Specific Aim 2. Of note, specific aim 2 is focused on determining if concentrations of providers alone or ratio of recognized providers affected the change in PQI rates and/or has correlation with the resultant (post) risk-adjusted PQI rates (DV).

Table 8: Measurement Outcomes for Specific Aim 2

Sub-Aims of Specific Aim 2: Independent Variables (IV) (Underlined/Bold)	Delta PQI Rates	2011 PQI Rates
1. Are risk-adjusted PQI rates affected by the ***PCD density*** among the 114 FIPS areas?	Dependent Variables (DV): AHRQ Risk Adjusted Composite PQI Rates	Dependent Variables (DV): AHRQ Risk Adjusted Composite PQI Rates
2. Are risk-adjusted PQI rates affected by the ***PCMH density*** among the 114 FIPS areas?		

For Specific Aim 3, it is anticipated that the technology-specific and care coordination composite capabilities will emerge as stronger directional correlations to the dependent variable of ACSC risk adjusted hospital admission composite rates. Table 5 depicts the grouping of PCMH evaluation elements into 10 PCMH capabilities that serve as the independent variables in a multiple regression analysis for one of several sub-aims. It is hypothesized that the clinical

information systems grouping of the six domains will correlate highly to a reduction in the outcome measure of reduced inpatient utilization (Table 9).

Table 9: Measurement Outcomes for Specific Aim 3

Sub-Aims of Specific Aim 3: Independent Variables (IV) (Underlined/Bold)	Delta PQI Rates	2011 PQI Rates
1. Do the **10 PCMH capability composites (Table 3)** effect risk-adjusted PQI rates?	Dependent Variables (DV): AHRQ Risk Adjusted Composite PQI Rates by FIPS and by Age	Dependent Variables (DV): AHRQ Risk Adjusted Composite PQI Rates by FIPS and by Age
2. Do **MU (Table 2) capability composites** effect risk-adjusted PQI rates?		
3. Do **MP (Table 3) capability composites** effect risk-adjusted PQI rates?		

Data Analysis

In 2000, the Agency for Health care Research and Quality (AHRQ) developed a population-based outcome measure of potentially preventable hospital admissions affected by the effectiveness of outpatient care. Based on over a decade of work, the Prevention Quality Indicators (Composite PQIs) and have been shown to effectively demonstrate use as an outcome of ambulatory care sensitive conditions (ACSC). Based on hospital discharge data, the PQIs consist of 13 individual disease conditions ranging from acute (e.g., urinary tract infection) to chronic conditions (e.g., diabetes). See Table 2 for a complete listing of all 16 PQIs, including the composites (overall, acute, chronic) that are based on a grouping of the individual PQIs.

For this study, the author will use all hospital discharges in the states of Vermont and North Carolina for baseline year 2008 and post intervention year 2011. The author will conduct a descriptive analysis of both state inpatient data files obtained from the AHRQ HCUP program office. Then the author will run the SID data files through the AHRQ PQI SAS programming logic to obtain risk-adjusted Composite PQIs by FIPS and age strata. There are 14 FIPS in the

state of Vermont and 100 FIPS areas in North Carolina. The AHRQ PQI SAS (Version 5.0) program uses four age strata as follows: (1) 18–39; (2) 40–64; (3) 65–74; (4) 75+.

The author will analyze the NCQA PCMH recognition program database by first conducting a data completeness and descriptive analysis. Then the author will prepare an extraction of the data to align with the FIPS counties from the Vermont and North Carolina composite PQI results. The author will use the AHRQ PQI SAS program to obtain total population within each FIPS by age strata previously described. The author will then use the CMS NPI dataset to obtain the number of primary care doctors (PCD) by FIPS area.

The author will use these three data points (PCDs, Population, and PCMH recognized practices) to develop two ratios as the predictor variables in analyzing the AHRQ composite PQIs by FIPS … the responder variable. These data will form the variables of analysis for Specific Aim 2 (Table 8). The author will use regression analysis to determine any statistically significant directional correlation and predictive strength of the predictor variables on the Delta and 2011 PQI rates Table 8.

For Specific Aim 3, the author will utilize the same AHRQ Composite PQI rates as the responder variables, but then use the PCMH capability composites to determine which of them has any statistically significant directional correlation and predictive strength on the risk-adjusted Delta and 2011 composite PQIs (Appendix B).

For this data analysis, the author will use SAS Version 9.4 licensed to Virginia Commonwealth University (VCU) via the VCU App-2-Go Citrix Platform. To prepare the data for analysis (averages and ratios) the author will use Microsoft Excel Version 2013. To prepare the responder variable (risk-adjusted AHRQ Composite PQI rates) for this analysis, the author will utilize the Version 5.0 (March 2015) AHRQ PQI SAS program (HCUP, 2011).

Chapter Summary

Chapter 4 provides an outline of the methodology, data, and analysis used to study the phenomenon in question: "Are increasing numbers of recognized PCMHs having an impact on ambulatory care sensitive conditions as measured by the risk-adjusted AHRQ composite PQI rates?" This chapter defines the specifics of the convenience data available to conduct the analysis. The strength of this study is its use of existing datasets and the use of validated instruments: the PCMH recognition program, the AHRQ Composite PQIs, and the CMS NPI data files. As well, this study is strengthened by its generalizability and replicability. In addition to the aforementioned strengths, this study is also simple in its methodological approach by utilizing regression and ANOVA analysis to determine associations and effect between the predictor (PCP, PCMH recognized PCDs, and PCMH element/factor scores) and responder (AHRQ Composite PQIs) variables. The results of this study are reported in Chapter 5.

Chapter 5: Analysis and Synthesis

The purpose of this chapter is to present the results of the statistical analysis, beginning with the descriptive statistics of each dataset used in this study. Then the author presents results from the data analysis of interactions between the independent and dependent variables through means comparisons and correlation/regression analysis. SPSS version 22 was accessed via the VCU App2Go (Citrix) servers to conduct all means comparisons, correlations, and regression analysis used in this study. The authored also used a combination of Microsoft Excel 2013 and Microsoft Access 2013 software to prepare data for analysis and present results in charts, figures, and tables.

Descriptive Statistics

Beginning with the population by age category within each state from which the hospital discharges are a subset, Table 10 illustrates that there was a small change (+4% or ~313K increase) in overall population from 2008–2011 in the total population of both states combined. Within that change, there was (as expected) an increase of ~18% in the aging of the population as more of the population moved (aged) into the over 65 category. North Carolina represents ~94% of the total population between the two states. However, the age distribution within each state is about the same, with 18–64 representing over 82%–84% of the population in each state. The Medicare-eligible population (65+) represents ~18% of the population within each state.

Table 10: State Population by Age Category

	Vermont						North Carolina						Totals					
Age Cat	**2008**	**%**	**2011**	**%**	**Delta**	**%**	**2008**	**%**	**2011**	**%**	**Delta**	**%**	**2008**	**%**	**2011**	**%**	**Delta**	**%**
18-39	170,692	0.35	168,731	0.34	-1,961	-0.01	2,811,233	0.40	2,846,507	0.39	35,274	0.01	2,981,925	0.40	3,015,238	0.38	33,313	0.01
40-64	232,444	0.47	235,147	0.47	2,703	0.01	3,074,900	0.44	3,237,897	0.44	162,997	0.05	3,307,344	0.44	3,473,044	0.44	165,700	0.05
65-74	46,242	0.09	51,889	0.10	5,647	0.12	651,838	0.09	726,650	0.10	74,812	0.11	698,080	0.09	778,539	0.10	80,459	0.12
75+	41,000	0.08	42,233	0.08	1,233	0.03	518,859	0.07	552,136	0.07	33,277	0.06	559,859	0.07	594,369	0.08	34,510	0.06
Totals	490,378	0.06	498,000	0.06	7,622	0.02	7,056,830	0.94	7,363,190	0.94	306,360	0.04	7,547,208	1.00	7,861,190	1.00	313,982	0.04

For purposes of this study, the population under the age of 18 is not included because the AHRQ PQI SAS program does not use that age group in the adult PQI rates.

The author established risk-adjusted composite prevention quality indicators (composite PQIs 90 (Overall); 91 (Acute); and 92 (Chronic)) for each state (Vermont (VT) and North Carolina (NC)) by using each State Inpatient Data (SID) file obtained from the Agency for Healthcare Research and Quality (AHRQ) Health Care Utilization Program (HCUP).

Given that North Carolina represents ~94% of the population between the two states, it also represents ~96% of all the discharges between the two states. Although the proportion of males (~40%) and females (60%) is about the same within each state, the proportion of race is much different with Vermont having ~92% white and North Carolina at ~68%. The proportion of the population living in metro versus urban areas is also much different within each state. Within North Carolina, ~63% of the population live in urban areas and only 27% for Vermont residents; a 36% difference. However, there is an even greater proportion (~24%) of the Vermont population living in isolated rural areas (where access to health care resources can be very scarce) versus less than ~6% for North Carolina. In terms of payers, both states tend to have about the same private payer coverage at ~32% and similar Medicaid populations at ~21%. The Medicare population in Vermont is slightly higher at ~42% versus 38% in North Carolina.

Of interest, the overall discharges in Vermont (-4%) went down at twice that of North Carolina (-2%) from 2008–2011. In other demographic categories, the overall changes in discharges for females (-9%) was three times that of males (-3%) and increasing by four times the rate for minority groups (~4%) than whites (<1%); however, the rate of missing and other categories fell at nearly 3% and could explain this Delta. Table 11 illustrates the total number of discharges by state with selected demographics (race, age, sex, payer, and geography).

Table 11: State Inpatient Dataset (Hospital Discharges)

	Vermont						North Carolina						Totals					
	2008		2011		Delta		2008		2011		Delta		2008		2011		Delta	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Toal Discharges	54,670	0.05	52,214	0.04	-2,456	-0.04	1,134,014	0.95	1,111,961	0.96	-22,053	-0.02	1,188,684	1.00	1,164,175	1.00	-24,509	-0.02
Race																		
Missing	3,380	6.18	2,585	4.95	-795	-0.24	356,109	31.4	9,725	0.87	-346,384	-0.97	359,489	0.30	12,310	0.01	-347,179	-1.21
White	50,352	92.10	48,266	92.44	-2,086	-0.04	525,288	46.32	738,566	66.42	213,278	0.29	575,640	0.48	786,832	0.68	211,192	0.25
Black	389	0.17	461	0.88	72	0.19	167,181	14.74	269,313	24.22	102,132	0.38	167,570	0.14	269,774	0.23	102,204	0.56
Hispanic	100	0.18	84	0.16	-16	-0.16	-	0	47,751	4.29	47,751	1.00	100	0.00	47,835	0.04	47,735	0.84
Asian/Pacific Islander	214	0.39	361	0.69	147	0.69	6,895	0.61	10,755	0.97	3,860	0.36	7,109	0.01	11,116	0.01	4,007	1.05
Native American	65	0.12	161	0.31	96	1.48	15,545	1.37	17,853	1.61	2,308	0.13	15,610	0.01	18,014	0.02	2,404	1.61
Other	170	0.31	296	0.57	126	0.74	62,996	5.56	17,998	1.62	-44,998	-2.50	63,166	0.05	18,294	0.02	-44,872	-1.76
Sex																		
Male	23,324	42.66	22,678	43.43	-646	-0.03	466,670	41.15	463,889	41.72	-2,781	-0.01	489,994	0.41	486,567	0.42	-3,427	-0.03
Female	31,341	57.33	29,532	56.56	-1,809	-0.06	667,297	58.84	647,932	58.27	-19,365	-0.03	698,638	0.59	677,464	0.58	-21,174	-0.09
Age																		
0-17	8,315	15.21	7,631	14.62	-684	-0.08	187,703	16.55	171,789	15.45	-15,914	-0.08	196,018	0.16	179,420	0.15	-16,598	-0.17
18-39	11,064	20.24	10,106	19.36	-958	-0.09	241,010	21.25	227,090	20.42	-13,920	-0.06	252,074	0.21	237,196	0.20	-14,878	-0.14
40-64	14,773	27.03	14,474	27.73	-299	-0.02	327,203	28.85	331,413	29.81	4,210	0.01	341,976	0.29	345,887	0.30	3,911	-0.01
65-75	7,438	13.61	7,398	14.17	-40	-0.01	157,931	13.93	163,317	14.69	5,386	0.03	165,369	0.14	170,715	0.15	5,346	0.03
75+	13,064	23.90	12,589	24.12	-475	-0.04	220,145	19.41	218,271	19.63	-1,874	-0.01	233,209	0.20	230,860	0.20	-2,349	-0.04
Primary Payor																		
Missing	34	0.06	375	0.72	341	10.03	3,050	0.27	4,572	0.41	1,522	0.50	3,084	0.00	4,947	0.00	1,863	10.53
Medicare	22,667	41.46	21,895	41.93	-772	-0.03	416,831	36.76	419,866	37.76	3,035	0.01	439,498	0.37	441,761	0.38	2,263	-0.03
Medicaid	11,042	20.20	11,210	21.47	168	0.02	243,691	21.49	236,509	21.27	-7,182	-0.03	254,733	0.21	247,719	0.21	-7,014	-0.01
Private	18,150	33.20	16,685	31.96	-1,465	-0.08	365,314	32.21	346,667	31.18	-18,647	-0.05	383,464	0.32	363,352	0.31	-20,112	-0.13
Self-Pay	1,739	3.18	1,053	2.02	-686	-0.39	71,100	6.27	68,596	6.17	-2,504	-0.04	72,839	0.06	69,649	0.06	-3,190	-0.43
No Charge	219	0.40	162	0.31	-57	-0.26	-	0.00	-	0.00	0	0.00	219	0.00	162	0.00	-57	-0.26
Other	816	1.49	834	1.60	18	0.02	34,028	3.00	35,751	3.22	1,723	0.05	34,844	0.03	36,585	0.03	1,741	0.07
Geography																		
Missing	2,456	4.49	2,285	4.38	-171	-0.07	31,880	2.81	29,148	2.62	-2,732	-0.09	34,336	0.03	31,433	0.03	-2,903	-0.16
Urban	15,128	27.67	14,225	27.24	-903	-0.06	712,907	62.87	707,431	63.62	-5,476	-0.01	728,035	0.61	721,656	0.62	-6,379	-0.07
Large town (rural)	13,000	23.78	12,463	23.87	-537	-0.04	243,059	21.43	235,454	21.17	-7,605	-0.03	256,059	0.22	247,917	0.21	-8,142	-0.07
Small town (rural)	11,438	20.92	10,695	20.48	-743	-0.06	81,220	7.16	77,878	7.00	-3,342	-0.04	92,658	0.08	88,573	0.08	-4,085	-0.11
Isolated (rural)	12,648	23.14	12,546	24.03	-102	-0.01	64,949	5.73	62,050	5.58	-2,899	-0.04	77,597	0.07	74,596	0.06	-3,001	-0.05

In addition to the AHRQ state inpatient dataset (SID) files, this study utilized the AHRQ SAS-based software program that is designed to provide users a series of ambulatory care

sensitive condition (ACSC) quality of care outcomes measures based on inpatient (hospital discharge) data files. This study used the AHRQ PQI SAS Version 5 (March 2015) software program to run against each of the state inpatient datasets (SID) for each year in this study (2008 and 2011). Table 12 represents the PQI rate means by year (2008 and 2011), and the change (Delta) in the risk-adjusted composite rates between the two years.

Table 12: Dependent Variable Means (PQI Rates)

		Delta PQI Rates						2011 PQI Rates						2008 PQI Rates					
		N=114 (all FIPS)		N=47 (no PCMH)		N=67 (w/PCMH)		N=114 (all FIPS)		N=47 (no PCMH)		N=67 (w/PCMH)		N=114 (all FIPS)		N=47 (no PCMH)		N=67 (w/PCMH)	
Dependent Variables		**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
PQI	**Age Cat**																		
90 (Overall)	**(1) >18<39**	-0.102	0.423	-0.180	0.539	-0.048	0.311	**1.008***	0.439	1.067	0.468	0.967	0.417	**1.110****	0.484	1.247	0.563	1.015	0.397
	(2) >40<64	**-0.140***	0.298	-0.214	0.384	-0.088	0.207	**0.960***	0.380	0.933	0.364	0.978	0.392	1.100	0.439	1.147	0.490	1.067	0.399
	(3) >65<74	**-0.214***	0.306	-0.283	0.373	-0.166	0.240	0.967	0.372	0.907	0.357	1.010	0.378	1.181	0.409	1.189	0.453	1.176	0.379
	(4) 75+	-0.164	0.267	-0.214	0.350	-0.129	0.182	0.958	0.310	0.907	0.295	0.993	0.318	1.122	0.317	1.120	0.366	1.123	0.281
91 (Acute)	**(1) >18<40**	**-0.233****	0.501	-0.397	0.614	-0.117	0.366	0.958	0.513	1.023	0.624	0.913	0.417	**1.193****	0.617	1.432	0.775	1.026	0.405
	(2) >40<65	-0.156	0.372	-0.232	0.497	-0.103	0.242	1.016	0.392	1.030	0.413	1.006	0.380	1.188	0.475	1.267	0.547	1.133	0.413
	(3) >65<75	-0.216	0.392	-0.262	0.490	-0.184	0.306	1.011	0.369	0.985	0.386	1.029	0.358	1.254	0.493	1.261	0.575	1.249	0.430
	(4) 75+	**-0.202***	0.339	-0.283	0.449	-0.145	0.220	1.023	0.369	0.978	0.364	1.054	0.372	1.233	0.442	1.255	0.517	1.217	0.383
92 (Chronic)	**(1) >18<41**	-0.018	0.505	-0.046	0.655	0.001	0.369	1.042	0.518	1.098	0.527	1.003	0.511	1.062	0.560	1.137	0.671	1.010	0.466
	(2) >40<66	**-0.135***	0.306	-0.210	0.380	-0.083	0.229	0.934	0.414	0.890	0.395	0.965	0.427	1.063	0.485	1.097	0.526	1.039	0.457
	(3) >65<76	**-0.226***	0.316	-0.309	0.368	-0.168	0.261	0.945	0.416	0.866	0.391	1.000	0.427	1.157	0.454	1.169	0.485	1.149	0.434
	(4) 75+	-0.171	0.278	-0.204	0.359	-0.147	0.202	0.907	0.330	0.852	0.323	0.945	0.332	1.073	0.335	1.063	0.353	1.081	0.324
PQI 90 (Overall)		**-0.002***	0.004	-0.003	0.005	-0.002	0.003	0.015	0.005	0.014	0.005	0.015	0.005	**0.017****	0.004	0.020	0.003	0.016	0.004
PQI 91 (Acute)		-0.001	0.002	-0.002	0.002	-0.001	0.002	0.006	0.002	0.006	0.002	0.006	0.002	0.007	0.002	0.007	0.003	0.007	0.002
PQI 92 (Chronic)		-0.002	0.002	-0.002	0.003	-0.001	0.002	0.009	0.003	0.008	0.003	0.009	0.003	0.010	0.004	0.010	0.004	0.010	0.003
***=p<.05 & **=<.01																			

There are 14 counties (FIPS) within Vermont and 100 within North Carolina for a total 114 counties in this study. Table 12 represents the descriptive statistics of the composite PQI rates for all 114 counties. There are four (4) age categories (Cat 1 (18-39), Cat 2 (40-64), Cat 3 (65-74), and Cat 4 (75+)) used in this study for each of the three risk-adjusted PQI composites: PQI 90 (Overall); PQI 91 (Acute); and PQI 92 (Chronic). Table 12 includes the overall PQI rates by age for all 114 counties, as well as a representation of rates for FIPS (counties) with NCQA-recognized PCMHs (67; NC=54, VT=13).

All three composite PQI mean rates across all age categories decreased from 2008 to 2011, as did the mean rates of each PQI regardless of age [PQI 90 (-.002), PQI 91 (-.001), PQI 92, (-.001)]. Among the age-specific mean differences for PQI 90, age category 3 (65-74) showed the greatest decrease among all FIPS (-.21) and the PCMH FIPS (-.17). As well, that same age category showed the highest risk-adjusted PQI over all others at 1.18 for all and PCMH-only FIPS. The 47 FIPS with no PCMHs showed the greatest decrease from 2008 to 2011 across all three PQI composite rates; however, the same 47 FIPS started in 2008 with the highest PQI mean rates. These mean rates indicate that the 67 FIPS where PCMH concentrations increased were already performing better than the 47 FIPS where no PCMH concentrations existed, even though the FIPS without PCMH concentrations decreased more significantly over the same time period than the FIPS with PCMHs (Figure 8).

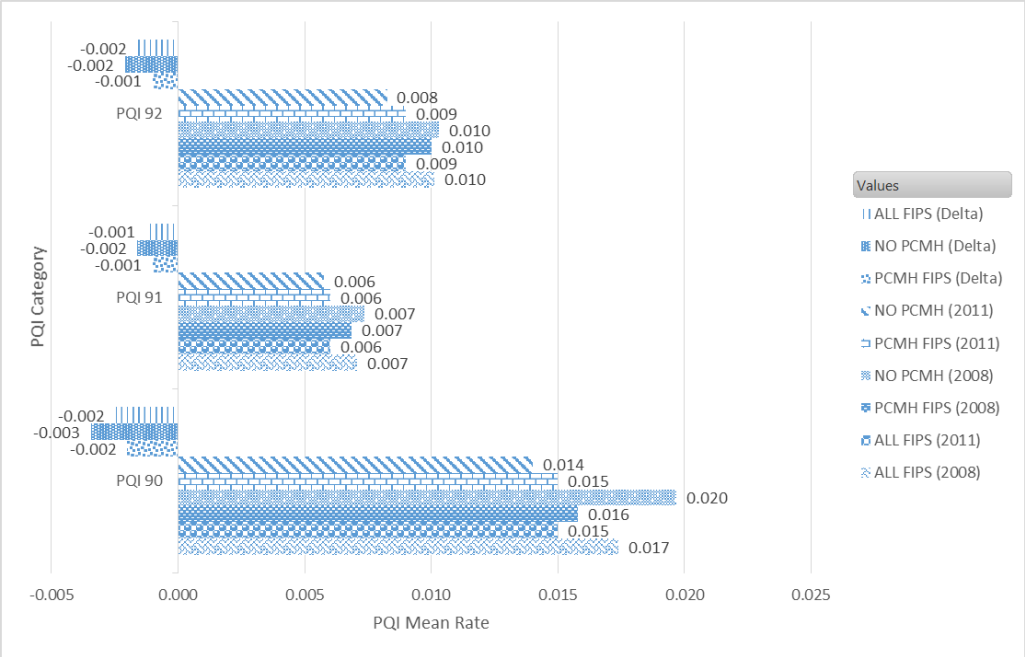


Figure 8: Mean PQI Rates (Chart)

In Figures 9–11, the age-specific rate means are charted. The younger age category (>18<39) show the highest rates in 2008 and also the greatest drops in PQIs 90 and 91 in 2011.

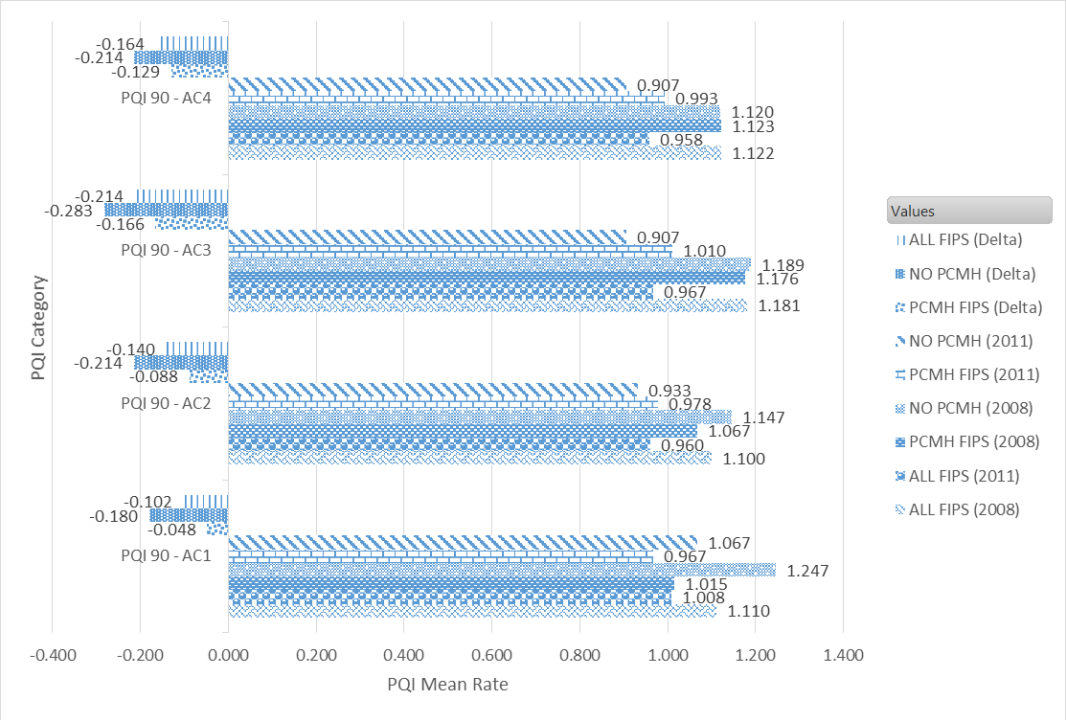


Figure 9: PQI 90 (Overall) Mean Rates by Age (Chart)

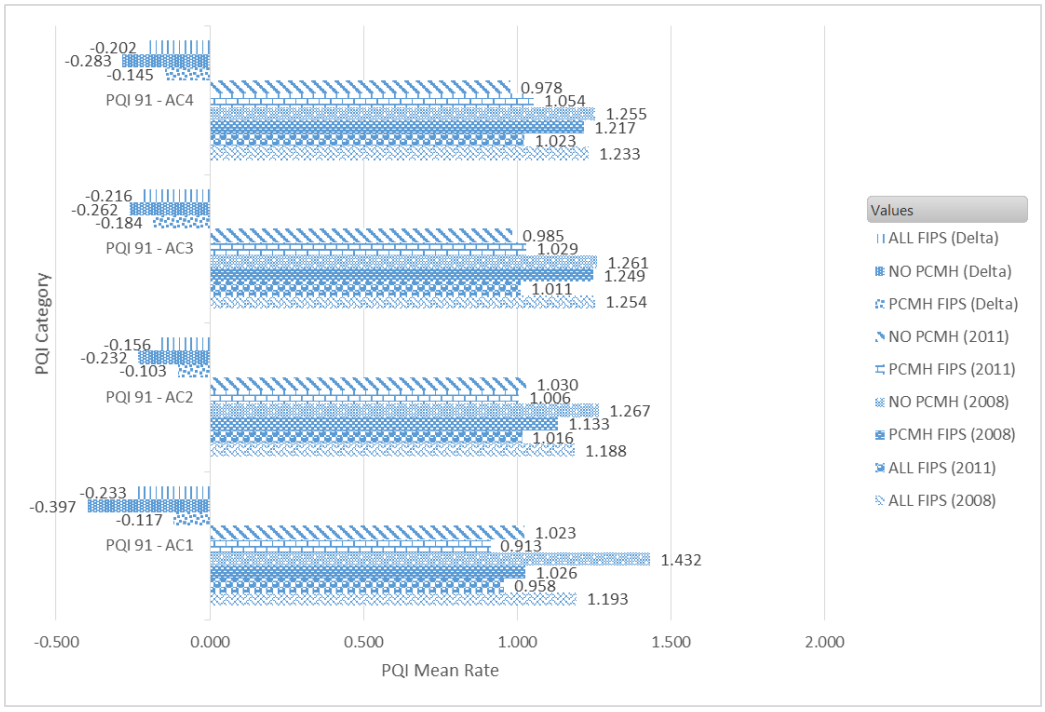


Figure 10: PQI 91 (Acute) Mean Rates by Age (Chart)

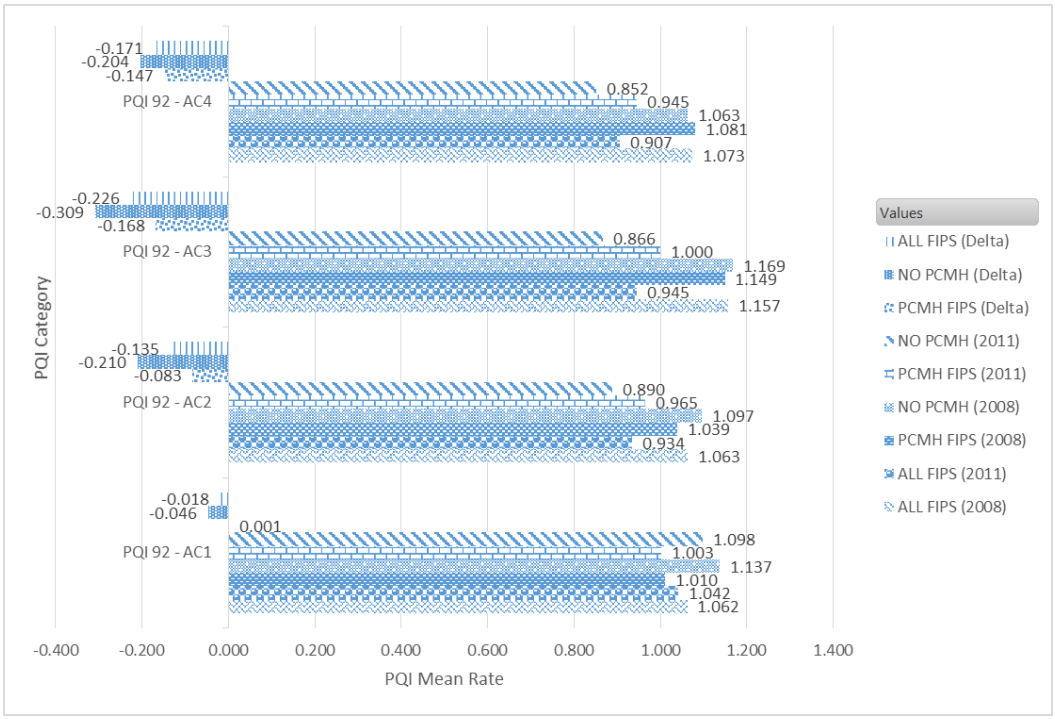


Figure 11: PQI 92 (Chronic) Mean Rates by Age (Chart)

For PQI 92, the older age category (>65<76) show the highest rates in 2008 and greatest drop in 2011. These two results make sense in terms of acute rates being higher for younger ages and chronic rates being higher for older age categories.

The NCQA PCMH recognition program standards were released in 2008. By 2012, the program had assessed ~4,800 practices. In 2011, NCQA released an updated version of the recognition program. The primary changes to the 2008 evaluation criteria were more explicit language in terms of alignment with the ONC MU program requirements for the use of EHRs.

For the purposes of this study, the focus is only those practices recognized under the 2008 standards, even though several more practices within both states (VT and NC) continued to become recognized under the new/updated standards.

After extracting data from the NCQA dataset for recognized primary care practices (Internal Medicine, General Practice, and Family Practice) recognized on the 2008 standards, the

resultant dataset included 1,421 doctors within 393 practices across NC (Doctors=1,181, Practices=322) and VT (Doctors=240, Practices=71); VT and NC represented ~30% of the total NCQA recognized doctors/practices at that time.

See Appendices A, B, and C for the results of the NCQA recognition data matched to the CMS NPI data and AHRQ SAS PQI population data to establish the primary care doctor (PCD) per population, PCMH per PCD ratios, PQI rates, and the PCMH capability composites used in this study.

Table 13 depicts that North Carolina (93%) represents the majority of recognized PCMH doctors versus Vermont at (7%); however, the overall percentage of recognized doctors in terms of density in Vermont counties (53%) is nearly three times that of North Carolina (18%).

Table 13: Population, Provider, Ratio Summary Chart

	Rec Prac	Total Docs	Pct of Tot Docs	Rec Docs	Pct of Tot Rec Docs	Total Pop >17 (2011)	Pct of Tot Pop	PCMH/PCD	PCD/Pop
VT Totals	71	454	7%	240	17%	498,000	6%	53%	1,097
NC Totals	322	6,423	93%	1,181	83%	7,363,190	94%	18%	1,146
Grand Totals	393	6,877	100%	1,421	100%	7,861,190	100%	21%	1,143

Means of the PCD and PCMH densities, as well as the PCMH capability composites are shown in Table 14. As would be expected, the PCMH density mean for all 114 FIPS areas was lower (~23%) when compared to the 67 FIPS areas with PCMHs (~39%), by a difference of ~16 percent. As well, the PCD density mean for the 67 FIPS areas was better at ~2400:1 than all 114 FIPS areas at ~3900:1, indicating the 67 FIPS areas with NCQA-recognized practices had better doctor-to-population ratios. It is also noted in Table 14 that the means of the PCD and PCMH

Table 14: Independent Variable Means (PCD/PCMH Densities and PCMH Cap Comp)

		N=114 (all FIPS)		N=47 (no PCMH)		N=67 (w/PCMH)	
Independent Variables		**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
	PCD Den	**3938****	4330	6119	5755	2408	1805
	PCMH Den	**0.227****	0.320	N/A		0.386	0.336
PCMH Capabilities	**IT**	10.452	9.299	N/A		17.783	3.963
	CSC	8.176	7.075			13.911	2.171
	CoC	10.292	8.900			17.512	2.695
	ACC	3.986	3.479			6.782	1.213
	RPT	4.372	3.858			7.439	1.526
	CDT	3.397	2.884			5.780	0.511
	NoN	1.280	1.230			2.178	0.777
	PxP	1.534	1.403			2.611	0.719
	PVS	2.097	1.837			3.569	0.670
	PTC	0.903	0.880			1.537	0.581
	MU	23.989	20.705			40.817	0.332
	MP	21.824	18.626			37.134	4.105
***=p<.05 & **=<.01**							

density rates are statistically significantly different between FIPS with PCMHs versus FIPS without PCMHs.

Directional Correlation and Predictive Strength Analysis

With regard to Specific Aim 2—that PCMH density rates within FIPS areas impact the risk-adjusted composite PQI rates—the author tested for correlation of the predictor variables PCD/population and PCMH/PCD density ratios (IVs) against the response variables, 2011 and Delta (2008-2011) PQI composite 90, 91, and 92 rates.

PCD and PCMH densities were used in a simple multiple regression analysis to predict 2011 and Delta (2008-2011) risk-adjusted avoidable hospital admission rates (PQIs) among the counties with PCMH practices within Vermont and North Carolina. The results are reported in

the following four tables and demonstrate varying strength of the correlations with each of the PQI rates.

The results in Table 15 indicate no statistical significance in any of the full models for PCD and PCMH density on any of the overall or age-specific Delta PQI rate means for all FIPS (n=114). The analysis of the PQI rates was done at two levels: 1) FIPS Summary-Level (no age categories), and 2) by four age-specific categories.

Table 15: Delta PQI Regression—All FIPS—PCD/PCMH Density

Aim 2 : Is there a statistical significance in the age-specific means of ***Delta*** PQI rates with regard to PCD and PCMH densities? ***(n=114)***												
		PCD		**PCMH**		**PCD**		**PCMH**		**F_Value**	**r-Sq**	**Sig**
PQI	**Age Cat**	**Corr**	**Sig**	**Corr**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**			
Delta 90 (Overall)	**(1) >18<39**	-0.061	0.259	0.076	0.212	-0.050	0.600	0.068	0.481	0.455	0.008	0.663
	(2) >40<64	0.008	0.466	0.067	0.238	0.019	0.201	0.070	0.735	0.274	0.005	0.761
	(3) >65<74	-0.081	0.195	0.030	0.376	-0.079	0.414	0.017	0.857	0.386	0.007	0.681
	(4) 75+	0.058	0.269	0.073	0.222	0.072	0.456	0.084	0.382	0.575	0.010	0.564
Delta 91 (Acute)	**(1) >18<40**	-0.084	0.186	0.182	0.026	-0.057	0.550	0.173	0.070	2.085	0.036	0.129
	(2) >40<65	0.040	0.337	0.104	0.136	0.058	0.545	0.113	0.239	0.791	0.014	0.456
	(3) >65<75	-0.030	0.378	-0.013	0.445	-0.032	0.136	-0.018	0.849	0.066	0.001	0.936
	(4) 75+	0.010	0.458	0.077	0.209	0.023	0.813	0.080	0.404	0.357	0.006	0.701
Delta 92 (Chronic)	**(1) >18<41**	-0.037	0.346	0.004	0.483	-0.038	0.695	-0.002	0.983	0.078	0.001	0.925
	(2) >40<66	-0.011	0.455	0.053	0.288	-0.002	0.980	0.052	0.586	0.156	0.003	0.856
	(3) >65<76	-0.102	0.139	0.076	0.212	-0.093	0.334	0.061	0.525	0.793	0.014	0.455
	(4) 75+	0.091	0.168	0.112	0.118	0.111	0.243	0.129	0.176	1.398	0.025	0.251
PQI 90 (Overall)		-0.008	0.468	0.069	0.234	0.003	0.972	0.069	0.473	0.262	0.005	0.770
PQI 91 (Acute)		0.033	0.364	-0.028	0.383	0.029	0.762	-0.023	0.808	0.090	0.002	0.914
PQI 92 (Chronic)		0.005	0.479	0.019	0.419	0.008	0.930	0.021	0.829	0.025	0.000	0.975
***=p<.05 & **=<.01**												

In addition, Table 16 indicates no statistical significance in any of the full models for PCD and PCMH density on any of the overall or age-specific Delta PQI rate means for the FIPS

Table 16: Delta PQI Regression—FIPS w/PCMH—PCD/PCMH Density

Aim 2 : Is there a statistical significance in the age-specific means of ***Delta*** PQI rates with regard to PCD and PCMH densities within communities with PCMHs? ***(n=67)***												
		PCD		**PCMH**		**PCD**		**PCMH**		**F_Value**	**r-Sq**	**Sig**
PQI	**Age Cat**	**Corr**	**Sig**	**Corr**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**			
Delta 90 (Overall)	**(1) >18<39**	**0.219***	0.037	-0.053	0.335	**.275***	0.037	-0.154	0.240	2.357	0.069	0.103
	(2) >40<64	-0.197	0.055	-0.152	0.110	-0.163	0.219	-0.093	0.482	1.548	0.046	0.221
	(3) >65<74	0.009	0.470	-0.111	0.186	0.057	0.668	-0.132	0.326	0.492	0.015	0.613
	(4) 75+	0.155	0.105	0.114	0.179	0.131	0.325	0.066	0.618	0.921	0.028	0.403
Delta 91 (Acute)	**(1) >18<40**	-0.059	0.318	0.038	0.381	-0.084	0.533	0.068	0.612	0.242	0.008	0.786
	(2) >40<65	-0.102	0.205	0.005	0.485	-0.120	0.372	0.048	0.718	0.405	0.012	0.669
	(3) >65<75	**-.024***	0.024	-0.150	0.113	-0.217	0.100	-0.070	0.589	8.161	0.063	0.123
	(4) 75+	-0.166	0.089	-0.109	0.189	-0.146	0.274	-0.056	0.672	1.003	0.030	0.372
Delta 92 (Chronic)	**(1) >18<41**	0.143	0.124	-0.036	0.387	0.180	0.177	-0.102	0.445	0.973	0.029	0.384
	(2) >40<66	-0.188	0.064	-0.134	0.139	-0.160	0.229	-0.076	0.566	1.340	0.040	0.269
	(3) >65<76	-0.092	0.230	-0.172	0.082	-0.033	0.801	-0.159	0.232	1.004	0.030	0.372
	(4) 75+	0.023	0.427	-0.050	0.343	0.047	0.725	-0.067	0.616	0.143	0.004	0.867
PQI 90 (Overall)		-0.104	0.201	-0.152	0.110	-0.056	0.673	-0.132	0.324	0.849	0.026	0.433
PQI 91 (Acute)		-0.066	0.299	**-.221***	0.036	0.017	0.895	-0.227	0.087	1.652	0.049	0.200
PQI 92 (Chronic)		0.012	0.463	-0.172	0.082	0.086	0.517	-0.204	0.127	1.198	0.036	0.308
***=p<.05 & **=<.01												

with PCMH (n=67), even though there is correlation (p<.05) with PCD density with PQI 90 age cat 1 (.219) and PQI 91 age cat 3 (-.024); as well, PCMH density shows negative (-.221) correlation (p<.05) for the overall Delta PQI 91 (Acute).

Table 17, regression results for all FIPS (n=114), shows a statistical significance in the full model for 2011 PQI 92 (2,114), f=3.775, r^2=.063 (p<.05) with positive correlation in PCD density r=-.183 (p<.05). There is also statistical significance in the full model for age-specific 2011 PQI 90 age cat 2 F(2,114), f=4.714, r^2=.078 (p<.05) with negative correlation in PCD r=-.165 (p<.05) and PCMH r=-.197 (p<.05) density; 2011 PQI 92 age cat 2 F(2,114), f=5.597, r^2=.092 (p<.01) with negative correlation in PCD r=-.194 (p<.05) and PCMH r=-.199 (p<.05) density; and 2011 PQI 92 age cat 3 F(2,114), f=2.997, r^2=.051 (p<.05) with negative correlation in PCD density r=-.189 (p<.05).

Table 17: 2011 PQI Regression—All FIPS—PCD/PCMH Density

Aim 2: Is there a statistical significance in the age-specific means of ***2011*** PQI rates with regard to PCD and PCMH densities? ***(n=114)***												
		PCD		**PCMH**		**PCD**		**PCMH**		**F_Value**	**r-Sq**	**Sig**
PQI	**Age Cat**	**Corr**	**Sig**	**Corr**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**			
2011 90 (Overall)	**(1) >18<39**	-0.058	0.268	**-.194***	0.019	-0.092	0.330	**-.209***	0.028	2.674	0.046	0.073
	(2) >40<64	**-.165***	0.040	**-.197***	0.018	**-.201***	0.031	**-.229***	0.015	4.714	**.078***	0.011
	(3) >65<74	**-.187***	0.026	-0.086	0.183	**-.201***	0.035	-0.118	0.213	2.716	0.047	0.071
	(4) 75+	-0.119	0.103	0.017	0.430	-0.120	0.213	0.002	0.981	0.799	0.014	0.452
2011 91 (Acute)	**(1) >18<40**	0.007	0.469	-0.130	0.084	-0.014	0.886	-0.132	0.169	0.961	0.017	0.386
	(2) >40<65	-0.046	0.315	-0.148	0.058	-0.071	0.456	-0.159	0.096	1.525	0.027	0.222
	(3) >65<75	-0.122	0.097	-0.053	0.289	-0.134	0.161	-0.074	0.437	1.153	0.020	0.319
	(4) 75+	-0.108	0.126	0.062	0.256	-0.101	0.294	0.046	0.630	0.774	0.014	0.463
2011 92 (Chronic)	**(1) >18<41**	-0.084	0.188	**-.189***	0.022	-0.117	0.215	**-.208***	0.028	2.873	0.049	0.061
	(2) >40<66	**-.194***	0.019	**-.199***	0.017	**-.231****	0.013	**-.236****	0.011	5.597	**.092****	0.005
	(3) >65<76	**-.189***	0.022	-0.093	0.163	-.209*	0.028	-0.126	0.180	2.997	**.051***	0.054
	(4) 75+	-0.100	0.144	-0.034	0.359	-0.108	0.259	-0.052	0.590	0.710	0.013	0.494
PQI 90 (Overall)		**-.166***	0.039	-0.111	0.121	**-.188***	0.048	-0.141	0.137	2.717	0.047	0.070
PQI 91 (Acute)		-0.096	0.154	-0.036	0.351	-0.105	0.275	-0.053	-0.555	0.677	0.012	0.510
PQI 92 (Chronic)		**-.183***	0.026	-0.142	0.066	**-.211***	0.026	-0.175	0.062	3.775	**.063***	0.026
***=p<.05 & **=<.01**												

Table 18, regression results for all FIPS with PCMHs (n=67), shows statistical significance in the full model for 2011 PQI 92 (2,67), f=5.983, r^2=.158 (p<.01) with negative correlation in PCMH density r=-.333 (p<.01); and 2011 PQI 90 (2,67), f=3.198, r^2=.109 (p<.01) with negative correlation in PCMH density r=-.269 (p<.01). There is also statistical significance in the full model for age-specific 2011 PQI 90 age cat 2 F(2,67), f=6.219, r^2=.163 (p<.01) with negative correlation in PCMH density r=-.368 (p<.01); 2011 PQI 90 age cat 3 F(2,67), f=4.826, r^2=.131 (p<.01) with negative correlation in PCMH density r=-.269 (p<.01); 2011 PQI 92 age cat 2 F(2,67), f=7.318, r^2=.186 (p<.05) with negative correlation in PCMH density r=-.400 (p<.01); and 2011 PQI 92 age cat 3 F(2,67), f=6.182, r^2=.162 (p<.01) with negative correlation in PCMH density r=-.299 (p<.01).

Table 18: 2011 PQI Regression—FIPS w/PCMH—PCD/PCMH Density

Aim 2 : Is there a statistical significance in the age-specific means of ***2011*** PQI rates with regard to PCD and PCMH densities within communities with PCMHs? ***(n=67)***												
		PCD		**PCMH**		**PCD**		**PCMH**		**F_Value**	**r-Sq**	**Sig**
PQI	**Age Cat**	**Corr**	**Sig**	**Corr**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**			
2011 90 (Overall)	**(1) >18<39**	0.080	0.259	**-.218***	0.038	0.184	0.158	**-.285***	0.031	2.663	0.077	0.077
	(2) >40<64	0.021	0.434	**-.368****	0.001	0.179	0.151	**-.433****	0.001	6.219	**0.163****	0.003
	(3) >65<74	0.127	0.152	**-.269****	0.014	**.260***	0.042	**-.364****	0.005	4.826	**.131****	0.011
	(4) 75+	0.115	0.178	-0.105	0.200	0.176	0.186	-0.169	0.205	1.258	0.038	0.291
2011 91 (Acute)	**(1) >18<40**	0.023	0.426	-0.133	0.142	0.082	0.536	-0.163	0.225	0.769	0.023	0.468
	(2) >40<65	0.056	0.326	**-.219***	0.038	0.157	0.230	-.267*	0.037	2.374	0.069	0.101
	(3) >65<75	0.078	0.266	-0.148	0.117	0.152	0.253	-0.203	0.128	1.393	0.042	0.256
	(4) 75+	0.080	0.260	0.002	0.495	0.092	0.495	-0.238	0.812	0.235	0.007	0.791
2011 92 (Chronic)	**(1) >18<41**	0.094	0.224	**-.224***	0.035	0.203	0.119	**-.297***	0.024	2.993	0.086	0.057
	(2) >40<66	0.006	0.482	**-.400****	0.000	0.175	0.154	**-.463****	0.000	7.318	**0.186****	0.001
	(3) >65<76	0.142	0.127	**-.299****	0.007	**.289***	0.022	**-.405****	0.002	6.182	**0.162****	0.004
	(4) 75+	0.137	0.134	-.191	0.061	0.239	0.068	**-.278***	0.034	3.001	0.086	0.057
PQI 90 (Overall)		0.081	0.257	**-.269****	0.014	0.206	0.108	**-.344****	0.009	3.198	**.109***	0.025
PQI 91 (Acute)		0.074	0.277	-0.102	0.205	0.128	0.338	-0.149	0.266	0.808	0.025	0.450
PQI 92 (Chronic)		0.079	0.263	**-0.333****	0.003	0.231	0.065	**-.419****	0.001	5.983	**.158****	0.004
***=p<.05 & **=<.01**												

With regard to Specific Aim 3—that PCMH capability composites impact the risk-adjusted composite PQI rates—the author tested for correlation of the predictor variables PCD/population and PCMH capability composites (IVs) against the response variables, 2011 and Delta (2008-2011) PQI composite 90, 91, and 92 rates.

PCD density and PCMH capability composites were used in a simple multiple regression analysis to predict 2011 and Delta (2008–2011) risk-adjusted avoidable hospital admission rates (PQI) among the counties with PCMH practices within Vermont and North Carolina. The results are reported, demonstrate varying strength of the correlations with each of the PQI rates. The analysis of the PQI rates was done at two levels: 1) Summary level (no age categories), and 2) By four age-specific categories. The 10 PCMH capability composites are used in the regression models that follow as a replacement for the PCMH density used in evaluating Specific Aim 2.

The results in Table 19 indicate no statistical significance in any of the regression models for PCD density and the 10 PCMH capability composites or any of the Delta PQI overall or age-specific Delta PQI rate means for all FIPS (n=114), even though there is correlation (p<.01-.05) with several of the PCMH capability composites amongst several age-specific PQI means.

Table 20 indicates no statistical significance in any of the regression models for PCD density and the 10 PCMH capability composites on any of the overall Delta PQI rate means for the FIPS with PCMH (n=67); however, there is statistical significance in the full model for age-specific Delta PQI age cat 2 F(11,67), f=2.224, r^2=.555 (p<.05) with positive correlation in information technology (IT) r=.227 (p<.05), clinical data tools (CDT) r=.361 (p<.01), and patient communications (PTC) r=.228 (p<.05).

The results in Table 21 indicate statistical significance in the full models for PCD density and the 10 PCMH capability composites for all FIPS (n=114) on 2011 PQI 90, F(11,114), f=2.017, r^2=.179 (p<.05) with negative correlation on PCD density at r=-.183 (p<.05); and 2011 PQI 92 F(11,114), f=2.201, r^2=.192 (p<.05) with negative correlation on PCD density at r=-.166 (p<.05) and positive correlation for condition specific care (CSC) r=.153 (p<.05). There is also statistical significance in the full models for age-specific 2011 PQI 90 age cat 2 F(11,114), f=2.174, r^2=.190 (p<.05) with negative correlation on PCD density at r=-.165 (p<.05); 2011 PQI 90 age cat 3 F(11,114), f=1.868, r^2=.168 (p<.05) with negative correlation on PCD density at r=-.182 (p<.05), and positive correlations for CSC r=.166, ACC r=.175 and PXP r=.166; 2011 PQI 92 age cat 2 F(11,114), f=2.275, r^2=.197 (p<.05) with negative correlation on PCD density at r=-.194 (p<.05); and 2011 PQI 92 age cat 3 F(11,114), f=1.889, r^2=.169 (p<.05) with positive correlations on PCD density at r=.189 (p<.05), IT r=.167, CSC r=.188, COC r=.188, ACC r=.197, RPT r=.163, and PXP r=.186.

Table 19: Delta PQI Regression—All FIPS—10 PCMH Capability Composites

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within all FIPs with regard to PCD densities and 10 PCMH capabilities? (n=114)

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	0.944	0.092	0.502
PQI 91 (Acute)	0.773	0.077	0.666
PQI 92 (Chronic)	0.828	0.082	0.612

IV		PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		-0.008	0.468	0.095	0.365	0.033	0.364	0.107	0.311	0.005	0.479	0.088	0.405
PCMH Capabilities	IT	0.243**	0.005	0.228	0.527	0.168*	0.037	0.198	0.587	0.214**	0.011	0.331	0.362
	CSC	0.209**	0.013	0.189	0.815	0.127	0.089	0.061	0.941	0.180*	0.028	0.534	0.511
	CoC	0.231**	0.007	0.468	0.419	0.157	0.048	0.629	0.282	0.195*	0.019	0.461	0.429
	ACC	0.212**	0.012	-0.074	0.897	0.137	0.074	0.102	0.861	0.181*	0.027	-0.058	0.921
	RPT	0.196*	0.019	-0.322	0.461	0.110	0.122	-0.457	0.300	0.162*	0.043	-0.238	0.588
	CDT	0.199*	0.017	-0.206	0.723	0.122	0.099	-0.225	0.701	0.161*	0.043	-0.510	0.385
	NoN	0.244**	0.004	0.231	0.368	0.137	0.073	0.008	0.976	0.202*	0.016	0.131	0.612
	PxP	0.172*	0.034	-0.089	0.735	0.097	0.151	-0.092	0.728	0.136	0.074	-0.096	0.717
	PVS	0.207**	0.013	-0.184	0.696	0.125	0.092	-0.232	0.627	0.173*	0.033	-0.293	0.538
	PTC	0.209**	0.013	0.033	0.880	0.165*	0.040	0.208	0.343	0.167*	0.038	-0.041	0.851

*=p<.05 & **=<.01

Aim 3: Is there a statistical significance in the *age-specific* means of *Delta* PQI rates within all FIPs with regard to PCD densities and 10 PCMH capabilities? (n=114)

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	0.990	0.096	0.461
PQI 90 (Age Cat 2)	0.901	0.089	0.542
PQI 90 (Age Cat 3)	0.642	0.065	0.789
PQI 90 (Age Cat 4)	0.741	0.074	0.697

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.061	0.259	0.000	0.997	0.008	0.466	0.112	0.285	-0.081	0.195	-0.013	0.902	0.058	0.269	0.143	0.177

Table 19: Continued

PCMH																	
	IT	0.182*	0.027	0.029	0.935	0.229**	0.007	0.187	0.605	0.202*	0.016	0.266	0.468	0.183*	0.025	0.256	0. 483
	CSC	0.167*	0.038	0.569	0.480	0.196*	0.018	-0.019	0.981	0.172*	0.034	-0.077	0.925	0.149	0.056	0.173	0.832
	CoC	0.190*	0.021	0.605	0.296	0.222**	0.009	0.502	0.387	0.179*	0.028	-0.127	0.828	0.168*	0.037	0.485	0.407
	ACC	0.183*	0.026	0.270	0.639	0.199*	0.017	-0.118	0.838	0.173*	0.033	0.094	0.873	0.148	0.058	-0.138	0.813
	RPT	0.152*	0.053	-0.457	0.296	0.185*	0.024	-0.308	0.482	0.164*	0.041	-0.338	0.446	0.142	0.066	-0.062	0.889
	CDT	0.145	0.062	-0.848	0.147	0.189*	0.022	-0.125	0.831	0.173*	0.033	0.207	0.726	0.140	0.068	-0.189	0.748
	NoN	0.201**	0.016	0.191	0.457	0.236**	0.006	0.249	0.334	0.211*	0.012	0.331	0.205	0.163*	0.041	0.046	0.858
	PxP	0.170*	0.035	0.221	0.401	0.166*	0.039	-0.073	0.781	0.158*	0.047	0.036	0.893	0.096	0.155	-0.264	0.321
	PVS	0.154*	0.051	-0.546	0.248	0.202*	0.016	-0.021	0.964	0.162*	0.043	-0.288	0.548	0.149	0.057	-0.075	0.875
	PTC	0.184**	0.025	0.175	0.420	0.191*	0.021	-0.003	0.990	0.186*	0.024	0.110	0.619	0.146	0.060	-0.026	0.905

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	1.72	0.156	0.079
PQI 91 (Age Cat 2)	0.916	0.09	0.528
PQI 91 (Age Cat 3)	0.287	0.03	0.987
PQI 91 (Age Cat 4)	0.856	0.085	0.585

IV		PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	-0.084	0.186	0.043	0.668	0.040	0.337	0.125	0.235	-0.030	0.378	0.013	0.902	0.010	0.458	0.113	0.283
PCMH Capabilities	IT	0.29**	0.001	-0.134	0.700	0.198*	0.017	0.277	0.444	0.078	0.204	-0.048	0.898	0.216**	0.010	0.055	0.880
	CSC	0.281**	0.001	0.480	0.538	0.148	0.058	-0.292	0.718	0.061	0.258	-0.636	0.447	0.186*	0.024	-0.313	0.700
	CoC	0.310**	0.000	0.807	0.150	0.174*	0.032	0.284	0.624	0.086	0.183	0.159	0.791	0.217**	0.010	0.553	0.342
	ACC	0.295**	0.001	0.052	0.926	0.149	0.057	-0.028	0.961	0.076	0.211	0.181	0.762	0.191*	0.021	-0.064	0.913
	RPT	0.255**	0.003	-0.796	0.061	0.144	0.063	-0.347	0.429	0.060	0.264	-0.387	0.393	0.185*	0.025	-0.204	0.641
	CDT	0.270**	0.002	-0.296	0.598	0.145	0.062	-0.020	0.973	0.081	0.196	0.565	0.349	0.185*	0.024	0.038	0.948
	NoN	0.313**	0.000	0.321	0.196	0.194*	0.019	0.232	0.367	0.080	0.198	0.151	0.569	0.218**	0.010	0.166	0.519
	PxP	0.279**	0.001	0.207	0.414	0.129	0.086	-0.030	0.910	0.070	0.231	0.008	0.976	0.153*	0.052	-0.169	0.522
	PVS	0.271**	0.002	-0.491	0.283	0.154*	0.051	-0.052	0.912	0.063	0.254	-0.047	0.924	0.194*	0.019	0.063	0.895
	PTC	0.284**	0.001	0.198	0.345	0.205**	0.014	0.235	0.282	0.085	0.186	0.159	0.479	0.211**	0.012	0.142	0.515

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	0.457	0.047	0.925
PQI 92 (Age Cat 2)	0.822	0.081	0.618
PQI 92 (Age Cat 3)	1.062	0.103	0.400

Table 19: Continued

PQI 92 (Age Cat 4)		0.627	0.063	0.802													
IV		PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		-0.037	0.346	-0.029	0.786	-0.011	0.455	0.092	0.380	-0.102	0.139	-0.025	0.811	0.091	0.168	0.154	0.148
PCMH Capabilities	IT	0.074	0.216	0.103	0.781	0.219**	0.009	0.104	0.775	0.253**	0.003	0.379	0.292	0.131	0.083	0.253	0.490
	CSC	0.061	0.260	0.385	0.642	0.199*	0.017	0.059	0.942	0.219**	0.010	0.150	0.851	0.104	0.134	0.431	0.600
	CoC	0.074	0.216	0.259	0.663	0.223**	0.009	0.556	0.341	0.217**	0.010	-0.281	0.626	0.111	0.120	0.377	0.521
	ACC	0.075	0.214	0.364	0.539	0.204*	0.015	-0.151	0.795	0.213**	0.012	0.035	0.951	0.099	0.148	-0.154	0.793
	RPT	0.059	0.267	-0.111	0.804	0.188*	0.023	-0.248	0.572	0.21**	0.012	-0.270	0.534	0.093	0.162	0.014	0.975
	CDT	0.038	0.343	-0.915	0.127	0.191*	0.021	-0.144	0.806	0.21**	0.012	0.021	0.971	0.090	0.169	-0.267	0.652
	NoN	0.090	0.170	0.086	0.744	0.233**	0.006	0.239	0.355	0.271**	0.002	0.434	0.091	0.106	0.131	-0.020	0.939
	PxP	0.068	0.237	0.168	0.533	0.169*	0.036	-0.082	0.756	0.195*	0.019	0.047	0.858	0.042	0.327	-0.313	0.243
	PVS	0.052	0.292	-0.388	0.424	0.205**	0.014	0.023	0.962	0.206**	0.014	-0.354	0.452	0.100	0.144	-0.108	0.822
	PTC	0.085	0.185	0.130	0.561	0.168*	0.037	-0.106	0.628	0.233**	0.006	0.100	0.644	0.094	0.161	-0.068	0.757
*=p<.05 & **=<.01																	

Table 20: Delta PQI Regression–FIPS w/PCMH—10 PCMH Capability Composites

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and 10 PCMH capabilities? (n=67)

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	1.398	0.219	0.200
PQI 91 (Acute)	0.905	0.153	0.542
PQI 92 (Chronic)	0.852	0.146	0.590

IV		PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		-0.104	0.201	-0.083	0.510	-0.066	0.299	-0.046	0.727	0.012	0.463	0.022	0.869
PCMH Capabilities	IT	0.218*	0.038	0.112	0.462	0.146	0.120	0.072	0.650	0.217	0.039	0.134	0.399
	CSC	-0.029	0.407	0.234	0.345	-0.092	0.229	0.134	0.602	0.040	0.374	0.294	0.257
	CoC	0.151	0.111	0.092	0.603	0.106	0.198	0.132	0.477	0.141	0.128	0.080	0.668
	ACC	0.005	0.483	-0.031	0.874	-0.020	0.437	0.049	0.809	0.048	0.349	-0.009	0.965
	RPT	-0.086	0.246	-0.116	0.496	-0.146	0.120	-0.157	0.374	-0.045	0.358	-0.074	0.678
	CDT	-0.26*	0.017	-0.344*	0.037	-0.255*	0.019	-0.271	0.112	-0.190	0.062	-0.323	0.060
	NoN	0.211*	0.043	0.289	0.079	0.032	0.397	0.061	0.717	0.148	0.116	0.161	0.344
	PxP	-0.146	0.118	-0.086	0.513	-0.142	0.125	-0.070	0.610	-0.115	0.178	-0.075	0.584
	PVS	-0.020	0.436	-0.281	0.125	-0.080	0.261	-0.238	0.211	0.004	0.487	-0.251	0.188
	PTC	0.077	0.267	-0.001	0.997	0.121	0.164	0.136	0.351	0.040	0.374	-0.061	0.679

*=p<.05 & **=<.01

Aim 3: Is there a statistical significance in the *age-specific* means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and 10 PCMH capabilities? (n=67)

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	1.725	0.257	0.092
PQI 90 (Age Cat 2)	1.241	0.199	0.284
PQI 90 (Age Cat 3)	0.878	0.149	0.566
PQI 90 (Age Cat 4)	0.923	0.156	0.525

IV		PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		0.143	0.124	0.155	0.210	-0.188	0.064	-0.166	0.196	-0.092	0.230	-0.076	0.563	0.023	0.427	0.035	0.792
PCMH Capabilitie	IT	0.198*	0.054	-0.019	0.898	0.184	0.068	0.103	0.505	0.123	0.162	0.106	0.505	0.207	0.046	0.125	0.427
	CSC	0.129	0.149	0.248	0.305	-0.053	0.335	0.132	0.598	-0.080	0.260	0.093	0.717	-0.023	0.425	0.182	0.478
	CoC	0.313**	0.005	0.217	0.214	0.156	0.104	0.119	0.508	-0.031	0.402	-0.157	0.397	0.128	0.151	0.122	0.508

Table 20: Continued

	ACC	0.233*	0.029	0.152	0.426	-0.010	0.467	-0.066	0.739	-0.051	0.341	0.055	0.786	-0.02	0.436	-0.058	0.776
	RPT	0.032	0.398	-0.261	0.118	-0.084	0.249	-0.092	0.593	-0.088	0.239	-0.114	0.522	-0.049	0.348	0.011	0.948
	CDT	-0.103	0.203	-0.284	0.076	-0.246*	0.022	-0.273	0.101	-0.163	0.093	-0.214	0.209	-0.209*	0.045	-0.271	0.111
	NoN	0.243*	0.024	0.205	0.198	0.207*	0.046	0.272	0.102	0.157	0.102	0.336*	0.051	0.103	0.204	0.103	0.541
	PxP	0.131	0.146	0.143	0.266	-0.124	0.158	-0.065	0.623	-0.065	0.300	0.006	0.966	-0.236*	0.028	-0.213	0.121
	PVS	0.041	0.372	-0.295	0.100	0.010	0.469	-0.177	0.338	-0.113	0.181	-0.289	0.131	-0.011	0.465	-0.171	0.366
	PTC	0.181	0.071	0.140	0.307	0.043	0.365	-0.025	0.859	0.077	0.268	0.060	0.681	0.042	0.367	-0.053	0.716

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	1.698	0.253	0.098
PQI 91 (Age Cat 2)	2.224	0.555*	0.026
PQI 91 (Age Cat 3)	0.872	0.149	0.572
PQI 91 (Age Cat 4)	1.101	0.18	0.378

IV		PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	-0.059	0.318	-0.046	0.708	-0.102	0.205	-0.082	0.488	-0.243*	0.024	-0.201	0.129	-0.166	0.089	-0.156	0.228
PCMH Capabilities	IT	0.156	0.104	-0.071	0.634	0.227*	0.032	0.137	0.338	-0.075	0.274	-0.041	0.796	0.161	0.097	0.038	0.808
	CSC	0.094	0.226	0.218	0.367	-0.151	0.111	0.043	0.854	-0.243*	0.024	-0.115	0.654	-0.085	0.248	-0.043	0.865
	CoC	0.318**	0.004	0.329	0.062	0.067	0.295	-0.017	0.918	-0.072	0.282	-0.037	0.843	0.184	0.068	0.191	0.295
	ACC	0.190	0.061	0.018	0.926	-0.119	0.169	-0.004	0.984	-0.117	0.172	0.077	0.708	-0.023	0.427	-0.047	0.816
	RPT	-0.051	0.342	-0.415*	0.015	-0.123	0.161	-0.120	0.453	-0.188	0.064	-0.117	0.509	-0.047	0.352	-0.055	0.752
	CDT	-0.044	0.362	-0.085	0.592	-0.361**	0.001	-0.366*	0.019	-0.199*	0.053	-0.108	0.524	-0.209	0.045	-0.151	0.365
	NoN	0.264*	0.015	0.273	0.089	0.185	0.067	0.315*	0.043	-0.020	0.437	0.169	0.321	0.175	0.078	0.184	0.270
	PxP	0.112	0.183	0.147	0.255	-0.146	0.120	-0.046	0.710	-0.088	0.240	-0.006	0.964	-0.165	0.092	-0.139	0.302
	PVS	0.034	0.391	-0.261	0.144	-0.075	0.274	-0.252	0.144	-0.189	0.063	-0.181	0.340	0.008	0.475	-0.085	0.647
	PTC	0.160	0.097	0.180	0.191	0.228*	0.031	0.197	0.139	0.000	0.498	0.112	0.446	0.150	0.112	0.133	0.357

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	1.203	0.194	0.307
PQI 92 (Age Cat 2)	0.852	0.146	0.591
PQI 92 (Age Cat 3)	1.030	0.171	0.433
PQI 92 (Age Cat 4)	0.877	0.149	0.568

Table 20: Continued

		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		0.219*	0.037	0.227	0.079	-0.197	0.055	-0.178	0.180	0.009	0.470	0.006	0.961	0.155	0.105	0.165	0.211
PCMH Capabilities	IT	0.166	0.090	0.009	0.953	0.135	0.138	0.064	0.687	0.215*	0.040	0.156	0.321	0.190	0.062	0.107	0.501
	CSC	0.119	0.168	0.163	0.515	-0.007	0.479	0.122	0.635	0.027	0.415	0.140	0.583	0.044	0.362	0.242	0.349
	CoC	0.223*	0.035	0.069	0.701	0.176	0.078	0.164	0.377	0.015	0.453	-0.186	0.311	0.094	0.224	0.087	0.637
	ACC	0.202*	0.050	0.209	0.296	0.036	0.385	-0.084	0.680	0.000	0.500	0.034	0.867	0.004	0.486	-0.051	0.802
	RPT	0.086	0.244	-0.090	0.601	-0.048	0.349	-0.064	0.718	-0.002	0.494	-0.099	0.570	-0.021	0.434	0.021	0.904
	CDT	-0.104	0.201	-0.314	0.060	-0.157	0.102	-0.178	0.295	-0.098	0.216	-0.196	0.242	-0.136	0.137	-0.233	0.172
	NoN	0.183	0.069	0.130	0.433	0.193	0.059	0.218	0.201	0.255*	0.019	0.394*	0.021	0.063	0.306	0.042	0.806
	PxP	0.113	0.181	0.103	0.439	-0.090	0.235	-0.060	0.662	-0.032	0.398	0.013	0.922	-0.234	0.028	-0.235	0.089
	PVS	0.046	0.355	-0.213	0.251	0.050	0.342	-0.100	0.599	-0.037	0.383	-0.266	0.158	0.017	0.446	-0.138	0.468
	PTC	0.159	0.100	0.094	0.507	-0.033	0.397	-0.103	0.481	0.133	0.142	0.052	0.717	0.022	0.431	-0.088	0.550
*=p<.05 & **=<.01																	

Table 21: 2011 PQI Regression—All FIPS—10 PCMH Capability Composites

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within all FIPs with regard to PCD densities and 10 PCMH capabilities? (n=114)

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	2.017	0.179*	0.034
PQI 91 (Acute)	1.121	0.108	0.353
PQI 92 (Chronic)	2.201	.192*	0.020

IV		PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	-0.166*	0.039	-0.175	0.080	-0.096	0.154	-0.112	0.281	-0.183*	0.026	-0.188	0.059
PCMH Capabilities	IT	0.120	0.101	0.233	0.497	0.064	0.248	0.137	0.702	0.136	0.074	0.256	0.452
	CSC	0.137	0.074	2.169**	0.006	0.078	0.204	1.786	0.027	0.153*	0.052	2.133**	0.006
	CoC	0.120	0.103	0.418	0.448	0.069	0.231	0.461	0.422	0.133	0.079	0.336	0.539
	ACC	0.142	0.066	0.249	0.651	0.079	0.201	-0.102	0.859	0.160	0.044	0.41	0.452
	RPT	0.111	0.119	0.025	0.952	0.069	0.232	0.140	0.747	0.122	0.097	-0.024	0.953
	CDT	0.087	0.178	-1.885**	0.001	0.040	0.335	-1.496	0.011	0.103	0.137	-1.879**	0.001
	NoN	0.100	0.145	-0.21	0.390	0.075	0.215	-0.028	0.911	0.101	0.143	-0.294	0.225
	PxP	0.128	0.088	0.288	0.251	0.082	0.193	0.258	0.324	0.140	0.069	0.276	0.267
	PVS	0.092	0.165	-1.112	0.015	0.045	0.319	-0.894	0.058	0.107	0.128	-1.108**	0.014
	PTC	0.077	0.208	-0.154	0.457	0.014	0.442	-0.268	0.215	0.103	0.139	-0.074	0.719

Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within all FIPs with regard to PCD densities and 10 PCMH capabilities? (n=114)

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	1.57	0.145	0.119
PQI 90 (Age Cat 2)	2.174	.190*	0.021
PQI 90 (Age Cat 3)	1.868	.168*	0.052
PQI 90 (Age Cat 4)	1.335	0.126	0.216

Table 21: Continued

IV		PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		-0.058	0.268	-0.144	0.156	-0.165*	0.040	-0.198*	0.047	-0.182*	0.026	-0.176	0.080	-0.119	0.103	-0.088	0.393
PCMH Capabilities	IT	-0.058	0.269	0.217	0.536	0.091	0.167	0.287	0.400	0.145	0.062	0.214	0.535	0.137	0.073	0.121	0.733
	CSC	-0.056	0.277	1.969**	0.013	0.099	0.148	2.416**	0.002	0.166*	0.039	1.872*	0.017	0.158	0.047	1.427	0.074
	CoC	-0.088	0.176	0.038	0.946	0.078	0.204	0.481	0.379	0.145	0.062	0.177	0.749	0.158	0.047	0.505	0.375
	ACC	-0.062	0.255	0.296	0.598	0.096	0.155	0.090	0.869	0.174*	0.032	0.436	0.431	0.175	0.031	0.285	0.615
	RPT	-0.091	0.168	-0.131	0.758	0.068	0.235	-0.028	0.946	0.142	0.066	-0.001	0.998	0.142	0.066	0.067	0.877
	CDT	-0.114	0.114	-1.684**	0.004	0.045	0.317	-1.998**	0.000	0.124	0.094	-1.605**	0.005	0.128	0.088	-1.327*	0.022
	NoN	-0.069	0.232	-0.134	0.589	0.052	0.290	-0.301	0.216	0.118	0.105	-0.227	0.357	0.131	0.082	-0.125	0.619
	PxP	-0.099	0.147	0.014	0.955	0.082	0.194	0.253	0.310	0.166*	0.039	0.333	0.188	0.159	0.045	0.237	0.359
	PVS	-0.087	0.179	-0.858	0.064	0.054	0.285	-1.178**	0.009	0.119	0.103	-1.063*	0.020	0.125	0.093	-0.779	0.095
	PTC	-0.037	0.349	0.122	0.564	0.068	0.237	-0.053	0.797	0.113	0.116	-0.075	0.717	0.058	0.271	-0.334	0.120

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	0.732	0.073	0.705
PQI 91 (Age Cat 2)	1.303	0.123	0.234
PQI 91 (Age Cat 3)	1.115	0.107	0.357
PQI 91 (Age Cat 4)	0.881	0.087	0.562

IV		PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		0.007	0.469	-0.047	0.658	-0.046	0.315	-0.094	0.360	-0.122	0.097	-0.140	0.177	-0.108	0.126	-0.089	0.395
PCMH Capabilities	IT	-0.067	0.240	-0.082	0.821	-0.006	0.476	0.043	0.904	0.061	0.260	0.139	0.697	0.114	0.114	0.201	0.578
	CSC	-0.058	0.271	1.384	0.092	0.018	0.423	2.246**	0.005	0.079	0.203	1.729*	0.033	0.117	0.107	1.110	0.172
	CoC	-0.063	0.253	0.399	0.496	-0.008	0.467	0.357	0.531	0.066	0.242	0.358	0.533	0.124	0.094	0.499	0.390
	ACC	-0.056	0.279	0.004	0.995	0.007	0.469	-0.206	0.717	0.084	0.188	0.094	0.870	0.127	0.090	-0.042	0.942
	RPT	-0.071	0.225	-0.179	0.685	0.012	0.448	0.274	0.523	0.064	0.248	0.071	0.870	0.109	0.123	0.076	0.862
	CDT	-0.097	0.152	-1.263*	0.034	-0.030	0.377	-1.696**	0.004	0.048	0.308	-1.337*	0.022	0.094	0.159	-1.085	0.065
	NoN	-0.023	0.406	0.159	0.539	0.004	0.483	-0.11	0.663	0.045	0.319	-0.184	0.469	0.117	0.107	-0.003	0.991

Table 21: Continued

	PxP	-0.058	0.270	0.168	0.528	0.013	0.445	0.207	0.424	0.085	0.185	0.266	0.309	0.126	0.091	0.235	0.373
	PVS	-0.076	0.212	-0.669	0.163	-0.023	0.404	-1.049*	0.026	0.039	0.340	-0.963*	0.042	0.096	0.154	-0.579	0.223
	PTC	-0.057	0.273	-0.006	0.978	-0.013	0.444	-0.134	0.531	0.018	0.423	-0.195	0.367	0.032	0.368	-0.363	0.098

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	1.781	0.161	0.067
PQI 92 (Age Cat 2)	2.275	.197*	0.016
PQI 92 (Age Cat 3)	1.889	.169*	0.049
PQI 92 (Age Cat 4)	1.357	0.128	0.205

IV		PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	-0.084	0.188	-0.169	0.094	-0.194*	0.019	-0.217*	0.029	0.189*	0.022	-0.173	0.086	-0.100	0.144	-0.065	0.524
PCMH Capabili	IT	-0.039	0.340	0.366	0.292	0.121	0.100	0.354	0.298	0.167*	0.038	0.222	0.520	0.126	0.090	0.022	0.950
	CSC	-0.042	0.330	1.882*	0.017	0.122	0.098	2.247**	0.004	0.188*	0.023	1.741*	0.026	0.160*	0.044	1.471	0.065
	CoC	-0.084	0.187	-0.223	0.689	0.105	0.133	0.476	0.382	0.165*	0.040	0.074	0.893	0.152*	0.053	0.393	0.489
	ACC	-0.053	0.289	0.409	0.462	0.122	0.097	0.201	0.712	0.197*	0.018	0.543	0.327	0.180*	0.027	0.499	0.379
	RPT	-0.081	0.195	-0.062	0.882	0.085	0.184	-0.136	0.740	0.163*	0.042	-0.024	0.954	0.142	0.066	0.077	0.858
	CDT	-0.097	0.152	-1.552**	0.006	0.071	0.225	-1.92**	0.001	0.146	0.060	-1.558**	0.006	0.130	0.084	-1.283*	0.026
	NoN	-0.083	0.189	-0.292	0.238	0.066	0.242	-0.352	0.146	0.139	0.070	-0.224	0.362	0.113	0.116	-0.224	0.375
	PxP	-0.100	0.144	-0.074	0.769	0.103	0.139	0.251	0.311	0.186*	0.023	0.333	0.187	0.156*	0.048	0.197	0.445
	PVS	-0.074	0.217	-0.779	0.089	0.080	0.200	-1.111**	0.014	0.143	0.064	-1.000*	0.029	0.122	0.098	-0.827	0.077
	PTC	-0.015	0.435	0.171	0.414	0.093	0.163	-0.020	0.921	0.143	0.064	-0.015	0.944	0.067	0.241	-0.245	0.251

*=p<.05 & **=<.01

The results in Table 22 indicate statistical significance in the full models for PCD density and the 10 PCMH capability composites for FIPS with PCMHs (n=67) on 2011 PQI 92, F(11,67), f=2.061, r^2=.192 (p<.05) with positive correlations on CSC r=.198 (p<.05) and ACC r=.214. There is also statistical significance in the full models for age-specific 2011 PQI 90 age cat 2 F(11,67), f=1.997, r^2=.285 (p<.05) with positive correlations on CSC r=.223 (p<.05); and age-specific 2011 PQI 92 age cat 2 F(11,67), f=2.059, r^2=.292 (p<.05) with no correlation on any of the IVs.

In addition to evaluating the effect of the 10 individual PCMH capability composites on the PQI rates, the author also evaluated the effects of the single composites of MU and MP. The MU and MP composites were evaluated as an independent composite because each of the composites is an amalgam of the various PCMH elements from the 10 PCMH capability composites analyzed. To account for any overlap in the capability composites, the various composites were analyzed independently. Just as with the evaluation of the 10 PCMH capability composites, the MU and MP composites will independently replace the PCMH density IV in the simple regressions that follow.

The results in Table 23 indicate statistical significance in the regression models for PCD density and the MU capability composite for all FIPS (n=114) on Delta PQI 90, F(11,114), f=3.637, r^2=.062 (p<.05) with positive correlation on MU r=.230 (p<.01). There is also statistical significance in the full models for age-specific Delta PQI 90 age cat 2 F(11,114), f=3.431, r^2=.085 (p<.05) with correlation on MU r=.218 (p<.01); Delta PQI 91 age cat 1 F(11,114), f=5.387, r^2=.088 (p<.01) with correlation on MU r=.295 (p<.01); Delta PQI 91 age cat 4 F(11,114), f=3.160, r^2=.054 (p<.05) with correlation on MU r=.209 (p<.01); Delta PQI 92 age

Table 22: 2011 PQI Regression—FIPS w/PCMH—10 PCMH Capability Composites

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and 10 PCMH capabilities? (n=67)

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	1.896	0.275	0.060
PQI 91 (Acute)	1.074	0.177	0.398
PQI 92 (Chronic)	2.061	0.192*	0.039

IV		PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	0.081	0.257	0.064	0.597	0.074	0.277	0.053	0.679	0.079	0.263	0.065	0.588
PCMH Capabilities	IT	0.099	0.213	0.039	0.788	0.087	0.242	0.022	0.886	0.090	0.233	0.042	0.770
	CSC	0.211*	0.043	0.711**	0.004	0.190	0.062	0.578*	0.025	0.198*	0.054	0.707**	0.004
	CoC	0.121	0.165	0.037	0.828	0.144	0.123	0.090	0.622	0.091	0.232	0.001	0.995
	ACC	0.217*	0.039	0.116	0.539	0.174	0.079	-0.014	0.944	0.214*	0.041	0.173	0.356
	RPT	0.066	0.299	0.019	0.907	0.113	0.181	0.056	0.748	0.036	0.386	0.004	0.980
	CDT	-0.114	0.180	-0.529**	0.001	-0.041	0.370	-0.38*	0.025	-0.139	0.131	-0.554**	0.001
	NoN	0.032	0.399	-0.052	0.742	0.095	0.223	0.029	0.863	-0.010	0.469	-0.093	0.548
	PxP	0.115	0.176	0.123	0.333	0.134	0.140	0.119	0.378	0.096	0.220	0.114	0.364
	PVS	-0.019	0.440	-0.489**	0.007	0.007	0.479	-0.376*	0.048	-0.034	0.393	-0.500**	0.005
	PTC	-0.024	0.423	-0.132	0.332	-0.064	0.303	-0.195	0.178	-0.001	0.496	-0.084	0.530

Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and 10 PCMH capabilities? (n=67)

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	1.41	0.220	0.195
PQI 90 (Age Cat 2)	1.997	0.285*	0.046
PQI 90 (Age Cat 3)	1.862	0.271	0.065
PQI 90 (Age Cat 4)	1.323	0.209	0.237

IV		PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
	PCD Den	0.080	0.259	0.038	0.765	0.021	0.434	-0.017	0.889	0.127	0.152	0.120	0.324	0.115	0.178	0.130	0.305
PCMH Capabilities	IT	0.206*	0.047	0.082	0.589	0.136	0.136	0.076	0.602	0.057	0.324	0.019	0.898	0.024	0.422	-0.007	0.963
	CSC	0.318**	0.004	0.624**	0.014	0.223*	0.035	0.788**	0.001	0.174	0.080	0.638**	0.009	0.128	0.152	0.481	0.056
	CoC	0.132	0.144	0.009	0.959	0.112	0.184	0.064	0.704	0.060	0.316	-0.047	0.786	0.129	0.149	0.072	0.685

Table 22: Continued

	ACC	0.242*	0.024	0.121	0.537	0.183	0.069	0.053	0.778	0.200*	0.053	0.191	0.314	0.203	0.050	0.131	0.506
	RPT	0.078	0.264	-0.072	0.671	0.050	0.345	0.009	0.958	0.045	0.359	0.004	0.980	0.044	0.361	0.026	0.879
	CDT	-0.014	0.455	-0.323*	0.050	-0.129	0.149	-0.529**	0.001	-0.114	0.178	-0.52**	0.002	-0.084	0.250	-0.415**	0.013
	NoN	0.085	0.246	-0.076	0.641	0.001	0.496	-0.122	0.435	-0.006	0.482	-0.047	0.763	0.028	0.412	-0.003	0.986
	PxP	0.018	0.443	0.004	0.976	0.088	0.240	0.109	0.384	0.129	0.149	0.143	0.260	0.105	0.198	0.099	0.452
	PVS	0.108	0.192	-0.321	0.081	-0.015	0.453	-0.511**	0.005	-0.059	0.318	-0.490**	0.007	-0.035	0.390	-0.359*	0.053
	PTC	0.167	0.089	0.079	0.571	0.041	0.371	-0.061	0.648	-0.016	0.449	-0.089	0.511	-0.155	0.105	-0.247	0.084

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	1.050	0.174	0.417
PQI 91 (Age Cat 2)	1.390	0.218	0.204
PQI 91 (Age Cat 3)	1.337	0.211	0.230
PQI 91 (Age Cat 4)	0.803	0.138	0.636

IV		PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		0.023	0.426	-0.019	0.886	0.056	0.326	0.001	0.994	0.078	0.266	0.071	0.573	0.080	0.260	0.087	0.511
PCMH Capabilities	IT	0.168	0.087	-0.017	0.915	0.095	0.223	-0.003	0.987	0.022	0.431	0.002	0.990	0.067	0.295	0.045	0.778
	CSC	0.317**	0.004	0.458	0.075	0.275**	0.012	0.741**	0.004	0.124	0.158	0.622*	0.015	0.097	0.219	0.372	0.154
	CoC	0.284**	0.010	0.210	0.253	0.126	0.155	0.077	0.666	0.052	0.337	0.020	0.911	0.138	0.133	0.099	0.597
	ACC	0.286**	0.009	-0.010	0.960	0.185	0.067	-0.062	0.750	0.137	0.134	0.067	0.734	0.136	0.136	0.010	0.962
	RPT	0.162	0.095	-0.113	0.518	0.184	0.068	0.118	0.486	0.037	0.383	0.042	0.807	0.050	0.343	0.028	0.876
	CDT	0.102	0.205	-0.127	0.445	0.003	0.492	-0.395*	0.018	-0.106	0.197	-0.466**	0.006	-0.068	0.293	-0.315	0.068
	NoN	0.236*	0.027	0.080	0.630	0.085	0.247	-0.042	0.797	-0.019	0.439	-0.039	0.812	0.074	0.277	0.049	0.772
	PxP	0.166	0.090	0.117	0.386	0.141	0.128	0.102	0.438	0.106	0.197	0.119	0.367	0.104	0.201	0.106	0.441
	PVS	0.156	0.104	-0.217	0.247	0.029	0.409	-0.437*	0.019	-0.084	0.250	-0.468**	0.013	-0.009	0.471	-0.262	0.172
	PTC	0.112	0.184	0.015	0.918	0.034	0.392	-0.104	0.457	-0.086	0.244	-0.168	0.237	-0.145	0.120	-0.260	0.081

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	1.568	0.239	0.135
PQI 92 (Age Cat 2)	2.059	0.292*	0.040
PQI 92 (Age Cat 3)	1.751	0.259	0.086
PQI 92 (Age Cat 4)	1.551	0.237	0.140

Table 22: Continued

IV		PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
		Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den		0.094	0.224	0.057	0.649	0.006	0.482	-0.022	0.855	0.142	0.127	0.135	0.273	0.137	0.134	0.156	0.214
PCMH Capabilities	IT	0.190	0.062	0.124	0.408	0.138	0.133	0.098	0.500	0.064	0.304	0.022	0.884	-0.022	0.430	-0.055	0.715
	CSC	0.263*	0.016	0.602*	0.016	0.185	0.067	0.751**	0.002	0.178	0.075	0.587*	0.017	0.137	0.134	0.511*	0.039
	CoC	0.024	0.422	-0.104	0.553	0.094	0.224	0.051	0.763	0.055	0.328	-0.073	0.675	0.092	0.229	0.031	0.858
	ACC	0.174	0.080	0.166	0.391	0.168	0.087	0.093	0.618	0.207*	0.047	0.227	0.237	0.225*	0.034	0.211	0.278
	RPT	0.023	0.426	-0.034	0.838	-0.004	0.488	-0.028	0.860	0.046	0.356	-0.009	0.956	0.039	0.376	0.032	0.850
	CDT	-0.069	0.289	-0.366*	0.025	-0.170	0.084	-0.545**	0.001	-0.108	0.193	-0.498**	0.002	-0.078	0.266	-0.437**	0.008
	NoN	-0.010	0.467	-0.146	0.364	-0.034	0.394	-0.144	0.352	0.000	0.499	-0.046	0.770	-0.024	0.422	-0.057	0.723
	PxP	-0.057	0.324	-0.049	0.703	0.063	0.305	0.106	0.395	0.130	0.148	0.143	0.266	0.093	0.226	0.079	0.544
	PVS	0.063	0.307	-0.319	0.079	-0.032	0.398	-0.504**	0.005	-0.045	0.359	-0.456**	0.012	-0.057	0.324	-0.393*	0.032
	PTC	0.165	0.091	0.097	0.483	0.037	0.384	-0.044	0.739	0.015	0.452	-0.049	0.722	-0.139	0.131	-0.197	0.159
*=p<.05 & **=<.01																	

Table 23: Delta PQI Regression—All FIPS—MU PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within all FIPs with regard to PCD densities and Meaningful Use (MU) capabilities composite? *(n=114)*

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	3.637	0.062*	0.030
PQI 91 (Acute)	1.799	0.031	0.170
PQI 92 (Chronic)	2.784	0.048	0.066

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.008	0.468	0.100	0.320	0.033	0.364	0.109	0.288	0.005	0.479	0.100	0.323
MU	.230**	0.007	.270**	0.008	0.147	0.060	0.190	0.065	.198*	0.017	.238*	0.02

Aim 3: Is there a statistical significance in the *age-specific* means of *Delta* PQI rates within all FIPs with regard to PCD densities and Meaningful Use (MU) capabilities composite? *(n=114)*

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	1.908	0.033	0.153
PQI 90 (Age Cat 2)	3.431	.058*	0.036
PQI 90 (Age Cat 3)	2.008	0.035	0.139
PQI 90 (Age Cat 4)	2.782	0.048	0.066

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.061	0.259	0.014	0.894	0.008	0.466	0.113	0.263	-0.081	0.195	-0.001	0.937	0.058	0.269	0.150	0.141
MU	.182*	0.026	0.187	0.068	.218**	0.010	.263**	0.010	.187*	0.023	0.184	0.074	.170*	0.035	.230*	0.025

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	5.387	.088**	0.006
PQI 91 (Age Cat 2)	2.588	0.045	0.080
PQI 91 (Age Cat 3)	0.259	0.005	0.772
PQI 91 (Age Cat 4)	3.160	.054*	0.046

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.084	0.186	0.040	0.687	0.040	0.337	0.130	0.201	-0.030	0.378	-0.003	0.979	0.010	0.458	0.111	0.273
MU	.295**	0.001	.311**	0.002	.174*	0.032	.226*	0.027	0.068	0.236	0.067	0.517	.209**	0.013	.253**	0.013

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	0.301	0.005	0.741

Table 23: Continued

PQI 92 (Age Cat 2)	3.157	.054*	0.046	
PQI 92 (Age Cat 3)	3.317	.056*	0.040	
PQI 92 (Age Cat 4)	2.105	0.037	0.127	

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.037	0.346	-0.010	0.923	-0.011	0.455	0.090	0.373	-0.102	0.139	-0.009	0.928	0.091	0.168	0.164	0.109
MU	0.073	0.221	0.069	0.506	.217**	0.010	.253**	0.014	.237**	0.006	.234*	0.022	0.118	0.106	0.183	0.074

*=p<.05 & **=<.01

cat 2 F(11,114), f=3.157, r^2=.054 (p<.01) with correlation on MU r=.217 (p<.01); and Delta PQI 92 age cat 3 F(11,114), f=3.157, r^2=.054 (p<.01) with correlation on MU r=.217 (p<.01).

The results in Table 24 indicate no statistical significance in the regression models for PCD density and the MU capability composite for FIPS with PCMH (n=67) on any of the overall or age-specific Delta PQI rates, even though there is varying correlation with PCD and/or MU capability composite on a few of the PQI rates.

The results in Table 25 indicate no statistical significance in the regression models for PCD density and the MU capability composite for all FIPS (n=114) on any of the 2011 PQI rates for the overall or age-specific 2011 PQI rates, even though there is varying correlation with PCD and/or MU capability composite on a few of the PQI rates.

The results in Table 26 indicate no statistical significance in the regression models for PCD density and the MU capability composite for FIPS with PCMHs (n=67) on the overall 2011 PQI rates. There is statistical significance in the full models for age-specific 2011 PQI 91 age cat 1 F(11,114), f=3.207, r2=.091 (p<.05) with positive correlation on MU r=.300 (p<.01).

The results in Table 27 indicate statistical significance in the full models for MP capability composite for all FIPS (n=114) on Delta PQI 90, F(11,114), f=3.256, r2=.056 (p<.05) with positive correlation on MP r=.218 (p<.01). There is also statistical significance in the full models for age-specific Delta PQI 90 age cat 2 F(11,114), f=3.203, r2=.053 (p<.05) with correlation on MP r=.204 (p<.05); and Delta PQI 91 age cat 1 F(11,114), f=1.387, r2=.085 (p<.01) with correlation on MP r=.289 (p<.01).

The results in Table 28 indicate no statistical significance in the full models for PCD density and the MP capability composite for FIPS with PCMHs (n=67) on any of the overall or

Table 24: Delta PQI Regression—FIPS w/PCMH—MU PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and *Meaningful Use* (MU) capabilities composite? *(n=67)*

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	1.350	0.040	0.266
PQI 91 (Acute)	0.212	0.007	0.809
PQI 92 (Chronic)	0.947	0.029	0.393

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.104	0.201	-1.943	0.272	-0.066	0.299	-0.075	0.557	0.012	0.463	-0.022	0.862
MU	0.149	0.115	7.342	0.165	0.034	0.392	0.049	0.702	0.168	0.087	0.172	0.175

Aim 3: Is there a statistical significance in the *age-specific* means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and *Meaningful Use* (MU) capabilities composite? *(n=67)*

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	2.543	0.074	0.087
PQI 90 (Age Cat 2)	2.127	0.062	0.128
PQI 90 (Age Cat 3)	0.329	0.010	0.721
PQI 90 (Age Cat 4)	0.706	0.022	0.498

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.143	0.124	0.098	0.430	-0.188	0.064	-0.220	0.079	-0.092	0.230	-0.100	0.433	0.023	0.427	-0.006	0.962
MU	.254*	0.019	0.235	0.060	0.125	0.157	0.168	0.178	0.024	0.425	0.043	0.735	0.147	0.118	0.148	0.245

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	1.790	0.053	0.175
PQI 91 (Age Cat 2)	0.611	0.019	0.546
PQI 91 (Age Cat 3)	2.971	0.085	0.058
PQI 91 (Age Cat 4)	1.671	0.05	0.196

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.059	0.318	-0.103	0.409	-0.102	0.205	-0.120	0.344	-.243*	0.024	-0.211	0.089	-0.166	0.089	-0.196	0.120
MU	.207*	0.047	0.227	0.072	0.069	0.289	0.093	0.465	-.205*	0.048	-0.164	0.182	0.113	0.181	0.151	0.228

Table 24: Continued

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	2.806	0.081	0.068
PQI 92 (Age Cat 2)	2.329	0.068	0.106
PQI 92 (Age Cat 3)	0.823	0.025	0.443
PQI 92 (Age Cat 4)	1.325	0.040	0.273

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.219*	0.037	0.184	0.138	-0.197	0.055	-0.231	0.065	0.009	0.470	-0.022	0.861	0.155	0.105	0.131	0.299
MU	0.220*	0.037	0.184	0.138	0.129	0.149	0.174	0.162	0.157	0.102	0.161	0.205	0.153	0.109	0.127	0.312

*=p<.05 & **=<.01

Table 25: 2011 PQI Regression—All FIPS—MU PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within all FIPs with regard to PCD densities and Meaningful Use (MU) capabilities composite? *(n=114)*

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	1.921	0.032	0.167
PQI 91 (Acute)	0.586	0.01	0.558
PQI 92 (Chronic)	2.268	0.039	0.108

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-.166*	0.039	-0.137	0.182	-0.096	0.154	-0.082	0.430	-.183*	0.026	-0.150	0.143
MU	0.127	0.090	0.072	0.481	0.070	0.231	0.037	0.719	0.143	0.065	0.083	0.414

Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within all FIPs with regard to PCD densities and Meaningful Use (MU) capabilities composite? *(n=114)*

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	0.692	0.012	0.503
PQI 90 (Age Cat 2)	1.590	0.028	0.209
PQI 90 (Age Cat 3)	2.372	0.041	0.098
PQI 90 (Age Cat 4)	1.502	0.026	0.227

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.058	0.268	-0.100	0.335	-0.165*	0.040	-0.153	0.138	-.182*	0.026	-0.144	0.159	-0.119	0.103	-0.071	0.487
MU	-0.063	0.252	-0.103	0.320	0.091	0.168	0.030	0.768	.154*	0.051	0.097	0.343	0.149	0.057	0.120	0.242

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	0.238	0.004	0.789
PQI 91 (Age Cat 2)	0.132	0.002	0.876
PQI 91 (Age Cat 3)	0.860	0.015	0.426
PQI 91 (Age Cat 4)	1.02	0.018	0.364

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.007	0.469	-0.021	0.841	-0.046	0.315	-0.053	0.609	-0.122	0.097	-0.115	0.264	-0.108	0.126	-0.073	0.476
MU	-0.062	0.255	-0.071	0.495	0.002	0.490	-0.019	0.856	0.064	0.250	0.018	0.862	0.116	0.109	0.087	0.398

Table 25: Continued

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	0.846	0.015	0.432
PQI 92 (Age Cat 2)	2.279	0.039	0.107
PQI 92 (Age Cat 3)	2.816	0.048	0.064
PQI 92 (Age Cat 4)	1.309	0.023	0.274

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.084	0.188	-0.123	0.235	-.194*	0.019	-0.174	0.088	-.189*	0.022	-0.140	0.169	-0.100	0.144	-0.051	0.622
MU	-0.049	0.303	-0.098	0.344	0.118	0.106	0.048	0.637	.178*	0.029	0.123	0.228	0.145	0.062	0.124	0.227

*=p<.05 & **=<.01

Table 26: 2011 PQI Regression—FIPS w/PCMH—MU PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and *Meaningful Use* (MU) capabilities composite? *(n=67)*

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	0.969	0.029	0.385
PQI 91 (Acute)	0.801	0.024	0.453
PQI 92 (Chronic)	0.817	0.025	0.446

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.081	0.257	0.051	0.686	0.074	0.277	0.046	0.714	0.079	0.263	0.052	0.682
MU	0.164	0.092	0.154	0.224	0.150	0.114	0.141	0.268	0.149	0.114	0.139	0.273

Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and Meaningful Use (MU) capabilities composite? *(n=67)*

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	2.990	0.085	0.057
PQI 90 (Age Cat 2)	1.180	0.036	0.314
PQI 90 (Age Cat 3)	0.796	0.024	0.456
PQI 90 (Age Cat 4)	0.541	0.107	0.585

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.080	0.259	0.024	0.841	0.021	0.434	-0.017	0.895	0.127	0.152	0.109	0.388	0.115	0.178	0.103	0.419
MU	0.291**	0.008	.287*	0.022	0.188	0.064	0.191	0.132	0.113	0.182	0.092	0.470	0.080	0.259	0.060	0.635

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	3.207	.091*	0.047
PQI 91 (Age Cat 2)	1.236	0.037	0.297
PQI 91 (Age Cat 3)	0.215	0.007	0.807
PQI 91 (Age Cat 4)	0.422	0.013	0.658

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.023	0.426	-0.037	0.764	0.056	0.326	0.020	0.876	0.078	0.266	0.073	0.570	0.080	0.260	0.064	0.615
MU	.300**	0.007	.307**	0.014	0.192	0.060	0.188	0.137	0.040	0.374	0.026	0.839	0.095	0.222	0.083	0.515

Table 26: Continued

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	1.963	0.058	0.149
PQI 92 (Age Cat 2)	0.957	0.029	0.389
PQI 92 (Age Cat 3)	1.033	0.031	0.362
PQI 92 (Age Cat 4)	0.634	0.019	0.534

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.094	0.224	0.050	0.686	0.006	0.482	-0.028	0.824	0.142	0.127	0.120	0.340	0.137	0.134	0.133	.298
MU	.235*	0.028	0.226	0.073	0.168	0.087	0.174	0.171	0.132	0.144	0.108	0.392	0.050	0.343	0.024	0.847

*=p<.05 & **=<.01

Table 27: Delta PQI Regression—All FIPS—MP PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within all FIPs with regard to PCD densities and *Must Pass (MP)* capabilities composite? *(n=114)*																
DV	F-Value	r-Sq	Sig													
PQI 90 (Overall)	3.256	0.056*	0.042													
PQI 91 (Acute)	1.773	0.031	0.175													
PQI 92 (Chronic)	2.388	0.041	0.097													
IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)							
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig				
PCD Den	-0.008	0.468	0.099	0.330	0.033	0.364	0.111	0.281	0.005	0.479	0.097	0.343				
MP	0.218**	0.010	0.259**	0.012	0.144	0.063	0.190	0.067	0.183*	0.026	0.223*	0.031				
Aim 3: Is there a statistical significance in the *age-specific* means of Delta PQI rates within all FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? *(n=114)*																
DV	F-Value	r-Sq	Sig													
PQI 90 (Age Cat 1)	1.700	0.030	0.187													
PQI 90 (Age Cat 2)	3.024	0.052*	0.053													
PQI 90 (Age Cat 3)	1.909	0.033	0.153													
PQI 90 (Age Cat 4)	2.459	0.042	0.090													
IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.061	0.259	0.012	0.908	0.008	0.466	0.111	0.276	-0.081	0.195	-0.007	0.943	0.058	0.269	0.148	0.150
MP	0.172*	0.034	0.177	0.088	0.204*	0.015	.249*	0.016	0.182*	0.026	0.179	0.083	.156*	0.049	.217*	0.036
DV	F-Value	r-Sq	Sig													
PQI 91 (Age Cat 1)	1.203	.085**	0.007													
PQI 91 (Age Cat 2)	2.283	0.040	0.107													
PQI 91 (Age Cat 3)	0.408	0.007	0.666													
PQI 91 (Age Cat 4)	2.964	0.051	0.056													
IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.084	0.186	0.042	0.674	0.040	0.337	0.128	0.212	-0.030	0.378	0.007	0.948	0.010	0.458	0.112	0.273
MP	0.289**	0.001	0.306**	0.003	0.161*	0.044	.214*	0.039	0.085	0.184	0.088	0.398	0.201*	0.016	.247*	0.017
DV	F-Value	r-Sq	Sig													
PQI 92 (Age Cat 1)	0.231	0.004	0.794													

Table 27: Continued

PQI 92 (Age Cat 2)	2.801	0.048	0.065													
PQI 92 (Age Cat 3)	2.847	0.049	0.062													
PQI 92 (Age Cat 4)	1.833	0.032	0.165													
IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.037	0.346	-0.014	0.895	-0.011	0.455	0.088	0.386	-0.102	0.139	-0.014	0.893	0.091	0.168	0.161	0.120
MP	0.063	0.252	0.057	0.582	.204*	0.015	.240*	0.020	.221**	0.009	.215*	0.037	0.103	0.138	0.169	0.102
*=p<.05 & **=<.01																

Table 28: Delta PQI Regression—FIPS w/PCMH—MP PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? *(n=67)*

DV	F-Value	r-Sq	Sig
PQI 90 (Overall)	0.386	0.012	0.681
PQI 91 (Acute)	0.143	0.004	0.867
PQI 92 (Chronic)	0.115	0.004	0.891

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.104	0.201	-0.107	0.394	-0.066	0.299	-0.067	0.596	0.012	0.463	0.006	0.961
MP	0.023	0.426	0.033	0.791	0.006	0.479	0.013	0.920	0.060	0.316	0.059	0.640

Aim 3: Is there a statistical significance in the *age-specific* means of *Delta* PQI rates within PCMH FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? (*n=67*)

DV	F-Value	r-Sq	Sig
PQI 90 (Age Cat 1)	2.103	0.062	0.130
PQI 90 (Age Cat 2)	1.168	0.035	0.318
PQI 90 (Age Cat 3)	0.024	0.001	0.976
PQI 90 (Age Cat 4)			

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.143	0.124	0.124	0.310	-0.188	0.064	-0.187	0.134	-0.092	0.230	-0.089	0.478	0.023	0.427	0.021	0.866
MP	.215*	0.040	0.204	0.099	-0.020	0.434	-0.002	0.984	-0.034	0.393	-0.025	0.840	0.018	0.444	0.016	0.902

DV	F-Value	r-Sq	Sig
PQI 91 (Age Cat 1)	1.177	0.035	0.315
PQI 91 (Age Cat 2)	0.545	0.017	0.583
PQI 91 (Age Cat 3)	2.315	0.067	0.107
PQI 91 (Age Cat 4)	0.978	0.03	0.381

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.059	0.318	-0.076	0.542	-0.102	0.205	-0.095	0.449	-.243*	0.024	-0.234	0.058	-0.166	0.089	-0.170	0.173
MP	0.173	0.081	0.180	0.150	-0.088	0.238	-0.080	0.525	-0.114	0.179	-0.093	0.448	0.029	0.408	0.045	0.718

Table 28: Continued

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	2.586	0.075	0.083
PQI 92 (Age Cat 2)	1.324	0.040	0.273
PQI 92 (Age Cat 3)	0.026	0.001	0.975
PQI 92 (Age Cat 4)	0.806	0.025	0.451

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	.219*	0.037	0.204	0.096	-0.197	0.055	-0.200	0.109	0.009	0.470	0.007	0.957	0.155	0.105	0.061	0.625
MP	0.183	0.069	0.164	0.179	0.014	0.455	0.033	0.792	0.028	0.413	0.027	0.831	0.029	0.408	0.139	0.267

*=p<.05 & **=<.01

age-specific Delta PQI rates, even though there is varying correlation with PCD and/or MP capability composite on a few of the PQI rates.

The results in Table 29 indicate no statistical significance in the full models for PCD density and the MP capability composite for all FIPS (n=114) on any of the overall or age-specific 2011 PQI rates, even though there is varying correlation with PCD and/or MP capability composite on a few of the PQI rates.

The results in Table 30 indicate no statistical significance in the full models for PCD density and the MP capability composite for FIPS with PCMHs (n=67) on any of the overall or age-specific 2011 PQI rates, even though there is varying correlation with the MP capability composite on a few of the PQI rates.

Summary of Aims Supported by Analysis

Table 31 provides a summary of the statistical evidence to support the specific aims of this study. As the table indicates, there are mixed results by specific aim and associated sub-aims depending on each of the 300 regression models evaluated. There is stronger statistical significance to suggest an association between the post-measurement (2011 PQI rates) and the PCMH density or PCMH capabilities; and less statistical significance to support an association between the Delta PQI rates and the PCD/PCMH densities or capabilities evaluated in the models. The only uniformly accepted null hypothesis among all the aims was the ratio of PCD/PCMH densities with the Delta PQI rates as noted in Table 31. All other aims as noted in Table 31 were supported by statistical evidence to demonstrate association with the risk-adjusted avoidable hospital admissions (PQI rates) with varying degrees of significance among select summary-level PQI rates and select age-specific PQI rates within the 114 counties evaluated.

Table 29: 2011 PQI Regression—All FIPS—MP PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within all FIPs with regard to PCD densities and *Must Pass (MP)* capabilities composite? *(n=114)*				
DV	F-Value	r-Sq	Sig	
PQI 90 (Overall)	1.733	0.03	0.182	
PQI 91 (Acute)	0.558	0.01	0.574	
PQI 92 (Chronic)	2.162	0.037	0.120	

IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-.166*	0.039	-0.141	0.171	-0.096	0.154	-0.085	0.415	-0.183*	0.026	-0.154	0.135
MP	0.117	0.107	0.059	0.568	0.063	0.252	0.028	0.786	0.133	0.078	0.070	0.495

Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within all FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? *(n=114)*				
DV	F-Value	r-Sq	Sig	
PQI 90 (Age Cat 1)	1.025	0.018	0.362	
PQI 90 (Age Cat 2)	1.553	0.027	0.216	
PQI 90 (Age Cat 3)	2.291	0.04	0.106	
PQI 90 (Age Cat 4)	1.483	0.026	0.231	

IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.058	0.268	-0.113	0.274	-.165*	0.040	-0.159	0.124	-.182*	0.026	-0.146	0.157	-0.119	0.103	-0.070	0.498
MP	-0.086	0.181	-0.133	0.200	0.079	0.202	0.013	0.898	0.149	0.057	0.088	0.388	0.148	0.058	0.119	0.248

DV	F-Value	r-Sq	Sig	
PQI 91 (Age Cat 1)	0.356	0.006	0.701	
PQI 91 (Age Cat 2)	0.149	0.003	0.862	
PQI 91 (Age Cat 3)	0.867	0.015	0.423	
PQI 91 (Age Cat 4)	0.963	0.017	0.385	

IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.007	0.469	-0.029	0.784	-0.046	0.315	-0.057	0.587	-0.122	0.097	-0.113	0.275	-0.108	0.126	-0.075	0.470
MP	-0.076	0.212	-0.087	0.402	-0.004	0.485	-0.027	0.797	0.069	0.234	0.022	0.834	0.111	0.119	0.778	0.438

Table 29: Continued

DV	F-Value	r-Sq	Sig
PQI 92 (Age Cat 1)	1.186	0.021	0.309
PQI 92 (Age Cat 2)	2.206	0.038	0.115
PQI 92 (Age Cat 3)	2.660	0.046	0.074
PQI 92 (Age Cat 4)	1.366	0.024	0.259

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	-0.084	0.188	-0.137	0.186	-.194*	0.019	-0.181	0.079	-.189*	0.022	-0.143	0.162	-0.100	0.144	-0.047	0.652
MP	-0.073	0.220	-0.130	0.212	0.105	0.134	0.030	0.772	.169*	0.036	0.110	0.282	0.149	0.057	0.130	0.210

*=p<.05 & **=<.01

Table 30: 2011 PQI Regression—FIPS w/PCMH—MP PCMH Capability Composite

Aim 3: Is there a statistical significance in the means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? *(n=67)*																
DV	F-Value	r-Sq	Sig													
PQI 90 (Overall)	0.605	0.019	0.549													
PQI 91 (Acute)	1.569	0.047	0.216													
PQI 92 (Chronic)	0.769	0.023	0.468													
IV	PQI 90 (Overall)				PQI 91 (Acute)				PQI 92 (Chronic)							
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig				
PCD Den	0.079	0.263	0.069	0.583	0.080	0.259	0.062	0.617	0.021	0.434	0.006	0.959				
MP	0.118	0.171	0.111	0.374	.207*	0.046	0.202	0.105	0.153	0.108	0.152	0.224				
Aim 3: Is there a statistical significance in the *age-specific* means of *2011* PQI rates within PCMH FIPs with regard to PCD densities and *Must Pass* (MP) capabilities composite? (*n=114*)																
DV	F-Value	r-Sq	Sig													
PQI 90 (Age Cat 1)	1.569	0.047	0.216													
PQI 90 (Age Cat 2)	0.769	0.023	0.468													
PQI 90 (Age Cat 3)	0.776	0.024	0.465													
PQI 90 (Age Cat 4)	0.649	0.002	0.526													
IV	PQI 90 (Age Cat 1)				PQI 90 (Age Cat 2)				PQI 90 (Age Cat 3)				PQI 90 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.080	0.259	0.119	0.340	0.021	0.434	0.006	0.959	0.127	0.152	0.119	0.34	0.115	0.178	0.107	0.393
MP	.207*	0.046	0.087	0.487	0.153	0.108	0.152	0.224	0.098	0.215	0.087	0.487	0.093	0.228	0.083	0.509
DV	F-Value	r-Sq	Sig													
PQI 91 (Age Cat 1)	2.819	0.081	0.067													
PQI 91 (Age Cat 2)	1.534	0.046	0.224													
PQI 91 (Age Cat 3)	0.394	0.012	0.676													
PQI 91 (Age Cat 4)	0.378	0.012	0.687													
IV	PQI 91 (Age Cat 1)				PQI 91 (Age Cat 2)				PQI 91 (Age Cat 3)				PQI 91 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.023	0.426	-0.003	0.978	0.056	0.326	0.037	0.764	0.078	0.266	0.070	0.575	0.080	0.260	0.073	0.559
MP	.285**	0.010	0.285*	0.021	.211*	0.044	0.207	0.096	0.085	0.246	0.079	0.530	0.080	0.261	0.073	0.562
DV	F-Value	r-Sq	Sig													
PQI 92 (Age Cat 1)	0.776	0.024	0.464													

Table 30: Continued

PQI 92 (Age Cat 2)	0.446	0.014	0.642	
PQI 92 (Age Cat 3)	0.868	0.026	0.425	
PQI 92 (Age Cat 4)	0.815	0.025	0.447	

IV	PQI 92 (Age Cat 1)				PQI 92 (Age Cat 2)				PQI 92 (Age Cat 3)				PQI 92 (Age Cat 4)			
	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig	Corr	Sig	Beta	Sig
PCD Den	0.094	0.224	0.083	0.507	0.006	0.482	-0.005	0.967	0.142	0.127	0.134	0.283	0.137	0.134	0.13	0.298
MP	0.130	0.147	0.122	0.328	0.117	0.173	0.118	0.349	0.093	0.228	0.080	0.519	0.090	0.235	0.078	0.532

*=p<.05 & **=<.01

Table 31: Summary of Specific Aims Supported

Specific Aims	PQI Regression Models w/Statistical Significance			
	2011 PQI Rates		Delta PQI Rates	
	n=114	n=67	n=114	n=67
Specific Aim 1: Is there literature to support the measurement framework?	Yes			
Specific Aim 2: Communities with higher PCMH-recognized practice concentrations among primary care practices will have lower risk-adjusted avoidable hospital admission rates.	Mixed			
-- Sub-Aim 1. Are risk-adjusted PQI rates affected by PCD density? (summary-level PQI rates)	92	No	No	No
-- Sub-Aim 1A: By age-specific PQI rates	90-AC2, 92-AC2/3	No	No	No
-- Sub-Aim 2. Are risk-adjusted PQI rates affected by PCMH density? (summary-level PQI rates)	No	90/92	No	No
-- Sub-Aim 2A: By age-specific PQI rates	90-AC2, 92-AC2	90-AC2/3, 92-AC2/3	No	No
Specific Aim (3): The use of technology and care coordination will have a greater correlation on risk-adjusted avoidable hospital admission rates than other PCMH capabilities.	Mixed			
-- Sub-Aim 1: Do the 10 PCMH capability composites affect risk-adjusted PQI rates? (summary-level)	90 (PCD-), 92 (PCD-/CSC+)	92 (CSC+/ACC+)	No	No
-- Sub-Aim 1A: By age-specific PQI rates	90-AC2 (PCD-), 90-AC3 (PCD-/CSC+/ACC+/PXP+), 92-AC2 (PCD-), 92-AC3 (PCD+/IT+/CSC+/COC+/ACC+/RPT+/PXP)	90-AC2 (CSC+), 92-AC 2	No	91-AC2 (IT+/CDT+/PTC+)
-- Sub-Aim 2: Do MU capability composites affect risk-adjusted PQI rates? (summary-level)	No	No	90	No
-- Sub-Aim 2A: By age-specific PQI rates	No	91-AC1	90-AC2, 91-AC1/4, 92-AC 2/3	No
-- Sub-Aim 3: Do MP capability composites affect risk-adjusted PQI rates? (summary-level)	No	No	90	No
-- Sub-Aim 2A: By age-specific PQI rates	No	No	90-AC2, 91-AC1	No
(+) = Positive Correlation // (-) = Negative Correlation				

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Chapter Summary

This chapter presents the statistical descriptions and analyses of the combined data sets used in this study. The chapter began with a descriptive analyses of the data sets, followed by a means comparison to establish differences in the risk-adjusted means. Then the author conducted a simple multiple regression analysis to ascertain the strength of the independent and dependent variable relationships.

The descriptive analyses established that in 2011, there were ~7.8M adults (≥18 years old) living within the 114 counties (14 in Vermont and 100 in North Carolina) with ~18% of the total population >65 years of age and accounted for ~35% of the discharges.

The AHRQ state inpatient datasets (SID) used for this study indicated that the total number of discharges from 2008-2011 dropped (~24K) by ~2% across all 114 FIPS, but Vermont had double the drop in total discharges at ~4% vs North Carolina at ~2%; means comparison test confirmed a statistically significant difference ($p<.05$) in means across all PQI rates between FIPS with vs without PCMHs.

The regression analysis provided statistical evidence to support the specific aims with varying degrees of relationships noted among the variables of interest. There were mixed results in terms of which IVs showed predictive strength in the full models and among the various PQI rates (summary-level vs. age-specific). Table 31 summarizes the statistical analysis results with a depiction of those aims/sub-aims that are supported (or not) by the analyses conducted in this chapter.

Based on these results from Chapter 5, the author provides implications, conclusions, and recommendations for further research in Chapter 6.

Chapter 6: Conclusion and Recommendations

Practice and Policy Implications

The results from this study help provide policy makers a generalizable, scientifically-based, outcome-based measure to gauge the contributions of recognized patient-centered medical home primary care practices on a community, state, and national scale. This finding is of particular importance as the nation recently, April 2015, signed into law the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) to repeal the Sustainable Growth Rate (SGR) formula that was aimed at reducing payments to primary care practices.

The new MACRA law establishes provider reimbursement to the very type of practice transformation defined by the NCQA PCMH evaluation standards(Carey, 2015)(Carey, 2015). As part of the agreement to repeal the SGR, the MACRA now puts into place economic incentives for providers to adopt the core tenets of the PCMH capabilities, instead of facing steep (~22%) fee-for-service (FFS) cuts. For exchange in staving off the reduction in fees and to receive additional incentive payments, practices must demonstrate transformation as a patient-centered, team-based practice.

These accountable care entities (e.g., primary care practices with an attributable and accountable patient population) will be measured on achieving a variety of (yet to be defined) specified levels of patient health quality indicators. These new payment models will need to establish evaluation metrics that measure the effectiveness of these non-traditional team-based

organizations to ensure value is achieved for the fees established. The results of this study could serve as an effective evaluation model and scientific basis of a fee-for-value payment structure.

In evaluating the PCD/PCMH density effect (Specific Aim 2), the PCD and PCMH ratios were not statistically significant ($p>.05$) variables contributing to the regression model for the Delta PQI rates in all counties, or even counties with PCMHs. This finding is significant as it indicates that while PCD density as reported in previous research impacts a reduction in overall hospital utilization (reduced admissions), it does not appear to have the same impact on the disease-specific conditions as measured by the AHRQ PQI rates. In addition, the results of this study indicate that fewer patients per doctor (PCD density) had an inverse relationship with PQI rates, meaning PQI rates were higher in counties instead of lower where there were more doctors per patient. One could infer from this finding that more doctors within a county does not lead to increased access to better primary care, just more access; possibly indicating higher utilization of the overall services within the system and an indicator of volume versus value health care.

As noted earlier, the PQI condition-specific rates are known to be cost-drivers, because they indicate inappropriate utilization of more expensive inpatient health care when not managed properly. As well as PCD density, PCMH density was not a statistically significant variable on the Delta PQI rates for any of the FIPS. This result indicates that PCD and PCMH density are not predictive variables with regard to the change experienced in these rates from 2008 to 2011. However, the 2011 PQI rates (the end point of the change in rates after PCMH intervention) did show statistical strength in the predictive models for both the PCD and PCMH density. The PCD and PCMH density showed predictive strength for all FIPS on the summary-level 2011 PQI 92 (Chronic) rates with PCD density demonstrating negative correlation. In addition, the PCD and PCMH density showed even more predictive strength for the FIPS with PCMHs (n=67) on the

summary-level 2011 PQI 90 (~11%) and PQI 92 (~16%) with PCMH density demonstrating negative correlation. The full models for age-specific 2011 PQI 90 and 92 showed statistical significance for age categories 2 and 3 in both PQIs with PCMH density demonstrating negative correlation. This is an important finding as it infers support for the current direction of policies aimed at PCMH practice transformation to reduce the total cost of care. For every hospital admission avoided, there was an average savings of ~$10,600 (Weiss, Barrett, & Steiner, 2015).

Avoiding preventable hospitalizations is an important step towards the triple aim of reducing total cost of care and improving overall health of the community. The regression analysis in this study showed that where PCMHs are present in the community, the affect was lower avoidable admissions related to chronic conditions (PQI 92), accounting for ~16-19% of the variation in the mean PQI rate for ages 39–74. Community planners now have evidence to work with primary care teams in their communities to target the PCMH density growth among PCDs to achieve the greatest impact on the outcomes of avoidable hospital admissions for these age groups. These early results are also encouraging in that they may also indicate that the correlation of impact on these younger age groups may signal avoidance of chronic conditions at later stages in life by growing densities of PCMHs within communities.

In addition to supporting recent legislation to pay practices to make the PCMH transformation a priority, the results of this study's third aim provides support in deciding which of the PCMH capabilities have the most impact on avoidable ambulatory specific hospitalizations. The 10 PCMH composite capabilities cover a range of functions expected of a primary care practice to demonstrate transformation as a patient-centered medical home. These 10 composite capabilities were used with the PCD density in place of the PCMH density regression model to determine the strength of these IVs on the PQI rates. In addition to the 10

PCMH capabilities, the MU and MP capability composites were also independently used with PCD density in place of the PCMH density regression model. The results of this study's results could aide policy makers in targeting specific PCMH capabilities to base incentives around that demonstrated predictive correlation with reducing the risk-adjusted PQI rates.

In summary, the results of this study provide policy makers with an outcome-based primary care performance measurement framework to support additional reforms to the currently proposed movement from a fee-for-service incentive model to a value-based incentive model.

Theoretical Implications

With regard to the General Systems Theory implications, there is evidence to support that changes to the primary care subsystem of the total health care system have an impact on the outcomes of health care quality for the populations within communities where densities of recognized PCMHs exist. There is also evidence to support the Donabedian conceptual model of quality improvement by which good structure and process begets more appropriate utilization of health care resources and better health outcomes as measured by the PCMH capabilities (structure/process) effect on the PQI rates. Although there were mixed results on the effect that changes to the primary care subsystem may have on the Delta PQI rates in this study, there is statistical significance in supporting the impact that PCMH densities within communities experienced lower levels of risk-adjusted avoidable hospital admissions.

Contributions to Health Services Research

The main contributions of this study reside in its use of validated measurement instruments (AHRQ PQI Rates and NCQA Recognition Program), use of accessible secondary data sets, and strength in its generalizability and repeatability as a measurement framework for monitoring changes to the health care ecosystem. The results of this study contribute to the on-

going research regarding the structure and process of the primary care delivery system in terms of the capabilities that have an effect on specific outcomes-based measures. Published research on the subject of primary care delivery were focused on individual practice locations with an assigned panel or enrolled population. This study extended prior research regarding the impact of doctor/patient ratios on access to care with a focus on specific care conditions known to be preventable by PCMH primary care management practices. This study demonstrated an evaluation/measurement framework to help further the understanding of the PCMH model and its impact on an outcomes-based measure. This evaluation framework informs future research in the continued study of primary care-based health care reform initiatives.

Limitations of the Study

Although this study offers supporting evidence that increased PCMH densities are having an impact on the reduction of avoidable hospitalizations related to ambulatory care sensitive conditions, there are still unexplained reductions in the same outcome measurement within communities that do not have any recognized PCMH practices. In this study, the 47 FIPS without PCMHs experienced greater reductions in PQI rates than the 67 FIPS with PCMHs. However, the 67 FIPS with PCMHs started in 2008 with better PQI rates than the 47 FIPs without PCMHs. One possible co-variant that is unexplained by the model proposed in this study is the assumption that populations living within the communities (FIPS) are the only patients utilizing the resources within those communities. The assumption that patients access care within their county boundaries does not likely hold true, particularly for those counties that are bordering states where the imaginary county lines do not necessarily represent where people access care.

This study is also limited in terms of the potential bias regarding the self-selection of practices that chose to become recognized versus not become recognized. For example, there may very well be practices that have adopted the PCMH model of delivering care, but this study has no visibility into that possibility. The participating practice that self-elected to become recognized may have also been operating as a PCMH practice prior to recognition. This limitation and possible phenomenon could also explain why the 67 FIPS that had PCMHs were already performing better on PQI rates than the 47 FIPS that did not have any FIPS by 2011. As well, there are limitations into the controllability of the intervention model.

In addition to the lack of visibility into the actual practice site capabilities before the PCMH recognition, there are other local and state environmental factors that may have impacted the reduction in the PQI rates. For example, there are many state and payer led initiatives to reduce the utilization of expensive hospital care, regardless of PCMH recognition status. The identified limitations in this study may explain the lack of statistical significance to support the impact of the PCMH density on the Delta PQI rates.

Areas of Future Research

While the findings of this study offer policy makers and healthcare decision makers additional guidance on primary care transformation, this study also highlights the need for additional research to determine other environmental factors that may not be detected by this proposed measurement framework. It may be useful to conduct controlled studies where the practices are pre-measured on their actual level of PCMH transformation and the outcome predictor of avoidable hospital admissions is monitored for attribution to the population within that community of evaluation. Such a study would need to be inclusive enough in terms of scope as to not replicate the many smaller studies that have preceded this study.

As well, the results of this study could be better informed by conducting a follow-up study within NC and VT to understand how the changes in the PCMH evaluation model (there are now two more versions (2011 and 2014) since this study's evaluation) may have impacted the 114 counties under evaluation in this study. Since 2011, both states have added many more NCQA recognized PCMH practices (NC at ~25% and VT at ~65% of all doctors in each state); a follow-on study should be conducted to determine if increased densities within counties resulted in furthering a sustained or increased reduction in risk-adjusted PQI rates. It's also probable that these increased PCMH densities may help to determine which of the PCMH capabilities may now correlate with PQI rates in terms of association, whereas this study may have not have had enough counties with significant PCMH density to detect such an association.

In addition to the two states evaluated in this study, there are another 46 states participating in the AHRQ HCUP program. To further evaluate this model, it would be important to look at other states in a similar study to determine if the results of this study are repeatable and generalizable within those states evaluated.

In addition to the adult PQIs evaluated in this study, there are also pediatric PQIs produced by AHRQ. The results of this study could be further evaluated using the same measurement framework for the pediatric populations within these states.

Conclusions

The US government, through recent legislation, is placing greater emphasis on the transformative affects that primary care practices can have on the cost, quality, and access to care. This study provides empirical evidence that increasing numbers of recognized PCMH practices are having a positive impact on avoiding preventable ambulatory care sensitive

condition (ACSC) hospital admissions within their respective communities. Specifically, this study resulted in the following statistically significant findings:

1. Decreased patients per doctor (PCD Density) was inversely related to PQI rates, and most models indicated no correlation on the change in avoidable hospitalizations (Delta PQI rates) or lower 2011 PQI rates
2. Increased PCMH densities are related to lower rates of avoidable hospitalizations, specific to chronic care conditions (2011 PQI 92); mainly affecting ages 40-64 (~16-18% predictive model)
3. Increased PCMH capabilities scores for Information Technology (IT), Clinical Data Tools (CDT), and Patient Communication Preferences (PTC) are related to reductions in avoidable hospitalizations for acute care conditions (Delta PQI 91); mainly affecting ages 40–64 (~55% predictive model)
4. Increased scores on MU capabilities are related to reductions in avoidable hospitalizations for both acute and chronic care conditions (Delta PQI 90/91/92); affecting all ages >18 (~5-9% predictive model)
5. Increased scores on NCQA MP capabilities are related to reductions in avoidable hospitalizations for overall and acute care conditions (Delta PQI 90/91); mainly affecting ages 18–39 (~6-8% predictive model)

Although the above conclusions are inferred from the statistical significance of the models evaluated, it is also noteworthy to mention there were mixed results among the models. The threats to validity and limitations to the study are likely contributing causes to the mixed results obtained in this study. For example, the 67 counties with PCMHs in 2011 had overall lower 2008 PQI rates than the 47 counties that did not have recognized PCMHs by endo of 2011.

There is also a probability that the PCMH capabilities models may show statistical significance for change scores across all 114 counties versus the 67 counties with PCMHs because the total number of counties with PCMHs are just too small and the larger number of counties provides for the variation needed to determine a difference in change scores or overall rates.

In addition to aiding policy makers with a model to evaluate community-wide health system performance based on outcomes of care, this evaluation framework also provides healthcare decision makers a method to determine which PCMH capabilities may be more influential in affecting avoidable ACSC hospital admissions within age-specific populations. This is particularly true of the recurrent age group of 40–64 that showed statistical significance in several of the models. This finding could indicate that age group is more responsive to the effects of the PCMH model in terms of behavior change and avoiding onset of chronic conditions; or could also be an indicator that this age group was most affected by the economic downturn and unemployment (or loss of insurance) during the same time period.

The results of this study build upon and extend the General Systems Theory, Donabedian QI, and Chronic Care Models in determining that effectively structured primary care, as evaluated by the NCQA recognition program, can produce better outcomes for patients and reduce utilization of more expensive ambulatory sensitive inpatient care at a community-level.

This study also provides recommendations for future research which includes a call to reproduce this model in other states and include more counties in the study; conduct a follow-on study within NC and VT to determine if increased densities or the updated PCMH capabilities has additional effect; conduct a controlled-study of the model to better control for patient/practice attribution and actual capabilities used in each model; and include or control for other confounding environmental factors (e.g., unemployment, economics) that may be

influencing the PQI rates to further the understanding of this study's limitations and threats to the validity of the research design presented.

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Appendix A

PCD and PCMH Density by FIPS

ST	FIPS	Total Docs	Rec Docs	Pop-2011	Rec Doc Den	Doc Den
NC	37001	65	4	117,179	0.06	1,803
NC	37003	1	0	28,946	0.00	28,946
NC	37019	27	2	90,057	0.07	3,335
NC	37021	243	48	192,698	0.20	793
NC	37023	38	0	70,799	0.00	1,863
NC	37025	131	73	133,316	0.56	1,018
NC	37027	18	3	64,390	0.17	3,577
NC	37035	87	22	118,314	0.25	1,360
NC	37037	6	3	50,562	0.50	8,427
NC	37049	78	0	80,659	0.00	1,034
NC	37051	211	6	238,208	0.03	1,129
NC	37053	1	0	18,545	0.00	18,545
NC	37057	30	16	125,121	0.53	4,171
NC	37059	5	5	32,123	1.00	6,425
NC	37063	805	65	209,568	0.08	260
NC	37065	10	0	42,764	0.00	4,276
NC	37067	518	93	268,153	0.18	518
NC	37069	10	1	46,466	0.10	4,647
NC	37071	119	39	158,437	0.33	1,331
NC	37073	0	0	9,331	0.00	9,331
NC	37081	395	47	378,755	0.12	959
NC	37087	25	0	47,795	0.00	1,912
NC	37089	72	6	86,345	0.08	1,199
NC	37093	4	3	34,679	0.75	8,670
NC	37097	96	4	121,752	0.04	1,268
NC	37101	37	1	125,782	0.03	3,400
NC	37103	12	0	7,957	0.00	663
NC	37109	24	11	60,990	0.46	2,541
NC	37115	2	0	16,658	0.00	8,329
NC	37119	871	307	705,963	0.35	811
NC	37127	43	5	73,645	0.12	1,713
NC	37129	216	22	164,076	0.10	760
NC	37133	75	1	132,461	0.01	1,766
NC	37135	398	67	105,156	0.17	264
NC	37137	3	0	10,866	0.00	3,622
NC	37141	7	0	41,486	0.00	5,927
NC	37145	12	1	30,730	0.08	2,561
NC	37147	211	25	130,058	0.12	616
NC	37151	28	2	108,211	0.07	3,865
NC	37157	33	0	73,361	0.00	2,223
NC	37159	75	14	105,842	0.19	1,411
NC	37169	10	10	37,279	1.00	3,728
NC	37179	54	19	145,012	0.35	2,685
NC	37183	508	142	689,848	0.28	1,358
NC	37191	43	0	93,285	0.00	2,169
NC	37197	6	3	29,677	0.50	4,946
NC	37013	14	0	37,426	0.00	2,673
NC	37029	0	0	7,546	0.00	7,546
NC	37031	25	1	54,872	0.04	2,195
NC	37045	61	13	75,097	0.21	1,231
NC	37055	7	0	27,562	0.00	3,937
NC	37077	17	15	47,015	0.88	2,766
NC	37083	22	0	41,899	0.00	1,905
NC	37085	18	6	86,261	0.33	4,792
NC	37099	24	0	32,101	0.00	1,338
NC	37105	27	2	43,816	0.07	1,623
NC	37107	29	0	45,341	0.00	1,563
NC	37111	6	0	35,571	0.00	5,929
NC	37125	83	3	70,548	0.04	850
NC	37131	2	0	17,429	0.00	8,715
NC	37139	16	0	31,319	0.00	1,957
NC	37143	1	0	10,806	0.00	10,806
NC	37153	18	3	35,370	0.17	1,965
NC	37155	53	0	98,763	0.00	1,863

ST	FIPS	Total Docs	Rec Docs	Pop-2011	Rec Doc Den	Doc Den
NC	37161	22	4	52,896	0.18	2,404
NC	37165	22	1	27,018	0.05	1,228
NC	37167	27	3	47,068	0.11	1,743
NC	37171	32	11	56,967	0.34	1,780
NC	37175	16	3	27,015	0.19	1,688
NC	37177	0	0	3,569	0.00	3,569
NC	37181	14	4	34,019	0.29	2,430
NC	37189	25	1	42,174	0.04	1,687
NC	37193	21	5	54,113	0.24	2,577
NC	37195	38	0	61,627	0.00	1,622
NC	37005	1	0	8,904	0.00	8,904
NC	37007	3	0	20,924	0.00	6,975
NC	37009	2	0	22,068	0.00	11,034
NC	37011	4	2	14,521	0.50	3,630
NC	37015	1	0	16,670	0.00	16,670
NC	37017	9	9	27,141	1.00	3,016
NC	37033	1	0	18,820	0.00	18,820
NC	37039	3	0	22,215	0.00	7,405
NC	37041	6	0	11,624	0.00	1,937
NC	37043	0	0	8,658	0.00	8,658
NC	37047	20	17	44,576	0.85	2,229
NC	37061	10	2	44,665	0.20	4,467
NC	37075	0	0	6,937	0.00	6,937
NC	37079	3	3	16,632	1.00	5,544
NC	37091	6	0	19,055	0.00	3,176
NC	37095	0	0	4,767	0.00	4,767
NC	37113	10	0	27,622	0.00	2,762
NC	37117	8	0	18,982	0.00	2,373
NC	37121	3	0	12,549	0.00	4,183
NC	37123	3	3	21,127	1.00	7,042
NC	37149	4	0	16,579	0.00	4,145
NC	37163	7	0	47,798	0.00	6,828
NC	37173	8	0	10,821	0.00	1,353
NC	37185	0	0	16,703	0.00	16,703
NC	37187	4	0	10,079	0.00	2,520
NC	37199	4	0	14,240	0.00	3,560
VT	50007	194	73	124,795	0.38	643
VT	50011	15	8	36,812	0.53	2,454
VT	50013	0	0	5,608	0.00	5,608
VT	50003	22	12	29,546	0.55	1,343
VT	50009	3	3	5,154	1.00	1,718
VT	50017	9	9	23,093	1.00	2,566
VT	50021	36	17	49,518	0.47	1,376
VT	50023	46	33	47,456	0.72	1,032
VT	50027	54	24	45,985	0.44	852
VT	50001	16	16	29,051	1.00	1,816
VT	50005	21	21	24,347	1.00	1,159
VT	50015	8	8	19,266	1.00	2,408
VT	50019	12	10	21,663	0.83	1,805
VT	50025	18	6	35,706	0.33	1,984

Appendix B

PCMH Capability Composites by FIPS

ST	FIPS	MU	MP	IT	CSC	CoC	ACC	RPT	CDT	NoN	PxP	PVS	PTC
NC	37001	42.50	38.00	23.25	13.50	15.00	6.50	6.00	6.00	2.25	3.00	4.00	2.00
NC	37003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37011	43.75	36.00	17.00	16.00	15.50	6.50	9.00	6.00	2.25	3.00	4.00	1.00
NC	37013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37017	33.21	37.46	12.25	11.83	18.96	6.71	7.75	6.00	2.00	3.00	2.67	1.67
NC	37019	43.88	41.25	21.88	15.50	17.50	7.75	9.00	6.00	2.63	1.50	4.00	1.50
NC	37021	42.04	40.48	18.29	14.92	17.79	7.77	7.63	6.00	1.88	2.50	4.00	1.67
NC	37023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37025	41.26	34.83	17.50	13.39	16.80	6.04	7.50	5.68	2.17	2.76	3.26	1.42
NC	37027	49.00	41.38	24.75	15.00	19.38	8.38	9.00	6.00	2.25	3.00	4.00	1.50
NC	37029	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37031	24.00	26.75	3.75	13.00	7.00	5.25	7.50	6.00	0.00	3.00	3.00	2.00
NC	37033	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37035	38.67	35.06	17.61	12.61	17.78	6.56	6.67	5.33	2.00	2.33	3.44	0.78
NC	37037	46.25	34.00	21.25	14.00	15.50	5.50	9.00	6.00	2.25	3.00	3.00	2.00
NC	37039	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37041	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37043	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37045	42.42	37.75	17.42	14.83	18.50	6.92	7.50	6.00	2.25	3.00	2.67	1.33
NC	37047	28.00	32.71	7.73	14.15	11.06	6.27	6.23	6.00	1.10	3.00	3.15	1.15
NC	37049	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37051	27.63	22.88	14.38	9.00	10.38	3.38	3.75	3.00	1.50	3.00	3.50	1.50
NC	37053	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37055	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37057	43.75	39.38	19.58	14.67	19.17	6.71	9.00	6.00	2.38	3.00	3.50	2.00
NC	37059	44.00	40.75	21.75	15.00	20.00	7.75	9.00	6.00	2.25	3.00	4.00	2.00
NC	37061	42.25	40.50	20.00	16.00	15.00	6.50	9.00	6.00	2.25	3.00	4.00	2.00
NC	37063	39.63	35.98	17.93	13.25	16.61	7.30	6.54	5.57	1.88	2.79	3.71	1.50
NC	37065	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37067	40.18	37.28	17.03	13.94	18.85	6.85	7.50	5.40	1.99	2.63	3.90	1.70
NC	37069	42.50	40.75	17.25	15.00	20.00	7.75	9.00	6.00	1.50	3.00	4.00	2.00
NC	37071	40.41	37.52	17.30	13.86	17.63	7.17	8.53	5.63	2.02	2.81	3.88	1.75
NC	37073	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37075	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37077	31.08	27.63	16.38	8.92	13.13	5.29	3.00	6.00	1.13	1.50	1.33	1.50
NC	37079	38.00	32.44	20.25	10.38	17.75	4.56	6.75	4.50	2.06	2.25	3.00	2.00
NC	37081	41.93	38.75	18.53	14.10	18.32	7.01	8.65	5.65	2.38	3.00	3.35	1.88
NC	37083	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37085	38.54	32.21	16.96	12.33	17.33	5.54	6.50	5.00	0.25	2.00	3.17	0.17
NC	37087	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37089	42.00	39.50	17.50	15.00	17.50	6.50	6.00	6.00	0.00	1.50	4.00	2.00
NC	37091	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37093	47.25	38.00	20.83	15.33	17.42	7.33	8.00	6.00	2.25	2.50	3.33	2.00
NC	37095	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37097	36.50	39.75	10.50	14.00	20.00	7.75	9.00	6.00	3.00	3.00	4.00	0.00
NC	37099	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37101	46.75	41.88	21.88	15.50	18.75	8.38	9.00	6.00	2.63	3.00	4.00	1.00
NC	37103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37105	45.13	37.88	18.25	15.50	17.25	6.63	9.00	6.00	2.63	3.00	3.50	2.00
NC	37107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37109	39.85	37.25	15.50	14.60	16.90	6.75	9.00	6.00	2.85	3.00	3.20	1.60
NC	37111	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37113	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37117	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37119	40.38	38.18	16.80	14.22	18.63	7.05	8.46	5.92	2.47	3.00	3.39	1.76
NC	37121	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37123	39.88	37.38	14.00	13.75	18.75	7.13	6.00	6.00	2.63	2.25	4.00	1.00
NC	37125	35.63	32.38	16.38	9.63	19.50	6.50	4.88	4.50	1.31	1.50	3.50	1.50
NC	37127	42.25	41.50	21.00	16.00	15.00	9.00	7.50	6.00	3.00	0.00	3.00	1.00

ST	FIPS	MU	MP	IT	CSC	CoC	ACC	RPT	CDT	NoN	PxP	PVS	PTC
NC	37129	39.13	34.13	17.38	12.00	20.00	5.88	5.63	4.50	1.69	0.00	3.00	2.00
NC	37131	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37133	30.75	41.50	8.75	16.00	15.00	9.00	4.50	6.00	0.00	3.00	4.00	0.00
NC	37135	43.79	39.11	19.36	15.50	18.32	6.54	7.50	6.00	2.46	2.57	3.43	1.57
NC	37137	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37139	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37141	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37143	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37145	49.00	40.50	22.75	15.00	20.00	9.00	7.50	6.00	3.00	3.00	4.00	1.00
NC	37147	45.25	40.00	20.50	15.50	18.25	7.25	8.25	6.00	2.63	3.00	3.00	2.00
NC	37149	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37151	41.50	39.63	18.75	14.50	17.50	7.13	9.00	6.00	2.63	3.00	3.00	2.00
NC	37153	47.50	40.25	20.50	16.00	19.00	7.75	8.50	6.00	2.25	2.00	3.00	2.00
NC	37155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37159	43.80	39.70	20.30	15.50	20.00	6.50	8.70	6.00	2.40	3.00	4.00	2.00
NC	37161	48.25	38.00	21.25	16.00	19.00	6.50	4.50	6.00	3.00	3.00	4.00	1.00
NC	37163	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37165	47.75	40.75	22.25	15.00	20.00	7.75	7.50	6.00	3.00	3.00	4.00	2.00
NC	37167	40.38	40.25	14.63	15.00	19.50	7.25	9.00	6.00	2.25	3.00	4.00	0.50
NC	37169	50.00	39.00	23.00	16.00	20.00	6.50	7.50	6.00	2.25	3.00	4.00	2.00
NC	37171	41.92	40.33	19.25	15.00	18.33	7.33	9.00	6.00	2.75	3.00	4.00	2.00
NC	37173	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37175	37.00	26.00	19.00	12.00	8.50	2.00	4.50	6.00	1.50	0.00	4.00	1.00
NC	37177	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37179	41.50	39.05	18.10	15.10	19.75	6.25	7.50	6.00	2.55	3.00	3.80	2.00
NC	37181	46.50	39.50	23.25	15.00	17.50	6.50	6.00	6.00	1.50	3.00	4.00	2.00
NC	37183	40.13	37.73	17.56	14.31	16.56	7.32	6.94	5.89	2.26	2.61	3.22	1.06
NC	37185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37187	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37189	18.50	30.00	14.00	3.00	15.00	4.00	6.00	6.00	0.00	3.00	0.00	0.00
NC	37191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37193	45.00	41.75	18.00	16.00	20.00	7.75	9.00	6.00	3.00	3.00	4.00	2.00
NC	37195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	37197	41.00	39.25	14.00	15.00	20.00	7.75	7.50	6.00	3.00	3.00	4.00	2.00
NC	37199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VT	50001	32.90	35.85	10.50	13.80	16.35	7.75	4.80	6.00	2.40	3.00	3.20	0.60
VT	50003	42.25	38.00	18.38	14.25	18.46	6.75	7.50	6.00	2.38	2.75	3.67	1.00
VT	50005	43.00	34.95	17.30	14.00	15.20	6.55	8.40	6.00	3.00	3.00	4.00	2.00
VT	50007	38.98	33.92	15.92	12.65	16.60	6.77	7.73	5.54	2.71	2.65	4.00	1.69
VT	50009	41.50	38.25	17.00	13.50	19.00	6.75	9.00	6.00	3.00	3.00	4.00	2.00
VT	50011	44.81	36.44	20.88	13.25	19.88	7.13	6.56	5.25	2.53	2.25	4.00	2.00
VT	50013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VT	50015	47.13	41.25	20.88	15.50	19.38	7.75	8.25	6.00	3.00	3.00	4.00	2.00
VT	50017	32.63	36.50	10.25	12.00	19.38	6.50	9.00	6.00	3.00	1.50	4.00	2.00
VT	50019	49.50	41.75	22.88	16.00	20.00	7.75	9.00	6.00	3.00	3.00	4.00	2.00
VT	50021	42.88	35.71	20.42	12.67	19.00	7.96	5.25	5.00	2.50	2.50	4.00	2.00
VT	50023	34.65	29.71	14.71	10.85	16.21	4.73	7.25	5.50	1.75	2.88	3.33	1.08
VT	50025	45.08	39.58	19.58	14.67	19.17	6.92	8.00	6.00	2.50	3.00	4.00	2.00
VT	50027	40.35	34.28	17.60	12.75	17.85	6.18	6.30	5.40	2.70	2.40	4.00	0.60

Appendix C

PQI Rates by Age Category by FIPS

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37001	1	0.929370	1.156550	0.787170	0.867290	0.775300	0.928100	-0.062080	-0.381250	0.140930
NC	37001	2	1.222550	1.116000	1.270150	0.990980	0.794640	1.075460	-0.231570	-0.321360	-0.194690
NC	37001	3	1.235640	1.231160	1.245340	1.030320	0.911220	1.094950	-0.205320	-0.319940	-0.150390
NC	37001	4	1.123690	1.236220	1.041160	0.791720	0.771380	0.809010	-0.331970	-0.464840	-0.232150
NC	37003	1	0.995250	1.658710	0.611850	1.079950	1.666100	0.739780	0.084700	0.007390	0.127930
NC	37003	2	1.057210	1.476360	0.894270	1.094610	1.412900	0.957470	0.037400	-0.063460	0.063200
NC	37003	3	1.234930	1.337100	1.207460	0.927400	0.996520	0.889670	-0.307530	-0.340580	-0.317790
NC	37003	4	1.109680	1.346310	1.006950	0.980450	0.938550	1.020860	-0.129230	-0.407760	0.013910
NC	37005	1	2.195740	4.309050	1.056210	1.698480	3.034500	0.978910	-0.497260	-1.274550	-0.077300
NC	37005	2	1.123710	1.912230	0.816600	0.882890	1.687030	0.568300	-0.240820	-0.225200	-0.248300
NC	37005	3	1.071870	1.943870	0.655780	0.968260	1.794070	0.569440	-0.103610	-0.149800	-0.086340
NC	37005	4	1.553040	2.305060	1.033460	0.981990	1.404880	0.676230	-0.571050	-0.900180	-0.357230
NC	37007	1	1.568530	1.090160	1.840210	1.207740	0.594020	1.547420	-0.360790	-0.496140	-0.292790
NC	37007	2	1.340690	1.123130	1.421470	0.991260	1.001300	0.980290	-0.349430	-0.121830	-0.441180
NC	37007	3	1.405190	1.398630	1.433250	0.994170	1.241890	0.871870	-0.411020	-0.156740	-0.561380
NC	37007	4	1.015860	0.982520	1.112630	0.584970	0.535790	0.626990	-0.430890	-0.446730	-0.485640
NC	37009	1	1.106860	1.712500	0.734060	1.224490	1.975580	0.756990	0.117630	0.263080	0.022930
NC	37009	2	0.917460	1.294510	0.760100	0.921100	1.625660	0.614610	0.003640	0.331150	-0.145490
NC	37009	3	1.280450	1.813410	1.027580	1.004450	1.690940	0.628300	-0.276000	-0.122470	-0.399280
NC	37009	4	1.166130	1.393900	1.074440	1.214810	1.634300	0.854690	0.048680	0.240400	-0.219750
NC	37011	1	1.464520	1.954890	1.221850	0.938360	1.693440	0.548360	-0.526160	-0.261450	-0.673490
NC	37011	2	1.250790	2.759750	0.683380	1.197860	1.987040	0.889460	-0.052930	-0.772710	0.206080
NC	37011	3	1.654240	3.159620	0.993650	1.281130	1.677750	1.085990	-0.373110	-1.481870	0.092340
NC	37011	4	1.829260	3.204260	1.055050	1.706000	2.483370	1.145040	-0.123260	-0.720890	0.089990
NC	37013	1	1.272930	1.488600	1.139950	0.921380	0.727920	1.047740	-0.351550	-0.760680	-0.092210
NC	37013	2	1.137680	1.178260	1.129170	1.075080	1.054400	1.085570	-0.062600	-0.123860	-0.043600
NC	37013	3	1.259850	1.076290	1.393570	0.814060	0.757340	0.845640	-0.445790	-0.318950	-0.547930
NC	37013	4	1.221540	1.246690	1.304790	0.805570	0.720710	0.875390	-0.415970	-0.525980	-0.429400
NC	37015	1	1.611550	1.288610	1.805410	1.164620	0.710270	1.424390	-0.446930	-0.578340	-0.381020
NC	37015	2	1.056210	1.397100	0.917460	1.023040	1.491570	0.835170	-0.033170	0.094470	-0.082290
NC	37015	3	1.451760	1.942220	1.208280	0.883920	1.022900	0.814430	-0.567840	-0.919320	-0.393850
NC	37015	4	1.163580	1.536100	0.889530	0.952020	1.094280	0.850550	-0.211560	-0.441820	-0.038980
NC	37017	1	0.769270	0.938610	0.682250	1.072490	1.223420	0.999300	0.303220	0.284810	0.317050
NC	37017	2	0.946460	1.126600	0.870550	0.996030	1.196590	0.911670	0.049570	0.069990	0.041120
NC	37017	3	1.004140	1.164860	0.925900	1.038720	1.286890	0.916160	0.034580	0.122030	-0.009740
NC	37017	4	1.037720	1.269120	0.877220	1.184100	1.414060	1.019540	0.146380	0.144940	0.142320
NC	37019	1	1.127520	0.994300	1.211540	1.105240	1.277890	0.996710	-0.022280	0.283590	-0.214830
NC	37019	2	0.878550	0.923570	0.857600	0.769120	0.796300	0.756110	-0.109430	-0.127270	-0.101490
NC	37019	3	1.009970	0.962180	1.039090	0.754260	0.805460	0.726330	-0.255710	-0.156720	-0.312760
NC	37019	4	1.182740	1.322970	1.098160	0.860240	1.017590	0.733210	-0.322500	-0.305380	-0.364950
NC	37021	1	0.903310	1.023430	0.833420	0.859900	0.835820	0.876000	-0.043410	-0.187610	0.042580
NC	37021	2	0.816030	0.955540	0.753270	0.765770	0.791450	0.749960	-0.050260	-0.164090	-0.003310
NC	37021	3	0.877260	0.991910	0.816230	0.832690	0.852600	0.820420	-0.044570	-0.139310	0.004190
NC	37021	4	0.758550	0.803070	0.729030	0.624350	0.637810	0.618770	-0.134200	-0.165260	-0.110260
NC	37023	1	0.905950	1.334900	0.642460	0.866580	0.681880	0.983360	-0.039370	-0.653020	0.340900
NC	37023	2	0.948980	1.162840	0.858610	0.813090	1.109690	0.684830	-0.135890	-0.053150	-0.173780
NC	37023	3	0.961640	0.984510	0.959980	0.848260	0.975450	0.779290	-0.113380	-0.009060	-0.180690
NC	37023	4	0.953420	0.957270	0.985310	0.734070	0.736690	0.731880	-0.219350	-0.220580	-0.253430
NC	37025	1	2.049930	1.689820	2.282710	1.298270	1.035330	1.469900	-0.751660	-0.654490	-0.812810
NC	37025	2	1.852710	1.753570	1.905140	1.303850	1.371960	1.276620	-0.548860	-0.381610	-0.628520
NC	37025	3	2.228420	2.178910	2.259680	1.554600	1.397950	1.647490	-0.673820	-0.780960	-0.612190
NC	37025	4	1.569550	1.494610	1.632060	1.455560	1.351150	1.545450	-0.113990	-0.143460	-0.086610
NC	37027	1	1.206670	1.093840	1.279390	1.169830	0.822420	1.389020	-0.036840	-0.271420	0.109630
NC	37027	2	1.071660	1.226230	1.005360	0.982280	0.932710	1.003160	-0.089380	-0.293520	-0.002200
NC	37027	3	1.178650	1.408210	1.063570	0.984590	1.037760	0.955790	-0.194060	-0.370450	-0.107780
NC	37027	4	1.129990	1.251610	1.046080	0.967860	1.072250	0.881650	-0.162130	-0.179360	-0.164430
NC	37029	1	1.089880	2.029550	0.453280	1.256650	1.374250	1.168040	0.166770	-0.655300	0.714760
NC	37029	2	1.127060	0.868020	1.250210	0.646880	0.890960	0.535840	-0.480180	0.022940	-0.714370
NC	37029	3	1.204140	0.892230	1.386860	0.537060	0.265280	0.695900	-0.667080	-0.626950	-0.690960
NC	37029	4	0.853540	0.798450	0.903450	1.301100	0.692550	1.836560	0.447560	-0.105900	0.933110
NC	37031	1	1.442220	1.377460	1.478530	1.392410	0.849480	1.750760	-0.049810	-0.527980	0.272230
NC	37031	2	1.320250	1.271610	1.347470	0.859990	0.847330	0.868870	-0.460260	-0.424280	-0.478600
NC	37031	3	1.418100	1.145700	1.578460	1.113560	1.069610	1.140350	-0.304540	-0.076090	-0.438110
NC	37031	4	1.457220	1.282320	1.618080	1.059860	0.903580	1.196050	-0.397360	-0.378740	-0.422030

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37033	1	0.964010	1.267640	0.779880	0.329400	0.247330	0.380860	-0.634610	-1.020310	-0.399020
NC	37033	2	0.579750	0.612170	0.566700	0.560250	0.680700	0.508660	-0.019500	0.068530	-0.058040
NC	37033	3	0.457450	0.493440	0.438490	0.619860	0.695400	0.579060	0.162410	0.201960	0.140570
NC	37033	4	0.553510	0.481270	0.621530	0.591070	0.804590	0.407870	0.037560	0.323320	-0.213660
NC	37035	1	0.875590	0.710930	0.978150	0.922860	0.747740	1.032320	0.047270	0.036810	0.054170
NC	37035	2	1.029850	1.068010	1.012890	0.895260	0.937660	0.875090	-0.134590	-0.130350	-0.137800
NC	37035	3	1.126680	1.081300	1.160070	0.910890	0.909240	0.911090	-0.215790	-0.172060	-0.248980
NC	37035	4	0.909200	1.011860	0.846030	0.804550	0.811840	0.800270	-0.104650	-0.200020	-0.045760
NC	37037	1	0.617890	0.871050	0.455470	0.792030	0.657680	0.875700	0.174140	-0.213370	0.420230
NC	37037	2	0.676460	0.754540	0.641460	0.591090	0.593960	0.588830	-0.085370	-0.160580	-0.052630
NC	37037	3	0.890000	0.951570	0.864110	0.501300	0.371420	0.572390	-0.388700	-0.580150	-0.291720
NC	37037	4	0.852240	0.921630	0.818820	0.601660	0.684670	0.531790	-0.250580	-0.236960	-0.287030
NC	37039	1	0.859250	1.411020	0.515560	1.317000	0.758850	1.671140	0.457750	-0.652170	1.155580
NC	37039	2	0.669820	0.881480	0.577820	0.672630	0.932070	0.559760	0.002810	0.050590	-0.018060
NC	37039	3	0.563410	0.744460	0.465830	0.444460	0.546550	0.389350	-0.118950	-0.197910	-0.076480
NC	37039	4	0.832750	1.069710	0.635940	0.472830	0.586910	0.377850	-0.359920	-0.482800	-0.258090
NC	37041	1	1.324600	1.793360	1.026500	1.328600	0.600880	1.799330	0.004000	-1.192480	0.772830
NC	37041	2	1.422090	1.414180	1.427460	1.031550	1.372920	0.883190	-0.390540	-0.041260	-0.544270
NC	37041	3	1.275690	1.320660	1.251730	1.264250	1.346110	1.220220	-0.011440	0.025450	-0.031510
NC	37041	4	1.010550	1.156500	0.883140	0.955480	1.023970	0.896000	-0.055070	-0.132530	0.012860
NC	37043	1	0.619990	1.293070	0.201590	0.249500	0.652120	0.000000	-0.370490	-0.640950	-0.201590
NC	37043	2	0.435310	0.839650	0.260020	0.330380	0.544750	0.236960	-0.104930	-0.294900	-0.023060
NC	37043	3	0.705610	0.566610	0.780500	0.245930	0.351430	0.189140	-0.459680	-0.215180	-0.591360
NC	37043	4	0.526730	0.468640	0.576260	0.278220	0.346030	0.221990	-0.248510	-0.122610	-0.354270
NC	37045	1	1.331480	1.043840	1.519260	1.718130	1.283270	2.002780	0.386650	0.239430	0.483520
NC	37045	2	1.337660	1.450290	1.290370	1.456320	1.355580	1.502370	0.118660	-0.094710	0.212000
NC	37045	3	1.201450	1.211330	1.201530	1.323610	1.298540	1.338240	0.122160	0.087210	0.136710
NC	37045	4	1.281090	1.358800	1.223410	1.035100	1.072650	1.001570	-0.245990	-0.286150	-0.221840
NC	37047	1	1.701690	1.745420	1.695540	0.600070	0.727780	0.535650	-1.101620	-1.017640	-1.159890
NC	37047	2	1.337350	1.478540	1.274110	0.935960	1.200270	0.827520	-0.401390	-0.278270	-0.446590
NC	37047	3	1.127810	1.253730	1.066440	0.849820	0.943900	0.802400	-0.277990	-0.309830	-0.264040
NC	37047	4	0.980490	1.096330	0.912190	0.699400	0.761260	0.657260	-0.281090	-0.335070	-0.254930
NC	37049	1	1.236770	1.561570	1.046750	1.074580	1.264540	0.963990	-0.162190	-0.297030	-0.082760
NC	37049	2	1.520170	1.503400	1.521610	1.069860	0.932640	1.118700	-0.450310	-0.570760	-0.402910
NC	37049	3	1.370100	1.136000	1.523920	0.857530	0.743860	0.913820	-0.512570	-0.392140	-0.610100
NC	37049	4	1.236660	1.286950	1.315660	0.645610	0.572920	0.708290	-0.591050	-0.714030	-0.607370
NC	37051	1	1.033840	0.739010	1.223720	1.469710	0.903320	1.834240	0.435870	0.164310	0.610520
NC	37051	2	1.344470	0.964370	1.516680	1.537110	1.225890	1.671470	0.192640	0.261520	0.154790
NC	37051	3	1.421200	1.105870	1.633680	1.494080	1.272190	1.614790	0.072880	0.166320	-0.018890
NC	37051	4	1.229640	1.122100	1.429050	1.161540	1.086020	1.225840	-0.068100	-0.036080	-0.203210
NC	37053	1	1.032090	0.698270	1.256080	0.357690	0.000000	0.602410	-0.674400	-0.698270	-0.653670
NC	37053	2	0.579780	0.507000	0.617290	0.516440	0.336440	0.604270	-0.063340	-0.170560	-0.013020
NC	37053	3	0.983260	0.432140	1.309940	0.528780	0.369320	0.624030	-0.454480	-0.062820	-0.685910
NC	37053	4	1.076760	1.001780	1.142550	0.800350	0.663840	0.920690	-0.276410	-0.337940	-0.221860
NC	37055	1	0.485050	0.595460	0.406610	0.619780	0.911080	0.416200	0.134730	0.315620	0.009590
NC	37055	2	0.542600	0.764570	0.440050	0.429070	0.423190	0.434120	-0.113530	-0.341380	-0.005930
NC	37055	3	0.847820	0.906050	0.815630	0.519850	0.621590	0.460460	-0.327970	-0.284460	-0.355170
NC	37055	4	1.068560	1.318990	0.839670	0.888720	1.073300	0.718800	-0.179840	-0.245690	-0.120870
NC	37057	1	1.284100	1.254450	1.303860	1.000170	0.948000	1.033120	-0.283930	-0.306450	-0.270740
NC	37057	2	1.212550	1.345750	1.149710	0.999850	1.162550	0.926450	-0.212700	-0.183200	-0.223260
NC	37057	3	1.359340	1.480050	1.294060	1.014780	1.213260	0.910550	-0.344560	-0.266790	-0.383510
NC	37057	4	1.241240	1.326730	1.184580	0.934940	1.087420	0.821980	-0.306300	-0.239310	-0.362600
NC	37059	1	1.835120	1.819210	1.836660	1.326460	0.946660	1.577330	-0.508660	-0.872550	-0.259330
NC	37059	2	1.275880	1.498130	1.177590	0.935610	0.959020	0.927980	-0.340270	-0.539110	-0.249610
NC	37059	3	1.822120	1.998950	1.727470	1.101170	1.107800	1.098550	-0.720950	-0.891150	-0.628920
NC	37059	4	1.526560	1.903060	1.200100	1.279830	1.211020	1.339070	-0.246730	-0.692040	0.138970
NC	37061	1	0.652780	0.764450	0.597420	0.678910	0.561120	0.751940	0.026130	-0.203330	0.154520
NC	37061	2	1.102560	1.164040	1.081220	0.866610	1.073270	0.780840	-0.235950	-0.090770	-0.300380
NC	37061	3	1.057440	1.608920	0.811520	1.063590	1.216750	0.987100	0.006150	-0.392170	0.175580
NC	37061	4	0.906740	1.148460	0.789680	0.860410	1.033880	0.735850	-0.046330	-0.114580	-0.053830
NC	37063	1	0.827830	0.727370	0.893690	0.666820	0.488920	0.781830	-0.161010	-0.238450	-0.111860
NC	37063	2	1.135170	0.772140	1.298740	1.003290	0.696100	1.136330	-0.131880	-0.076040	-0.162410
NC	37063	3	1.237470	1.066630	1.363160	0.991470	0.750900	1.121790	-0.246000	-0.315730	-0.241370
NC	37063	4	0.883630	0.891160	0.939750	0.716840	0.718760	0.715160	-0.166790	-0.172400	-0.224590

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37065	1	1.807810	1.543990	1.984170	1.892340	1.190920	2.319980	0.084530	-0.353070	0.335810
NC	37065	2	1.766380	1.671750	1.801060	1.774520	1.558130	1.846790	0.008140	-0.113620	0.045730
NC	37065	3	1.584550	1.633370	1.580620	1.283680	1.403890	1.222740	-0.300870	-0.229480	-0.357880
NC	37065	4	1.347760	1.725160	1.108560	1.221330	1.574190	0.960730	-0.126430	-0.150970	-0.147830
NC	37067	1	1.222840	1.137990	1.277300	1.202470	1.088440	1.275950	-0.020370	-0.049550	-0.001350
NC	37067	2	1.301230	1.385340	1.262760	1.274880	1.161010	1.322510	-0.026350	-0.224330	0.059750
NC	37067	3	1.301420	1.181780	1.365980	1.238960	1.242420	1.236470	-0.062460	0.060640	-0.129510
NC	37067	4	1.247280	1.326030	1.182940	1.163970	1.263970	1.081110	-0.083310	-0.062060	-0.101830
NC	37069	1	1.064810	0.957180	1.131780	1.302580	0.510910	1.796750	0.237770	-0.446270	0.664970
NC	37069	2	1.432960	0.997690	1.625930	0.721490	0.439920	0.842110	-0.711470	-0.557770	-0.783820
NC	37069	3	1.601320	1.294480	1.808270	0.705300	0.534760	0.797530	-0.896020	-0.759720	-1.010740
NC	37069	4	1.242270	1.167060	1.398110	0.823650	0.681710	0.943920	-0.418620	-0.485350	-0.454190
NC	37071	1	1.098300	1.299440	0.973550	1.251220	1.206700	1.283220	0.152920	-0.092740	0.309670
NC	37071	2	1.295040	1.452650	1.239040	1.397760	1.563480	1.327120	0.102720	0.110830	0.088080
NC	37071	3	1.189760	1.248580	1.186470	1.277670	1.373690	1.225810	0.087910	0.125110	0.039340
NC	37071	4	1.007520	1.106020	0.985490	1.173870	1.282460	1.080130	0.166350	0.176440	0.094640
NC	37073	1	0.375570	0.502110	0.300590	0.493880	0.263250	0.633760	0.118310	-0.238860	0.333170
NC	37073	2	0.802140	0.375350	0.970860	0.385780	0.120460	0.491280	-0.416360	-0.254890	-0.479580
NC	37073	3	1.331320	1.277650	1.357030	0.758330	0.664240	0.804330	-0.572990	-0.613410	-0.552700
NC	37073	4	0.657880	0.684430	0.642480	0.465670	0.392950	0.527150	-0.192210	-0.291480	-0.115330
NC	37075	1	0.322830	0.604220	0.168940	1.081420	1.812350	0.681330	0.758590	1.208130	0.512390
NC	37075	2	0.858130	1.421970	0.633880	0.406800	0.897760	0.213920	-0.451330	-0.524210	-0.419960
NC	37075	3	0.390970	0.373870	0.398430	0.592520	1.133830	0.329280	0.201550	0.759960	-0.069150
NC	37075	4	0.743930	0.976080	0.574930	0.490500	0.640450	0.381530	-0.253430	-0.335630	-0.193400
NC	37077	1	0.985910	0.781670	1.109090	0.723650	0.844760	0.650660	-0.262260	0.063090	-0.458430
NC	37077	2	1.307100	1.287190	1.324940	0.892640	0.795870	0.932520	-0.414460	-0.491320	-0.392420
NC	37077	3	1.487320	1.408390	1.570940	1.216530	1.283780	1.179590	-0.270790	-0.124610	-0.391350
NC	37077	4	1.353500	1.414680	1.425060	1.077420	1.015200	1.131510	-0.276080	-0.399480	-0.293550
NC	37079	1	0.823060	1.195230	0.632710	0.616280	0.497850	0.683770	-0.206780	-0.697380	0.051060
NC	37079	2	1.411070	0.591540	1.713730	1.097370	1.022380	1.117730	-0.313700	0.430840	-0.596000
NC	37079	3	1.078870	1.162050	1.050580	1.130440	1.383030	1.005700	0.051570	0.220980	-0.044880
NC	37079	4	1.051420	1.235730	0.969880	1.009680	1.213130	0.860730	-0.041740	-0.022600	-0.109150
NC	37081	1	0.940870	0.966090	0.926940	0.928280	0.838980	0.987720	-0.012590	-0.127110	0.060780
NC	37081	2	1.049570	1.020750	1.061560	1.027090	1.044300	1.019150	-0.022480	0.023550	-0.042410
NC	37081	3	1.004320	1.087670	0.959040	1.020030	1.116920	0.968910	0.015710	0.029250	0.009870
NC	37081	4	0.962340	0.997340	0.933000	0.937880	1.042680	0.848860	-0.024460	0.045340	-0.084140
NC	37083	1	1.656960	1.723770	1.642480	1.212000	1.461680	1.084550	-0.444960	-0.262090	-0.557930
NC	37083	2	2.076790	1.447510	2.332400	1.676790	1.311180	1.806900	-0.400000	-0.136330	-0.525500
NC	37083	3	1.812720	1.547720	2.010400	1.392490	1.306490	1.431890	-0.420230	-0.241230	-0.578510
NC	37083	4	1.321240	1.362110	1.433090	1.313780	1.217750	1.394670	-0.007460	-0.144360	-0.038420
NC	37085	1	1.022830	0.880350	1.113120	1.054860	0.964760	1.112280	0.032030	0.084410	-0.000840
NC	37085	2	1.521250	1.419480	1.574890	1.513860	1.366840	1.575210	-0.007390	-0.052640	0.000320
NC	37085	3	1.927820	1.910930	2.001450	1.575690	1.722870	1.494950	-0.352130	-0.188060	-0.506500
NC	37085	4	1.461440	1.680470	1.411240	1.544630	1.550980	1.541900	0.083190	-0.129490	0.130660
NC	37087	1	1.336390	1.628360	1.146950	1.588640	1.734090	1.491200	0.252250	0.105730	0.344250
NC	37087	2	1.192510	1.657750	0.984900	1.165480	1.306260	1.101330	-0.027030	-0.351490	0.116430
NC	37087	3	1.246730	1.417430	1.151410	1.123750	1.237390	1.060060	-0.122980	-0.180040	-0.091350
NC	37087	4	1.148730	1.365100	0.967590	1.107610	1.119050	1.101940	-0.041120	-0.246050	0.134350
NC	37089	1	1.237280	1.184720	1.270290	0.889220	0.729380	0.989470	-0.348060	-0.455340	-0.280820
NC	37089	2	0.955340	1.177070	0.860490	0.714950	0.863530	0.649220	-0.240390	-0.313540	-0.211270
NC	37089	3	0.901470	0.793350	0.972640	0.689170	0.686050	0.690540	-0.212300	-0.107300	-0.282100
NC	37089	4	0.836060	0.856860	0.862760	0.634430	0.726780	0.557690	-0.201630	-0.130080	-0.305070
NC	37091	1	2.230100	1.929320	2.421810	0.519780	0.194810	0.706670	-1.710320	-1.734510	-1.715140
NC	37091	2	2.682910	3.245650	2.452360	0.616160	0.538600	0.641720	-2.066750	-2.707050	-1.810640
NC	37091	3	2.541560	3.436900	2.122150	0.696330	0.877670	0.606870	-1.845230	-2.559230	-1.515280
NC	37091	4	2.397710	2.814950	2.232480	0.909940	0.889900	0.930510	-1.487770	-1.925050	-1.301970
NC	37093	1	0.677450	0.599660	0.728100	0.726150	0.529830	0.852210	0.048700	-0.069830	0.124110
NC	37093	2	1.186120	0.721730	1.387400	1.128630	0.826960	1.258360	-0.057490	0.105230	-0.129040
NC	37093	3	1.191050	0.908710	1.356550	1.694700	0.910960	2.117990	0.503650	0.002250	0.761440
NC	37093	4	1.016160	0.957330	1.093470	1.193440	0.837410	1.491670	0.177280	-0.119920	0.398200
NC	37095	1	0.788100	0.390470	0.997140	0.390700	0.000000	0.591570	-0.397400	-0.390470	-0.405570
NC	37095	2	0.786240	1.096930	0.664520	0.895260	1.148720	0.792390	0.109020	0.051790	0.127870
NC	37095	3	1.045320	1.323280	0.936190	1.364190	1.397190	1.346260	0.318870	0.073910	0.410070
NC	37095	4	1.142720	1.491960	0.991630	0.888170	0.884630	0.896210	-0.254550	-0.607330	-0.095420

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37097	1	1.506500	1.772880	1.319930	1.271260	1.338830	1.219090	-0.235240	-0.434050	-0.100840
NC	37097	2	1.605050	1.619300	1.620510	1.368300	1.307380	1.401340	-0.236750	-0.311920	-0.219170
NC	37097	3	1.681860	1.655340	1.754230	1.466570	1.403010	1.505200	-0.215290	-0.252330	-0.249030
NC	37097	4	1.577080	1.422380	1.863670	1.374820	1.269140	1.464670	-0.202260	-0.153240	-0.399000
NC	37099	1	1.274890	1.547760	1.102790	0.574490	0.543000	0.596410	-0.700400	-1.004760	-0.506380
NC	37099	2	0.756410	1.133750	0.592200	0.569040	0.798230	0.469340	-0.187370	-0.335520	-0.122860
NC	37099	3	0.731200	1.048350	0.558580	0.476840	0.531010	0.447540	-0.254360	-0.517340	-0.111040
NC	37099	4	0.955560	1.102960	0.833420	0.597970	0.787150	0.438460	-0.357590	-0.315810	-0.394960
NC	37101	1	0.992760	1.148560	0.895760	0.936180	0.972120	0.913850	-0.056580	-0.176440	0.018090
NC	37101	2	1.195420	1.172520	1.211540	1.121910	1.178390	1.095750	-0.073510	0.005870	-0.115790
NC	37101	3	1.510480	1.357350	1.632440	1.428580	1.393160	1.447030	-0.081900	0.035810	-0.185410
NC	37101	4	1.479830	1.481620	1.614250	1.208480	1.301830	1.132440	-0.271350	-0.179790	-0.481810
NC	37103	1	1.748540	3.327840	0.761250	1.388220	1.797790	1.133150	-0.360320	-1.530050	0.371900
NC	37103	2	1.493080	1.632910	1.435520	1.175340	1.451240	1.055450	-0.317740	-0.181670	-0.380070
NC	37103	3	2.472400	1.962790	2.851350	1.570520	1.163230	1.790770	-0.901880	-0.799560	-1.060580
NC	37103	4	1.650770	1.672670	1.820100	0.837530	0.541170	1.085120	-0.813240	-1.131500	-0.734980
NC	37105	1	1.044810	1.067660	1.032910	1.214040	0.947690	1.384630	0.169230	-0.119970	0.351720
NC	37105	2	1.401210	1.227270	1.485830	1.584930	1.451600	1.641640	0.183720	0.224330	0.155810
NC	37105	3	1.407880	1.203300	1.561680	1.640900	1.448790	1.744930	0.233020	0.245490	0.183250
NC	37105	4	1.250180	1.207050	1.367790	1.204300	1.242020	1.172450	-0.045880	0.034970	-0.195340
NC	37107	1	2.075550	2.020050	2.134900	1.646330	1.531260	1.729910	-0.429220	-0.488790	-0.404990
NC	37107	2	1.884840	1.905170	1.894800	1.327830	1.222580	1.359620	-0.557010	-0.682590	-0.535180
NC	37107	3	1.539690	1.820290	1.463290	1.249130	1.229350	1.256620	-0.290560	-0.590940	-0.206670
NC	37107	4	1.309800	1.450830	1.363600	1.165000	1.198090	1.146650	-0.144800	-0.252740	-0.216950
NC	37109	1	1.029940	0.856670	1.137110	1.052160	1.308400	0.885700	0.022220	0.451730	-0.251410
NC	37109	2	1.295270	1.348190	1.272240	1.241150	1.277020	1.223290	-0.054120	-0.071170	-0.048950
NC	37109	3	1.265710	1.117200	1.353850	1.222590	1.163880	1.253890	-0.043120	0.046680	-0.099960
NC	37109	4	1.276320	1.251490	1.322980	1.162830	1.245300	1.095990	-0.113490	-0.006190	-0.226990
NC	37111	1	1.247710	1.394730	1.159870	1.399160	1.195070	1.530570	0.151450	-0.199660	0.370700
NC	37111	2	0.877460	1.203370	0.739760	0.941660	1.081040	0.882140	0.064200	-0.122330	0.142380
NC	37111	3	1.008880	1.014060	1.023870	0.950910	0.991780	0.929170	-0.057970	-0.022280	-0.094700
NC	37111	4	0.982480	1.010260	1.014480	0.794290	0.860380	0.736290	-0.188190	-0.149880	-0.278190
NC	37113	1	0.841620	0.567740	1.017150	1.008190	0.577400	1.284920	0.166570	0.009660	0.267770
NC	37113	2	0.432520	0.591770	0.363830	0.731770	0.654640	0.766590	0.299250	0.062870	0.402760
NC	37113	3	0.446270	0.495370	0.422510	0.544380	0.642770	0.490660	0.098110	0.147400	0.068150
NC	37113	4	0.668850	0.743120	0.636200	0.635800	0.732940	0.553110	-0.033050	-0.010180	-0.083090
NC	37115	1	0.760370	1.307300	0.415140	1.175830	1.712640	0.837760	0.415460	0.405340	0.422620
NC	37115	2	0.719910	0.769010	0.699550	0.564090	0.544120	0.573550	-0.155820	-0.224890	-0.126000
NC	37115	3	0.941350	0.550640	1.155480	0.709500	0.788060	0.667070	-0.231850	0.237420	-0.488410
NC	37115	4	0.644950	0.483440	0.781550	0.766400	0.798820	0.736840	0.121450	0.315380	-0.044710
NC	37117	1	1.372160	1.687840	1.207840	1.119810	1.106850	1.142490	-0.252350	-0.580990	-0.065350
NC	37117	2	1.816850	1.538330	1.914100	1.126710	1.061480	1.149050	-0.690140	-0.476850	-0.765050
NC	37117	3	1.621900	1.811010	1.530620	0.818400	1.030040	0.723200	-0.803500	-0.780970	-0.807420
NC	37117	4	1.690860	2.200470	1.342150	0.786730	1.103530	0.589050	-0.904130	-1.096940	-0.753100
NC	37119	1	0.785140	0.724880	0.823470	0.740380	0.597010	0.831630	-0.044760	-0.127870	0.008160
NC	37119	2	0.897540	0.904310	0.893260	0.902100	0.841400	0.927120	0.004560	-0.062910	0.033860
NC	37119	3	1.023060	0.986180	1.042610	0.882580	0.878960	0.884100	-0.140480	-0.107220	-0.158510
NC	37119	4	1.102280	1.155430	1.060850	0.890320	0.954570	0.836990	-0.211960	-0.200860	-0.223860
NC	37121	1	1.799980	2.641810	1.288810	1.006100	1.006570	1.008020	-0.793880	-1.635240	-0.280790
NC	37121	2	1.726390	2.691920	1.332920	1.239090	1.741210	1.021670	-0.487300	-0.950710	-0.311250
NC	37121	3	1.489110	2.254750	1.119970	1.223390	1.469540	1.090490	-0.265720	-0.785210	-0.029480
NC	37121	4	1.151210	1.517780	0.941400	0.984850	0.973220	0.995480	-0.166360	-0.544560	0.054080
NC	37123	1	0.701660	0.737500	0.689210	1.257200	0.684720	1.594550	0.555540	-0.052780	0.905340
NC	37123	2	0.971950	1.134820	0.902440	0.782270	0.748960	0.789790	-0.189680	-0.385860	-0.112650
NC	37123	3	1.144140	1.224450	1.104360	0.750410	0.889390	0.681830	-0.393730	-0.335060	-0.422530
NC	37123	4	0.903410	0.939950	0.882660	0.683430	0.615300	0.738940	-0.219980	-0.324650	-0.143720
NC	37125	1	1.091530	1.016340	1.139170	1.018780	0.985640	1.039990	-0.072750	-0.030700	-0.099180
NC	37125	2	0.941930	0.906470	0.956020	1.126130	0.914840	1.216650	0.184200	0.008370	0.260630
NC	37125	3	0.907270	1.010810	0.850510	0.725100	0.618320	0.782780	-0.182170	-0.392490	-0.067730
NC	37125	4	0.773540	0.730540	0.811210	0.693300	0.698100	0.690430	-0.080240	-0.032440	-0.120780
NC	37127	1	1.367480	1.286470	1.418810	1.548810	1.095830	1.835610	0.181330	-0.190640	0.416800
NC	37127	2	1.332440	1.209560	1.394440	1.241650	1.273850	1.225830	-0.090790	0.064290	-0.168610
NC	37127	3	1.105310	1.237290	1.056300	1.129630	1.225810	1.076870	0.024320	-0.011480	0.020570
NC	37127	4	1.025590	1.132040	1.005720	1.313240	1.335860	1.296390	0.287650	0.203820	0.290670

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37129	1	0.724180	0.551660	0.834960	0.703470	0.565940	0.792260	-0.020710	0.014280	-0.042700
NC	37129	2	0.728250	0.695510	0.742090	0.730700	0.704600	0.741690	0.002450	0.009090	-0.000400
NC	37129	3	0.841610	0.850120	0.836990	0.729130	0.743690	0.721250	-0.112480	-0.106430	-0.115740
NC	37129	4	0.834530	0.801720	0.862260	0.807180	0.825650	0.791500	-0.027350	0.023930	-0.070760
NC	37131	1	2.528700	1.334890	3.226320	1.308090	1.142640	1.414030	-1.220610	-0.192250	-1.812290
NC	37131	2	1.459170	1.346330	1.506400	1.120300	1.475960	0.975110	-0.338870	0.129630	-0.531290
NC	37131	3	1.324550	1.232040	1.406000	0.941360	0.898080	0.960580	-0.383190	-0.333960	-0.445420
NC	37131	4	1.095630	1.358310	0.980930	1.006250	0.879220	1.109000	-0.089380	-0.479090	0.128070
NC	37133	1	0.621250	0.398900	0.756520	0.502030	0.356070	0.592030	-0.119220	-0.042830	-0.164490
NC	37133	2	1.256870	1.177320	1.289480	1.105550	0.974800	1.160610	-0.151320	-0.202520	-0.128870
NC	37133	3	1.468390	1.159990	1.637530	1.080090	1.113980	1.061090	-0.388300	-0.046010	-0.576440
NC	37133	4	1.402710	1.423710	1.404570	1.086490	1.008780	1.152970	-0.316220	-0.414930	-0.251600
NC	37135	1	0.426240	0.396230	0.445770	0.433860	0.353790	0.484190	0.007620	-0.042440	0.038420
NC	37135	2	0.726960	0.845610	0.675840	0.561670	0.567100	0.555560	-0.165290	-0.278510	-0.120280
NC	37135	3	1.025180	1.131270	0.992390	0.555440	0.596620	0.532990	-0.469740	-0.534650	-0.459400
NC	37135	4	1.050750	1.196890	1.030260	0.829960	0.921940	0.762840	-0.220790	-0.274950	-0.267420
NC	37137	1	1.668830	1.460970	1.791840	1.341410	0.872780	1.629360	-0.327420	-0.588190	-0.162480
NC	37137	2	1.115040	1.015020	1.159300	0.639280	0.385890	0.749320	-0.475760	-0.629130	-0.409980
NC	37137	3	0.817340	0.682720	0.901770	0.723520	0.524010	0.832720	-0.093820	-0.158710	-0.069050
NC	37137	4	1.359120	1.094680	1.692380	0.588940	0.621420	0.563180	-0.770180	-0.473260	-1.129200
NC	37139	1	0.915780	0.903320	0.932990	0.851160	0.606010	0.999390	-0.064620	-0.297310	0.066400
NC	37139	2	1.187360	1.033490	1.238720	0.754230	0.532100	0.834800	-0.433130	-0.501390	-0.403920
NC	37139	3	1.222020	1.310520	1.176660	0.798000	0.835500	0.778250	-0.424020	-0.475020	-0.398410
NC	37139	4	0.960350	1.097350	0.862920	0.747780	0.824830	0.693090	-0.212570	-0.272520	-0.169830
NC	37141	1	0.982350	0.910740	1.027060	0.718940	0.825150	0.652740	-0.263410	-0.085590	-0.374320
NC	37141	2	0.900890	1.014630	0.850410	0.814770	0.969890	0.746550	-0.086120	-0.044740	-0.103860
NC	37141	3	1.124880	1.137540	1.118410	0.869330	0.851620	0.878430	-0.255550	-0.285920	-0.239980
NC	37141	4	1.054210	1.093210	1.034850	0.979250	1.069270	0.906400	-0.074960	-0.023940	-0.128450
NC	37143	1	2.052650	2.008260	2.081450	0.588810	0.505950	0.641470	-1.463840	-1.502310	-1.439980
NC	37143	2	1.346040	1.462390	1.294870	0.943200	0.535660	1.119200	-0.402840	-0.926730	-0.175670
NC	37143	3	1.572570	1.360540	1.694460	0.704700	0.900760	0.597870	-0.867870	-0.459780	-1.096590
NC	37143	4	1.258300	1.040380	1.461550	0.873600	0.912320	0.842890	-0.384700	-0.128060	-0.618660
NC	37145	1	1.066080	1.416380	0.845560	1.156030	1.194720	1.131840	0.089950	-0.221660	0.286280
NC	37145	2	1.266460	1.284420	1.260290	1.245620	1.249290	1.242150	-0.020840	-0.035130	-0.018140
NC	37145	3	1.626790	1.522600	1.712720	1.340120	1.113060	1.462830	-0.286670	-0.409540	-0.249890
NC	37145	4	1.544830	1.445200	1.682450	1.362980	1.449340	1.292250	-0.181850	0.004140	-0.390200
NC	37147	1	0.767850	0.696690	0.816780	1.058850	0.838200	1.207310	0.291000	0.141510	0.390530
NC	37147	2	1.339110	1.044590	1.470030	1.506700	1.167770	1.657700	0.167590	0.123180	0.187670
NC	37147	3	1.489160	1.394950	1.543350	1.225330	1.160700	1.261530	-0.263830	-0.234250	-0.281820
NC	37147	4	1.189860	1.058770	1.300630	1.129730	0.982850	1.252420	-0.060130	-0.075920	-0.048210
NC	37149	1	1.073340	0.395720	1.498050	0.408000	0.419360	0.399650	-0.665340	0.023640	-1.098400
NC	37149	2	0.860050	1.047320	0.776480	0.512960	0.798110	0.385760	-0.347090	-0.249210	-0.390720
NC	37149	3	0.735890	0.762660	0.723190	0.622730	0.701800	0.578770	-0.113160	-0.060860	-0.144420
NC	37149	4	0.980160	1.167500	0.824520	0.768460	0.997460	0.569600	-0.211700	-0.170040	-0.254920
NC	37151	1	1.039240	1.261780	0.902500	0.752740	0.891300	0.667340	-0.286500	-0.370480	-0.235160
NC	37151	2	0.896430	1.112120	0.806150	0.872400	1.278090	0.697220	-0.024030	0.165970	-0.108930
NC	37151	3	0.971250	1.189950	0.867020	0.902380	1.209880	0.736250	-0.068870	0.019930	-0.130770
NC	37151	4	0.994190	1.132090	0.936740	0.810090	0.918330	0.719800	-0.184100	-0.213760	-0.216940
NC	37153	1	2.218840	1.857550	2.443950	2.218320	1.604800	2.585690	-0.000520	-0.252750	0.141740
NC	37153	2	2.105240	1.829400	2.208630	2.240810	1.901900	2.356360	0.135570	0.072500	0.147730
NC	37153	3	2.166890	2.187180	2.207260	2.011420	1.712420	2.153040	-0.155470	-0.474760	-0.054220
NC	37153	4	1.240000	1.283240	1.259240	1.246470	1.181120	1.302360	0.006470	-0.102120	0.043120
NC	37155	1	1.503640	1.706860	1.405830	2.000770	1.820740	2.125860	0.497130	0.113880	0.720030
NC	37155	2	1.706270	1.484430	1.780920	2.007620	1.778720	2.082540	0.301350	0.294290	0.301620
NC	37155	3	1.645660	1.688610	1.630010	1.816270	1.587560	1.923820	0.170610	-0.101050	0.293810
NC	37155	4	1.293490	1.266260	1.335620	1.484480	1.579250	1.422140	0.190990	0.312990	0.086520
NC	37157	1	1.654300	2.104510	1.375500	1.155180	1.098040	1.193850	-0.499120	-1.006470	-0.181650
NC	37157	2	1.631870	1.624960	1.645370	1.521310	1.701720	1.442720	-0.110560	0.076760	-0.202650
NC	37157	3	1.824300	1.826090	1.866810	1.886670	1.982950	1.834410	0.062370	0.156860	-0.032400
NC	37157	4	1.606750	1.834700	1.536560	1.675500	1.901770	1.484340	0.068750	0.067070	-0.052220
NC	37159	1	1.446490	1.059230	1.696540	1.210950	1.384440	1.103970	-0.235540	0.325210	-0.592570
NC	37159	2	1.067330	1.174240	1.022220	1.092270	1.186740	1.052560	0.024940	0.012500	0.030340
NC	37159	3	1.091780	1.258550	1.001450	0.963640	1.081900	0.899490	-0.128140	-0.176650	-0.101960
NC	37159	4	0.972760	1.090800	0.871000	0.794970	0.914030	0.691140	-0.177790	-0.176770	-0.179860

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37161	1	0.686250	0.654130	0.711630	1.023340	1.003760	1.045680	0.337090	0.349630	0.334050
NC	37161	2	0.780470	0.759840	0.787270	0.923380	0.891430	0.929410	0.142910	0.131590	0.142140
NC	37161	3	0.714230	0.892400	0.639590	0.790580	0.854860	0.757770	0.076350	-0.037540	0.118180
NC	37161	4	0.677140	0.907800	0.544980	0.717770	0.880940	0.598470	0.040630	-0.026860	0.053490
NC	37163	1	1.102100	0.950600	1.200890	0.889200	0.805440	0.944810	-0.212900	-0.145160	-0.256080
NC	37163	2	1.268130	1.054410	1.373860	1.175500	1.212260	1.161040	-0.092630	0.157850	-0.212820
NC	37163	3	1.034790	0.918860	1.120070	1.173680	1.273900	1.119420	0.138890	0.355040	-0.000650
NC	37163	4	0.862260	0.781630	0.979560	1.265390	1.294450	1.237560	0.403130	0.512820	0.258000
NC	37165	1	1.554240	1.446640	1.632350	1.775530	2.160530	1.578160	0.221290	0.713890	-0.054190
NC	37165	2	2.067280	1.689330	2.201900	1.894720	1.560060	2.011210	-0.172560	-0.129270	-0.190690
NC	37165	3	1.190610	0.908300	1.327570	1.343270	1.025170	1.495360	0.152660	0.116870	0.167790
NC	37165	4	1.205150	0.996600	1.477430	1.163140	1.044680	1.260490	-0.042010	0.048080	-0.216940
NC	37167	1	1.070840	1.674110	0.695210	0.844460	1.097490	0.686340	-0.226380	-0.576620	-0.008870
NC	37167	2	1.221260	1.688920	1.017670	0.930430	0.902780	0.940950	-0.290830	-0.786140	-0.076720
NC	37167	3	1.176310	1.233120	1.144870	0.920110	1.080000	0.833050	-0.256200	-0.153120	-0.311820
NC	37167	4	1.121200	1.143040	1.105230	0.941570	0.788410	1.071410	-0.179630	-0.354630	-0.033820
NC	37169	1	0.969150	1.210800	0.812810	1.313360	1.215730	1.372130	0.344210	0.004930	0.559320
NC	37169	2	1.150720	1.301770	1.082470	1.254660	1.374820	1.199800	0.103940	0.073050	0.117330
NC	37169	3	1.349430	1.606680	1.206120	0.963420	1.129960	0.870770	-0.386010	-0.476720	-0.335350
NC	37169	4	1.272200	1.272560	1.281860	1.127810	1.170200	1.094760	-0.144390	-0.102360	-0.187100
NC	37171	1	1.314020	1.525040	1.185810	1.088630	1.164840	1.043700	-0.225390	-0.360200	-0.142110
NC	37171	2	1.186250	1.372530	1.115210	1.328220	1.408260	1.297130	0.141970	0.035730	0.181920
NC	37171	3	1.290610	1.355010	1.283930	1.463560	1.466580	1.476660	0.172950	0.111570	0.192730
NC	37171	4	1.181510	1.119100	1.323570	1.172500	1.098510	1.265830	-0.009010	-0.020590	-0.057740
NC	37173	1	2.454060	2.579770	2.380200	1.585190	1.560570	1.604330	-0.868870	-1.019200	-0.775870
NC	37173	2	1.907380	2.185540	1.788910	1.027740	1.276760	0.919620	-0.879640	-0.908780	-0.869290
NC	37173	3	1.457290	1.840660	1.249140	0.961180	1.159570	0.854330	-0.496110	-0.681090	-0.394810
NC	37173	4	1.863640	2.745190	1.132020	0.977440	1.483430	0.556520	-0.886200	-1.261760	-0.575500
NC	37175	1	1.578120	1.292920	1.757280	0.906910	0.427740	1.207700	-0.671210	-0.865180	-0.549580
NC	37175	2	0.487350	0.618950	0.429640	0.635070	0.712430	0.600440	0.147720	0.093480	0.170800
NC	37175	3	0.513310	0.649750	0.443810	0.479670	0.689070	0.365270	-0.033640	0.039320	-0.078540
NC	37175	4	0.559990	0.683420	0.478530	0.543770	0.659680	0.447480	-0.016220	-0.023740	-0.031050
NC	37177	1	0.184230	0.000000	0.279070	0.347430	0.515530	0.263700	0.163200	0.515530	-0.015370
NC	37177	2	0.537580	0.745240	0.454530	1.032010	1.190980	0.963910	0.494430	0.445740	0.509380
NC	37177	3	0.712300	0.721030	0.706780	0.776570	1.087290	0.622710	0.064270	0.366260	-0.084070
NC	37177	4	0.828960	0.807750	0.852910	0.817920	0.642990	0.951750	-0.011040	-0.164760	0.098840
NC	37179	1	0.799170	0.832350	0.771610	0.947330	1.070410	0.857490	0.148160	0.238060	0.085880
NC	37179	2	1.068330	1.070560	1.070180	0.936180	1.016580	0.901230	-0.132150	-0.053980	-0.168950
NC	37179	3	1.349410	1.421300	1.308520	1.166620	1.309350	1.084340	-0.182790	-0.111950	-0.224180
NC	37179	4	1.665700	1.659890	1.667080	1.305220	1.362770	1.250510	-0.360480	-0.297120	-0.416570
NC	37181	1	1.566880	1.343500	1.714400	1.456180	1.615590	1.382380	-0.110700	0.272090	-0.332020
NC	37181	2	1.609700	1.295460	1.741780	1.292170	1.212870	1.314500	-0.317530	-0.082590	-0.427280
NC	37181	3	1.185090	1.231030	1.200380	1.047090	1.006240	1.065050	-0.138000	-0.224790	-0.135330
NC	37181	4	0.915010	0.928440	0.983920	1.008020	1.161270	0.897370	0.093010	0.232830	-0.086550
NC	37183	1	0.680700	0.552490	0.765010	0.689830	0.428240	0.867120	0.009130	-0.124250	0.102110
NC	37183	2	0.811600	0.697800	0.869910	0.694170	0.524600	0.778480	-0.117430	-0.173200	-0.091430
NC	37183	3	1.094460	1.030160	1.136700	0.878280	0.688920	0.992200	-0.216180	-0.341240	-0.144500
NC	37183	4	1.199520	1.070750	1.327070	0.969150	0.803990	1.117770	-0.230370	-0.266760	-0.209300
NC	37185	1	0.756200	0.632070	0.831800	1.331070	0.883810	1.588640	0.574870	0.251740	0.756840
NC	37185	2	0.716350	0.660010	0.736470	0.665890	0.653720	0.665810	-0.050460	-0.006290	-0.070660
NC	37185	3	0.555380	0.632020	0.525230	0.656220	0.659110	0.653440	0.100840	0.027090	0.128210
NC	37185	4	0.533820	0.504380	0.585200	0.574680	0.720680	0.468180	0.040860	0.216300	-0.117020
NC	37187	1	0.577890	0.997100	0.343930	1.440480	1.256280	1.563790	0.862590	0.259180	1.219860
NC	37187	2	0.896210	1.096880	0.812900	0.862280	1.084530	0.770300	-0.033930	-0.012350	-0.042600
NC	37187	3	1.123910	1.024130	1.173740	1.250160	1.180220	1.283390	0.126250	0.156090	0.109650
NC	37187	4	0.936410	1.181000	0.768510	1.254600	1.454020	1.113220	0.318190	0.273020	0.344710
NC	37189	1	0.389200	0.569480	0.290430	0.214900	0.312050	0.161610	-0.174300	-0.257430	-0.128820
NC	37189	2	0.460450	0.728720	0.355300	0.495230	0.713390	0.407510	0.034780	-0.015330	0.052210
NC	37189	3	0.535110	0.582660	0.517900	0.583470	0.805340	0.474930	0.048360	0.222680	-0.042970
NC	37189	4	0.949490	1.115720	0.911170	0.800980	1.011260	0.646280	-0.148510	-0.104460	-0.264890
NC	37191	1	1.335930	0.791210	1.686220	1.117640	0.791170	1.328960	-0.218290	-0.000040	-0.357260
NC	37191	2	1.436400	1.022500	1.619110	1.357660	1.107480	1.468840	-0.078740	0.084980	-0.150270
NC	37191	3	1.274890	1.017110	1.418190	1.267010	1.179930	1.315860	-0.007880	0.162820	-0.102330
NC	37191	4	1.091510	0.888620	1.261460	0.886040	0.812510	0.945960	-0.205470	-0.076110	-0.315500

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
NC	37193	1	1.190590	1.853310	0.777110	1.153580	1.225110	1.111610	-0.037010	-0.628200	0.334500
NC	37193	2	1.248780	1.698360	1.055930	1.354770	1.740080	1.190990	0.105990	0.041720	0.135060
NC	37193	3	1.103880	1.076220	1.124310	1.289390	1.439470	1.214580	0.185510	0.363250	0.090270
NC	37193	4	1.172090	1.256120	1.118070	1.199070	1.315970	1.112370	0.026980	0.059850	-0.005700
NC	37195	1	0.929850	1.019760	0.889540	1.173560	0.724370	1.442870	0.243710	-0.295390	0.553330
NC	37195	2	1.014580	0.969190	1.033160	1.074740	1.117150	1.051070	0.060160	0.147960	0.017910
NC	37195	3	1.087510	1.215640	1.055570	0.826240	1.024110	0.728380	-0.261270	-0.191530	-0.327190
NC	37195	4	0.869670	0.971360	0.862500	0.965680	1.142950	0.836570	0.096010	0.171590	-0.025930
NC	37197	1	0.976780	1.131570	0.875460	1.411710	2.064690	0.990520	0.434930	0.933120	0.115060
NC	37197	2	1.675280	2.127490	1.480490	1.492930	1.715190	1.399660	-0.182350	-0.412300	-0.080830
NC	37197	3	1.772020	1.677050	1.850810	1.570930	1.183900	1.799630	-0.201090	-0.493150	-0.051180
NC	37197	4	1.363360	1.132980	1.617760	1.429050	1.418230	1.487650	0.065690	0.285250	-0.130110
NC	37199	1	1.534460	2.069980	1.202740	2.229910	2.379160	2.142110	0.695450	0.309180	0.939370
NC	37199	2	1.157200	1.857740	0.860430	1.017400	1.052300	1.003570	-0.139800	-0.805440	0.143140
NC	37199	3	1.148820	1.345150	1.069980	0.807130	0.680290	0.877160	-0.341690	-0.664860	-0.192820
NC	37199	4	1.246420	1.577310	1.057470	1.085080	1.319210	0.883240	-0.161340	-0.258100	-0.174230
VT	50001	1	0.926390	0.346410	1.322540	0.819310	0.993400	0.692190	-0.107080	-0.115340	-0.098800
VT	50001	2	0.465870	0.786410	0.316920	0.457990	0.505650	0.437820	-0.007880	-0.003850	-0.011910
VT	50001	3	0.922720	1.120460	0.807030	0.729780	0.966550	0.591420	-0.192940	-0.179810	-0.206070
VT	50001	4	1.424480	1.992200	0.894300	0.955730	1.290700	0.636880	-0.468750	-0.464170	-0.473320
VT	50003	1	1.127890	1.048800	1.175820	0.568050	0.695060	0.477620	-0.559840	-0.568100	-0.551570
VT	50003	2	1.270650	1.714720	1.068790	0.666360	0.957240	0.533570	-0.604290	-0.602640	-0.605930
VT	50003	3	1.579570	1.706210	1.507560	1.202220	1.035260	1.300760	-0.377350	-0.369780	-0.384910
VT	50003	4	1.575290	1.896700	1.277610	1.435890	1.461820	1.407550	-0.139400	-0.137560	-0.141230
VT	50005	1	0.480500	0.672180	0.360610	0.037590	0.000000	0.061240	-0.442910	-0.104370	-0.439760
VT	50005	2	0.384570	0.401550	0.376670	0.069110	0.091470	0.059340	-0.315460	-0.220290	-0.317930
VT	50005	3	0.564380	0.765500	0.455330	0.097670	0.139600	0.075070	-0.466710	-0.340860	-0.477150
VT	50005	4	0.730880	0.975590	0.525150	0.122010	0.151460	0.097070	-0.608870	-0.587840	-0.608910
VT	50007	1	0.607800	0.808870	0.461950	0.411280	0.503400	0.343190	-0.196520	-0.196340	-0.196700
VT	50007	2	0.538810	0.794230	0.420650	0.527640	0.702300	0.447630	-0.011170	-0.008680	-0.013650
VT	50007	3	0.720290	0.960100	0.578670	0.726400	0.801150	0.683170	0.006110	0.012690	-0.000480
VT	50007	4	0.848580	0.828700	0.862430	0.819860	0.770810	0.862000	-0.028720	-0.026620	-0.030830
VT	50009	1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.032660
VT	50009	2	0.521440	0.741830	0.428580	0.117570	0.202610	0.082220	-0.403870	-0.180600	-0.411120
VT	50009	3	0.276080	0.136450	0.346180	0.000000	0.000000	0.000000	-0.276080	0.000000	-0.293880
VT	50009	4	0.300640	0.314540	0.292060	0.026150	0.059700	0.000000	-0.274490	0.000000	-0.281720
VT	50011	1	0.672510	0.982680	0.453340	0.519290	0.598590	0.460810	-0.153220	-0.155790	-0.150670
VT	50011	2	0.519400	0.831070	0.374870	0.604450	0.758860	0.534580	0.085050	0.090050	0.080060
VT	50011	3	0.960190	1.697590	0.524460	0.990560	1.163150	0.890540	0.030370	0.043370	0.017370
VT	50011	4	1.282970	1.827720	0.777150	1.306850	1.725090	0.913720	0.023880	0.026900	0.020870
VT	50013	1	0.450410	1.067220	0.000000	0.476320	0.561790	0.409480	0.025910	0.000000	0.052260
VT	50013	2	0.433740	0.607450	0.351860	0.662980	0.603540	0.699210	0.229240	0.230460	0.228030
VT	50013	3	0.949260	1.599090	0.550130	0.316680	0.499060	0.205280	-0.632580	-0.445410	-0.649390
VT	50013	4	1.665510	1.614760	1.709560	1.512330	1.754190	1.267460	-0.153180	-0.159290	-0.147070
VT	50015	1	0.932680	0.484910	1.230930	1.716230	1.089430	2.131830	0.783550	0.783780	0.783310
VT	50015	2	0.557850	0.991040	0.359710	0.720690	1.330600	0.441430	0.162840	0.166590	0.159090
VT	50015	3	0.628880	1.018410	0.404570	0.896630	1.427760	0.590290	0.267750	0.298600	0.236890
VT	50015	4	0.988630	1.227370	0.771790	1.441530	1.849800	1.065850	0.452900	0.469740	0.436070
VT	50017	1	0.478620	0.831930	0.239210	0.293150	0.483860	0.163090	-0.185470	-0.050500	-0.181030
VT	50017	2	0.296330	0.456270	0.223420	0.431580	0.556880	0.375090	0.135250	0.140380	0.130110
VT	50017	3	0.894110	1.156280	0.743470	0.520150	0.591930	0.479260	-0.373960	-0.364230	-0.383690
VT	50017	4	0.875990	1.056730	0.710270	0.694230	0.819350	0.579580	-0.181760	-0.179320	-0.184200
VT	50019	1	0.667050	0.902270	0.529920	1.030700	1.278670	0.886740	0.363650	0.357680	0.369630
VT	50019	2	0.493050	0.619350	0.438200	0.499020	0.501440	0.494530	0.005970	0.007630	0.004300
VT	50019	3	0.707570	0.838690	0.639050	0.213910	0.300000	0.169550	-0.493660	-0.479540	-0.507780
VT	50019	4	0.806960	0.888100	0.748260	0.258150	0.339610	0.194180	-0.548810	-0.546310	-0.551320
VT	50021	1	1.270370	0.919380	1.501400	1.402600	1.301970	1.463530	0.132230	0.125100	0.139360
VT	50021	2	0.731130	0.886420	0.661890	1.058460	1.088750	1.048200	0.327330	0.328740	0.325930
VT	50021	3	1.381680	1.734670	1.178090	1.348860	1.618770	1.193540	-0.032820	-0.023830	-0.041820
VT	50021	4	1.415020	1.434320	1.392580	1.371220	1.531750	1.219470	-0.043800	-0.043150	-0.044460
VT	50023	1	0.698160	0.825570	0.605910	0.696320	1.019400	0.468800	-0.001840	-0.006310	0.002630
VT	50023	2	0.705110	0.905610	0.613850	0.646290	0.622940	0.660790	-0.058820	-0.055680	-0.061950
VT	50023	3	1.032350	1.469120	0.774530	0.724730	0.722450	0.727340	-0.307620	-0.300490	-0.314760
VT	50023	4	1.058520	1.325790	0.801530	1.054370	1.209740	0.902420	-0.004150	-0.000610	-0.007690

ST	FIPS	AGE CAT	PQI90-08	PQI91-08	PQI92-08	PQI90-11	PQI91-11	PQI92-11	Delta-90	Delta-91	Delta-92
VT	50025	1	0.749370	0.845290	0.680060	0.488140	0.880120	0.218230	-0.261230	-0.268460	-0.254000
VT	50025	2	0.499380	0.731100	0.393800	0.520530	0.674660	0.450800	0.021150	0.023380	0.018930
VT	50025	3	1.065120	1.240680	0.964580	0.699410	0.710350	0.693920	-0.365710	-0.352220	-0.379220
VT	50025	4	1.002930	1.197690	0.823800	0.891360	1.039200	0.753790	-0.111570	-0.108730	-0.114410
VT	50027	1	0.637970	0.851540	0.488740	0.300050	0.402310	0.228330	-0.337920	-0.318890	-0.333760
VT	50027	2	0.428260	0.619100	0.340630	0.427830	0.605490	0.346270	-0.000430	0.000990	-0.001850
VT	50027	3	0.528520	0.687800	0.436320	0.584830	0.666280	0.537950	0.056310	0.066080	0.046540
VT	50027	4	0.928900	1.147290	0.726510	0.901860	1.075620	0.740910	-0.027040	-0.024530	-0.029570

Vita

Rick Allen Moore was born on February 7, 1966, in Ft Thomas, Kentucky. He is an American citizen and retired military officer (Major) after 20 years of service in the United States Air Force. He graduated from James E. Taylor High School, Katy, Texas in 1984. Rick has served as the Chief Information Officer for the National Committee for Quality Assurance (NCQA) since January, 2008, where he leads the development of data collection systems that support programs such as the Patient Centered Medical Home (PCMH) recognition. He received his Bachelor of Science degree in Industrial Technology from Southern Illinois University, Carbondale, Illinois in 1991. Rick received a Master of Science degree in Management from Troy State University, Troy, Alabama in 1994; and a Master of Science degree in Health Informatics from University of Alabama at Birmingham, Birmingham, Alabama in 2003.