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A First Look at the Patient-Centered Medical Home for Minority Veterans:
Implementation and Utilization

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Abstract

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In 2010 the Veterans Health Administration (VHA) began implementing Patient Aligned Care Teams (PACT), a nationwide patient-centered medical home (PCMH) model, designed to transform primary care into team-based care in over 900 primary care clinics. PACT is focused on improving access to care and coordination between primary and specialty care through the use of interdisciplinary teams composed of primary care providers, RN case managers, clinical and administrative staff, and patients. To date, no study in the peer review literature has reported utilization, patient outcomes, or other evaluative metrics by race/ethnicity for PCMH models of primary care. I aim to fill this gap in the literature in this dissertation by testing: 1) whether PACT implementation varied by the percent of minority veterans served at a facility; 2) whether the association between PACT implementation and changes in healthcare utilization differed

across individuals of racial/ethnic minority groups; and 3) whether trends in the rate of hospitalizations for ambulatory care sensitive conditions (ACSCs) were similar between Black and White veterans, and between facilities with different racial compositions. The rate of hospitalizations for ACSCs is a key measure of ambulatory care quality.

In the first study of this dissertation, I found facilities with higher percentages of minority patients had modestly less effective PACT implementation. In the second study, I found some evidence to support PACT was associated with different changes in healthcare utilization for minorities relative to Whites. Changes in the trends of utilization, when they did occur, were small and racial/ethnic group specific. I did not find evidence of PACT-associated changes in rates of hospitalization for ACSCs or that they differed by a veteran's race/ethnicity. In the third study, I found the VHA experienced a substantial decline in the Black-White disparity for hospitalizations for ACSCs. The decline in the disparity was a result of the substantial decline within facilities of similar racial composition. Specifically, among medium and high minority facilities the Black-White disparity declined dramatically and was nearly eliminated in high minority facilities. This finding provides some support of moderating role of facility racial composition on the within Black-White disparity. That is, the Black-White disparity within facilities depended on the racial composition of the facility. I also found significant disparities between facilities of different racial compositions, which remained unchanged over time.

This dissertation provides some evidence to indicate Whites and minority groups experienced the implementation of PACT differently. PACT was implemented at modestly lower levels in facilities caring for large proportions of minority veterans. However, I did not find that PACT overall was associated with worsening of disparities in hospitalizations for ACSCs, which is a key indicator of primary care quality. The Black-White disparity in the rate

of hospitalization for ACSCs improved substantially between 2003 and 2012, although the disparity was not eliminated.

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DEDICATION

For My Mother and Mama Juana

Chapter 1. INTRODUCTION

1.1 BACKGROUND

The U.S. and Veterans Health Administration (VHA) are experiencing dramatic changes to their demographic profile. The Census Bureau's estimates indicate that by 2043 the U.S. will become a plurality nation, whereby the non-Hispanic White population is the largest single group, but with no racial/ethnic group majority.¹ Racial and ethnic minority populations include: American Indian/ Alaska Native; Asian American, Black/African American, Native Hawaiian/Other Pacific Islander, and Hispanic/Latino.² Projections indicate that from 2011 to 2040 the veteran population will increase from 20.9-percent to 34-percent minority.³ Racial/ethnic minorities often experience poorer health outcomes than their White counterparts.^{4,5} Eliminating health disparities is national health objective.⁶

In the seminal report, *Unequal Treatment*, the Institute of Medicine (IOM) found racial/ethnic disparities occur not only in health outcomes but also in the delivery of healthcare.⁷ This comprehensive report reframed healthcare disparities as a quality of care issue, amenable to intervention. However, racial/ethnic disparities in healthcare continue to exist along a variety of dimensions.^{7,8,9,10} The mechanisms leading to healthcare disparities are poorly understood and complicated. One hypothesis is that healthcare disparities are produced as a result of racial/ethnic minorities receiving care at a small number of low quality facilities.^{7,11,12,13,14} Racial/ethnic disparities in health and healthcare also exist in the VHA, despite being a system whereby insurance and cost related barriers to care are largely absent.¹⁵⁻¹⁷ Similar to the private sector, healthcare disparities in the VHA may be in part attributable to disproportionate greater use of lower quality facilities by minorities.¹⁵⁻¹⁹ Healthcare for minorities in the VHA is also

concentrated among few providers, with 28% of all VHA medical centers caring for 75% of Black VHA enrollees.¹⁴

Evidence suggest racial/ethnic minorities experience fragmented care to a greater degree than non-minority populations and therefore may benefit more from interventions focused on improving care coordination.⁷ Based on their review of the evidence, the IOM recommended using multidisciplinary teams as an intervention to overcome challenges in care coordination, address behavioral and social risks, and thereby reduce disparities. The patient-centered medical home (PCMH) is considered a promising model for reducing healthcare disparities.^{20,21,22,23}

The patient-centered medical home (PCMH) concept was developed in the late 1960s as a healthcare delivery model for special needs pediatric populations,²⁴ and numerous studies of its effectiveness on the pediatric population exist and are mixed.²⁵⁻²⁷ The application of PCMH as a model for strengthening adult primary care occurred rapidly based on limited evidence on the importance of primary care,²⁸ early studies on PCMH demonstrations, and patient surveys.^{20,30} There is much heterogeneity in the operationalization of the PCMH, but across the definitions common elements include whole-person care instead of disease focused, enhanced provider-patient communication, prevention and health promotion, and patient-provider shared decision making.³¹ Since 2006, the evidence base for the PCMH in adult medicine has grown with respect to implications for clinical quality, cost savings and utilization reductions, and patient experience.³²⁻⁴⁴ However, heterogeneity of the study interventions, targeted populations, organizational structures, and different baseline levels of PCMH infrastructure, make broad generalizations difficult to ascertain. Individual study findings suggest a complex and mixed picture.^{39,42} As more PCMH projects begin to publish their results, pooling of data will become

more feasible and informative to conduct meta-analyses.⁴⁵ Importantly, to date, no study in the peer review literature has reported utilization, or other evaluative metrics by race/ethnicity.

In 2010, the VA began implementing Patient Aligned Care Teams (PACT), a PCMH model of care, in its over 900 primary care.⁴⁶⁻⁵⁰ PACT builds on many of the PCMH components implemented in the late 1990s by redesigning primary care around personal relationships, team delivery of whole patient care, coordination across specialties and settings of care, quality and safety improvements, and open access. Open access in the VA is defined “in terms of improved continuity in the patient-provider/care team relationship and increased capacity in the team’s schedule to accommodate patients’ desire for same-day and future scheduled appointments.”⁴⁹

At the center of PACT is formation of interdisciplinary teams.⁴⁶⁻⁵⁰ The core team (teamlet) includes: the Veteran patient, his/her provider, (which maybe an MD, NP, or PA), a RN case manager, a clinical staff assistant, and an administrative staff member. An expanded team, those outside the core team (e.g., specialists), are used for consultation on an as needed basis. The teamlet is responsible for coordinating care and collaborating with other medical and support staff. Two care integration roles, a RN case manager and a RN/SW (social work) case manager, have been added to provide smooth hand-offs between care settings. Through this team based approach to care, the VHA expects to improve access to face-to-face and remote/virtual medical encounters (secure messaging and telephone visits), improve patient engagement, promote more efficient use of healthcare services and thereby reduce costs to the VHA, and integrate the veteran’s community as a resource when VHA resources are not available. Through virtual visits providers will be better able to help patients manage their care

between in-office visits. For a full-time physician provider a panel consists of approximately 1200 patients and 3.0 full-time equivalents (FTEs) of primary care support staff.^{48,50}

1.2 OBJECTIVES

The goal of this dissertation is to assess whether PACT affects minority veterans differently than non-minority Veterans. Annually, the VHA's budget is approximately \$55-60 billion, with 16.4 million encounters; serving approximately 5 million unique patients. Roll out of the PACT initiative in the VHA, cost approximately \$820 million in 2010. The current dissertation may help inform future changes in the provision of healthcare services to minority veterans in the VHA. In addition, this is the only study of a PCMH model of care large enough to evaluate its effect on healthcare utilization for racial/ethnic minority groups. This dissertation makes important contributions to the evidence base on characteristics of facilities serving large proportions of racial/ethnic minorities; the effectiveness of the PCMH model of primary care for minority groups; and identifying sources of healthcare disparities.

The specific aims of this dissertation are:

Aim 1 PACT and Implementation

Aim 1 investigates whether PACT was implemented differently by facilities in relation to the percent of minority veterans served at a facility. I used a validated measure of PACT implementation, the PACT Implementation Progress Index (Pi^2), to address the following research question:

Question 1.1: Do facilities serving high proportions of minority Veterans have lower scores in the Pi^2 ?

Aim 2 PACT and Utilization

Aim 2 investigates whether minority veterans experienced differential changes to utilization associated with PACT.

Question 2.1: Compared to White veterans, did minorities have different healthcare utilization (primary care and specialty mental health) and probability of a hospitalization for ambulatory care sensitive conditions (ACSCs) in the years leading up to PACT?

Question 2.2: Compared to White veterans, did individuals of racial/ethnic minority groups experience differential changes in healthcare utilization and probability of hospitalization for ACSCs associated with PACT?

Aim 3 Equity in Improvements to Hospitalizations for ACSCs

Aim 3 investigates whether overall declines in hospitalizations for ACSCs were experienced similarly across racial groups and across facilities of different racial compositions.

Question 3.1 Overall, did the Black-White disparity in hospitalizations for ACSCs conditional on facility racial composition change between 2003-2012?

Question 3.2 Overall, did the rate of hospitalizations for ACSCs between-facilities with different racial compositions conditional on race change from 2003-2012?

Question 3.3 Did Black and White veterans at facilities with low, medium, and high racial composition experience similar changes to the rate of ACSCs hospitalization from 2003-2012?

1.3 CONCEPTUAL MODEL

Figure 1.1 is the conceptual model guiding this dissertation. The model is a combination of the Andersen-Newman framework⁵¹ for healthcare utilization and a conceptual framework for evaluating safety net and other community-level factors on access and access outcomes.⁵² Access to healthcare has been previously categorized into: potential, realized, and outcomes.^{52,53} Potential access is measured as an individual's usual source of care or health insurance. Realized access is measured through actual healthcare utilization. Access outcomes “measure the extent to which effective and efficient access is achieved once an individual enters the system.”⁵² Hospitalizations for ambulatory care sensitive conditions, conditions for which appropriate management in the outpatient setting could potentially prevent disease progression to need hospitalization, is often used as an access outcome.^{52,54}

PACT and Access. PACT is a healthcare system level intervention. The main features of PACT, and changes from the pre-PACT organization of the VA delivery system, are creating teamlets with specified staffing ratios and reducing panel size.⁴⁶⁻⁵⁰ The reduction in panel size for primary care providers (PCPs) is expected to improve realized access for primary care by adding capacity through the hiring of PCPs in order to reduce panel size and hiring of other team members. Realized access is also directly being increased through the addition of virtual visits (telephone and email) and adoption of “open access” aimed to improve availability of same-day and future scheduled appointments.⁴⁹ Open access as adopted in the VA requires teamlets to evaluate their schedule and reschedule appointments or shift patients to virtual visits based on need.⁴⁹ This frees up a few slots to be used the same day or near future by other patients, depending on when the schedule is reviewed. Thus, through these mechanisms healthcare utilization for primary care and virtual care may increase.

The adoption of teamlets and increased realized access for primary care may also affect realized access for other healthcare services. However, the impact may depend on type of service. Improved realized access (outpatient &/or virtual visits) for patients may lead to improved access outcomes—decreases in hospitalizations for ambulatory sensitive conditions (ACSC) (pathway: health system → teamlet→ realized access (outpatient and virtual visits)→ improved care management→ decreases in hospitalizations for ACSC). Furthermore, coordination across providers through the RN care manager and team huddles may lead to decreases in hospitalizations for ACSC as PCP make specialty referrals for patients with pent up demand or who are not managed effectively in primary care, and RN care managers follow-up with referrals and make sure appointments are made and information is communicated back to the PCP (pathway: health system → teamlet→ realized access (primary care)→ realized access (specialty care)→ improved care management→ decreases in hospitalizations for ACSC).^{49,55}

In addition, in the short-run improved realized access for primary care may stimulate use of specialty mental health visits for a subset of patients with pent up demand for specialty care previously bottlenecked by the delay in PCP assessment and referral (pathway: health system → realized access (primary care and virtual visits→ small increases in specialty mental health visits). The VA has a gatekeeper model whereby patients must obtain a referral to obtain specialist services. On the other hand, the decrease in panel size and addition of the teamlet members will allow for longer visits and the ability for PCPs to address some mental health conditions in primary care. Improved management of mental health conditions in primary care may lead to a reduction in specialty mental health services (pathway: health system → teamlet → realized access (primary care and virtual visits)→ improved management of mental health conditions →small decreases realized access (specialty mental healthcare).

Access and Minorities. The goal of Aims 2 & 3 is to estimate whether realized access and an access outcome for minority veterans is different than White veterans. Specifically Aim 2 investigates whether PACT differentially affects primary care and specialty mental health visits and hospitalizations for ACSCs for minorities relative to Whites. Aim 3 investigates whether Whites and Blacks have experienced similar declines in hospitalizations for ACSCs. There might be differential utilization because PACT implementation may not be uniform across the VA and may vary by the minority composition of a facility. Minority-serving facilities may be of lower quality because they are located in areas that experience challenges with recruitment, and may not be located in neighborhood with other social support networks. If facilities caring for large proportions of minorities implement PACT less fully than facilities caring for low proportions of minority patients it may create a mechanism through which PACT is not experienced by minorities equitably and may lead to different changes to utilization. On the other hand, PACT may provide needed resources that would improve access to healthcare and may lead to increases in utilization. Similarly, if facilities caring for Blacks have not improved relative to facilities caring for large proportions of Whites, this may create a mechanism through which Blacks do not experience similar improvements to hospitalization to ACSCs.

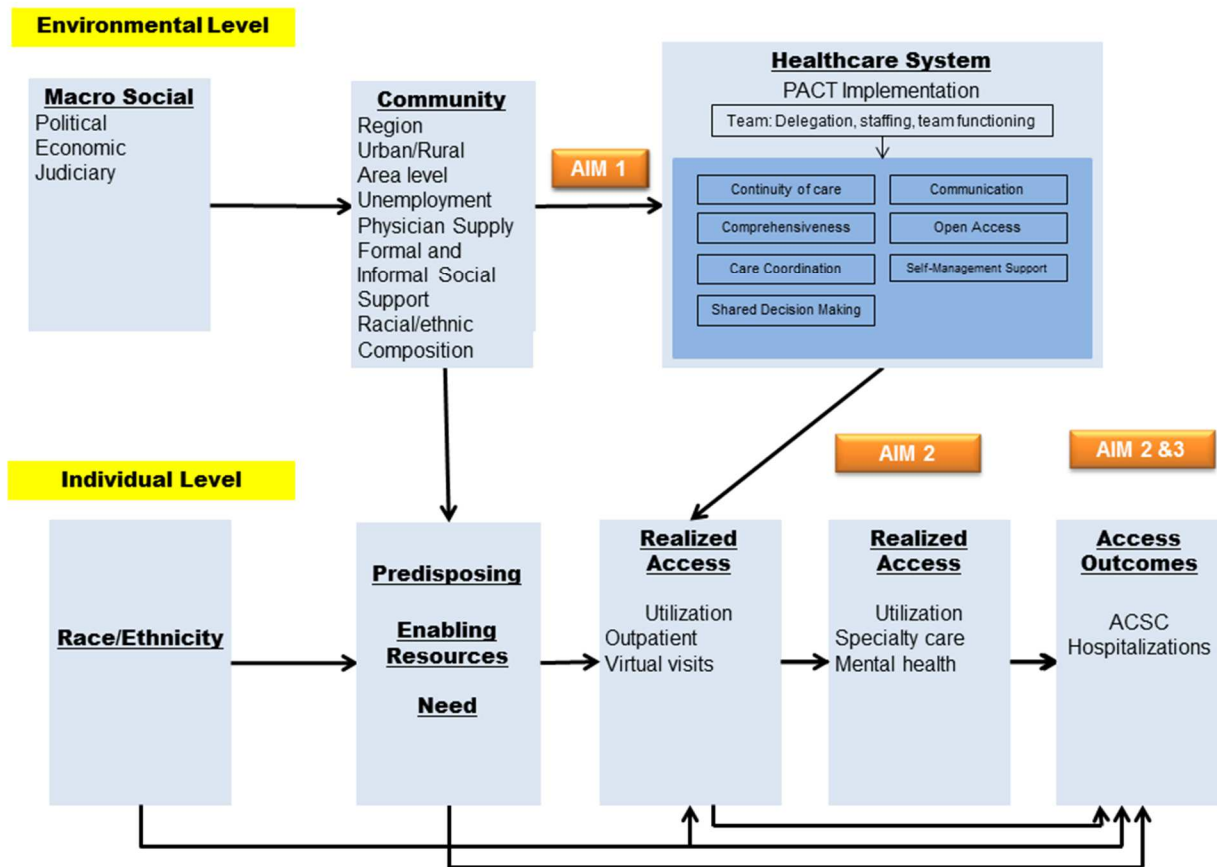


Figure 1.1 Conceptual Framework for Evaluating Community, Facility, and Individual Factors on Access to Healthcare

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Chapter 2. A FIRST LOOK AT PACT IMPLEMENTATION FOR MINORITY VETERANS

2.1 ABSTRACT

Background: Implementation of Patient Aligned Care Teams (PACT), a patient-centered medical home model, has been inconsistent among the more than 900 primary care facilities in the Veterans Health Administration (VHA).

Objective: Determine if the degree of PACT implementation at a facility varied with the percentage of minority veteran patients at the facility.

Research Design: Cross-sectional, facility-level analysis of PACT implementation measures in 2012.

Subjects: VHA hospital-based and community-based primary care facilities.

Measures: We utilized a previously validated PACT Implementation Progress Index (Pi²) and its eight domains: access, continuity of care, care coordination, comprehensiveness, self-management support, and patient-centered care and communication, shared decision making domains, and team functioning. Facilities were categorized as low (<5.2%, n=209), medium (5.2%-25.8%, n=415), and high (greater than 25.8%, n=208) percent minority based on the percent of their own veteran population.

Results: Most minority veterans received care in high minority (69%) and medium minority facilities (29%). In adjusted analyses, medium and high minority facilities scored 0.726 (p=0.009) and 0.938 points lower on the Pi² score relative to low minority facilities. Relative to low minority facilities, both medium and high minority facilities had a lower probability of having high Pi² scores (2 and higher) and had a higher probability of having low Pi² scores (-2

and lower). Both medium and high minority facilities had the same 3 domain scores lower than low minority facilities (care coordination, comprehensiveness, and self-management).

Conclusions: Overall PACT implementation varied with respect to the racial/ethnic composition of a facility, with medium and high minority facilities having a lower implementation scores.

2.1 BACKGROUND

Racial and ethnic disparities in health and healthcare exist throughout the U.S. health care system, including in the Veterans Health Administration (VHA) even though veterans enrollees face fewer cost-related barriers to healthcare than other Americans.¹⁻⁵ These disparities may be in part attributable to disproportionately greater use of lower quality facilities by minorities.²⁻⁶ Similar to the private sector, healthcare for minorities is concentrated among few providers, with 28% of all VHA medical centers caring for 75% of Black VHA enrollees.⁷ Therefore, targeting lower performing facilities for quality improvement interventions may yield the highest impact on reducing disparities in healthcare for minority veterans.

In 2010 the VHA began implementing Patient Aligned Care Teams (PACT) system-wide, a patient-centered medical home (PCMH) model, structured around the formation of interdisciplinary primary care teams to improve continuity, access and care coordination.⁸⁻¹⁰ Implementation of PACT has been variable among the over 900 VHA primary care facilities nationwide.^{10,11} In addition, relatively low levels of implementation of PACT are associated with lower patient satisfaction, lower clinical quality, higher staff burnout, higher hospitalization rates for ambulatory care-sensitive conditions (H-ACSC), and higher emergency department visits.¹⁰ Since minorities are concentrated among a few selected facilities, heterogeneous rollout of PACT could potentially either close or exacerbate disparities in the VHA.⁷ To date, there is limited information on the degree to which PACT has been implemented in facilities serving a large number of minority patients. The goal of this study is to determine if the degree of PACT implementation at a facility varied with the percentage of minority veterans patients at the facility.

2.2 METHODS

This was an observational, facility-level analysis of VHA hospital-based and community-based primary care facilities nationwide. This study was approved by the VA Puget Sound Health Care System and the University of Washington institutional review boards.

Data

We used five VHA data sources for this study: the Corporate Data Warehouse (CDW); the Vital Status file; the Survey of Healthcare Experiences of Patients (SHEP); the Consumer Assessment of Healthcare Providers and Systems (CAHPS)-PCMH survey; and the PACT Primary Care Personnel Survey. The CDW contains clinical and administrative data at the individual patient (veteran) level. We aggregated CDW data for fiscal year (FY) 2012 (October 1, 2011-September 30, 2012) to the facility-level. The Vital Status file is designed to help identify deceased Veterans, and contains data on race/ethnicity. The SHEP assesses patient experience and is administered quarterly to a weighted random sample of veterans who received outpatient care from VHA. We used SHEP data from October 2003 - September 2012. The Consumer Assessment of CAHPS-PCMH survey is a validated instrument measuring patient experience and satisfaction and was administered to a weighted random sample of veterans who received outpatient care from June 1 to December 31, 2012.¹² The 2012 PACT Primary Care Personnel Survey is a web based survey that was emailed to all clinical leadership in primary care, nursing, pharmacy, social work, and nutrition from May 21 through June 29, 2012.¹³ Patient-level data from the CDW, SHEP and CAHPS-PCMH survey and provider-level data from the PACT Primary care Personnel Survey were aggregated to the facility level. The final study sample consisted of 832 unique facilities after excluding facilities with less than 100 patients (n=2) and having less than 10 SHEP respondents (n=79).

Measures

PACT Implementation Progress Index (Pi²). We used a validated measure of PACT implementation, the PACT Implementation Progress Index (Pi²), to determine if the degree of PACT implementation at a facility varied with the percentage of minority veteran patients at the facility. Details of the construction and validation of Pi² has been published elsewhere.¹⁰ Briefly, Pi² consists of 53 items across eight PACT domains (access, continuity of care, care coordination, comprehensiveness, self-management support, and patient-centered care and communication, shared decision making domains, and team functioning).¹⁰ For each individual item of a domain, we generated a standardized facility-level response by subtracting the national mean from the facility-level mean and dividing by the standard deviation of all facilities. We standardized individual items in order to facilitate combining different data sources. We then created domain scores for each facility by averaging the standardized means of the available items in each domain. Pi² is a count of domain scores in the top quartile minus the number of domains in the bottom quartile. Since there are 8 domains, scores could range from 8 (best) to -8 (worst). For example, if a facility had three domain scores in the top quartile and one domain in the bottom quartile their Pi² score would be 2. In a prior study, Pi² scores of 5 or greater (top decile) relative to scores -5 or lower (bottom decile) were correlated with higher patient satisfaction, lower hospitalizations and emergency room utilization, and lower provider burnout.¹⁰

Facility Minority Composition. The primary independent variable of interest was a facility's racial/ethnic composition and was defined as the percentage of minority veterans out of all patients assigned to primary care providers at a given facility. To minimize missing data, we obtained race/ethnicity data from the SHEP, the CDW, and Vitals Master files. Within each of

the sources we created the following eight categories: White, non-Hispanic; Black/African American, non-Hispanic; American Indian/Alaska Native, non-Hispanic; Asian/Native Hawaiian/Other Pacific Islander, non-Hispanic; multiple races, non-Hispanic; other, non-Hispanic; Hispanics; and missing.¹⁴ Therefore, Hispanic veterans could be of any race. We combined Asian, Native Hawaiian, and Other Pacific Islanders together because these categories were combined in the Vital Statistic file. We classified Black/African American, non-Hispanic; Hispanic; American Indian/Alaska Native, non-Hispanic; Asian/Native Hawaiian/Other Pacific Islander; and multiple race veterans as minorities and aggregated to the facility-level. Using this definition of minority, facilities were then categorized as low (<5.2%, n=209), medium (5.2%-25.8%, n=415), and high (greater than 25.8%, n=208) percent minority. These cutoffs represent the 25th and 75th percentiles of the percent minority composition of facilities. Using this algorithm, the average percentage of veterans with missing race/ethnicity data by facility was 2.8%.

Patient level sociodemographic and comorbidity variables. We obtained patient case-mix variables (age, sex, and Elixhauser comorbidity score) from the CDW. We calculated modified Elixhauser scores for each patient using ICD-9 diagnosis codes extracted from 2011 utilization data for all inpatient and outpatient visits.¹⁵

Statistical Analysis

We performed bivariate comparisons of minority composition and facility characteristics using ANOVA F-statistic. Using a test of proportions, we assessed equality of the proportions between Whites and minorities of being in high implementation facilities (top decile, Pi² scores of 5 or higher) and low implementation facilities (bottom decile, Pi² scores -5 or lower). To test whether PACT implementation differed by facilities based on the percentage of minority

veterans at the facility, we used both linear and ordered logit models. For the linear models, we used a continuous measure of Pi^2 as the dependent variable. For the unadjusted and adjusted linear models, we used weighted least squares estimators where the conditional variance of Pi^2 was a function of facility size in order to account for potential heteroskedasticity. For the ordered logit models, we categorized Pi^2 scores into five levels of implementation (high implementation 5 to 8; 2 to 4; 1-1, -4 to -2, and low implementation -5 to -8) for the dependent variable and used robust standard errors after assessing that proportional odds assumption was satisfied. We estimated average adjusted predicted probabilities of being in each level of Pi^2 for low, medium, and high percent minority facilities.¹⁶ For each level of Pi^2 , we also calculated the average marginal predicted probabilities. This marginal effect represents the change (difference) in the predicted probability for each level of Pi^2 between low (referent group) and medium or high percent minority facilities. To assess differences in the implementation of specific domains that make up Pi^2 , we estimated similar linear models with individual domain scores as the dependent variable. For the team based care domain we included only facilities with more than 5 respondents to the PACT Primary Care Personnel Survey (n=320 facilities).

In all the adjusted models, we adjusted for mean age, proportion female, and mean Elixhauser score among primary care patients assigned to a VHA facility. We adjusted for age, sex, and Elixhauser comorbidity score because these factors are associated with differences in response patterns for CAHPS, which is a component of Pi^2 .¹⁷ We did not control for facility- or community-level factors which may influence the ability of facilities to implement PACT, such as facility-level clinician turnover or vacancies because these could represent possible mechanism through which PACT does not reach minority veterans. In our main analysis, we also did not control for the size of a facility because this could also impact a facility's ability to

implement PACT. It is unclear whether larger facilities would be better equipped to implement PACT or whether size could interfere with implementing a complex change in healthcare delivery. However, we included facility size in sensitivity analyses to better understand the role facility size plays in PACT implementation.

2.3 RESULTS

These analyses included 832 outpatient primary care facilities serving approximately 6 million veterans enrolled in VHA primary care facilities in FY 2012 [Table 2.1]. Facility average age, percent female, and number of patients varied significantly across low, medium and high percent minority facilities, but we did not find significant differences in mean Elixhauser score [Table 2.1]. Most minority veterans received care in high minority (69%) and medium minority facilities (29%) [Table 2.1]. Using a test of proportions, we found 3.5% of minority veterans versus 5.2% of White veterans received their care at high implementation facilities (P_i^2 score 5 or greater, $p < .001$); 11.3% of minority veterans versus 8.3% of White veterans received their care at low implementation facilities (a P_i^2 score -5 or lower, $p < .001$).

In the adjusted linear model analyses, medium (-0.78, $p = .009$) and high (-0.94, $p = .007$) minority facilities were associated with lower P_i^2 scores relative to low minority facilities [Table 2.2]. These differences can be interpreted to mean that on average medium and high percent minority facilities had approximately one additional domain in the lowest quartile (or one domain less in the highest quartile) than did low minority facilities. Medium and high minority facilities were also associated with lower domain scores relative to low minority facilities for care coordination; comprehensiveness; and self-management [Table 2.2]. In addition, medium minority facilities had worse domain scores for patient-centered care and communication, and

high minority facilities had worse domain scores for access compared to low minority facilities [Table 2.2].

In the adjusted ordered logit analysis, relative to low minority facilities, medium and high minority facilities had a lower probability of being in the top levels of P_i^2 (scores of 2 and higher) and a higher probability of being in the bottom levels of P_i^2 (scores of -2 and lower) [Table 2.3]. These differences in probabilities ranged from -10.9 to 8.9 percentage points [Table 2.3].

In the sensitivity analyses for the linear models, which included the number of patients at a facility, the results remained qualitatively the same except that the differences were slightly attenuated across the models. Similarly, for the ordered logit analysis, the differences in probability were attenuated, but they remained qualitatively the same.

2.4 DISCUSSION

Facilities with higher percentages of minority patients were associated with lower levels of implementation of the patient-centered medical home at VHA. Relative to low minority facilities, medium and high minority facilities exhibited lower scores in three domains (care coordination, comprehensiveness, and self-management); suggesting both types of facilities face similar challenges to implementation in these domains. We also found medium and high minority facilities had higher probability of being a low implementer overall and lower probability of being a high implementer overall. These findings suggest disparities in PCMH implementation exist across race/ethnicity groups since 98% of all minority veterans versus 83% of White veterans, receive care at facilities with medium and high minority composition. Because care for minority veterans is concentrated in facilities less apt to have successfully

implemented this new system of care, it appears that they are, overall, less likely to benefit from any resulting improvements in care.

While differences in Pi^2 are statistically significant, the clinical significance to minority veterans is unclear, but other evidence suggests these differentials might be meaningful. For instance, Nelson and colleagues found significant differences in clinical markers of care between facilities in the highest 10% and lowest 10% of Pi^2 scores.¹⁰ In addition, in a recent study of quality of care in acute U.S. hospitals researchers found racial and ethnic disparities in process of care shrank between 2005-2010, as both between-hospital and within-hospital differences in delivery of recommended treatment declined.¹⁸ Thus, both improvement of care for all patients regardless of race and greater improvement in hospitals treating disproportionate shares of minorities contributed to the reduction in disparities in U.S. hospitals.¹⁸ Thus, it is possible the differences in Pi^2 might also be associated with meaningful differences in patient-centered, clinical, and provider outcomes.

Medium and high minority facilities scored lower in three out of the four domains derived exclusively from the CAHPS-PCMH patient experience survey. A recent study of patient experience in the VHA found differences (both positive and negative) in reported patient experience by Blacks and Hispanics relative to White veterans across the VHA.¹⁹ However, researchers found the differences in patient experience were more often attributable to between facility rather than within facility differences, suggesting veterans at a particular facility were more likely to report similar experiences. These findings were also consistent with findings in other non-VHA settings.^{20,21} Researchers question whether the differences they found represented true differences in care or whether they could be attributable to differences in patient expectations or response style. Importantly, in the present study we found lower scores in two of

the three domains (access and care coordination) that were a combination of administrative and patient experience data; but we did not find differences in the team based domain that only derived information from the personnel survey.

This the first study, to our knowledge, to describe the distribution of minority patients across primary care facilities within an integrated health system and to examine whether facility-level implementation of a system-wide rollout of a PCMH model of primary care varied by the racial/ethnic composition of a facility's patient population. This is also the first study to use race/ethnicity data from the SHEP. By using the combined sources of race/ethnicity data we described earlier, we derived a measure of minority composition that included all minority groups. Previous studies of facility-level disparities used percent of Black veterans receiving care at a facility as a proxy measure for all minority groups because of issues with completeness, accuracy, and consistency over time with race/ethnicity data within the VHA.^{4,7,22,23}

Studies investigating the contribution of site care in the VHA and disparities paint a mixed picture. Many find that disparities are often explained more by within-facility differences than between-facility differences in the VHA; meaning within facilities there are disparities between whites and minorities for particular outcomes.^{4,7,24} However, other studies support the between facility role of disparities; meaning within facilities whites and minorities have similar outcomes and variation across different facilities may be causing disparities.^{2,19, 25, 26} The present study provides some support for the latter hypothesis because where minorities get care and white veterans get care have different levels of implementation and high levels of implementation are associated with important patient and provider outcomes.

This study has several limitations. First, the cutoff points for percent minority of a facility are somewhat arbitrary. In the present study, we chose 25- and 75-percentiles because

this allowed for an adequate number of facilities in each category and also an adequate number of minority patients in each category. However, cutoff points vary across prior studies investigating facility-level racial/ethnic composition, although most were based on the distribution of the proportion of minorities at a facility or based on the proportion of minorities represented in the study population.^{7, 26-34} One study noted the nonlinear relationship between the composition of facilities and the outcome studied, supporting the use of categorical versus linear measures of racial/ethnic composition.³⁵ Second, the team based care domain included only 320 facilities due to a low response rate of the personnel survey and these sites may not be representative of all VHA facilities. Third, Pi^2 is a cross-sectional measure with no baseline comparison, so we were unable to assess change in Pi^2 . Although medium and high minority serving facilities had lower levels of implementation, they may have experienced the most change in the domains of care that comprise Pi^2 . Future studies will be able to investigate progress towards greater implementation of PACT at the VHA, and how facility-level progress varies by the percent of minority veterans served by the facility.

2.5 CONCLUSION

Our study presents a first look at whether facility-level implementation of the PCMH model through the largest system wide rollout to date varied with the racial/ethnic composition of facilities' patient population. Our findings suggest the PACT initiative is not reaching minority veterans equally; they are disproportionately receiving care at facilities with lower levels of PACT implementation and fewer PCMH components in place. Further research is needed to elucidate the relationship between the racial/ethnic composition of a facility and other characteristics that may impede or improve PACT implementation, and investigate how less

effective PACT implementation affects clinical and patient-centered outcomes for minority veterans.

Table 2.1 Facility-Level Characteristics by Minority Composition

Minority Composition FY2012 ¹	Total	Low (<5.2%)	Medium (5.2-25.8%)	High (>25.8%)
Number of Facilities	832	209	415	208
Age, (SD), years ²	64.3(3.8)	66.4(2.7)	64.8(3.5)	61.3(3.5)
Percent Female, (SD) ²	5.5(4.1)	3.8(1.0)	5.2(2.0)	7.9(1.0)
Percent White, (SD) ²	79.0(18.4)	94.3(1.9)	84.5(6.8)	52.4(15.8)
Percent Black, (SD) ²	10.1(13.3)	1.0(.8)	6.8(5.5)	25.6(17.4)
Percent Hispanic, (SD) ²	4.8(10.5)	.7(.4)	3.0(3.0)	12.3(18.5)
Percent missing race/ethnicity, (SD) ²	2.7(2.7)	2.0(1.7)	2.5(2.2)	4.1(3.8)
Elixhauser Score, (SD)	1.66(.030)	1.66(.036)	1.65(.028)	1.66(1.66)
Average Number of Patients, (SD) ²	7211(7572)	3783(3613)	7217(6583)	10645(10329)
Total Minority Patients, N (%)	1,435,129	29367(2.0)	420404(29.3)	985358(68.6)
Total White Patients, N (%)	4,376,255	742694(17.0)	2493283(57.0)	1140278(26.1)
Total patients, N	5,999,869	790,745	2,994,899	2,214,225

Notes:

1. Fiscal Year (FY) 2012 - October 2011-Sept 2012
2. ANOVA F* test, p<.001. The F* test is a modification of the standard F test that is much less sensitive to violations of the homogeneity of variance.

Table 2.2 Linear Pi² Score by Facility Minority Composition¹

FY 2012 ²	Unadjusted Means (SD) ³				Adjusted Marginal Effect (SE) ⁴				
	Minority Composition	Low (<5.2%)	Medium	High (>25.8%)	p-value	Medium	p-value	High (>25.8%)	p-value
Number of Facilities	209	415	208		415		208		
PI ² Score	0.914(3.179)	-0.193(3.084)	-0.668(3.161)	<0.001	-0.777(0.298)	0.009	-0.938(.346)	0.007	
Domain Score									
Access	0.092(0.413)	0.004(0.445)	-0.112(0.417)	<0.001	0.056(0.041)	0.172	-0.172(0.048)	<.001	
Continuity	0.113(0.744)	0.080(0.691)	-0.095(0.757)	0.005	0.030(0.059)	0.611	-0.026(0.069)	0.702	
Care Coordination	0.127(0.392)	-0.017(0.420)	-0.063(0.444)	<0.001	-0.128(0.038)	.001	-0.166(0.049)	<.001	
Comprehensiveness	0.136(0.752)	-0.062(0.691)	0.046(0.682)	0.003	-0.219(0.059)	<.001	-0.243(0.068)	<.001	
Self-Management	0.158(0.782)	-0.102(0.740)	0.050(0.703)	<0.001	-0.232(0.062)	<.001	-0.186(0.072)	0.010	
Patient-Centered Care & Communication	0.208(0.773)	-0.036(0.835)	-0.132(0.783)	<0.001	-0.164(0.070)	0.019	-0.089(0.081)	0.275	
Shared Decision Making	0.118(0.779)	-0.085(0.744)	-0.056(0.670)	0.004	-0.104(0.061)	0.090	0.037(0.071)	0.608	
Number of Facilities	46	174	100		174		100		
Team Functioning ⁴	-0.045(0.464)	-0.025(0.420)	-0.108(0.445)	0.311	0.090(0.085)	0.286	0.026(0.093)	0.777	

Notes:

1. PACT Implementation Progress Index (Pi²)
2. Fiscal Year (FY) 2012 -October 2011-Sept 2012
3. ANOVA, F-statistic
4. Weighted least square regression adjusted for mean age, proportion female, mean Elixhauser Score, and number of patients. Low minority facilities are the referent group. Pi² scores can range from -8 to 8.
5. Among facilities with at least 5 respondents, N=320

Table 2.3 Categorical Pi^2 Score by Facility Minority Composition¹

FY 2012 ²	Unadjusted Means ³				Average Adjusted Predicted Probabilities ⁴ (SE)						Average Marginal Predicted Probability ⁵ (SE)				
	Minority Composition	Low (<5.2%)	Medium	High (>25.8%)	p-value	Low	p-value	Medium	p-value	High (>25.8%)	p-value	Medium	p-value	High (>25.8%)	p-value
Categories of Pi^2 Score ⁶															
High Pi^2 5 to 8	12.9(27)	6.5(27)	6.3(13)	<.001	12.1(1.8)	<.001	7.04(.90)	<.001	6.0(1.1)	<.001	-5.1(1.6)	0.001	6.1(1.8)	0.001	
2 to 4	32.1 (67)	22.2(92)	18.3(38)		30.8(2.5)	<.001	22.1(1.6)	<.001	20.0(2.3)	<.001	-8.7(2.3)	<.001	-10.9(3.1)	<.001	
-1 to 1	34.0(71)	40(166)	38.0(79)		36.5(1.9)	<.001	38.7(1.7)	<.001	38.3(1.8)	<.001	2.2(1.2)	0.057	1.8(1.2)	0.129	
-4 to -2	15.3(32)	21.9(91)	21.6(25)		14.4(1.7)	<.001	21.4(1.6)	<.001	23.3(2.2)	<.001	7.0(1.8)	<.001	8.9(2.5)	<.001	
Low Pi^2 , -5 to -8	5.7(12)	9.4(39)	159(33)		6.2(1.0)	<.001	10.8(1.2)	<.001	12.4(1.9)	<.001	4.6(1.2)	<.001	6.2(1.9)	0.010	

Notes:

1. PACT Implementation Progress Index (Pi^2)

2. Fiscal Year 2012 (October 2011-Sept 2012)

3. ANOVA, F-statistic

4. Average adjusted predicted probabilities an ordered logit with robust standard errors adjusted for mean age, proportion female, and mean Elixhauser Score. Expected probability that the outcome will be 1.

5. Average Marginal Effects after an ordered logit with robust standard errors adjusted for mean age, proportion female, and mean Elixhauser Score. Low minority facilities are the referent group. Change in probability when facility composition goes from low to medium/high. Values represent percentage point differences.

6. Pi^2 scores can range from -8 to 8. Score 5 to 8 (top decile) are associated with lower patient satisfaction, lower clinical quality, higher staff burnout, higher hospitalization rates for ambulatory care-sensitive conditions (H-ACSC), and higher emergency department relative to scores in the lowest decile (-5 to -8).

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Chapter 3. A FIRST LOOK AT PACT ASSOCIATED CHANGES TO UTILIZATION FOR MINORITY VETERANS

3.1 ABSTRACT

Background: In 2010 the Veterans Health Administration (VHA) became the largest integrated delivery system in the U.S. to implement the patient-centered medical home (PCMH) in primary care. No study to date has addressed whether this initiative is having a differential effect on minority veterans.

Objective: To assess: 1) whether there were baseline differences in healthcare utilization and probability of a hospitalization for ambulatory care sensitive conditions (ACSCs) in the years leading up to PCMH; and 2) whether any change in trends associated with PCMH differed by veterans' race/ethnicity.

Research Design: Interrupted time series analyses using random effect negative binomial models to assess outpatient utilization and a random effect logit model for hospitalization for ACSCs.

Subjects: A 10% random sample of veterans receiving primary care in the VHA for each of the forty-four quarters in our study period, 9,666,577 patients from October 2002 - September 2013. This included 69% White (n=6,682,156); 22% Black (n=2,092,355); and 7% Hispanic (n=670,586).

Interventions: Patient Aligned Care Teams (PACT), a primary care based patient-centered medical home model focused on team based care beginning in April 2010.

Measures: VHA primary care and specialty mental health visit counts and ACSC hospitalization probability.

Results: Prior to PACT, we found a greater number of differences in utilization between White and minority veterans. We found small heterogeneous changes to utilization associated with PACT across racial/ethnic groups.

Conclusions: We found weak evidence to support PACT was associated with changes in trends in utilization for minorities relative to Whites. The direction of changes in the trends of utilization, when they did occur, were racial/ethnic group specific. Future studies of racial/ethnic minorities in the VHA should not lump these disparate groups together.

3.2 BACKGROUND

In 2010 the Veterans Health Administration (VHA) became the largest integrated delivery system in the U.S. to implement the patient-centered medical home (PCMH) in primary care. The Patient Aligned Care Team (PACT) initiative is the VHA's version of the PCMH, focusing on team based care and is a complex multifaceted care delivery redesign.^{1,2,3} PACT teamlets include the veteran patient, his/her provider (e.g., physician, nurse practitioner, or physician assistant), a registered nurse (RN) case manager, a clinical staff assistant, and an administrative staff member. The teamlet is responsible for coordinating care and collaborating with other medical and support staff. Through this team based approach to care, the VHA expects to improve access to face-to-face and remote/virtual medical encounters (virtual visits include telephone and email), improve patient engagement, promote more efficient use of healthcare services, and reduce costs to the VHA.

No study to date has addressed whether PACT is having a differential effect on minority veterans, but there are findings that suggest it might. Hospitalizations for ambulatory care conditions (ACSCs)—which are believed to be influenced by the quality of primary care—were higher in the pre-PACT period among Black veterans relative to White veterans.⁴ Expanded access to primary care and increased care coordination are two key elements of PACT that may ameliorate shortfalls in ambulatory care use for minority veterans that may have been contributing to disparity in ACSC hospitalizations. On the other hand, there is evidence that facilities serving higher proportions of minority patients have modestly lower levels of PACT implementation which could exacerbate racial disparities in ambulatory care use and veterans' health.^{5,6,7} The healthcare use and outcomes of minority veterans is especially important because minorities are a growing proportion of the veteran population, and projections indicate the

proportion of minority veterans will increase from 21% to 34% from 2012 to 2040.⁸ Moreover, minorities comprise significant portions of younger veteran cohorts. For instance, among veterans 17-34 years old minorities comprise 93% of the population.⁸ Therefore, understanding how minorities' utilization may have changed with the implementation of this major care redesign may help the VHA prepare for the future provision of healthcare services to a more diverse population and may help inform future efforts to address disparities at a system level.

To understand how minorities have fared under PACT, we tracked trends in veterans' use of outpatient primary and specialty mental health care and trends in the probability of a hospitalization for ACSCs in the years leading up to PACT, and assessed whether the change in trends after PACT differed by veterans' race/ethnicity. To our knowledge, this is the only study of a PCMH model of care large enough to evaluate its effect on healthcare utilization for racial/ethnic minority groups.

3.3 METHODS

Data Sources and Study Sample

We used national data from the VHA Corporate Data Warehouse (CDW) for patient demographics (age, sex, comorbidity, copayment exempt status) and utilization. We limit our analyses to veterans 18-64 years old because of substantial non-VHA utilization for Medicare eligible veterans, which is only available to us with a significant time lag.^{9,10} To ensure the most complete and accurate race/ethnicity data we used three different data sources: Survey of Healthcare Experiences (SHEP), CDW, and Vitals Status File.¹¹

We identified veterans who were in the VHA Primary Care Management Module (PCMM) at any time from October 2002 to September 2013 (fiscal year (FY) 2003 to FY2013).

The PCMM is used for patient empanelment and primary care management and represent nearly all veterans who are active users of VHA care.^{12,13} Using these inclusion criteria we derived independent 10% random samples of veterans for each quarter-year in our study period. In total our study included 44 quarters: 30 in the period before PACT and 14 quarters after PACT implementation began. The unit of analysis for all statistical models was patient-quarter observations. Patients could contribute to more than one quarter of time to our study, although 65% contributed three or fewer quarters and 97% of our study sample contributed to seven or fewer quarters.

Primary dependent variables

The dependent variables were measures of outpatient healthcare use and a measure of the quality of ambulatory care. For outpatient use we used two categories of healthcare utilization that we hypothesized would be the most sensitive to PACT implementation and that we used in previous evaluations of PACT: primary care visits and specialty mental health visits.^{3,4,14} Outpatient utilization measures were defined as a count of the number of face-to-face visits with providers identified to be providing primary and specialty mental health care, respectively.^{3,4,14} For the measure of the quality of ambulatory care we used the U.S. Agency for Healthcare Research and Quality (AHRQ) definition of hospitalizations for ambulatory care sensitive condition (ACSC) Quality Indicators, Version 4.4, March 2012, which consisted primarily of acute care hospitalizations for heart failure, pneumonia, chronic obstructive pulmonary disease, and diabetes.¹⁵ We excluded angina and hypertension because they were not measured reliably in early years in our dataset.

Definition of Race/Ethnicity

The primary independent variables of interest were a veteran's race/ethnicity. For race we created mutually exclusive categories: non-Hispanic White (White); non-Hispanic Black/African; and Hispanics.^{11,16,17} Hispanic veterans could be of any race.

Covariates

We used the Andersen-Newman framework for healthcare utilization to select possible confounders; the framework defines predisposing, enabling and need determinants of healthcare use.¹⁸ We included age, sex and race/ethnicity as predisposing factors; Gagne comorbidity scores as a need characteristic using ICD-9 codes for care obtained in the previous year¹⁹; and veteran copayment status (exempt and not exempt) as an enabling resource. Veteran copayment status was a proxy for socioeconomic status because it was determined by a combination of percent service connected disability, financial means test, and other criterion.⁹

Statistical analyses

We performed bivariate comparisons between White and minority groups (Blacks and Hispanics) for demographic characteristics using ANOVA F-statistic for continuous variables and chi2(χ^2) tests for categorical variables.

We used interrupted time series analyses to assess: 1) if there were racial differences in utilization in the pre-PACT period (baseline), 2) if racial/ethnic minorities experienced differential changes in utilization associated with PACT.²⁰ To assess racial/ethnic differences in utilization in the pre-PACT period we included an interaction between race/ethnicity and time (continuous quarters). To assess whether racial/ethnic minorities utilization associated with PACT differed, we included an interaction term between time, race/ethnicity, and a PACT indicator variable. We used a random effect negative binomial model for outpatient visits and a

random effect logit model for the probability of hospitalization for ACSCs. All models controlled for patient covariates described earlier, a continuous time variable, and seasonality indicator variables.

To calculate racial/ethnic differences in utilization and hospitalizations for ACSCs in the pre-PACT period, we used the parameter estimates from these models and calculated average adjusted predicted visit counts/probability of hospitalization for ACSCs for each racial/ethnic group for each time period (quarter) using the margins command in STATA 12.1 which uses the method of recycled predictions.²¹ This procedure accounts for the non-constant marginal effect of independent variables in non-linear models; and calculates correct marginal effects and standard errors for the utilization measures, while accounting for the interaction terms in the statistical model.^{22,23} We then tested whether there were differences in visits/probabilities between Whites and each racial/ethnic minority group using Wald tests for the entire period.

To assess racial differences in use and hospitalizations in the post-PACT period, we calculated the average adjusted predicted visit counts/ probability of hospitalization for each racial/ethnic group, for each time period with the dummy variable for PACT set equal to 1, and again with the dummy variable for PACT equal to zero. Counts/probabilities with the PACT dummy set equal to zero represented an estimate of expected utilization if pre-PACT trends had continued. The difference between these estimates and estimates with PACT dummy equal to 1 reflected PACT-associated changes in healthcare use and hospitalizations for ACSCs. We then tested whether the PACT-associated changes to visits/probabilities were different for each racial/ethnic minority group relative to Whites using Wald tests. In total we estimated three separate models, one model for each utilization category.

3.4 RESULTS

The study included 9,445,097 veteran quarters from 3,444,304 unique veterans from October 2002 - September 2013. Across our entire study period this included 71% White (n=6,682,156); 22% Black (n=2,092,355); 7% Hispanic (n=670,586) veteran quarters. In our baseline quarter, the distribution of age, sex, Gagne comorbidity score; and copayment status varied significantly across racial/ethnic groups [Table 3.1]. We saw a similar pattern for the final quarter in our study. Relative to White veterans, Black, Hispanic veterans were younger, had lower Gagne comorbidity scores, and had higher percentages of being copayment exempt.

Unadjusted Results

At baseline Black veterans had fewer primary care visits, on average, and a higher probability of hospitalization for ACSCs relative to White veterans [Table 3.1]. By the last quarter of our study, Black veterans had more primary care visits than Whites, but continued to have a higher probability of hospitalization for ACSC, although the gap had attenuated. Black veterans had more specialty mental health visits both at baseline and at study end relative to White veterans. On the other hand, Hispanic veterans had more primary care visits and a higher probability of hospitalization for ACSCs relative to White veterans [Table 3.1]. At end of our study, Hispanic veterans continued to have more primary care visits, but had a lower probability of hospitalization for ACSCs. Hispanic veterans had higher rates of specialty mental health visits both at baseline and at study end relative to White veterans.

Adjusted Baseline (Pre-PACT) Utilization

Primary care visits were increasing for Whites, Blacks, and Hispanics [Figure 3.1, Table 3.2]. However, primary care visits for Black and Hispanic veterans were increasing more than

they were increasing for Whites. On average, per quarter Blacks had approximately 36.7 more visits than Whites per 1,000 veterans ($(1.1 \text{ visits} / 30 \text{ quarters}) * 1000$).

Specialty mental health visits were increasing for all groups. However, the rate was increasing slower for Blacks and increasing faster for Hispanics relative to Whites [Figure 3.2, Table 3.2]. On average, per quarter Blacks had approximately 28 fewer visits than Whites per 1,000 veterans.

The probability of hospitalization for ACSCs was decreasing for Whites, Blacks, and Hispanics. However, Blacks had higher a probability of hospitalization but a faster rate of decline; and Hispanics had a similar probability relative to Whites [Figure 3.3, Table 3.2]. On average, per quarter Blacks had approximately 3.3 more hospitalizations than Whites per 10,000 veterans ($(.01/30)*10000$).

Changes in utilization associated with PACT

We also found modest changes in outpatient use associated with PACT across racial/ethnic groups. All racial/ethnic groups experienced declines in per person primary care visits associated with PACT [Figure 3.1, Table 3.3]. Black and White veterans experienced a similar decline in visits associated with PACT. For Hispanics, the decrease in primary care visits associated with PACT was larger than the decrease experienced by White veterans—approximately 4.3 fewer visits per 1000 veterans per quarter ($(-.17/14)*1000$) [Table 3.3].

PACT-associated changes to specialty mental health visits were mixed [Figure 3.2, Table 3.3]. Whites and Hispanics experienced a decline in visits associated with PACT, whereas Blacks experienced a slight increase associated with PACT. For Hispanics, the decrease in specialty mental health visits associated with PACT was larger than the decrease experienced by Whites—approximately 35 fewer visits per 1000 veterans per quarter [Table 3.3]. For Blacks,

the increase in specialty mental health visits associated with PACT, relative to the decline in visits associated with PACT for White veterans translated into approximately 53.6 more visits per 1000 veterans per quarter for Blacks [Table 3.3].

Finally, no group experienced changes to the probability of a hospitalization for ACSCs associated with PACT—the Pre-PACT probability of hospitalization continued [Figure 3.3, Table 3.3].

3.5 DISCUSSION

The goals of this study were to assess: 1) if there were racial differences in utilization in the pre-PACT period (baseline), and 2) if racial/ethnic minorities experienced differential changes in utilization associated with PACT. We undertook this study because disparities exist in the VHA and recent data indicate PACT has not reached minorities equitability.^{5,6} In particular, facilities caring for disproportionate shares of minorities have lower levels of PACT implementation creating a potential mechanism for worsening disparities in the VHA.⁶ In the pre-PACT period, primary care visits and specialty mental health visits in the VHA were increasing for White, Black, and Hispanic veterans, while rates of hospitalizations for ACSCs were decreasing for each racial/ethnic group. However, we found minority differences in the three utilization trends relative to White veterans.

The implementation of the PACT at the VHA affected the trajectory of use of primary care and specialty mental health, but we did not find PACT-associated changes to the probability of hospitalization for ACSCs. We found some modest evidence for differences in the effect of PACT by racial/ethnic group, although the differences were small and varied across the groups. For example, the decrease in primary care visits associated with PACT for Hispanics was larger

than the decrease experienced by White veterans, while Blacks and Whites experienced similar changes to visits associated with PACT. Importantly, Hispanics had a higher baseline rate in primary care relative to Whites. This larger decline associated with PACT in primary care visits may reflect a greater substitution of virtual visits (phone and secure messaging) which we did not measure in our study. We found Blacks increased utilization of specialty mental health visits associated with PACT relative Whites. Blacks also had lower baseline rates in specialty mental health visits, so this uptake in utilization may reflect some unmet need.

This study makes important contributions to the literature on racial/ethnic disparities in the VHA and to the literature on PCMHs. This is the first study to assess longitudinal measures of outpatient care and hospitalization for ACSC by racial/ethnic groups, to determine if there are baseline differences, and to control for underlying trends. This is also the first study to assess whether a PCMH model of care is associated with different changes to outpatient use and the probability of hospitalization for ACSCs.

This study also has several limitations. First, this is an intent to treat analysis and assumes all PACT elements were fully implemented at all VHA facilities in April 2010. We know PACT has not been uniformly implemented, and results may differ at facilities with more well developed PACTs. Second, PACT was rolled out nationwide in April 2010, and given the unique features of the VHA there was no suitable control group. However, by using an interrupted times series approach we were somewhat able to mitigate that limitation by accounting for underlying trends in utilization. Third, to the degree that we could attribute these findings to PACT, they represent short run effects (3.5 years after the national roll out).

3.6 CONCLUSION

In conclusion, we found some evidence to support PACT was associated with differences in trends in utilization for minorities relative to Whites. Changes in the trends of utilization, when they did occur, were small and racial/ethnic group specific. This implies studies of racial/ethnic disparities in the VHA should not lump these disparate groups together. Finally, this study examines only changes to outpatient use and hospitalization for ACSCs. Future studies should assess whether racial/ethnic groups have different changes to clinical outcomes and other measures of patient-centered care such as patient experience.

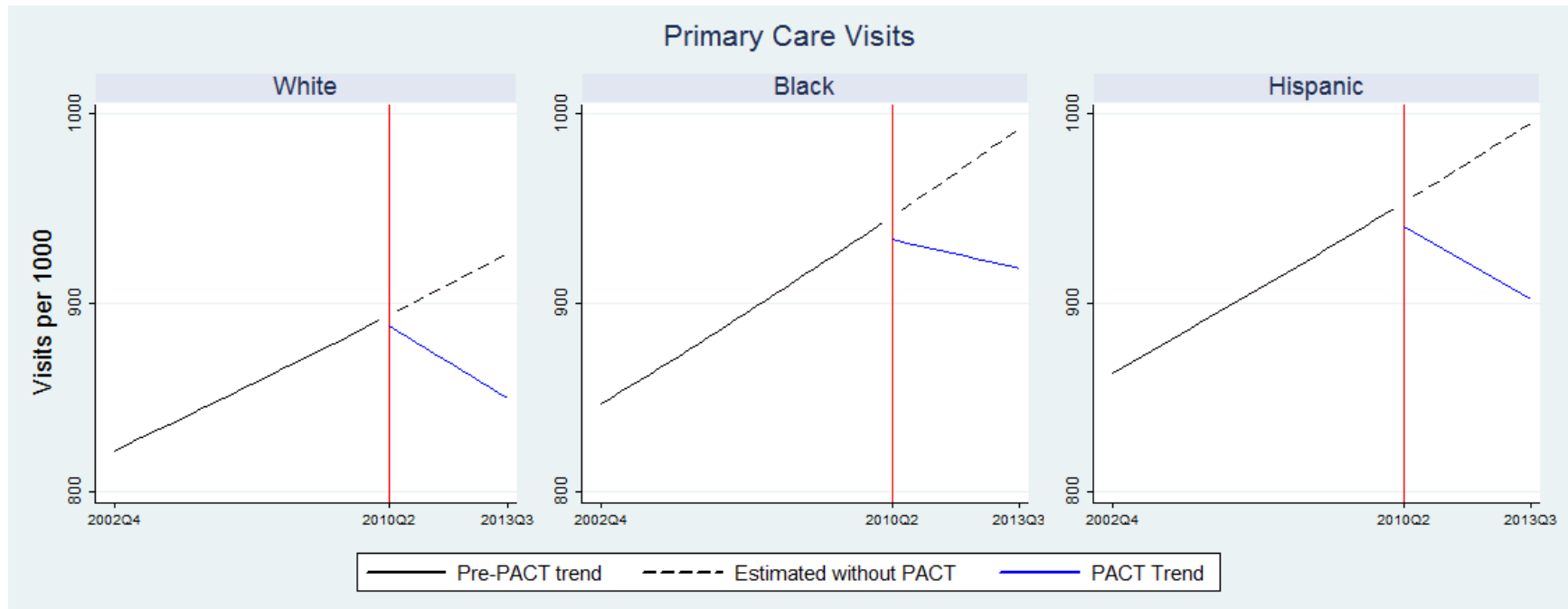


Figure 3.1 Trends in Primary Care Visits by Race/Ethnicity

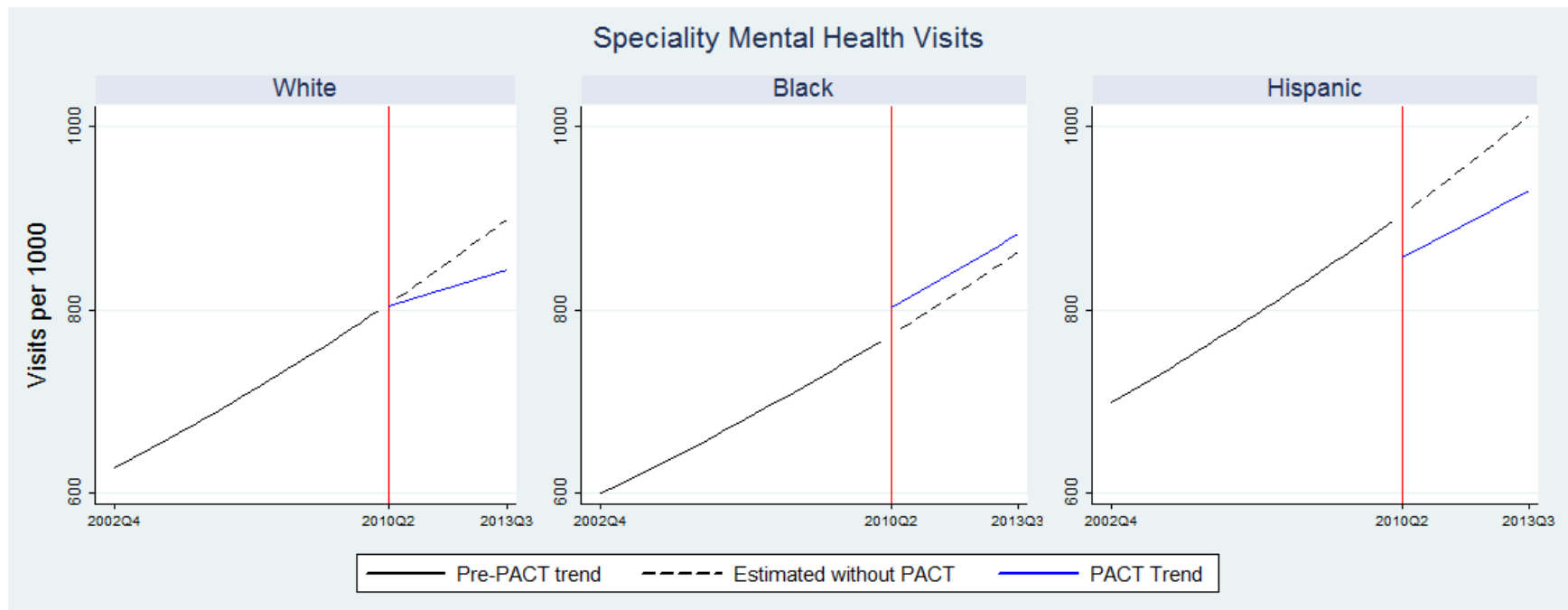


Figure 3.2 Trends in Specialty Mental Health Visits by Race/Ethnicity

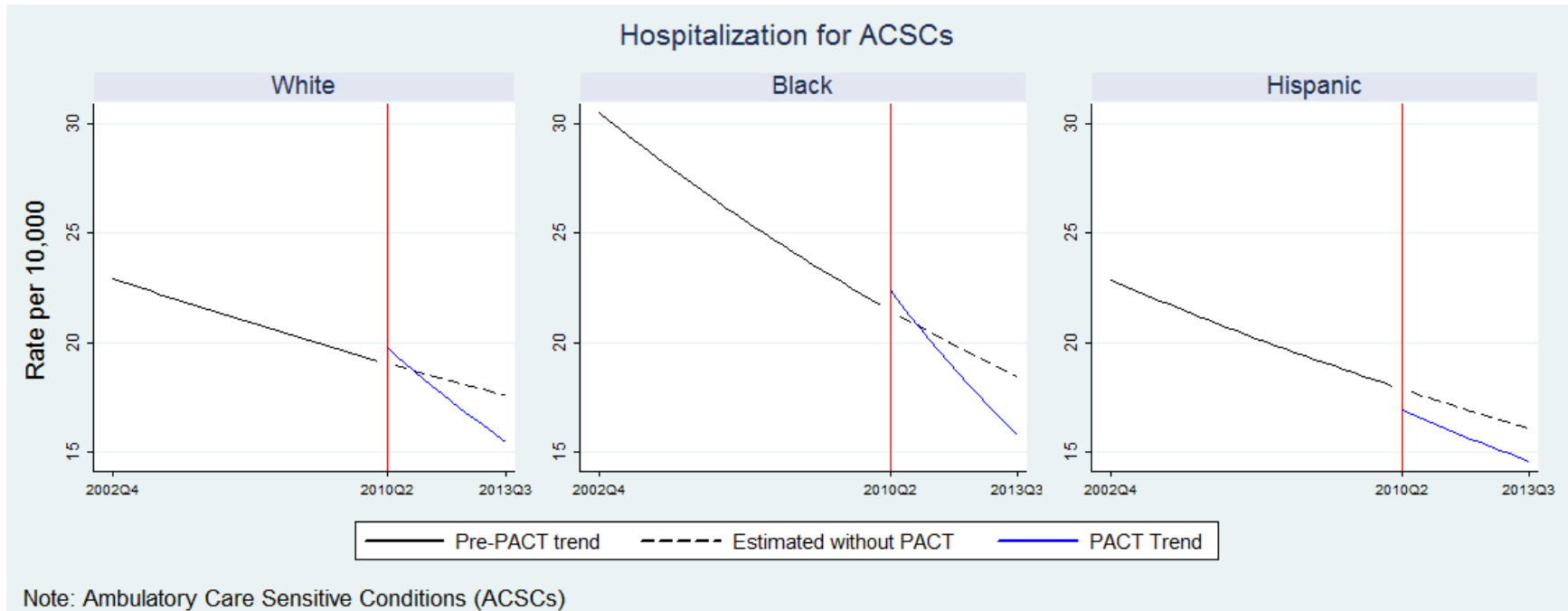


Figure 3.3 Trends in Hospitalization for ACSCs by Race/Ethnicity

Table 3.1 Patient Demographics, Veterans 18-64¹

	Fiscal Year 2003, quarter 1 (October 2002 - December 2002)				Fiscal Year 2013, quarter 4 (July 2013 - Sept 2013)			
	White	Black	Hispanic ²	p-value	White	Black	Hispanic ²	p-value
N	114,947	33,678	9,487		160,412	57,706	19,558	
Age, (SD), years	53.3(8.3)	49.9(8.5)	50.9(9.0)	<.001	50.3(12.2)	50.8(10.2)	46.4(12.8)	<.001
Age, (%)								
18-24	0.3	0.3	0.6	<.001	1.5	0.8	2	<.001
25-34	4.3	5.9	6.7		15.5	9.7	24.1	
35-44	9.8	18.1	13.8		13.1	14.2	16.9	
45-54	29.8	41.6	36.4		21.7	31.1	21.2	
55-64	55.9	34.1	42.6		48.3	44.3	35.8	
Percent Male, (%)	93	90	93	<.001	89	83	88	<.001
Gagne Score, (SD)	.126(.779)	.103(.793)	.091(.722)	<.001	.202(.832)	.189(.911)	.168(.760)	<.001
Percent Co-payment Exempt, (%)	51	54	58	<.001	89	93	90	<.001
Average number of Primary Care, (SD)	.73(1.06)	.68(1.07)	.80(1.13)	<.001	.83(1.32)	.89(1.33)	.87(1.32)	<.001
Average number of Mental Health, (SD)	.65(3.29)	1.13(5.54)	.78(3.71)	<.001	1.00(3.54)	1.43(4.68)	1.11(3.60)	<.001
Percent with an H-ACSC	0.270	0.410	0.320	<.001	0.190	0.260	0.170	0.009
Average number of H-ACSC	.003(.063)	.005(.079)	.003(.059)	<.001	.002(.053)	.003(.060)	.002(.048)	0.014
Average number of H-ACSC, (H-ACSC>0) ³	1.14(.39)	1.16(.44)	1.03(.18)	<.001	1.13(.41)	1.13(.36)	1.12(.33)	0.986

Notes:

1. Age, Gagne Comorbidity Score, and Average number of H-ACSC, ANOVA F-test. Percent Male, Percent Free Care, Percent with an H-ACSC, chi2 test.
2. Hispanics could be of any race.
3. Among Veterans with at least one inpatient hospitalization for an ambulatory care sensitive condition (H-ACSC).

Table 3.2 Pre-PACT Per Person Utilization by Race/Ethnicity

Fiscal Year 2003-2012(October 2002 - March 2010)¹	White	Black	Hispanic²
Pre-PACT, N	4,365,658	1,312,546	407,770
Primary Care Visits			
Total Pre-PACT Average Adjusted Predicted Counts (SE) ³	25.5(.20)	26.6(.21)	27.0(.21)
Difference in Total Pre-PACT Average Adjusted Predicted Counts (SE) ⁴	-	1.1(.04)	1.5(.07)
P-Value		<.001	<.001
Specialty Mental Health Visits			
Total Pre-PACT Average Adjusted Predicted Counts (SE) ³	19.8(.39)	18.9(.38)	22.1(.44)
Difference in Total Pre-PACT Average Adjusted Predicted Counts (SE) ⁴	-	-.84(.05)	2.3(.09)
P-Value		<.001	<.001
Hospitalization for ACSCs⁵			
Total Pre-PACT Average Adjusted Predicted Probability (SE) ⁶	.06(.001)	.07(.002)	.06(.002)
Difference in Total Pre-PACT Average Adjusted Predicted Probability (SE) ⁷	-	.01(.001)	.002(.002)
P-Value		<.001	0.347

Notes:

1. Positive differences indicate more utilization relative to Whites; Negative differences indicate less utilization relative to Whites.
2. Hispanics could be of any race
3. Total average adjusted predicted counts after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.
4. Total average adjusted predicted counts after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality. Whites are the referent group.
5. Ambulatory care sensitive conditions
6. Total average adjusted predicted probability after a random effect logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.
7. Difference in total average adjusted predicted probability after random effect logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality. Whites are the referent group.

Table 3.3 Per Person PACT Associated Utilization by Race/Ethnicity

FY 2003-FY2013 (April 2010 - September 2013)¹	White	Black	Hispanic²
Post-PACT, N	2,316,498	779,809	262,816
Primary Care Visits			
Total Average Adjusted Predicted Counts if PACT had not occurred (SE) ³	12.7(.10)	13.6(.11)	13.6(.13)
Total Average Adjusted Predicted Counts during PACT (SE) ⁴	12.2(.09)	13.0(.10)	12.9(.10)
Difference in Utilization Associated with PACT, (SE) ⁵	-.57(.02)	-.60(.05)	-.75(.08)
P-Value	<.001	<.001	<.001
Difference in Utilization Associated with PACT Relative to Whites (SE) ⁶	-	-.03(.05)	-.17(.08)
P-Value		0.567	0.038
Mental Health Visits			
Total Average Adjusted Predicted Counts if PACT had not occurred (SE) ³	11.9(.23)	11.4(.23)	13.4(.29)
Total Average Adjusted Predicted Counts during PACT (SE) ⁴	11.5(.23)	11.8(.23)	12.5(.25)
Difference in Utilization Associated with PACT, (SE) ⁵	-.40(.04)	.35(.06)	.89(.13)
P-Value	<.001	<.001	<.001
Difference in Utilization Associated with PACT Relative to Whites (SE) ⁶	-	.75(.08)	-.49(.13)
P-Value		<.001	<.001
Hospitalization for ACSC			
Total Average Adjusted Predicted Counts if PACT had not occurred, PACT=0 (SE) ⁷	.03(.0008)	.03(.001)	.02(.002)
Total Average Adjusted Predicted Counts during PACT, PACT=1 (SE) ⁸	.02(.0006)	.03(.0008)	.02(.001)
Difference in Utilization Associated with PACT, (SE) ⁹	-.001(.0007)	-.001(.001)	-.002(.002)
P-Value	0.11	0.221	0.42
Difference in Utilization Associated with PACT Relative to Whites (SE) ¹⁰	-	-.0003(.001)	-.0007(.002)
P-Value		0.813	0.765

Notes:

1. Positive differences indicate more utilization relative to Whites; Negative differences indicate less utilization relative to Whites.
2. Hispanics could be of any race
3. Total average adjusted predicted counts after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality, if PACT had not occurred (PACT=0).
4. Total average adjusted predicted counts after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality, during PACT (PACT=1).
5. Difference in total average adjusted predicted counts associated with PACT after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.
6. Difference in total average adjusted predicted counts associated with PACT relative to Whites after random effects negative binomial model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.
7. Total average adjusted predicted probability after random effects logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality, if PACT had not occurred (PACT=0).
8. Total average adjusted predicted probability after random effects logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality, during PACT (PACT=1).
9. Difference in total average adjusted predicted probability associated with PACT after random effects logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.
10. Difference in total average adjusted predicted probability associated with PACT relative to Whites after random effects logit model adjusted for age, sex, copayment exempt, Gagne Comorbidity Score, time, and seasonality.

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Chapter 4. EQUITY IN IMPROVEMENTS TO HOSPITALIZATIONS FOR AMBULATORY CARE SENSITIVE CONDITIONS

4.1 ABSTRACT

Background: The Veterans Health Administration (VHA) has experienced substantial declines in rates of hospitalizations for ambulatory care sensitive conditions (ACSCs). However, few studies have examined whether racial/ethnic disparities in hospitalizations for ACSCs exist or whether racial/ethnic groups have experienced equivalent declines in hospitalizations for ACSCs.

Objective: We estimated whether overall declines in hospitalizations for ACSCs were experienced similarly across racial groups and across facilities of different racial compositions between 2002 and 2012.

Design: We used logit models to estimate risk-adjusted probabilities of a hospitalization for ACSCs and to assess how the racial composition of the site of care was associated with changes in hospitalization between 2002 and 2012.

Subjects: Veterans enrolled in the VHA ages 34-64.

Measures: The main dependent variable was the probability of a hospitalization for any ACSC. The primary independent variables of interest were a veteran's race/ethnicity and the racial composition of the facility where they received primary care.

Results: There was a substantial decline in the Black-White disparity for hospitalizations for ACSCs between 2002 and 2012. The decline in the disparity was a result of the substantial decline within facilities of similar racial composition (3 per 1000 fewer, $p < .001$). The higher

hospitalization rates among medium (3 per 1000 more in 2012, $p < .001$) and high minority (5 per 1000 more in 2012, $p < .001$) serving facilities compared to low minority serving facilities persisted between 2002 and 2012. The Black-White disparities within medium and high minority facilities narrowed dramatically, and was nearly eliminated for high minority facilities.

Conclusions: The VHA has made substantial progress toward eliminating disparities in a key marker of ambulatory care quality. However, the disparity among medium-, high- and low-minority serving facilities persisted. Improving the quality of primary care at minority serving facilities would further improve care for White and Black veterans and reduce the Black-White disparity in ACSCs.

4.2 BACKGROUND

Hospitalizations for ambulatory care sensitive conditions (ACSCs) are considered potentially preventable events for which appropriate and timely management in the outpatient setting could potentially prevent disease progression and the need for hospitalization.^{1,2} Many healthcare systems, including the Veterans Health Administration (VHA) use hospitalizations for ACSCs to evaluate whether improvements to outpatient care are effective.³ Evaluators also recommend tracking hospitalizations for ACSCs as a key outcome in patient-centered medical home evaluations, which focus on strengthening primary and outpatient care.⁴

Since 1997 the VHA has experienced substantial declines in hospitalizations for ACSCs.⁵⁻⁷ Between 1997-2007 rates of ACSC hospitalizations declined 46% from 52 to 28 per 1000 patients treated in VA medical centers.⁶ However, rates varied significantly by geographic location, with hospitals located in the mid-south having higher than expected hospitalizations for ACSCs.⁶ Hebert et al found rates of hospitalizations for ACSCs were trending down in the VHA, but were trending up in the rest of the country for people 64 years old and younger from 2003-2010.⁷ Importantly, rates in 2003 were higher in the VHA, but ended lower than in the private sector in 2010.⁷

These declining rates may be attributed to structural and cultural changes towards healthcare delivery in the VHA. In 1996 there was a system wide reorganization to focus care delivery from hospital to ambulatory and community based settings, with an emphasis on primary care as the first point of contact.⁸ Reorienting the system required hiring of more primary care providers, although this did not always meet the rising demand for healthcare.⁷ The organizational restructuring created 22 Veterans Integrated Services Networks (VISNs) with global budgets based on prospective capitation rate per veteran.⁸ In 2002 VISNs 13 and 14

merged to create VISN 23 leaving a total of 21 VISNs.⁹ The increased emphasis on primary care was embodied by the adoption of electronic medical records, patient empanelment software tools to help manage patient healthcare, and quality improvement programs. In parallel, there was a cultural shift from one focused on disease and medical discipline to one that was patient-centered, prevention-oriented, and community-based.¹⁰

Although ACSCs are a key measure of the VHA's progress toward better primary care, few studies in the VHA have examined the magnitude of racial/ethnic disparities in ACSC hospitalization rates, whether racial/ethnic disparities have attenuated over time, and potential sources for any disparity.^{6,7,11,12} Hernandez et al (2012) found that rates of ACSC hospitalizations decreased faster from 2002-2012 among VHA facilities caring for large proportions of minorities relative to facilities with smaller proportions of minorities; however, the ecological nature of the study precluded an assessment of whether minorities and White veterans benefited equally at minority-serving facilities.¹³ In addition, this study did not examine whether there were differences in the types of ACSCs conditions experienced by racial/ethnic groups which could assist in targeting of interventions to reduce hospitalizations for ACSCs.

Racial/ethnic minority groups receive healthcare services from a small number of VHA facilities, and studies indicate these facilities may perform sub-optimally relative to facilities caring for a predominately White patient population.^{14,15} These disparities are characterized as occurring "between" facilities because everyone in the lower performing facility receives lower quality care regardless of their race/ethnicity. On the other hand, racial/ethnic disparities may occur inside of facilities (at the same facility). These disparities are often categorized as occurring "within" facilities because at the same facility minority patients may receive lower quality care relative to their White counterparts.

We estimated whether overall declines in hospitalizations for ACSCs in the VHA between 2002 and 2012 were experienced similarly across Black and White veterans and at facilities with different racial compositions. We classified VHA facilities in terms of the percentage of Black veterans they served. We then estimated decreases in the Black-White disparity in hospitalizations for ACSCs conditional on facility racial composition. Next, we then estimated reductions in disparities in the rate of hospitalizations for ACSCs between-facilities with different racial compositions conditional on race (reductions in “between” facility disparities). We estimated whether Blacks and Whites at facilities with differing racial compositions experienced similar changes to the rate of ACSCs hospitalization. Finally, we estimated whether there were differences in the probability of hospitalization for specific types of ACSCs, and whether declines in the probability for these specific conditions differed between White and Black veterans.

4.3 METHODS

Data Sources and Study Sample

We used data from the VHA Corporate Data Warehouse for patient demographics (age, sex, comorbidity, and copayment exempt status), utilization, and facility characteristics (urban/rural). We also included local area unemployment rates from the Bureau of Labor and Statistics.^{16,17} To ensure the most complete and accurate race/ethnicity data we used four different data sources (Survey of Healthcare Experiences (SHEP), CDW, Department of Defense (DoD) and Vitals Statistics.¹⁸ Studies indicate these data sources are accurate for categorizing White and Black veterans.¹⁸⁻²⁰

We included non-Hispanic White (White) and non-Hispanic Black (Black) veterans who were enrolled in VHA primary care in fiscal year (FY) 2003 or FY2012 (October 1, 2002-September 30, 2003 or October 1, 2011-September 30, 2012) and were ages 35-64. These patients represented 82.3% of the VHA population in FY 2003 and 83.5% in 2012 that were 35-64. We limited our analyses to veterans 35-64 because of the substantial amount of healthcare obtained outside the VHA among Medicare eligible veterans.^{21,22} In addition, hospitalizations for specific types of ACSCs, such as congestive heart failure or asthma, happened infrequently among veterans 18-34 in our dataset, and we were unable to generate reliable estimates if we included this cohort.

The number of primary care facilities, which include both hospital outpatient-based clinics at VA Medical Centers (VAMCs) and stand-alone community-based outpatient clinics (CBOCs), increased over time from 670 in FY2003 to 885 in FY2012. Since we were interested in estimating changes to the rates of hospitalizations between FY2003 and FY2012 for patients 35-64, we limited our analyses to primary care facilities that were present during the entire time period and cared for these patients (n=643). In FY2003 these 643 facilities cared for nearly 100% (n= 1,474,179) of the all Black and White patients in primary care population ages 35-64. In 2012 the same facilities cared for 86.7% (n= 1,199,614) of White veterans; and 91.2% (n= 461,727) of all Black veterans ages 35-64.

Study outcomes

The main dependent variable was a dichotomous indicator for a hospitalization for any ACSC. We used the U.S. Agency for Healthcare Research and Quality (AHRQ) definition of hospitalizations for ACSC Quality Indicators, Version 4.4, March 2012, which consist primarily of hospitalizations for congestive heart failure, pneumonia, chronic obstructive pulmonary

disease, and diabetes.² We excluded angina and hypertension from our measure because they were not measured reliably in early years in the VHA. Each hospitalization for an ACSC was attributed to a patient's assigned primary care facility rather than the facility where the hospitalization took place.⁶ The unit of analysis was the patient-year.

Independent variables

The primary independent variables of interest were veterans' race/ethnicity and the proportion of minority veterans at each facility. Within each of the four data sources we created mutually exclusive categories: non-Hispanic White (White) and non-Hispanic Black/African American (Black).¹⁸⁻²⁰ For each facility where a patient received primary care we calculated the proportion of its total primary care patients who were Black, and classified each facility as low (<.7%, n=159), medium (.7%-11%, n=330), and high (greater than 11%, n=154) minority composition in FY2003. These cutoffs represent the 25th and 75th percentiles of the distribution of Black composition across primary care facilities in FY 2003. We classified the primary care facilities rather than the hospitals where these admissions took place because hospitalizations for ACSCs are a measure of access for primary and outpatient care.

Covariates

We used the Andersen-Newman framework, which describes factors potentially affecting healthcare utilization, to select possible cofounders.²³ In this framework, factors predicting healthcare use are categorized as predisposing, enabling, and need characteristics. Predisposing characteristics included biological and social factors that affect an individual's likelihood to need healthcare services such as age, sex, and race/ethnicity. Enabling resources include factors affecting a person's ability to access resources such as healthcare insurance or income. At the VHA, a veteran's healthcare copayment and benefits are determined through a combination of

percent service connected disability, financial means tests, and other criterion that assign each veteran to a priority group.²⁴ There are eight priority groups, and groups 1-6 do not have copayments for VHA healthcare. We included an indicator for copayment exemption.²¹ Need was operationalized as comorbidity burden using the Elixhauser method, using ICD-9 diagnosis codes for all inpatient and outpatient visits over the past 12 months.^{25,26} Because previous studies have found substantial association between mental health conditions and hospitalizations for ACSCs, we included indicator variables for substance abuse and depression.¹² We also included indicator variables for the other most prevalent conditions which were also included in the Elixhauser: hypertension, diabetes, psychosis, obesity, and alcohol abuse.

Although personal health practices are influence the probability of hospitalization for an ACSC, there is no dataset that currently documents information on health practices systematically over time.

Statistical Analyses

We performed bivariate comparisons of predisposing, enabling, and need variables between White and Black veterans. We performed bivariate comparisons of facility characteristics and facilities of low, medium, and high Black composition. We used ANOVA F-statistic for continuous variables and χ^2 tests for categorical variables.

To assess the sources of any disparity decline we estimated two logit models of hospitalization for ACSCs as a function of patient demographics, comorbidity, racial composition of the facility where the patient received primary care, and time, with standard errors corrected for the clustering of patients within facilities. In Model 1 we included only race, race and time interaction, and patient level covariates. The race and time interaction in Model 1 gives an estimate of the overall change in disparities between FY 2003 and FY 2012 in the VHA.

In Model 2, we added indicator variables for facility racial composition and two interaction terms. In Model 2 the interaction term between race and time provides an estimate of Black-White disparity changes conditional on facility racial composition.^{27,28} We added the interaction terms between time and minority composition of a facility (low, medium, and high) to examine changes between-facilities with different racial compositions conditional on race (e.g. whether facilities caring for large portions of Black patients improved). To estimate if Whites and Blacks at facilities with the same type of minority composition (low, medium, and high), experienced similar changes to the rate of ACSCs hospitalization we added an interaction term between time, race, and minority composition of a facility.

After we estimated the models, we used the margins command in STATA 12.1, which uses the method of recycled predictions, to account for the non-constant incremental effect of independent variables in non-linear models. This method calculates the correct incremental effects of race, time and facility-level racial composition on hospitalization rates for ACSCs.^{29,30}

Using the specifications of Model 1, we estimated the differences in the probability of hospitalization for each category of ACSCs.

4.4 RESULTS

Our study included 1,474,043 veterans (77.5% White and 22.5% Black) in FY 2003 and 1,199,614 veterans (72.2% White and 27.8% Black) in FY 2012 [Table 4.1], representing 2,588,623 unique veterans. In both years, relative to White veterans, Black veterans were younger, and had a higher proportion of females and veterans who were copayment exempt [Table 4.1]. Although Whites and Black veterans had similar comorbidity burden scores and similar disease distribution at baseline, a higher proportion of Black veterans were diagnosed

with hypertension, and a higher proportion of White veterans were diagnosed with alcohol abuse and drug use in FY 2012 [Table 4.1]. In both years, Black veterans had a higher unadjusted probability of having any hospitalization for an ACSC and had more hospitalizations on average than White veterans [Table 4.1]. However, among veterans with any hospitalization for an ACSC, both groups experienced a similar number [Table 4.1]. Overall, the probability of hospitalization for an ACSC was rare, approximately 1% in each year [Table 4.1]. High minority facilities cared for approximately 82% of Black veterans, and almost half of all patients in 2003 and 2012 [Table 4.2]. Relative to low minority facilities, they were more likely to be located in urban areas, to be VAMCs, serve more patients on average, care for more female veterans, have a younger population, and have a higher proportion of veterans who were copayment exempt [Table 4.2].

In Model 1, which included a time and race interaction, representing the overall VHA disparity change from FY2003-2012, we found a statistically significant 50% decline in the Black-White disparity. The disparity decreased from Blacks experiencing 6 more hospitalizations per 1000 veterans in FY2003 to experiencing 3 more hospitalizations per 1000 veterans in 2012 relative to Whites [Figure 4.1, Table 4.3].

In Model 2, we found the Black-White disparity in hospitalizations for ACSCs conditional on facility racial composition from FY 2003 to FY 2012 decreased by 75% [Figure 4.1, Table 4.3]. However, we did not find a statistically significant change in the disparity between facilities with different racial compositions conditional on race [Figure 4.1, Table 4.4]. The higher hospitalization rates among medium (3 per 1000 more in 2012, $p < .001$) and high minority (5 per 1000 more in 2012, $p < .001$) serving facilities compared to low minority serving facilities persisted between 2002 and 2012. Within each category of facility minority

composition, White and Black veterans experienced different changes to their probability of hospitalization for ACSCs [Figure 4.2, Table 4.5]. Among low minority facilities, White veterans experienced a 29% decline and Black veterans experienced no change in the probability of a hospitalization. However, we did not find a statistically significant Black-White disparity in 2003 or 2012 at low-minority facilities, or a statistically significant difference in the change of probability of hospitalization in either groups (although this was due in part to the small number of Black patients at low minority facilities). Among medium minority facilities, both groups experienced statistically significant declines in the probability of hospitalization. We found Black-White disparities in hospitalizations in both years in medium minority facilities; however, the disparity gap had closed by 50% in 2012. In high minority facilities, we found a Black-White disparity in 2003 that was nearly eliminated by 2012 (the disparity was marginally significant). In high minority facilities, the White-Black disparities declined almost by 100% relative to 2003.

Using a model similar to Model 1 we examined changes in hospitalizations for each type of ACSCs. We found statistically significant Black-White disparities in both 2003 and 2012 for five conditions (CHF, diabetes long term complications, diabetes short-term complications, diabetes related amputation, uncontrolled diabetes) [Figure 4.3, Table 4.6]. However, for four of those conditions (CHF, diabetes long term complications, diabetes short-term complications, and uncontrolled diabetes) the disparity gap closed significantly, although it was not eliminated [Figure 4.3]. For diabetes related amputations we found the disparity persisted [Figure 4.3]. For urinary tract infections we did not find disparities in 2003 or 2012. For dehydration, we found a statistically significant Black-White disparity in 2003, but no disparity in 2012. This disparity closure was due to fewer hospitalizations among Blacks. For ruptured appendix we found a

reverse disparity in both years; however the disparity decreased due to lower hospitalizations among Whites. For COPD/asthma and bacterial pneumonia our findings were mixed. We found no Black-White disparity in COPD/asthma in 2003, but a reverse disparity in 2012. For bacterial pneumonia, we found a Black-White disparity in 2003, but a reverse disparity in 2012.

4.5 DISCUSSION

The VHA experienced a substantial decline in the Black-White disparity for hospitalizations for ACSCs. The decline in the disparity was a result of the substantial decline in the within facility disparity. Overall, within facilities of similar racial composition, Blacks experienced approximately 1 more hospitalization per 1000 than their White counterparts in FY 2012. The Black-White disparities within medium and high minority facilities narrowed dramatically during our study period. Among high minority facilities the Black-White disparity was nearly eliminated. This may be partly attributable to the lower baseline rates of hospitalization for ACSCs among low minority facilities, whereas medium and high minorities had higher baseline rates leaving more room for improvement. However, we found significant disparities in 2003 between facilities of different minority composition that remained statistically significant in 2012.

The role of within versus between facility factors driving disparities in the VHA is complex. Some studies find no disparities within facilities for quality measures of process of care, but substantial disparities in intermediate outcomes such as blood pressure control attributed to within facility disparities.^{15,31} Other studies find substantial disparities attributable to between hospital differences; the greater concentration of Blacks in lower performing facilities is driving the overall disparity in the outcomes studied.^{14,32-34} For some of these studies^{15,31} the

unit of analysis was the facility. In others, as in the present study, facilities were grouped by the percent of minorities at the facility.³²⁻³⁴ We found both types of disparities, although the disparities among facilities with different racial compositions were larger than the disparity within facilities with similar racial composition and did not change during our study period.

This study has several limitations. First we were not able to capture healthcare utilization occurring outside the VHA and White veterans are more likely to obtain care outside the VHA.¹⁴ If White veterans were more likely to be hospitalized for an ACSC outside the VHA, the disparity we found would be attenuated. However, by limiting our population to veterans ages 35-65 we are able to somewhat mitigate this limitation because few veterans under 65 are Medicare eligible. Second, we were not able to account for possible differences in medication adherence, health literacy, or social support which may serve as a mediator of the disparities we found,¹⁴ and may have changed from 2003 to 2012. Third, we included a crude measure of income which may not have adequately controlled for the income differences between Blacks and Whites in our study. Fourth, the cutoff points we used for the percent Black composition were arbitrary, although no consistent cutoff points have been used in studies investigating composition effects of a facility.^{33,35-40} Fifth, the years included in our study are somewhat arbitrary and it is possible the relationship we observed in this study could have changed if we included all years between 2003 and 2012.

4.6 CONCLUSION

Although the disparity in ACSCs has decreased significantly over time, it has not been eliminated, and the disparities between high and low minority facilities remained unchanged for hospitalizations for ACSCs. This suggests VHA quality improvement initiatives and the general

trend outside the VHA on preventing hospitalizations for ACSCs³ may have brought more standardization of care within facilities, but may not have improved the lower performance of facilities caring for disproportionate shares of Black veterans, or brought them up to the level or standard set by the low minority facilities. In addition, we found a moderating role of facility racial composition on the Black-White disparity. This implies future studies of disparities in the VHA should include interaction terms between race/ethnicity and facility racial composition because excluding the term distorts the true relationship between race and outcome. Because the VHA is an integrated delivery system, disparities or variation in care across the system are concerning. The VHA is in a unique position to address some of the challenging aspects of treating vulnerable populations.

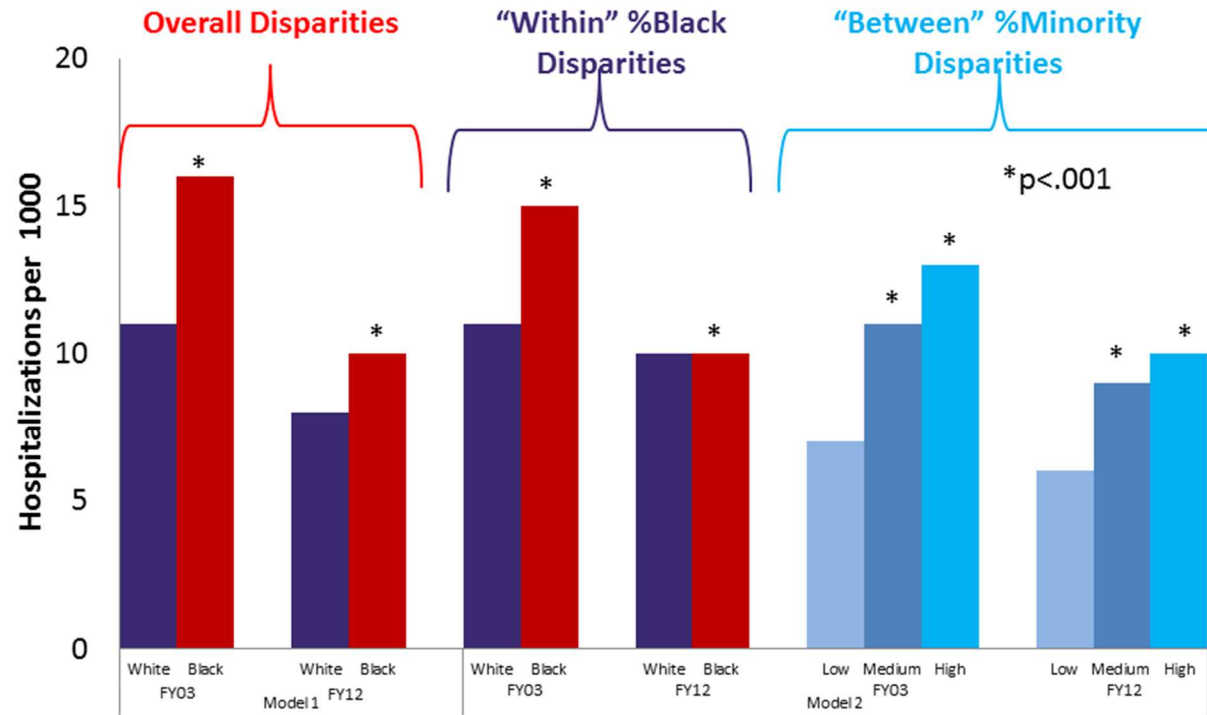


Figure 4.1 Rates of Hospitalization by Race and by Facility Racial Composition

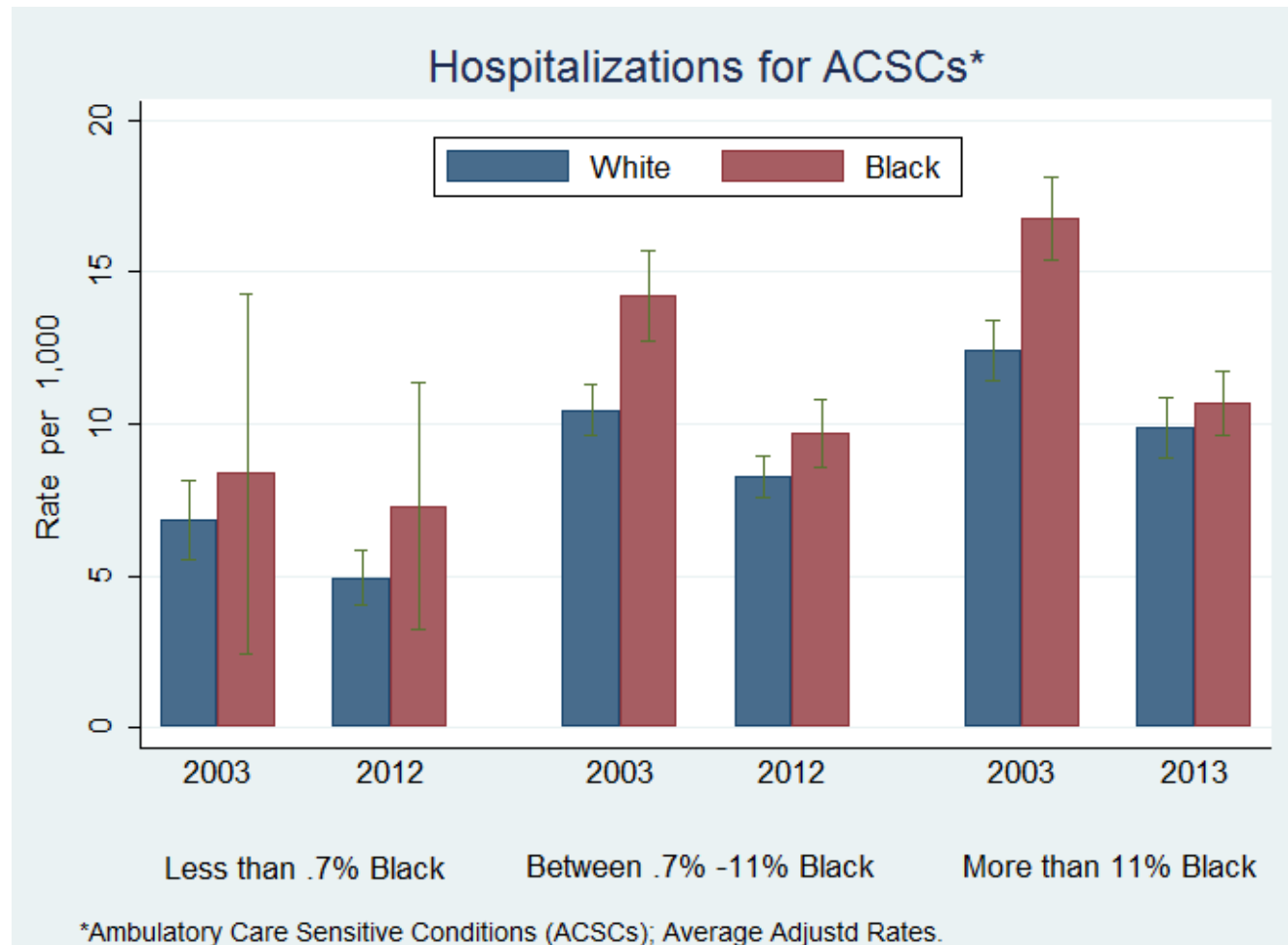


Figure 4.2 Hospitalizations for ACSCs by Race and Facility Racial Composition

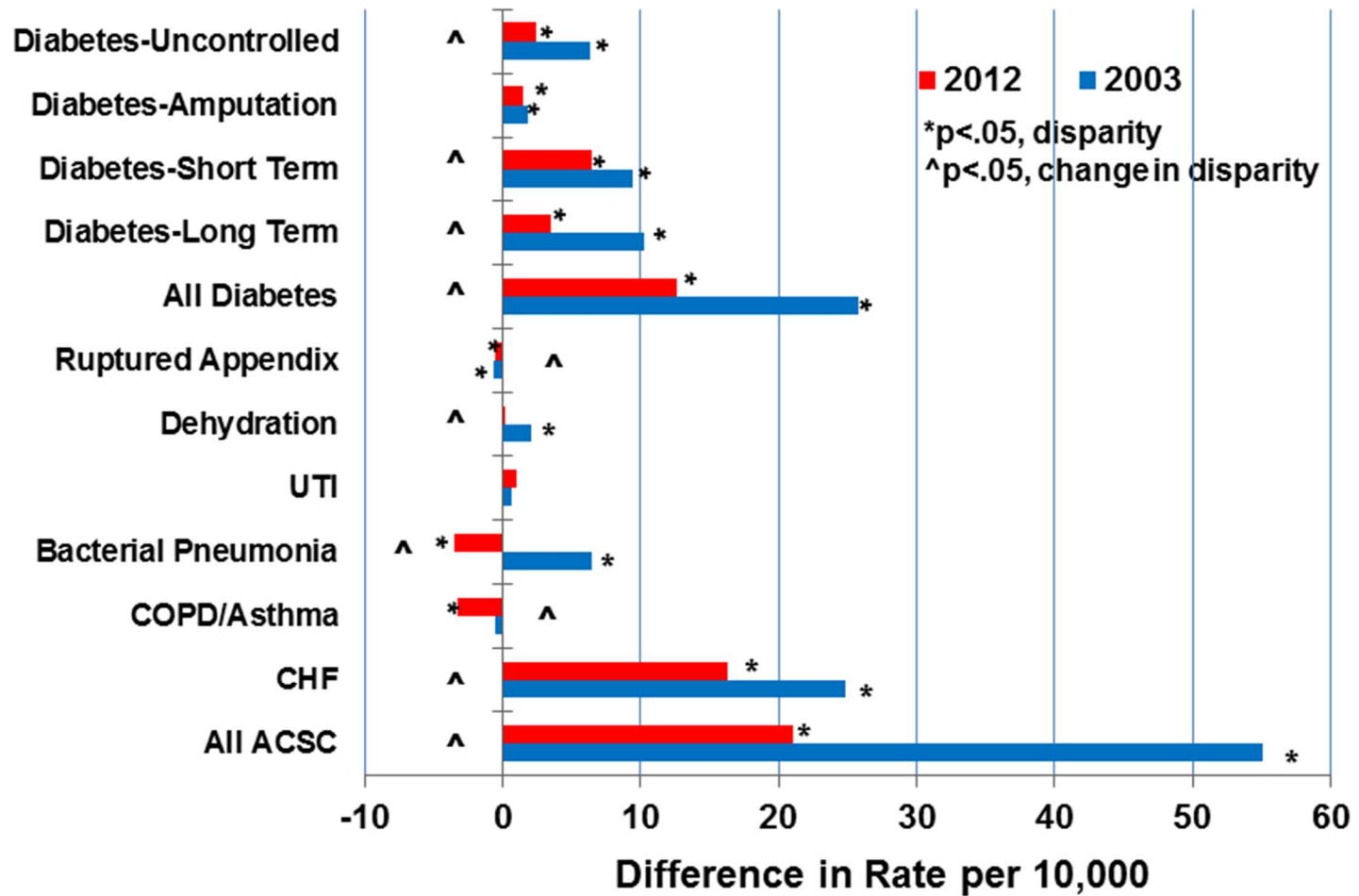


Figure 4.3 Black-White Disparities in Hospitalizations for Types of ACSCs

Table 4.1 Patient Demographics, Veterans 18-64, FY 2003 & FY 2012

	FY 2002: October 2002 -September 2003				FY 2012: October 2011 -September 2012			
	Total	White	Black	p-value	Total	White	Black	p-value
N	1,474,043	1,142,681	331,362		1,661,341	1,199,614	461,727	
Age, (SD), years	53.6(7.0)	54.4(6.8)	51.0(7.1)	<.001	54.6(8.1)	55.0(8.3)	53.3(7.6)	<.001
Age, (%)								
35-44	13.1	11.0	20.3	<.001	15.2	14.9	15.9	<.001
45-54	33.5	30.4	43.9		27.2	24.4	34.5	
55-64	53.5	58.6	35.8		57.6	60.7	49.5	
Percent Male	94.5	95.1	92.4	<.001	90.4	93.3	87.5	<.001
Copayment Exempt, %	64.5	63.0	69.8	<.001	88.5	87.20	92.10	<.001
Comorbidity								
Elixhauser Score, (SD)	0.646	.647(1.0)	.645(1.0)	0.237	.800(1.2)	.800(1.2)	.798(1.2)	0.393
Hypertension w/o Complications, %	24.1	24.2	24.0	0.076	23.9	23.8	24.0	0.033
Diabetes w/o Complications, %	11.6	11.6	11.6	0.790	13.1	13.1	13.1	0.657
Depression, %	4.5	4.5	4.4	0.670	6.6	6.6	6.6	0.860
Psychosis, %	4.4	4.4	4.3	0.156	5.9	5.9	5.9	0.249
Obesity, %	3.4	3.4	3.4	0.369	5.9	5.9	5.9	0.735
Alcohol Abuse, %	1.9	2.0	1.9	0.496	3.1	3.2	3.1	0.002
Substance Abuse, %	1.1	1.1	1.1	0.938	2.0	2.0	1.9	0.019
Percent with an H-ACSC	1.1	0.98	1.35	<.001	1.0	0.9	1.1	<.001
Average number of H-ACSC	0.01(.15)	0.01(.14)	0.02(.17)	<.001	.01(.15)	.01(.14)	.02(.16)	<.001
Average number of H-ACSC, (H-ACSC>0) ²	1.3(.67)	1.3(.66)	1.3(.70)	0.249	1.3(.68)	1.3(.66)	1.3(.7)	<.001

Notes:

1. Age, Elixhauser Score, and Average number of H-ACSC, ANOVA F-test. Percent Male, Percent Copayment Exempt, Individual Comorbidities, Percent with an H-ACSC, chi2 test.
2. Among Veterans with at least one inpatient hospitalization for an ambulatory care sensitive condition (H-ACSC).

Table 4.2 Facility-Level Characteristics by Black Composition, Fiscal Year 2003

	FY 2003: October 2002 -September 2003				
	Total	Low (.7%<)	Medium	High (11%>)	p-value
Number of Facilities	643	159	330	154	
Age, (SD), years ¹	54.5(1.3)	55.4(.9)	54.7(1.1)	53.3(1.2)	<.001
Percent Male, (SD) ¹	96.0(4.3)	97.3(.1.6)	96.4(2.6)	93.9(7.4)	<.001
Percent White, (SD) ¹	86.8(16.2)	99.3(.8)	91.8(5.8)	63.1(15.9)	<.001
Percent Black, (SD) ¹	13.2(16.2)	.7(.8)	8.2(5.8)	36.9(15.9)	<.001
Elixhauser Score, (SD) ¹	.65(.05)	.65(.06)	.65(.05)	.65(.03)	0.768
Copayment Exempt ¹	60.7(10.1)	56.6(10.6)	69.2(9.7)	65.9(8.1)	<.001
Percent Local Unemployment, (SD) ¹	6.0(1.0)	5.7(2.1)	6.1(1.0)	6.0(.7)	<.001
Facility Type, %²					
Community Based Outpatient Clinic	76.4	91.8	77.9	57.1	<.001
VA Medical Center	23.4	8.2	22.1	42.9	
Location, %²					
Highly Rural	2.5	9.4	0.3	0	<.001
Rural	32.4	62.9	26.1	14.3	
Urban	65.2	27.7	73.6	85.7	
Average Number of Patients, (SD) ¹	2292(3184)	838(1045)	1934(2461)	4563(4553)	<.001
Total Black Patients, N (%)	331,362	1022(.3)	58300(17.6)	272040(82.1)	
Total White Patients, N (%)	1,142,681	132177(11.6)	579913(50.8)	430591(37.7)	
Total, N (%)	1,474,043	133199(9.0)	638213(43.3)	702631(47.7)	

Notes:

1. Age, Elixhauser Score, Percent Local Unemployment, Average Number of Patients, ANOVA F-test.
2. Percent Male, Percent White, Percent Black, Percent Copayment Exempt, Facility Type, Location, chi2 test.

Table 4.3 Facility-Level Characteristics by Black Composition, Fiscal Year 2012

	FY 2012: October 2011 -September 2012				
	Total	Low (.7%<)	Medium	High (11%>)	p-value
Number of Facilities	643				
Age, (SD), years ¹	55.2(1.2)	55.8(1.0)	55.3(1.1)	54.2(1.3)	<.001
Percent Male, (SD) ¹	93.0(4.7)	95.0(2.0)	93.4(2.6)	90.0(7.7)	<.001
Percent White, (SD) ¹	82.8(19.8)	98.7(1.5)	88.7(8.1)	53.9(18.2)	<.001
Percent Black, (SD) ¹	17.2(.19.8)	1.3(1.5)	11.3(8.0)	46.1(18.2)	<.001
Elixhauser Score, (SD) ¹	.80(.05)	.80(.07)	.80(.05)	.81(.05)	0.837
Copayment Exempt ¹	87.9(4.6)	86.0(5.2)	87.6(4.1)	90.5(3.8)	<.001
Percent Local Unemployment, (SD) ¹	8.3(1.5)	7.5(1.5)	8.5(1.5)	8.6(1.3)	<.001
Facility Type, %²					
Community Based Outpatient Clinic	76.4	91.8	77.9	57.1	<.001
VA Medical Center	23.6	8.2	22.1	42.9	
Location, %²					
Highly Rural	2.5	9.4	0.3	0	<.001
Rural	32.4	62.9	26.1	14.3	
Urban	65.2	27.7	73.6	85.7	
Average Number of Patients, (SD) ¹	2584(3232)	1025(1138)	2106(2158)	5217(4743)	<.001
Total Black Patients, N (%)	461,727	2097(.5)	84863(18.4)	374767(81.2)	
Total White Patients, N (%)	1,199,614	160949(13.4)	610036(50.9)	428629(35.7)	
Total, N (%)	1,661,341	163046(9.8)	694899(41.8)	803396(48.4)	

Notes:

1. Age, Elixhauser Score, Percent Local Unemployment, Average Number of Patients, ANOVA F-test.

2. Percent Male, Percent White, Percent Black, Percent Copayment Exempt, Facility Type, Location, chi2 test.

Table 4.4 Within Facility Probability of Hospitalization for ACSC

	Model 1		Model 2	
		p-value	Within-Facility (Time*Race)	p-value
White				
2003	.011(.0003)		.011(.0003)	
2012	.008(.0003)		.010(.0004)	
Difference (2003-2012)	.003(.0002)	<.001	.002(.0002)	<.001
Percent change from 2003	27.3%		18.2%	
Black				
2003	.016(.0006)	<.001	.015(.0005)	
2012	.010(.0004)	<.001	.010(.0004)	
Difference (2003-2012)	.006(.0004)	<.001	.005(.0005)	<.001
Percent change from 2003	37.5%		33.3%	
White-Black Difference				
2003	-.006(.0005)	<.001	-.004(.0005)	<.001
2012	-.002(.0004)	<.001	-.001(.0003)	<.001
2003-2012	-.003(.0004)	<.001	-.003(.0005)	<.001
Percent change from 2003	50.0%		75.0%	

Notes:

Ambulatory Care Sensitive Condition (ACSC)

FY 2002: October 2002-September 2003; FY 2012: October 2011-September 2012

Model 1: Average Adjusted Probability, controlling for black & time interaction, age, sex, copayment exempt status, year and race interaction, alcohol, uncomplicated diabetes, depression, drug, un complicated hypertension, obesity, and psychosis.

Model 2: Average Adjusted Probability, controlling for covariates in Model 1, interactor variables for proportion Black, interaction between proportion Black and time, and three-way interaction between race, time and proportion Black.

Table 4.5 Between Facility Probability of Hospitalization for ACSCs^{1,2,3}

	Less than .7% Black	p-value	Between .7- 11% Black	p-value	More than 11% Black	p-value
FY 2003	.007(.001)		.011(.0005)		.013(.0005)	
FY 2012	.006(.0007)		.009(.0004)		.010(.0005)	
Difference (FY2003-2012)	.002(.001)	0.098	.003(.0003)	<.001	.003(.0003)	<.001
Percent change from FY 2003	-		27.3%		23.1%	
Difference in Probability						
FY 2003	-		-.004(.001)	<.001	-.006(.001)	<.001
FY 2012	-		-.003(.0008)	<.001	-.005(.0009)	<.001
Difference (FY2003-2012)	-		-.001(.001)	0.323	-.002(.001)	0.108
Percent change from FY 2003	-		-		-	

Notes:

1. Ambulatory Care Sensitive Conditions (ACSCs)
2. FY 2002: October 2002-September 2003; FY 2012: October 2011-September 2012
3. Average Adjusted Probability controlling for black and time interaction, age, sex, copayment exempt status, year and race interaction, alcohol, uncomplicated diabetes, depression, drug, un complicated hypertension, obesity, and psychosis (Model 1), proportion Black at a facility (Model 2), and interaction between proportion Black and time, and three-way interaction between race, time and proportion Black.

Table 4.6 Within Facility Probability of Hospitalization for ACSC by Facility Racial Composition^{1,2,3}

	Low (<.7)	p-value	Medium (.7-11%)	p-value	High (>11%)	p-value
White						
2003	.007(.0007)		.010(.004)		.012(.0005)	
2012	.005(.005)		.008(.0004)		.010(.0005)	
Difference (2003-2012)	.002(.0005)	<.001	.002(.0003)	<.001	.003(.0004)	<.001
Percent change from 2003	28.6%		20.0%		25.0%	
Black						
2003	.008(.003)		.014(.0008)		.017(.0007)	
2012	.007(.002)		.010(.0006)		.011(.0005)	
Difference (2003-2012)	.001(.004)	0.763	.005(.0008)	<.001	.006(.0004)	<.001
Percent change from 2003	-		35.7%		35.3%	
White-Black Difference						
2003	-.002(.003)	0.588	-.004(.0006)	<.001	-.004(.0006)	<.001
2012	-.002(.002)	0.227	-.001(.0004)	0.001	-.0008(.004)	0.051
2003-2012	.0008(.004)	0.825	-.002(.0007)	0.002	-.004(.0004)	<.001
Percent change from 2003	-		50.0%		100.0%	

Notes:

1. Ambulatory Care Sensitive Conditions (ACSCs)
2. FY 2002: October 2002-September 2003; FY 2012: October 2011-September 2012
3. Average Adjusted Probability, controlling for black and time interaction, age, sex, copayment exempt status, year and race interaction, alcohol, uncomplicated diabetes, depression, drug, un complicated hypertension, obesity, and psychosis (Model 1), proportion Black at a facility (Model 2), and interaction between proportion Black and time, and three-way interaction between race, time and proportion Black.

Table 4.7 Probability of Hospitalization for the Top 5 ACSCs^{1,2}

	White			Black			White-Black Difference				
	FY2003	FY2012	p-value	FY2003	FY2012	p-value	FY2003	p-value	FY2012	p-value	
Chronic Heart Failure	.002(.00007)	.002(.00006)		.005(.0002)	.003(.0001)		.002(.0002)	<.001	.002(.0001)	<.001	
Difference (FY2012-2003)	.0005(.00007)		<.001	.001(.0002)		<.001	-.0008(.0002)				<.001
Chronic Obstructive Pulmonary Disorders or Asthma in Older Adults	.003(.0001)	.002(.0002)		.002(.0001)	.002(.0001)		.0001(.0002)	0.77	.0003(.0001)	0.01	
Difference (FY2012-2003)	.0004(.0001)		<.001	.0007(.0001)		<.001	-.0003(.0002)				0.084
Bacterial Pneumonia	.002(.0001)	.002(.0001)		.003(.0002)	.002(.0001)	<.001	-.0007(.0001)	<.001	.0004(.0001)	<.001	
Difference (FY2012-2003)	.0005(.0001)		<.001	.002(.0001)		<.001	-.001(.0001)				<.001
Diabetes with Long Term Complications	.002(.0001)	.001(.00004)		.003(.0001)	.001(.0001)		-.001(.0001)	<.001	-.0004(.0001)	<.001	
Difference (FY2012-2003)	.0006(.0001)		<.001	.001(.0001)		<.001	-.007(.0001)				<.001
Urinary Tract Infections	.001(.0001)	.001(.00004)		.001(.0001)	.001(.0001)		-.0001(.0001)	0.377	-.0001(.0001)	0.096	
Difference (FY2012-2003)	.0001(.0001)		0.023	.0001(.0001)		0.334	.00003(.0001)				0.7227

Notes:

1. Ambulatory Care Sensitive Condition (ACSC)
2. FY 2002: October 2002-September 2003; FY 2012: October 2011-September 2012
3. Average Adjusted Probability, controlling for black and time interaction, age, sex, copayment exempt status, year and race interaction, alcohol, uncomplicated diabetes, depression, drug, un complicated hypertension, obesity, and psychosis (Model 1).

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Chapter 5. CONCLUSION

5.1 SUMMARY

The current dissertation fills an important gap in the literature regarding whether a patient-centered medical home of primary care is reaching minorities equitably and whether racial minorities have benefited equitably in improvement to hospitalizations for ACSCs for the largest integrated delivery system in the US. This dissertation also provides some of the first evidence on the effectiveness of a patient-centered medical home model (PCMH) of primary care in mitigating disparities. In this dissertation I investigated whether: 1) whether PACT implementation varied by the percent of minority veterans served at a facility; 2) whether the association between PACT implementation and changes in healthcare utilization differed across individuals of racial/ethnic minority groups; and 3) whether trends in the rate of hospitalizations for ambulatory care sensitive conditions (ACSCs) were similar between Black and White veterans, and between facilities with different racial compositions.

This dissertation is innovative in several aspects. Chapter 2 represents the first investigation of PACT implementation by facilities in relation to the percent of minority Veterans served at a facility. This study adds to the body of literature regarding site of care as an important contributor to disparities by estimating whether facilities serving a higher percent of minority Veterans had lower PACT implementation scores than facilities serving lower proportions of minority Veterans. In Chapter 2 I found primary care facilities with higher percentages of minority patients had modestly less effective PACT implementation. Medium and high minority facilities overlapped with lower scores in three domains of care coordination, comprehensiveness, and self-management. Medium and high minority facilities had greater

probability of being a low implementer and lower probability of being a high implementer. This research indicates PACT may not be reaching minorities equitably.

Chapter 3 represents the first investigation of the effect of a PCMH model of care on healthcare utilization and the probability of hospitalization for ACSCs for individuals of racial/ethnic minority groups. In Chapter 3 I found some evidence that PACT was associated with differences in trends in utilization for minorities relative to Whites. Changes in the trends of utilization, when they did occur, were small and racial/ethnic group specific. This implies studies of racial/ethnic disparities in the VHA should not lump these disparate racial/ethnic groups together. Importantly, I did not find a widening of existing disparities associated with PACT for ACSCs, a key indicator of primary care. This suggests the modest disparities in implementation I found in Chapter 2 may not have translated into widening of differences in the quality of care delivered by facilities caring for large proportions of minority veterans.

Chapter 4 represents the first investigation of trends in rates of hospitalization for ACSCs for individuals of a racial minority group and facilities with differing racial composition. In Chapter 4 I found the VHA experienced a substantial decline in the Black-White disparity for hospitalizations for ACSCs. The decline in the disparity was a result of the substantial decline in the disparity within facilities of similar racial composition. The Black-White disparities within medium- and high-percent-minority facilities narrowed dramatically between 2003 and 2012. Among high-minority facilities the Black-White disparity was nearly eliminated by 2012. This suggests a moderating role of facility racial composition on the within Black-White disparity. However, I found significant disparities between facilities of different racial composition that remained unchanged. This finding also suggests VHA quality improvement initiatives and the general trend outside the VHA on preventing hospitalizations for ACSCs may have brought

more standardization of care for patients of all races within facilities, but may not have improved the poorer performance of facilities caring for disproportionate share of Black veterans and brought them up to the level or standard set by the low minority facilities.

5.2 FUTURE RESEARCH

This dissertation provides some evidence to indicate Whites and minority groups have experienced the implementation of PACT differently. This dissertation also provides some evidence to indicate Black veterans have benefited from improvements to preventing hospitalizations for ACSCs, but disparities still exist in this measure of ambulatory care quality. Further research is needed to elucidate the relationship between the racial/ethnic composition of a facility and other facility characteristics that may impede or improve PACT implementation. Future research should track the progress of PACT implementation across facilities with different racial/ethnic compositions. Future studies should also assess whether racial/ethnic groups have different changes to clinical outcomes and other measures of patient-centered care such as patient experience associated with PACT. This dissertation also provides some evidence to indicate the VHA has made substantial gains in closing the Black-White disparity gap in a key measure of ambulatory care quality. Future research should investigate factors that may be contributing to the persistent between facility disparities we found. Future studies of disparities in the VHA should also examine the possible moderating role of the racial composition of a facility on the racial disparities within a facility.

5.3 POLICY IMPLICATIONS

PACT was rolled out across the VHA because VHA leaders saw room for improvement in delivering patient-centered care. PACT was not designed to specifically address the healthcare disparities prevalent in the VHA. This dissertation provides some support to indicate disparities have not worsened with the implementation of PACT. However, this dissertation provides some indication to also suggest facilities caring for large percentages of minority veterans would likely benefit from more targeted resources to address the modest shortcomings in PACT implementation.

Furthermore, this study provides evidence to indicate generic models of the patient-centered medical home like PACT may not be sufficient to address healthcare disparities in VHA. Although the VHA's previous investments in electronic medical records, population management, and primary care may have contributed to the narrowing of Black-White disparities in hospitalizations for ACSCs, we did not find PACT was associated with a further narrowing of the disparity in hospitalizations for ACSCs. However, this initial wave of PACT implementation may serve as a spring board for the VHA to tailor the next iteration of PACT to meet the unique needs of a facility's patient population. For example, federally qualified health centers often have social services, such as Special Supplemental Nutrition Program for Women, Infants and Children collocated at pediatric clinics in low income neighborhoods.¹ There are also innovative programs such as those by Health Leads which could be adopted to meet the needs of vulnerable veterans by connecting them to community resources not provided by the VHA.¹ These programs address the social determinants of health that may be contributing to the between facility disparities I found in Chapter 4.

Finally, this dissertation provides some support to indicate facilities caring for large proportions of Black veterans may be of lower quality or may struggle with providing high quality care to large portions of socially vulnerable veterans. Socially vulnerable patients include patients with low literacy, low socioeconomic status, and members of racial/ethnic minority groups.² Although we found a near elimination of Black-White disparities at facilities with a high percent of minority at their facility, these facilities had higher rates of hospitalizations relative to facilities with a low percent of minorities at their facility. This suggests improving the care at these facilities may yield the highest impact in further reducing healthcare disparities in the VHA.

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VITA

Susan Elizabeth Hernandez grew up in Queens, New York. In 2003 she earned her Bachelor of Arts degree from the City College of New York, City University of New York, where she majored in healthcare policy. She earned her Masters of Public Administration in Health Policy and Management from the Robert F. Wagner Graduate School of Public Service at New York University in 2008. Susan began her doctoral work in Health Services, School of Public Health at the University of Washington (UW) in 2009 and completed her Ph.D. in 2015. Before beginning her doctoral work, Susan worked as the program associate for the Program in Health Care Disparities at the Commonwealth Fund. There, she collaborated with the assistant vice president to develop grants, write publications, and analyze Fund-sponsored surveys. As doctoral student at UW she worked as a research assistant on two projects for Dr. Doug Conrad:

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She also worked as a research assistant for Dr. Paul L. Hebert examining patient-aligned care teams, a patient-centered medical home model of primary care, at the Veterans Health Administration. Susan's research interests include organizational approaches to improving quality in primary care settings, adoption of patient-centered medical home practices in organizations disproportionately serving minority patients, and eliminating racial/ethnic disparities.