Primary Care Clinic Switching Due to Provider Network Restrictions: Effects on Costs, Utilization, and Quality

A Dissertation
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

Daniel Crespin

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Advisor: Jon B. Christianson, PhD

August 2016

© Daniel Crespin 2016

Acknowledgment

To my committee members, Dr. Jon Christianson, Dr. Jean Abraham, Dr. Michael Finch, and Dr. Peter Huckfeldt, I am extremely thankful for your thoughtful assistance, suggestions, and support throughout this project. I also would like to express a special thank you to my advisor, Dr. Jon Christianson, as well as my committee chair, Dr. Jean Abraham, for taking me on as a mentee early in my tenure as their student. I am forever grateful for your guidance and all of the opportunities you gave me throughout the last six years that helped me achieve so much as a student as well as a successful start to my own career.

I also thank the University of Minnesota Graduate School for providing funding for this project through a Doctoral Dissertation Fellowship. I thank the University of Minnesota Office of Human Resources for allowing me access to their data.

Lastly, I would like to thank the cohort. It took only one candid happy hour to know I made the right decision in pursuing my degree at Minnesota. It is an honor and privilege to have you as colleagues and friends.

Dedication

To Ellen,

I cannot imagine anyone else with whom I would have rather had
by my side, hand-in-hand, for every step of this journey.

Thank you for your love (and lots of patience).

Abstract

Employers are turning towards health plans with limited provider networks to combat increasing health care costs. Some new enrollees of these plans will switch their usual primary care providers due to network restrictions leading to interruptions in continuity-of-care and potentially higher medical expenditures and/or lower quality care when compared to enrollees whose providers remain in-network. In this study, I analyzed the effects of switching primary care clinics on costs, utilization, and quality of care after enrollment in a limited network plan. The study setting was the employee benefits plan of the University of Minnesota, where after changes to the menu of its health plans in 2012, 4% (1,151 of 26,345) of covered adult lives enrolled in a limited network plan and subsequently switched primary care clinics. I answered three questions pertaining to enrollment in the limited network plan: 1) did individuals who switched primary care clinics have higher costs or more utilization compared to individuals who kept their clinics 2) did individuals who switched clinics switch to higher or lower quality clinics, and 3) what were the associations between clinic attributes and the clinic choices of enrollees who switched clinics? Switching primary care clinics was not associated with an increase in expenditures or the probabilities of having a hospitalization or an emergency department visit. However, switching primary care clinics was associated with approximately 1 additional primary care visit in the following year for enrollees in the sickest health risk quartile and approximately 0.5 fewer specialty care visits for enrollees in the three sickest health risk quartiles. The decreased utilization of specialty care is a potential negative implication of limited network plans as patients can receive higher quality care from specialty care providers on some conditions including diabetes and asthma. Furthermore, enrollees who switched primary care clinics obtained care at clinics with lower performance on clinical and behavioral quality as well as patient experience than if they had been able to keep their previous clinics. However, these differences were relatively small, with the exception of a 5.4 percentage point decrease in performance regarding patients' satisfaction with timeliness of care. Of enrollees who switched primary care clinics, distance, payor mix, and the percent of specialty physicians had the largest effects on their choices. Quality had little association with

primary care clinic choice. Given that the primary care clinic exclusions of the limited network plan did not have a substantial impact on the average performance of clinics available, these results suggest that enrollees did not emphasize quality of care when choosing primary care clinics. Overall, these results imply that employers offering limited network plans may be unlikely to face higher financial costs associated with enrollees switching primary care providers, although for individuals who would have to switch clinics, enrollment may not be appropriate if they are in need of timely specialty care.

Table of Contents

Acknowledgment ..... **i**
Dedication ..... **ii**
Abstract ..... **iii**
List of Tables ..... **vii**
List of Figures ..... **viii**
List of Appendix Tables ..... **x**
1. Introduction **1**
2. Background **8**
2.1. Employer-based Limited Provider Network Plans 8
2.2. Effects of Switching Primary Care Providers 11
2.3. Primary Care Provider Choices and Quality of Care 15
2.4. Needs of the Literature 17
3. Study Setting **19**
3.1. University of Minnesota UPlan Health Plans 20
3.2. Decision to Drop the HealthPartners Health Plan 22
3.3. Selection of Health Plans by Former HealthPartners Plan Enrollees 22
3.4. Primary Care Provider Network Changes 23
3.5. External Validity of the University of Minnesota 24
4. Data **26**
4.1. UPlan Data Details and Constructed Measures 26
4.1.1. Utilization and Costs 27
4.1.2. Health Risk Score 28
4.1.3. Appending the 2008 through 2011 Claims with the 2012 Claims 29
4.1.4. Creation of a Crosswalk from Provider Identifiers to Clinics 30
4.1.5. Providers with Unknown or Multiple Clinics 31
4.2. Minnesota Community Measurement Data Details and Constructed Measures 32
4.2.1. Diabetes and Vascular Disease Care Performance 32
4.2.2. Patient Experience Performance 34
4.2.3. Clinic Characteristics 35

5. Analysis 36
5.1. Primary Care Clinic Assignment 36
5.2. Analytic Sample 38
5.3. Sample Selection Issues 39
5.4. Effects of Switching Primary Care Clinics on Costs and Utilization 41
5.5. Difference in Quality After Switching Primary Care Clinics 45
5.6. Clinic Attributes Associated with Primary Care Clinic Choices 46
6. Results 51
6.1. Effects of Switching Primary Care Clinics on Costs and Utilization 51
6.2. Difference in Quality after Switching Primary Care Clinics 58
6.3. Clinic Attributes Associated with Primary Care Clinic Choices 59
7. Discussion 62
7.1. Limitations 67
7.2. Conclusion 69
8. References 70

List of Tables

Table R-1 Definitions of Performance Measures **76**
Table 3-1 Health Plans Offered by the University of Minnesota UPlan, 2011 ..... **77**
Table 3-2 Difference in Performance of Primary Care Clinics in Enrollees' Market Areas by Health Plan, 2012 ..... **79**
Table 4-1 Characteristics of 2012 UPlan Enrollees Unmatched to 2008 through 2011 Claims **80**
Table 5-1 Characteristics of New Medica Elect/Essential Enrollees, 2012 ..... **81**
Table 6-1 Coefficients for Probit Models Predicting the Probabilities of Having a Hospitalization or an Emergency Department Visit **82**
Table 6-2 Coefficients for Negative Binomial Models Predicting Visits with Primary Care and Specialty Care Providers **85**
Table 6-3 Changes in Specialty Care Provider Visits after Switching Primary Care Clinics For Enrollees in the Three Sickest Health Risk Quartiles, by Specialty Type **88**
Table 6-4 Coefficients for Generalized Linear Models Predicting Total Expenditures .. **89**
Table 6-5 Coefficients for Generalized Linear Models Predicting Non-Emergency Department Outpatient and Prescription Drug Expenditures **92**
Table 6-6 Coefficients for Generalized Linear Models Predicting Hospital Inpatient and Emergency Department Expenditures **95**
Table 6-7 Coefficients for Multinomial Logit Choice Models Predicting Primary Care Clinics Choices **98**
Table 6-8 Primary Care Clinic Choice Probability Elasticity with Respect to Clinic Attributes by Health System **103**

List of Figures

Figure 3-1 2012 Health Plan Choices of Former HealthPartners Plan Enrollees **105**

Figure 3-2 Distribution of Performance for Primary Care Clinics in the Twin Cities, 2012 ..... **107**

(A) Clinical Quality 107

(B) Behavioral Quality 108

(C) Getting Care When Needed 109

(D) Provider Communication 110

(E) Courteous and Helpful Staff 111

(F) Overall Provider Rating 112

Figure 5-1 UPlan Enrollees Included in Analysis **114**

Figure 5-2 Expenditures for New 2012 Medica Elect/Essential Enrollees, 2008 through 2012 ..... **116**

(A) Total Expenditures 116

(B) Non-Emergency Department Outpatient Expenditures 117

(C) Prescription Drug Expenditures 118

(D) Hospital Inpatient Expenditures 119

(E) Emergency Department Expenditures 120

Figure 5-3 Utilization for New 2012 Medica Elect/Essential Enrollees, 2008 through 2012 ..... **122**

(A) Percent of Enrollees with a Hospitalization 122

(B) Percent of Enrollees with an Emergency Department Visit 123

(C) Visits with Primary Care Providers 124

(D) Visits with Specialty Care Providers 125

Figure 6-1 Adjusted Changes in Percent of Enrollees with a Hospitalization and Percent of Enrollees with an Emergency Department Visit After Switching Primary Care Clinics **126**

Figure 6-2 Adjusted Changes in the Number of Visits with Primary Care and Specialty Care Providers After Switching Primary Care Clinics **128**

Figure 6-3 Difference in Visits with Primary Care Providers per Enrollee from Previous Year by Month, Enrollees in the Sickest Health Risk Quartile **130**
Figure 6-4 Difference in Visits with Specialty Care Providers per Enrollee from Previous Year by Month, Enrollees in the Three Sickest Health Risk Quartiles **131**
Figure 6-5 Adjusted Changes in Total, Non-Emergency Department Outpatient, and Prescription Drug Expenditures After Switching Primary Care Clinics **132**
Figure 6-6 Adjusted Changes in Hospital Inpatient and Emergency Department Expenditures After Switching Primary Care Clinics **134**
Figure 6-7 Clinical and Behavioral Performance of Enrollee's New Primary Care Clinics Relative to Their Previous Clinics **136**
Figure 6-8 Patient Experience Performance of Enrollee's New Primary Care Clinics Relative to Their Previous Clinics **138**

List of Appendix Tables

Table A-1 HealthPartners Providers Included in Medica Plans Offered by the University of Minnesota UPlan **140**

Table A-2 Place of Service Codes for Outpatient and Inpatient Utilization **142**

Table A-3 Provider Specialty Codes for Outpatient Evaluation and Management Visits **144**

Table A-4 Common Procedural Terminology and UB-04 Revenue Codes for Outpatient Evaluation and Management Visits and Emergency Department Visits **145**

Table A-5 Minnesota Community Measurement Patient Experience Survey Tool Questions **147**

1. Introduction

Despite the backlash employers faced in the late 1990s by steering their employees into restrictive managed care plans, employers are once again turning towards health plans with limited, or narrow, provider[1] networks to combat increasing plan costs (Kaiser Family Fondation/Health Research and Education Trust (KFF/HRET) 2015). In a survey of 595 employers with at least 1,000 employees, 18% offered at least one limited network plan in 2014 with a 2 percentage point increase predicted for 2015 (Tower Watson 2014). These plans are highly attractive to employers, who rein in costs by restricting enrollees' access to high-cost specialty care providers and hospitals (Gruber and McKnight 2016; Lo Sasso and Atwood 2015). The exclusion of entire health systems and physician practices also eliminates primary care providers from networks. Thus, the re-introduction of limited network plans places some individuals in the dilemma of choosing either a lower cost, limited network plan and losing in-network access to their usual primary care providers or selecting a higher cost, broad network plan. Given consumers' price-sensitivity to plan premiums (Strombom, Buchmueller, and Feldstein 2002), many consumers are opting for lower premiums over provider choice (Peters and Holahan 2014).

Individuals who elect to enroll in limited network plans and who must switch primary care providers may have higher medical expenditures and/or receive lower quality care, at least compared to enrollees whose primary care providers remain in-network. A recent study by Gruber and McKnight (2016) examining Massachusetts state employees enrolled in limited network plans found that while enrollment in a limited network plan decreased expenditures, the savings was accrued only by enrollees who kept their primary care physicians. One plausible reason for this result is that switching primary care providers interrupts continuity-of-care. Because primary care providers often are responsible for referrals to specialty care providers and hospitals, switching primary care providers may have continuity-of-care implications for primary and non-primary care

[1] I use provider as a catch-all term for any source of health care including individual clinicians and practitioners, physicians practices, hospitals, clinics, and any other location or individual providing care.

settings. Disruptions of continuity-of-care are linked to higher costs stemming from increased outpatient, hospital, and emergency department (ED) utilization (Saultz and Lochner 2005; van Walraven et al. 2010). Similarly, discontinuous care may lead to worse clinical outcomes, such as meeting a specific HbA1c goal for individuals with diabetes (Mainous et al. 2004; Parchman et al. 2002). Aside from continuity-of-care arguments, limited network plan enrollees who switch primary care providers may receive lower quality of care because they switch to relatively low-quality providers, either due to network exclusions of high-quality providers or enrollees selecting new providers based on considerations other than quality.

The effects of switching primary care providers for sicker patients are of particular concern, because they have the most to gain from sustained primary care provider relationships and receiving care at the highest quality providers (Bodenheimer 2008; Nutting et al. 2003). Although high-risk individuals are less likely to enroll in limited network plans when given a choice, individuals of all health risk levels are sensitive to plan premiums (Strombom, Buchmueller, and Feldstein 2002), suggesting some high-risk individuals do enroll in limited network plans.

In this study, I analyzed the effects of switching primary care clinics on costs, utilization, and quality of care after enrollment in a limited[2] network plan. A primary care clinic is a single site location that is generally freestanding or a primary care department within a hospital. These clinics can be thought of as usual sources of care. Literature suggests that variation in costs, utilization, and quality are primarily determined by the location of care and not individual physicians, particularly for medically complex patients such as patients with chronic conditions (Hueston 2010; Mainous et al. 2004). I also analyzed the primary care clinic choices for individuals who switched primary care clinics in order to understand the relative associations between clinic attributes, including quality, and clinic choices.

[2] There is no agreed upon definition of a limited, or narrow, network. For the study, the limited network plan simply excluded a subset of the providers offered in the other plans available to the study population.

The study setting for this analysis was the employee benefits plan of the University of Minnesota, where after changes to the menu of its health plans offered to employees in 2012, 4% (1,151 of 26,345) of covered adult lives enrolled in a limited network plan and subsequently switched primary care clinics. To reduce costs after a substantial state funding cut, the university dropped a traditional, broad network plan administered by HealthPartners (Bloomington, Minnesota). Fifty-eight percent of the former HealthPartners plan enrollees (5,470 of 9,452) selected a limited network plan that excluded the majority of the heavily utilized HealthPartners health system (including the exclusion of 18 of 26 primary care clinics). Of the new enrollees of the limited network plan, 20% (1,151 of 5,470) switched to a new primary care clinic due to network restrictions (i.e. their former clinic was out-of-network in the new plan). Using the population of the new limited network plan enrollees I answered the following questions regarding switching primary care clinics:

1) Did individuals who switched primary care clinics have higher costs (total, outpatient, prescription drug, inpatient, and ED) or more utilization (hospitalizations, ED visits, primary care provider visits, and specialty care provider visits) compared to individuals who kept their clinics?

2) Did individuals who switched primary care clinics switch to higher or lower quality clinics as measured by publicly reported clinical and behavioral performance as well as patient experience measures?

3) What were the associations between clinics' attributes, including quality, and the clinic choices of enrollees who switched primary care clinics?

I employed a longitudinal difference-in-differences analysis for Aim 1. I compared individuals who enrolled in the limited network plan and subsequently switched primary care clinics from 2011 to 2012 due to network restrictions to individuals who kept their clinic because their 2011 clinic was included in the limited network plan. In Aim 2, I compared the performance of enrollees' new primary care clinics to the performance of

their former clinics using public reports. For both Aim 1 and Aim 2, I examined the moderating effect of health risk. Of the individuals who enrolled in the limited network plan, 23% belonged to the least healthy quartile of university enrollees across all health plans, indicating that sicker individuals did enroll in the limited network plan. I obtained 2008 through 2012 medical claims and eligibility files from the University of Minnesota Office of Human Resources. These data permitted me to estimate the effect of switching primary care clinics on a number of measures pertaining to costs and utilization. In addition, the inclusion of International Classification of Disease Revision 9 (ICD-9) codes and medication prescriptions allowed me to examine differences in the effect of switching primary care clinics by health risk. During the time frame of this study, Minnesota Community Measurement (MNCM) published performance on several quality measures for most primary care clinics in Minnesota as well as some clinic in bordering states. I used measures pertaining to diabetes care (2007-2012), vascular disease care (2008-2012), and patient experience (2012) to determine if enrollees switched to primary care clinics of higher or lower quality relative to their original clinics. Lastly, in Aim 3, I developed a discrete choice model to describe the attributes of the primary care clinics chosen by enrollees who switched clinics in order to understand the relative magnitudes of the associations between clinic choices and clinic attributes including quality, distance, and physician mix.

I found that switching primary care clinics was not associated with an increase in expenditures of any type or the probabilities of having a hospitalization or ED visit after enrollment in the limited network plan. This result implies that employers offering limited network plans may be unlikely to face higher financial costs associated with some enrollees switching primary care providers. However, switching primary care clinics was associated with differences in the amounts of primary care and specialty care provider visits. My results indicate that for enrollees in the sickest health risk quartile, switching primary care clinics was associated with, on average, 1.01 (95% Confidence Interval (CI): 0.08 to 1.95) additional visits with primary care providers in the following year compared to enrollees who did not switch clinics. In addition, enrollees in the three sickest health risk quartiles who switched primary care clinics experienced a decrease in

visits with specialty care providers (0.50 (95% CI: -0.23 to 1.23) for the sickest quartile, 0.49 (95% CI: -0.10 to 1.08) for the second sickest quartile and 0.77 (95% CI: 0.46 to 1.07) for the third sickest quartile) compared to enrollees who did not switch clinics. These changes occurred in the first half of the year after switching primary care clinics and persisted when controlling for each clinic's health system and performance on clinical and behavioral quality, suggesting that the effects were tied to continuity-of-care disruptions rather than to switching to clinics of different quality or practice style.

The decreased utilization of specialty care providers by enrollees who switched primary care clinics is a potential negative implication of limited network plans. Three plausible mechanisms for this result are: 1) primary care providers are reluctant to refer some new patients to specialty care providers until after they have attempted to manage illnesses through primary care, 2) patients have difficulty in accessing the specialty care providers utilized by their new primary care providers, perhaps due to long wait times for appointments, and 3) patients wait to seek specialty care after losing access to their former providers. Through any of these mechanisms, this effect may have negative consequences for quality of care. Past research indicates that patients often receive higher quality care from specialty care providers for several conditions including diabetes (McAlister et al. 2007), asthma (Schatz et al. 2005; Vollmer et al.1997), and drug therapy for myocardial infarction (Ayanian et al. 1994). My regression results corroborate these studies, indicating that primary care clinics with better clinical performance for diabetes and vascular disease care employed more specialty care (0.014 visits per 1 percentage point increase in clinical performance (95% CI: 0.004 to 0.031)) and less primary care (0.03 visits per 1 percentage point increase in clinical performance (95% CI: 0.01 to 0.05)). The decrease in visits in this study occurred across multiple specialties including oncology and surgery, which may have substantial health consequences.

On average, enrollees who switched primary care clinics obtained care at clinics with lower performance on measures pertaining to clinical and behavioral quality as well as patient experience than if they had been able to keep their former clinics. However, these differences in performance were relatively small, with the exception of a 5.4 percentage

point average decrease in performance on patient satisfaction with timeliness of care[3]. Of enrollees who switched primary care clinics, distance, payor mix of patients at the clinic, and the percent of specialty care physicians had the strongest associations with clinic choices. The quality measures had little association with the primary care clinic choices. Given that the limited network enrollees had access to primary care clinics of similar quality to the excluded HealthPartners clinics, these results suggest that enrollees did not emphasize quality of care when choosing primary care clinics, perhaps because they were not well informed when making their selections.

This study had limitations that constrain its scope and generalizability. First, I was limited to one employer in Minnesota and a single limited network plan. Minnesota is dominated by large, integrated delivery systems and is generally considered to be one the top-ranking states in terms of quality of care and integration (Moody and Silow-Carroll 2009). Although a large, integrated health system was excluded in the limited network plan examined in this study, enrollees were still able to switch to new clinics in other large, integrated systems. This aspect may limit this study's external validity when compared to areas with lower states of integration or limited network plans that have larger impacts on the type of providers and health systems enrollees can access in-network. However, recent trends have shown an increase in the rates of mergers and acquisitions throughout the U.S. leading to more vertically integrated health systems and concentrated markets (Baker, Bundorf, and Kessler 2014; Christianson, Carlin, and Warwick 2014). Furthermore, although the limited network plan only excluded the majority of one large, integrated delivery system, this type of exclusion is becoming more commonplace. In 2015, the Kaiser Family Foundation reported that 9% of employers (with 50 or more employees) had a hospital or health system dropped from a health plan (KFF/HRET 2015). For these reasons the experiences of the university are likely applicable to understanding the impact and appropriateness of limited network plans in other employer settings. A second major limitation of this study was the lack of individual outcome measures of quality or patient experience. While I found enrollees

[3] This measure was the percent of questions pertaining to receiving timely care answered with the most favorable rating by surveyed patients (conducted by MNCM). See **Section 4.2**. for a detailed explanation.

switched to lower quality primary care clinics, I was unable to determine if enrollees did in fact experience lower clinical quality or have worse satisfaction. Future studies examining individual quality measures, such as Hemoglobin A1c levels for patients with diabetes, will be valuable in determining the effects of provider switching and limited networks on enrollee well-being.

In this study I estimated the effect of switching primary care clinics after enrollment in a limited network plan through the employee benefits plan of the University of Minnesota. My results suggest that switching primary care clinics was not associated with increased expenditures, hospitalizations, or ED visits. However, switching primary care clinics was associated with a decrease in specialty care provider visits, highlighting that the clinics had a large amount of control over care that occurred downstream from primary care providers. In addition, enrollees obtained care at primary care clinics with worse performance on publicly reported quality measures than if they had remained in their previous clinics, although these differences were relatively small. Overall, these results imply that for individuals who would have to switch primary care clinics, enrollment in a limited network plan may not be appropriate if they are in need of timely specialty care. This study supports the need to provide potential enrollees of limited network plans with information pertaining to the characteristics of available providers and the possible consequences of switching primary care providers in order to allow them to make well-informed decisions.

2. Background

Despite consumer backlash over the growth of restrictive managed care plans in the late 1990s, employers are once again increasingly offering health plans with limited provider networks to their employees. In search of lower premiums, many individuals are likely to select these plans even if doing so requires them to switch primary care providers. This provider switching may affect enrollees' costs, utilization, and quality of care either via a disruption of continuity-of-care, potentially leading to negative consequences, or by switching to primary care providers of different quality or practice style. For the latter, it is unclear whether enrollees would receive care at primary care providers that are of higher or lower quality than their original providers because of limited quality information and poor consumer decision-making practices.

2.1. Employer-based Limited Provider Network Plans

Employers offering health plans with limited provider networks is not a new concept. The first major expansion of employer-based plans featuring selective contracting with providers is most prominently tied to the passing of the Health Maintenance Organization (HMO) Act of 1973 (Fox and Kongstvedt 2007). This act provided financial assistance to start and expand HMOs as well as required employers with at least 25 employees to include an HMO option if they were already offering health plans to their employees (42 USC §300e et seq. 1973). HMOs and subsequent managed care plans, such as Preferred Provider Organization and Point-of-Service plans, aimed to lower health care costs (medical expenditures and health plan premiums) through several mechanisms including: actively managing a selective network of providers (while penalizing out-of-network utilization), using negotiating leverage to keep prices low, and employing utilization management activities to encourage providers to use less costly services (Christianson 2014). Through the early 1990s, employers generally offered managed care plans alongside traditional, broad network plans, with their healthiest employees taking

advantage of the managed care plans' lower premiums and sicker employees selecting the less restrictive network plans.

Attempting to capitalize on the cost savings of managed care plans, employers increasingly stopped offering their employees broad network plans in the mid- and late 1990s (Christianson 2014; Fox and Kongstvedt 2007). Doing so often left employees with little control over their health plan choices and forced employees who preferred broad network plans into the more restrictive managed care plans. Eventually this occurrence promoted backlash, as consumers grew to perceive managed care plans' cost savings methods, including limits placed on provider choice, as merely means to increase profits rather than encourage high-value care (Kaiser Family Foundation 2000). These negative opinions of managed care plans coupled with economic growth in the late 1990s, in which employers faced increased competition to attract and retain employees, led to a drop in consumer demand for managed care plans and employers opted to offer health plans with broader networks and less reliance on utilization management (Christianson, 2014).

With continuing growth in health plan premiums throughout the last decade and weaker labor markets, employer and consumer demand has once again turned to health plans with restrictive provider networks in order to reduce health plan costs (KFF/HRET 2015; McKinsey and Company 2015). These new incarnations, commonly referred to as limited, narrow, or high-performance network plans do not always rely as heavily on utilization management as the preceding managed care plans, but they still restrict provider choices (Abelson 2016). In many cases they use provider networks smaller than traditional HMO plans (KFF/HRET 2015). These plans have been attractive to some employers because of their capacity to reduce utilization at high-cost hospitals and specialty care providers. (Gruber and McKnight 2016; Lo Sasso and Atwood 2015). In a survey of 595 employers with at least 1,000 employees, 18% offered at least one limited network plan in 2014 with a 2 percentage point increase predicted for 2015 (Tower Watson 2014). Similarly, 9% of employers (with 50 or more employees) offering health insurance reported that their insurer dropped a hospital or health system in 2015 to reduce

costs (KFF/HRET 2015) compared to 6% in 2014 (KFF/HRET 2014). Price-sensitive consumers are attracted to limited network plans because of their lower premiums (Gruber and McKnight 2016) and, in some instances, lower cost-sharing responsibilities compared to broad network plans.

Some of the recent growth in limited network plans is likely tied to provisions in the Affordable Care Act of 2010 (ACA) that restrict insurers' options for designing low-cost plans. The ACA removed limits on annual lifetime benefits as well as requires health plans to cover a set of Essential Health Benefits[4] in small group markets (1 to 100 employees) and to cover preventive services without any cost-sharing. These provisions intend to increase the value of health plans, but are costly for insurers to implement. Moreover, these regulations constrain how insurers can manipulate health plan design to offer low-cost plans. Network structure is one of the few options employers and insurers have that can have a significant impact on costs, in terms of medical payments and premiums.

Outside of employer settings, limited network plans are widespread in the ACA Marketplaces. In 2014, 57% of Silver plans in the ACA Marketplaces, the most commonly selected plan-tier (Assistance Secreatry of for Planning and Evaluation (ASPE) 2016), included less than 40% of their market areas' primary care physicians (Polsky and Weiner 2015). This circumstance is particular relevant for low-income families and individuals (with income at 100% to 250% of the federal poverty level) obtaining plans in the Marketplaces. Specifically, these enrollees can obtain both premium and cost-sharing subsidies with enrollment in Silver plans, which tend to have limited provider networks. Sixty-eight percent of all consumers (8.5 million people) who enrolled in a Marketplace plan during the 2016 open enrollment period selected a Silver plan (ASPE 2016).

[4] Plans offered in individual and small group markets (1-100 employees) must cover the following benefits: (1) ambulatory patient services; (2) emergency services; (3) hospitalization; (4) maternity and newborn care; (5) mental health and substance use disorder services including behavioral health treatment; (6) prescription drugs; (7) rehabilitative and habilitative services and devices; (8) laboratory services; (9) preventive and wellness services and chronic disease management; and (10) pediatric services, including oral and vision care.

2.2. Effects of Switching Primary Care Providers

Increased enrollment in limited network plans will undoubtedly lead some price-sensitive individuals to trade-off provider choice in exchange for lower premiums. Because these health plans often eliminate entire physician practices and health systems, some primary care providers are eliminated from networks (Polsky and Weiner 2015). Thus, some new enrollees in limited network plans will need to switch their primary care providers. Switching primary care providers may affect many aspects of patients' care, as these providers are frequently responsible for disease management and care-coordination including referrals to specialty care providers and hospitals. Individuals who switch primary care providers may be at risk of having higher medical expenditures and/or receiving lower quality care, at least compared to limited network plan enrollees whose providers remain in-network, either due to continuity-of-care disruptions or by switching to lower quality providers. However, the literature explicitly studying primary provider switching is sparse. Although the growth in managed care plans throughout the 1970s to the 1990s saw many enrollees change their primary care providers (Davis et al. 1995), the managed care literature did not focus on the effects of switching providers apart from the other attributes of managed care (i.e. limited networks, benefit restrictions, utilization management, etc.).

Gruber and McKnight (2016) present the most compelling evidence that switching primary care providers after enrollment in a limited network plan may increase costs and utilization in comparison to enrollees who keep their providers. The authors examined costs and utilization in limited network plans offered to Massachusetts state employees in 2012. During their 2012 open enrollment period, the state offered a three-month premium holiday to encourage enrollment in limited network plans. New enrollees who took up the incentive subsequently had 36% lower medical costs on average, largely driven by reductions in visits with specialty care providers and less expensive hospitalizations. However, when the authors stratified their results by enrollees who kept their primary care physicians and enrollees whose original physicians were excluded in their limited network plan, they found that only enrollees who kept their physicians generated savings.

Enrollees who lost their primary care physicians had no significant decrease in spending or visits with specialty care providers with enrollment in a limited network plan.

Although Gruber and McKnight (2016) offers insights into the potential effects of switching primary care providers after enrollment in a limited network plan, their analysis does have shortcomings. In particular, their setting may be atypical of the environment most employers would face when offering limited network plans, raising issues concerning the study's generalizability. Foremost, their source of variation used to estimate changes in costs and utilization with enrollment in a limited network plan stemmed solely from the financial incentives that encouraged employees to switch plans. Unlike the experience of the University of Minnesota, none of the broad network plans offered to the Massachusetts state employees were dropped during the study, therefore all individuals could remain in the same health plan if they preferred it. Comparatively, many employers have dropped broad network plans and replaced them with more restrictive plans as they look for ways to cut costs (KFF/HRE 2015; Tower Watson 2014), thus forcing employees to make active choices regarding their health plans and providers. In addition, the financial incentive created by the premium holiday was quite large, and combined with the lower premiums of the limited network plans, enrollees reduced their annual premiums by an average of 37%. This large financial incentive could have persuaded some individuals to enroll in the limited network plans, who would be unlikely to enroll in settings with smaller financial incentives (e.g. only the difference in annual premiums). Lastly, the authors did not examine differences by health risk or the quality of the new primary care providers as I propose in this study. Differential effects by health risk are likely because switching providers is potentially more detrimental for high-risk, complex patients who benefit more from continuous, high-quality care than low-risk patients.

Two older, but relevant papers also studied primary care physician switching and its association with costs and utilization. However, in contrast to this study, neither paper examined switching that explicitly resulted from a change in health plan. Joffe et al. (1999) examined the effects of primary care physician switching on utilization for

children enrolled in Medicaid in New York. The authors found that primary care physician switching was associated with higher utilization through increases in emergency department (ED) and preventive care visits. A study by Weiss and Blustein (1996), using data on traditional Medicare enrollees, found that shorter physician-patient relationships were associated with higher costs and a higher likelihood of hospitalization compared to individuals with longer physician-patient relations. However, both studies suffer from methodological limitations that could bias their results. By using cross-sectional data, neither can adequately control for the direction of causality between switching (or duration) and outcomes. Their results, which show higher costs and utilization when consumers leave their primary care physicians, could be due to sicker patients being more likely to switch physicians.

The continuity-of-care literature gives further insight into the potential outcomes associated with switching primary care providers. The Institute of Medicine considers continuity-of-care to be a vital aspect of primary care (Donaldson et al.1996). By persistently utilizing the same physician or source of care over time, providers can learn about patients' medical needs and empathize with their values regarding treatment options, potentially leading to more effective, efficient, and satisfying care (Starfield 1992). Recent literature provides evidence in support of this knowledge accrual. Using answers to the Medicare Current Beneficiary Survey, Parchman and Burge (2003) found that longer physician-patient relationships were associated with better communication and physicians' knowledge of their patients. Rodriguez et al. (2007) found similar results at a large multispecialty practice in Massachusetts and also showed that longer relationships were associated with better health promotion support and access to care. Continuity-of-care should benefit sicker patients more than relatively healthy patients, because complex medical conditions offer more potential for learning effective and efficient treatments (Bodenheimer 2008; Nutting et al. 2003). However, the increased use of limited network plans forces some enrollees to switch primary care providers, potentially squandering providers' accrued knowledge about their patients.

It is important to note this literature does not explicitly study single switches from one assigned primary care provider to another, but rather indices of continuity (see Jee et al. 2006 for examples) that measure how often an individual sees one provider relative to others over a defined time period. Although this concept is related to simply switching primary care providers, the concepts are not identical. For instance, the analyses presented in this study reflect a single break in patient's relationships with primary care providers, while continuity-of-care indices also may reflect patients moving back and forth between multiple providers.

Two literature reviews, van Walraven et al. (2010) and Saultz and Lochner (2005) provide concise summaries of the effects of continuity-of-care on measures of costs and utilization. In general, they conclude continuity-of-care is good for patients. The authors found that of 29 articles examining the relationship between continuity-of-care and measures of cost and utilization, only two failed to find a reduction in costs or utilization on at least one measure. Reduced hospitalizations and ED visits drove the decreases in costs and utilization, although two studies also found decreases in outpatient visits (Hennelly and Boxerman 1979; Raddish, Horn, and Sharkey 1999) and 3 studies found decreases in laboratory tests (Alpert et al. 1976; Heagarty et al.1970; Hjortdahl and Borchgrevink, 1991). Only one study found any increase in cost and utilization related to continuity-of-care. Hjortdalh and Borchgrevink (1991) found continuity-of-care was associated with increased prescription drug use and referrals to specialty care providers. In more recent work, Hussey et al. (2014) found continuity-of-care was associated with a lower total cost of care and a lower likelihood of having a hospitalization or ED visit for Medicare beneficiaries with congestive heart failure, chronic pulmonary disease, or type 2 diabetes.

The effect of continuity-of-care on health outcomes is mixed. Although the above summary highlights that continuity-of-care is associated with decreases in hospitalizations and ED visits, studies using clinical outcome measures have had conflicting results. For example, Mainous et al. (2004) and Parchamn et al. (2002) found

that continuity-of-care was associated with better glycemic control for individuals with diabetes, while Gulliford, Naithani, and Morgan (2007) found no such relationship.

Both van Walraven et al. (2010) and Saultz and Lochner (2005) document weaknesses in the continuity-of-care literature. Like Joffe et al. (1999) and Weiss and Blustein (1996), the majority of the continuity-of-care literature is based on cross-sectional data. Both reviews state that the associations between continuity-of-care and measures of utilization, costs, and health outcomes are potentially driven by selection into which patients switch providers. If sicker patients are more likely to switch providers, then some of the results may be explained by unobserved differences in health between switchers and non-switchers. In other words, individuals who switch providers may appear to have worse outcomes not because they switched but because they are persistently sicker than patients who remain with the same provider.

Overall, the literature suggests that individuals who switch providers will have higher costs and utilization. These increases are mainly tied to higher likelihoods of hospitalizations and ED visits, and Joffe et al. (1999), Raddish et al. (1999), and Hennelly and Boxerman (1979) indicate that an increase in outpatient visits is also possible. The effect of provider switching on clinical outcomes is unclear.

2.3. Primary Care Provider Choices and Quality of Care

Enrollment in limited network plans may lead enrollees to seek care from low-quality primary care providers. Individuals who have to switch primary care providers may obtain care from relatively low-quality providers for two reasons: 1) insurers excluding high-quality providers and/or 2) enrollees selecting low-quality providers over high-quality providers among in-network providers, either due to selecting providers on attributes other than quality or by chance due to a lack of comparative quality information.

Insurers often exclude one or more relatively high-quality health system(s) or hospital(s) from limited network plans (Shepard 2016). These exclusions are generally done to reduce utilization at high-cost specialty care providers and hospitals. For example, limited network plans tend to exclude academic medical centers (Richards 2013), which often are relatively high-quality, but also are costly compared to non-academic hospitals (Kupersmith 2005). Shepard (2016) explains that insurers also may exclude high-quality providers to avoid adverse selection into limited network plans, as sicker patients are more likely to seek out plans that include high-quality providers. Most of the evidence on provider exclusions concerns hospitals. Thus it is unknown if insurers ever specifically exclude high-cost, high-quality primary care providers. Likely, any exclusion of high-quality primary care providers is a consequence of excluding entire physician practices and health systems.

Even when high-quality primary care providers are present in limited network plans, enrollees may still select providers of relatively low-quality. Although individuals state that they place importance on quality of care when selecting providers, they often have difficulty choosing high-quality providers (Victoor et al. 2012). Many consumers are simply uninformed about the quality of potential providers when they make a decision. Although the use of provider report cards attempts to convey provider quality including patient experience, only a small fraction of individuals seek out this information and use it to make well-informed decisions (Damman et al. 2009). For example, in 2015, only 24% of individuals with chronic conditions in Minnesota were aware of the publicly reported quality data for diabetes care and vascular disease care employed in this study (Scanlon et al. 2015). Furthermore, even when individuals are aware of quality report cards, many find that the available information is challenging to interpret, making it difficult to incorporate it into their decisions (Fasolo et al. 2010).

Enrollees also may select low-quality primary care providers due to their lack of engagement in the provider market. As stated above, individuals are unlikely to seek out quality information regarding providers. They also rarely comparison shop for providers and typically stick with their initial choice, which could lead to poor matches (Damman

et al. 2009). Harris (2003) found that only 31% of individuals seriously consider alternative physicians before choosing a current provider. Similarly, Hoerger and Howard (1995) found that only 25% of pregnant women considered more than one pre-natal physician and of those women, only 60% spoke with or visited two or more providers. Often individuals simply select the closest provider, which has particularly been the case for hospital care. Schwartz (2005) found that that only 10% of patients consider a non-local hospital.

There are reasons to believe individuals would select high-quality primary care providers. While individuals are unlikely to use formal quality information, they do gather informal information from friends and families, physicians, and their own experiences (Victoor et al. 2012). Friends and family may suggest primary care providers who delivered satisfying care to them. Additionally, patients may receive recommendations from their former primary care providers before choosing their next provider. Lastly, individuals own positive experiences with specialists or hospitalists of still in-network health systems could influence them to choose a new primary care provider from those systems.

Although the literature concludes that individuals are frequently disengaged, they may be more engaged when choosing a primary care provider compared to specialty care providers and hospitals. Much of the provider choice literature concerns choices of hospitals and specialty care providers, where patients may be apt to passively rely on referrals from their current providers rather than making their own well-informed decisions. However, choosing a new primary care provider may put individuals in a position with little information or guidance. Without information to go on, individuals may be more willing to seek out quality information.

2.4. Needs of the Literature

Research pertaining to primary care provider switching as well as the effects of current limited provider network plans is relatively sparse. Although Gruber and McKnight

(2016) offers insights into the possible consequences of switching primary care providers with enrollment in a limited network plan, their setting may be atypical of what many employers would face if they decided to offer more restrictive plans. In addition, the continuity-of-care literature has suffered from methodological limitations because of difficulty in controlling for selection into who switches providers. The employment of limited network plans, particularly when they replace broad network plans, offers opportunities to better study primary care provider switching because it functions as an exogenous shock forcing both individuals of good and poor health to make active choices about their health plan and providers. In addition, little is known about the consequences of enrollment in current limited network plans in general, likely due to the difficulty in obtaining data that include both plan choices and medical claims with provider choices, costs, and utilization. Information regarding the effect of limited networks health plans on costs and enrollees' wellbeing will provide employers and policymakers with insights regarding how to optimally design these plans and when they are appropriate to offer.

3. Study Setting[5]

The study setting for this analysis was the University of Minnesota health benefits plan from 2008 through 2012. The university health benefits plans covers approximately 32,000 adult lives on an annual basis through a health insurance program commonly referred to as the 'UPlan'. Through 2011, the UPlan offered health plans from HealthPartners (Bloomington, Minnesota) and Medica (Hopkins, Minnesota). Due to reduced funding from the state, the UPlan elected to utilize Medica as its sole health plan administrator beginning in 2012. Individuals previously enrolled in the HealthPartners plan could either switch to a Medica plan or forego health insurance coverage. One of these plans, Medica Elect/Essential (MEE) excluded the majority of providers from the HealthPartners health system. Enrollees who switched from the HealthPartners plan to the MEE plan, and had utilized now out-of-network HealthPartners primary care clinics, were therefore required to find a new clinic in 2012. This analysis follows the primary care clinic choices, costs, utilization, and quality of care for these enrollees in comparison to enrollees who did not switch clinics because they continuously utilized a clinic in the MEE plan's network.

The University of Minnesota offers an appropriate setting for this study and knowledge pertaining to its experiences is applicable to other employer settings for several reasons. First, the Twin Cities (i.e. Minneapolis and St. Paul), the main location of the university, is a highly consolidated market dominated by large, integrated delivery systems, a characteristic that is becoming more commonplace throughout urban areas of the U.S. (Christianson, Carlin, and Warwick 2014). Second, the university employs a broad and diverse workforce given its need to employee faculty, administrative and professional staff, and blue-collar workers. This feature of the university helps bolster this study's external validity relative to research based on homogenous populations. Third, the limited

[5] The institutional details in this chapter concerning the University of Minnesota's UPlan and the health plans it offered are derived from the "2011 Open Enrollment Update & UPlan Changes: Calendar Year 2012", a presentation given by the University of Minnesota Office of Human Resources. Retrieved from: <https://www1.umn.edu/ohr/prod/groups/ohr/@pub/@ohr/documents/asset/ohr_asset_361472.pptx>

network plan in this study excluded a large, integrated health system, an exclusion that is increasingly occuring in employer-sponsored health plans.

3.1. University of Minnesota UPlan Health Plans

The University of Minnesota is a large, self-insured employer with five primary campuses including the Twin Cites (86% of adult covered-lives in 2011), Duluth (9%), Morris (2%), Crookston (1%), and Rochester (0.4%). During this study, the UPlan covered approximately 32,000 adults each year including employees, spouses, and dependents. From 2008 through 2011 the UPlan relied on two insurers, HealthPartners and Medica, to administer health plans. HealthPartners offered one health plan, which utilized a broad, regional provider network. The health plan was available to enrollees from all campuses and had the second largest enrollment of all plans, enrolling 36% of the UPlan population in 2011 (**Table 3-1**). In 2011, enrollees of this plan had slightly worse health compared to the full UPlan population as indicated by a health risk score[6] of 1.05 relative to 1.00 for the full population. Approximately half of the enrollees of the HealthPartners plan utilized primary care clinics within the HealthPartners health system. Medica offered five different health plans in 2011 with a variety premiums and cost-sharing responsibilities (see **Table 3-1** for details). An attribute of all but one of the Medica plans was the exclusion of the majority of HealthPartners providers (see **Table A-1** for details). I classify these Medica plans as limited network plans because of these exclusions. The five Medica plans included:

- *Medica Elect/Essential*: The base Medica plan for the Twin Cities and Duluth campuses. This health plan excluded 18 of 26 (69%) of HealthPartners primary care clinics and all specialty care clinics (except eye clinics). HealthPartners' Minnesota hospital, Regions Hospital, was included. (38% of the UPlan population in 2011; health risk score = 0.87).

[6] The health risk score was created using the Chronic Illness and Disability Payment System algorithm using ICD-9 codes and medication prescriptions (retrevied from: http://cdps.ucsd.edu/). I indexed the risk scores such that mean health in the UPlan population is 1.00. Higher risk scores indicate worse health.

- *Medica Choice National*: A health plan available to all campuses featuring a national provider network. This plan excluded 14 of 26 (54%) of HealthPartners primary care clinics and all behavioral health clinics. Regions Hospital was included. (12% of the UPlan population in 2011; health risk score = 1.18).

- *Medica Choice Regional*: The base Medica plan for campuses outside of the Twin Cities and Duluth. This health plan included the same HealthPartners providers as the Medica Choice National plan. (8% of the UPlan population in 2011; health risk score = 0.92).

- *Medica Choice Insights*: A health plan available to all campuses featuring a tiered-provider network with increasing copayments by tier. This health plan included the entirety of the HealthPartners health system in the cheapest tier. (5% of the UPlan adult population in 2011; health risk score = 1.00).

- *Medica Health Savings Account*: A high-deductible health plan available to all campuses. This health plan included the same HealthPartners providers as the Medica Choice National plan. (1% of the UPlan population in 2011; health risk score = 0.75).

For the Medica plans in 2011, the majority of enrollees selected the MEE plan, which is the base plan for the Twin Cities and Duluth campus as well as the Media Choice Regional (MCR) plan, which is the base plan for all other campuses, respectively. A subset of, on average, sicker enrollees selected the Medica Choice National (MCN) plan, while very few enrollees selected the Medica Choice Insights (MCI) tiered-network plan or the high-deductible Medica Health Savings Account (MHSA) plan.

3.2. Decision to Drop the HealthPartners Health Plan

Prior to 2012 open enrollment, the University of Minnesota was met with pressure to reduce the administrative costs of the UPlan. In 2011 the state reduced its funding to the University of Minnesota and due to these reductions the university required most departments to cut expenses by 5% including the UPlan insurance program. This cut required reduced costs of $12.7 million in 2012 by the UPlan and $11.4 million in subsequent years. The UPlan aimed to meet these cost reductions through two mechanisms: 1) pass on the costs of health insurance to employees by increasing premiums and co-payments and 2) selecting Medica as the sole health plan administrator and dropping coverage through HealthPartners (although access to HealthPartners providers would still be available in various degrees under the Medica plans). The UPlan anticipated that the latter would save over $14 million dollars between 2012 and 2017.

It is important to note that in the tiered-network MCI plan HealthPartners is in the least expensive tier, suggesting that HealthPartners is not a high-cost health system. The university's decision to drop the HealthPartners plan was primarily driven by the expected administrative savings of using only one insurer and by increasing enrollment in the limited network MEE plan, which had lower premiums than the HealthPartners plan. Therefore, enrollees who had been utilizing HealthPartners primary care providers potentially could have switched to providers with similar or even higher prices, which could bias the effects of switching clinics in this study when making comparisons to limited network plans that specifically exclude high-cost health systems. I discuss this point more thoroughly in the limitations portion of the discussion in **Section 7.1.**

3.3. Selection of Health Plans by Former HealthPartners Plan Enrollees

The decision to select Medica as the sole health plan administrator in the UPlan constrained the former HealthPartners enrollees to choose one of the Medica plans in 2012. Enrollees who did not select a new plan during open enrollment received no medical coverage in 2012 (i.e. no automatic enrollment). Overwhelmingly, the former

HealthPartners enrollees selected either the limited network MEE plan (55% of former HealthPartners enrollees) or the tiered-network MCI plan (41%) in 2012 (**Figure 3-1**). Only 4% of former HealthPartners enrollees selected the MCR, MCN, or MHSA plans.

Enrollees who selected a Medica plan other than the tiered-network MCI plan and who had been receiving primary care from a now out-of-network HealthPartners primary care clinic had to obtain care from a new in-network clinic, pay out-of-network fees, or choose to not receive care. Nearly all of the enrollees (99%) who switched primary care clinics were from the Twin Cities campus, as HealthPartners providers are not in the vicinity of the other campuses. In addition, the vast majority (95%) of enrollees who switched primary care clinics were new enrollees of the limited network MEE plan. Although the MCR and MCN health plans excluded HealthPartners primary care clinics, only 4% of former HealthPartners enrollees selected these plans and the majority of those enrollees were from campuses outside the Twin Cities. Therefore, this study focuses on primary care clinic switching by new enrollees of the limited network MEE plan from the Twin Cities campus.

3.4. Primary Care Provider Network Changes

The HealthPartners primary care clinics excluded in the limited network MEE plan are in general of average- to high-quality compared to other clinics in the Twin Cities area. **Figure 3-2** presents the 2012 performance of primary care clinics in the Twin Cities area[7] utilized by UPlan enrollees and that reported to MNCM (refer to **Table R-1** for summarized descriptions of each measure; detail descriptions are in **Section 4.2.**). The excluded HealthPartners primary care clinics best performances relative to all Twin Cities clinics were for clinical quality (**Figure 3-2A**) pertaining to diabetes care and vascular disease as well as timeliness of care (**Figure 3-2C**). Very few excluded HealthPartners primary care clinics fell into the bottom quartile of clinics on any performance measure.

[7] For **Figure 3-2**, the Twin Cities is defined by the following counties: Anoka, Dakota, Hennepin, Ramsey, and Washington.

Figure 3-2 highlights that while the limited network MEE plan excluded some high-quality HealthPartners primary care clinics, a large number of high-quality clinics from other health systems remained as in-network options. This is not surprising, as Minnesota is dominated by large, integrated delivery systems (Christianson, Carlin, and Warrick 2014). The state is generally considered to be one of the top-ranking states in terms of quality of care and integration (Moody and Silow-Carroll 2009). Given the number of primary care clinics in the Twin Cities (~180), excluding the HealthPartners clinics, even though they were of average- to high-quality, had little impact on the average quality of clinics within enrollees' market areas[8] (**Table 3-2**).

It is important to note that MEE plan enrollees could continue to receive primary care within the HealthPartners health system if they switched to an in-network HealthPartners primary care clinic. However, all specialty care clinics (except eye care) were excluded from the MEE plan. The HealthPartners primary care clinics included in the MEE plan also were generally located on the periphery of the Twin Cities distant from the university. HealthPartners Health Center for Women and Regions Hospital, both in St. Paul, were exceptions. Therefore, MEE enrollees wishing to stay within the HealthPartners health systems likely would incur increased travel costs relative to switching to a closer in-network clinic. In rare cases, enrollees could obtain permission for a short-term continuation with an out-of-network provider (without paying out-of-network fees) if they had received care from the provider in the previous 90 days for a serious and on-going medical condition (e.g. life-threatening acute care episode, pregnancy, etc.).

3.5. External Validity of the University of Minnesota

Using a single setting raises questions concerning the generalizability of this study. Foremost, the Twin Cities area is dominated by large, integrated delivery systems. This attribute could weaken generalizability to areas with less consolidation and/or integration.

[8] An urban (rural) enrollee's market area is defined as 12.5-mile (17.5-mile) radius from the center of their zip code of residence.

However, recent trends have shown an increase in the rates of mergers and acquisitions throughout the U.S. leading to more integrated health systems and concentrated markets, especially in urban areas (Baker, Bundorf, and Kessler 2014; Christianson, Carlin, and Warwick 2014). Much of this consolidation and integration is occuring through health systems and hospitals acquiring physicians practices. From 2002 to 2008 the number of physician practices owned by hospitals more than doubled (Kocher and Sahni 2011). Furthermore, the recent advent of accoutable care organizaitons has spurred integration between hospitals and physicians, with over 400 accoutable care organizaitons in existence as of 2013, spanning 49 states and the District of Colubmia (Essential Hospital Instititute 2013). These trends suggest that other markets are increasingly becoming more like the Twin Cities, thus allowing for analyses conducted in the Twin Cities to be applicable to other areas. However, only 7% of my analytic sample resided in rural settings, creating difficulty in generalizing my results to non-urban markets.

The university's broad workforce also strengthens this study's external validity by not limiting the analysis to a narrow subpopulation that could create selection bias. The university employs faculty, administrative and professional staff, as well as blue-collar workers. This attribute allows for a representative spectrum of individuals, in particular, spanning large ranges of income and educational attainment. However, the university's workforce is less racially and ethnically diverse when compared to the entire U.S. labor force. Approximately, 15% to 20% of the university's workforce (not including student-employees) is comprised of individuals who are either non-White or White Hispanic (University of Minnesota Office of Institutional Research 2016) compared to the national average of 34% (Bureau of Labor Statistics 2015).

Lastly, although the limited network MEE plan only excluded the majority of one large, integrated delivery system, this type of exclusion is becoming more commonplace. In 2015, the Kaiser Family Foundation reported that 9% of employers (with 50 or more employees) had a hospital or health system dropped from a health plan offered to their employees (KFF/HRET 2015).

4. Data

I used three sources of data in this study. First, I obtained 2008 through 2012 claims and eligibility files that include the care locations (e.g. clinic, hospital, etc.), health plan choices, costs, utilization, and diagnoses as well as enrollee demographic indicators. The UPlan changed medical claim vendors in 2012 creating difficulty in appending the 2008 through 2011 claims with the 2012 claims due non-matching individual identifiers across vendors. This occurrence led to the exclusion of roughly 13% of the former HealthPartners plan enrollees from the analysis (explained in **Section 4.1.3.**).

Second, I created a dataset of 875 potential primary care clinics in Minnesota and surrounding states by combining the list of clinics that UPlan enrollees visited and the clinics reporting to MNCM. To determine the primary care clinics that did not report to MNCM, I generated a crosswalk from the provider names in the outpatient claims file to clinics (explained in **Section 4.1.4.**). For this dataset, I obtained the percent of primary care and specialty care physicians at each clinic, the percent of physicians by sex at each clinic, whether the clinic was part of a hospital, and the latitude and longitude of each clinic from on-line sources.

Third, I obtained data from MNCM pertaining to clinic performance on diabetes care (2009 through 2012), vascular disease care (2009 through 2012), and patient experience (2012) for 620 primary care clinics. I lacked the performance of every primary care clinic due to the voluntary nature of reporting, although the non-reporting clinics were not highly utilized by the UPlan enrollees. These data also include the number of physicians as well as the payor mix for patients with diabetes at each reporting primary care clinic.

4.1. UPlan Data Details and Constructed Measures

The UPlan data include outpatient, inpatient, and prescription drug medial claims as well as eligibility files, which document health plan choices and demographic indicators

including sex, age, campus of employment (for employees), and zip code of home residence. I obtained access to the 2008 through 2012 files through the University of Minnesota Office of Human Resources. Each year included between 29,982 and 33,366 adult UPlan enrollees (employees, spouse, and dependents). These data have encrypted individual identifiers and no location variables smaller than zip code (with the exception of campus work location for employees).

4.1.1. Utilization and Costs

I used the UPlan claims to create utilization and cost measures. I first identified each relevant type of utilization:

- *Outpatient Utilization:* I considered an enrollee with at least one outpatient claim with a place of service code for an outpatient facility (see **Table A-2**) and a length of stay equal to one to have had outpatient utilization. I also identified outpatient visit types. I defined a unique visit as a set of claims with the same patient identifier, same provider identifier and same service date. I created measures for the following visit types:

    - *Primary Care Evaluation and Management (E&M) Visits*: Primary care E&M visits included visits with a primary care or internal medicine provider (See **Table A-3**) and an office or preventive medicine E&M Common Procedural Terminology (CPT) code (see **Table A-4**).

    - *Specialty Care Provider E&M Visits*: Specialty care E&M visits included visits with a non-primary care or -internal medicine provider (see **Table A-3**) and an office or preventive medicine E&M CPT code (see **Table A-4**).

    - *Emergency Department (ED) Visits*: ED visits included visits with an ED CPT code or UB-04 revenue code (see **Table A-4**).

- *Hospital Inpatient Utilization:* I considered any enrollee with at least one inpatient claim with a hospital inpatient place of service code and a length of stay greater than one to have had hospital inpatient utilization.

- *Prescription Drug Utilization:* I considered any enrollee with at least one prescription drug claim to have had prescription drug utilization.

I created cost measures pertaining to total, non-ED outpatient, ED, hospital inpatient, and prescription drug utilization. Each measure was the total of plan payments and individual out-of-pocket spending. ED, hospital inpatient, and prescription drug expenditures included expenditures for all utilization as defined above. Non-ED outpatient expenditures included all outpatient utilization minus ED utilization. Thus, the non-ED outpatient expenditures included expenditures for primary and specialty provider E&M visits as defined above as well as non-E&M visits. Total expenditures were the sum of all the expenditures across categories. I adjusted all expenditures to 2012 dollars using the medical care component of the consumer price index.

4.1.2. Health Risk Score

I used the Chronic Illness and Disability Payment System risk adjustment algorithm developed by Richard Kronick and colleagues at the University of California-San Diego to compute a measure of health risk for each enrollee in each year. I indexed the risk scores to have a mean of one in the full population of adult UPlan enrollees. Larger risk scores signify greater health risk. The algorithm uses ICD-9 codes and prescribed medicines from claims to calculate an index measure of expected health care costs in the following year. Note, this measure is designed and calibrated for Medicaid populations and thus differences in relative payments between diagnoses for Medicaid patients and UPlan enrollees create measurement error and attenuate estimated effects towards zero.

I used this measure for reasons of comprehensiveness and convenience. The designers of the measure examined every ICD-9 code and received extensive physician feedback in

order to create a comprehensive measure of expected health care costs (Kronick et al. 2000). From this process the designers created a composite measure that is a linear combination of 23 medical condition categories, age, and sex. Thus, the measure has the capacity to capture changes in health risk in a way that is more nuanced than using demographic indicators or broad measures of past utilization, such as having had a hospitalization. Conveniently, the measure's algorithm is freely available (http://cdps.ucsd.edu/) and simple to implement in statistical software packages.

4.1.3. Appending the 2008 through 2011 Claims with the 2012 Claims

In 2012 the UPlan administration changed its medical claim processer and vendor from Optum (Minneapolis, Minnesota) to Truven Health Analytics (Ann Arbor, Michigan). This change in vendors created differences in the file layout and coding for the 2012 claims. As part of these changes, Truven Health Analytics created new encrypted individual identifiers. Therefore, an individual would have one identifier from 2008 to 2011 and a new identifier in 2012. Truven Health Analytics provided a crosswalk from the old identifiers to the new identifiers, however of the 33,366 adult enrollees in 2012, 7,113 (21%) did not have a match in the crosswalk (**Table 4-1**) and could not be included in the analysis because I was unable to observe their data prior to when the UPlan dropped the HealthPartners plan. The unmatched enrollees were on average younger (37.5 for unmatched enrollees vs. 42.5 for the full UPlan population), less likely to be female (49.8% vs. 53.6%), and were healthier (0.93 risk score vs. 1.02 risk score) compared to the full UPlan adult population. The age and health differences are likely due to the unmatched enrollees including all of the new UPlan enrollees in 2012. From 2009 through 2011, the UPlan enrollment data had roughly 3,300 new unique adult observations, suggesting that about half of the unmatched enrollees were new enrollees and therefore would have been excluded from the study regardless, because they lacked data prior to when the UPlan dropped the HealthPartners plan. In addition, only 36% of 2011 UPlan enrollees were enrolled in the HealthPartners plan analyzed in this study. Therefore, the inability to crosswalk enrollees to the 2012 claims files is responsible for

the exclusion of roughly (7,113 – 3,300) * 0.36 ≈ 1,373 enrollees, or 13% (1,373 / (9,452 + 1,373) * 100) of the former HealthPartners plan enrollees.

In addition, the 2012 claims used different coding schemes for place of service and provider specialty fields, which I used to identify outpatient and inpatient utilization as well as to distinguish between primary care and specialty care outpatient E&M visits. The place of service codes for each year are listed in **Table A-2** and the provider specialty codes for each year are listed in **Table A-3**.

4.1.4. Creation of a Crosswalk from Provider Identifiers to Clinics

I created a crosswalk from the provider identifiers in the claims to clinics in order to identify the clinics serving the UPlan population and assign enrollees to primary care clinics. From the claims, I took the list of all unique provider name, place of service, and provider zip code combinations with at least one primary care outpatient E&M visit. Provider names in the data were usually clinician names (of physicians, physician assistants, nurses, etc.), but also could be clinic, hospital, or health system names. Using on-line provider directories (including health system websites, HealthGrades.com, etc.) I matched each provider name, place of service, and provider zip code combination to a clinic. I excluded clinics that I determined to be specialty care clinics (obvious by name or information on website). I also excluded all clinics in any state other than Minnesota, North Dakota, South Dakota, Wisconsin, or Iowa. I appended this list with any MNCM reporting clinics not already in the list generated from the claims. I further condensed multiple clinics within the same health system but in the same general location (e.g. within the same hospital complex, city block) into one clinic, which resulted in reducing 58 clinics to 22. In general, doing so combined primary care and internal medicine departments in hospitals or medical complexes, where determining the specific department of individual practitioners was not feasible. In total, I identified 875 primary care clinics potentially serving the UPlan population. Of these clinics the majority were from Minnesota (637 clinics) with Wisconsin (102), Iowa (49), North Dakota (48), and South Dakota (39) accounting for the remainder. Using the list of primary care clinics I

attributed each primary care outpatient E&M visit to a clinic, which allowed me to assign enrollees to clinics based on a plurality of visits (explain in detail in **Section 5.1.**).

For this list of primary care clinics, I obtained the percent of primary care and specialty care physicians at each clinic, the percent of physicians by sex at each clinic, whether the clinic was part of a hospital, and the latitude and longitude of each clinic from health system websites and on-line provider directories.

4.1.5. Providers with Unknown or Multiple Clinics

For 9.6% (30,035 of 312,358) of the primary care outpatient E&M visits, I was unable to determine the specific primary care clinic location. These cases affected the assignment of enrollees to primary care clinics. They do not affect any other constructed measure in this study.

For 43% (12,820) of these visits, I was able to construct a reasonable list of possible primary care clinics for the visit (generally between 2 to 5 clinics). This occurrence typically happened when a provider name, place of service, provider zip code combination included a business or headquarters zip code (i.e. not the zip code of the clinic) and the clinician given in the provider name field worked at multiple locations within his or her health system. For the purposes of primary care clinic assignment based on a plurality of visits, I split these visits between the possible clinics. For example, if I could not determine whether a visit occurred at Clinic A or Clinic B, then I attributed 0.5 visits to each primary care clinic.

I was unable to generate a reasonable list of potential primary care clinics for the remaining 57% (17,215) of visits with an undeterminable clinic. These cases were generally due to a combination of a business or headquarters zip code and the provider name field populated with the health system name of a large system (e.g. more than 10 clinics). I counted these visits towards an “unknown” clinic when making primary care clinic assignments. I excluded all enrollees assigned to an “unknown” primary care clinic

in at least one year. The impact of these exclusions on the analysis is given in **Section 5.1.** and **Section 5.2.** regarding primary care clinic assignment and the analytic sample construction, respectively.

4.2. Minnesota Community Measurement Data Details and Constructed Measures

MNCM reports the annual performance of clinics on several quality measures. A 2008 Minnesota statute mandated public reporting for all Minnesota clinics staring with 2009 performance (Healthcare Payment and Pricing Reform 2008). Although reporting was made mandatory, there is no apparent penalty for not reporting and about 15% of Minnesota clinics to date have chosen not to report. Some clinics outside of Minnesota voluntarily report. Of the 875 primary care clinics serving the UPlan population, 620 reported to MNCM at least once. These clinics were mostly located in Minnesota (537 clinics) with North Dakota (29), Wisconsin (28), South Dakota (23) and Iowa (3) accounting for the remainder. I utilized performance for diabetes care (2009 through 2012), vascular disease care (2009 through 2012), and patient experience (2012) for these clinics.

4.2.1. Diabetes and Vascular Disease Care Performance

For diabetes and vascular disease care performance, clinics submit patient-level data to MNCM from either electronic medical records or paper-based medical charts. These data include a set of treatment goals for each condition. For diabetes care, the set of goals is:

- Hemoglobin A1c < 8%
- Blood pressure < 130/80 mmHg (changed to < 140/80 mmHg in 2010)
- Low-density lipoprotein (LDL)-cholesterol < 100 mg/dl

- Daily aspirin use unless contraindicated (changed to included only patients with ischemic vascular disease in 2010)

- Documented tobacco-free status

Vascular disease care has the same set of goals excluding the hemoglobin A1c measure. For each clinic, MNCM reports the percent of patients in the relevant patient population achieving the treatment goal.

Large changes in performance were observed during this study due to changes in the definitions of the blood pressure and daily aspirin goals that made them easier to achieve. Following McCullough et al. (2015), I estimated the average change in performance due to the definition changes and adjusted the performance measures to reflect the new definitions. The authors modeled each individual performance measure *p* for clinic *c* in year *t* as:

$$p_{ct} = \alpha + \beta_1 t + \beta_2 t^2 + \gamma Definition_t + \delta Cohort_c + \lambda t * Cohort_c + \epsilon_{ct}$$

where *t* is the reporting year (t = 0 for 2009, t = 1 for 2010, etc.), *Definition* is an indicator equal to 1 if *p* is performance in a year during or after a definition change and 0 otherwise, and *Cohort* is a set of dummy variables for the first year the clinic reported to MNCM. I estimated this model using ordinary least squares regression for each diabetes and vascular disease care performance measure that had a definition change. I added γ, the parameter on *Definition* to all performance measures prior to the definition change.

Using the diabetes and vascular disease care measures, I created two composite performance measures:

- *Clinical Performance*: The average performance on hemoglobin A1c, blood pressure, and LDL-cholesterol from the diabetes care measures and blood pressure and LDL-cholesterol from the vascular disease care measures.

- *Behavioral Performance*: The average performance on aspirin use and tobacco free status rom the diabetes care measures and aspirin use and tobacco free status from the vascular disease care measures.

4.2.2. Patient Experience Performance

MNCM conducted patient surveys in 2012 to document patient experience at clinics. The survey instrument was the Consumer Assessment of Healthcare Providers and Systems Clinician & Group 12-Month Survey and was mailed or completed over the phone by a random sample of patients (not exclusive to individuals included in this study) who had office visits during September through November 2012 (Minnesota Community Measurement 2014). The survey contained patient experience measures on four domains:

- Getting Care When Needed
- Courteous and Helpful Staff
- Provider Communication
- Overall Provider Rating

The Getting Care When Needed, Courteous and Helpful Staff, and Provider Communication domains consisted of multiple questions answered with “Never”, “Sometimes”, “Usually”, or “Always”. The questions are worded such that “Always” is the most favorable response (see **Table A-5** for specific questions). MNCM created composite measures for each of these three domains equal to the percent of questions answered with “Always”. The Overall Provider Rating asked respondents to rate their provider from 0 (worst) to 10 (best). MNCM reports the percent of respondents rating their provider as a 9 or 10. From the population surveyed, MCNM generated patient

experience measures for 588 clinics or 67% of the primary care clinics serving the UPlan population.

4.2.3. Clinic Characteristics

MNCM data included for each primary care clinic: the number of patients with diabetes and vascular disease, the number of practicing physicians, and the proportion of patients with diabetes that were enrolled in Minnesota Health Care Programs (includes Medicaid and other programs for low-income individuals), Medicare, or private insurance.

5. Analysis

I determined the effect of switching primary care clinics on costs, utilization, and quality of care after enrollment in a limited network plan. The study population consisted of UPlan enrollees who selected the limited network MEE plan in 2012 after the University of Minnesota dropped a traditional, broad network plan administered by HealthPartners. Using a longitudinal difference-in-differences design, I compared the costs and utilization of enrollees who switched primary care clinics (because their clinics under the HealthPartners plan were excluded in the MEE plan) to the costs and utilization of enrollees who did not have to switch clinics. I then determined if enrollees who switched primary care clinics selected higher or lower quality clinics by comparing the performance of their new clinics to their previous clinics. Lastly, I employed a discrete choice model to describe the characteristics of primary care clinics chosen by individuals who switched clinics and to determine the relative associations between clinic attributes, including quality, and clinic choices.

5.1. Primary Care Clinic Assignment

The analysis necessitated assigning enrollees to primary care clinics. In each year from 2009 through 2012, I assigned each new MEE enrollee to the primary care clinic with the plurality of his or her primary care outpatient E&M visits. In cases of ties (11% of assignments), I assigned each enrollee to the primary care clinic with his or her plurality of primary care outpatient expenditures. Thirty-three percent of enrollees had no primary care outpatient E&M visits in either 2011 or 2012 and were excluded from the analysis because I could not assign them to primary care clinics.[9] Unsurprisingly, compared to all new MEE enrollees (**Table 5-1**), enrollees without primary care visits were substantially healthier (0.65 risk score for enrollees without primary care visits vs. 1.01 risk score for

[9] The Centers for Disease Control and Prevention estimated that in 2014 that approximately 21% of adults, aged 18-65, had no contact with any health professional, thus one-third of the new MEE enrollees not having a primary care outpatient E&M visit in either 2011 or 2012 is reasonable.

all MEE enrollees) as well as younger (41.0 vs. 43.9) and less likely to be female (40.2% vs. 54.0%).

Fourteen percent of new MEE enrollees were assigned to an "unknown" primary care clinic in either 2011 or 2012 because the plurality of their primary care outpatient E&M visits were at undeterminable locations. Enrollees assigned to "unknown" primary care clinics in 2011 or 2012 were excluded from the analysis because I could not determine if they switched clinics. Compared to enrollees whose primary care clinics were "known", enrollees with "unknown" clinics were younger (42.6 for enrollees with an "unknown" clinic vs. 46.2 for enrollees with a "known" clinic), less likely to be female (54.1% vs. 62.5%), and healthier (1.07 risk score vs. 1.22 risk score).

Seven percent of new MEE enrollees were assigned to primary care clinics that did not report diabetes or vascular disease care performance to MNCM in either 2011 or 2012. Compared to all enrollees assigned to primary care clinics, these enrollees were younger (41.8 for enrollees at non-reporting clinics vs. 46.2 for all enrollees assigned to clinics), substantially more likely to be female (79.5% vs. 62.5%), and healthier (1.07 risk score vs. 1.22 risk score). The higher percent of female enrollees among this group is largely due to women obtaining primary care at obstetrics/gynecology clinics, which may not meet the requirements for reporting to MNCM. In addition, 16% of new MEE enrollees were assigned to primary care clinics for which patient experience measures were not reported. Compared to all enrollees assigned to primary care clinics, these enrollees were again younger (43.7 for enrollees at non-reporting clinics vs. 46.2 for all enrollees assigned to clinics), and healthier (1.07 risk score vs. 1.22 risk score), although no substantial difference existed in the percent of enrollees by sex. I excluded observations at non-reporting clinics from any analyses using the corresponding MNCM performance measures.

5.2. Analytic Sample

The analytic sample was generated from individuals who were enrolled in the broad network HealthPartners plan in 2011 and then enrolled in the limited network MEE plan in 2012. Of 9,452 former HealthPartners plan enrollees, 5,194 (55%) selected the MEE plan in 2012 (**Figure 5-1**). Forty-one percent of former HealthPartners enrollees selected the tiered-network MCI plan in 2012. The MCI enrollees were on average sicker than the new MEE enrollees while the new MEE enrollees' had an average health risk similar to that of the full UPlan population. This occurrence was expected as sicker enrollees generally have a preference for less restrictive health plans (Strombom et al. 2002). Although the MCI enrollees constituted a possible control group of individuals who did not switch primary care clinics, using them in that manner likely would produce results reflecting differences between being in a limited network relative to being in a tiered-network, rather than the effect of switching clinics. Therefore, I excluded the MCI enrollees from the analysis. Four percent of enrollees selected a plan other than the MCI or MEE plan. Because these enrollees were primarily from campuses outside the Twin Cities that are not in the vicinity of HealthPartners providers, they were largely unaffected in terms of primary care clinic choices and therefore also excluded from the analysis. From the new MEE enrollees, I created my treatment and control groups:

- *Treatment Group:* Enrollees who selected the MEE plan and switched out of HealthPartners primary care clinics due to network restrictions (N = 1,151; 22% of new MEE enrollees).

- *Control Group:* Enrollees who selected the MEE plan and did not switch primary care clinics because their original clinics were in the MEE plan's network (N = 916; 18% of new MEE enrollees).

Comparatively, the treatment and control groups were of similar age (46.9 for enrollees who did switch primary care clinics vs. 46.8 for enrollees who did not switch clinics), although enrollees who switched clinics were less likely to be female (57.3% vs. 61.5%)

and healthier (1.19 risk score vs. 1.30 risk score). I controlled for these differences in my analyses by including sex and health risk as explanatory variables. The remaining MEE enrollees were excluded. Reasons for exclusion included:

- Voluntarily switching primary care clinics[10] (N = 651, 13% of new MEE enrollees)

- No primary care outpatient E&M visits in 2011 or 2012 (N = 1,739, 33% of new MEE enrollees)

- An undeterminable primary care clinic in 2011 or 2012 (N = 737, 14% of new MEE enrollees)

5.3. Sample Selection Issues

The above exclusions create an analytic sample that is older, more likely to be female, and sicker compared to all of the new MEE enrollees as well as the full UPlan population. This occurrence may weaken the generalizability of the analysis to healthier populations, however switching primary care clinics likely has less effect on healthy individuals and knowing the effects of switching clinics on sicker individuals is of more importance. Still, issues pertaining to selection into the treatment and control groups existed that must be addressed in order to better understand and interpret results. First, I excluded enrollees who voluntarily switched primary care clinics. I make this exclusion due to the potential endogeneity of voluntary switching. However, I am only able to observe this event among enrollees who could have been selected into the control group. A portion of the enrollees in the treatment group may have voluntarily switched out of HealthPartners primary care clinics regardless of enrolling in the MEE plan. If the effect of switching primary care clinics differs between the voluntary and non-voluntary switchers, then the inclusion of the voluntary switchers in the treatment group creates

[10] For the MEE plan I defined voluntarily switching primary care clinics as switching from a non-excluded HealthPartners primary care clinic to any other clinic.

bias when interpreting the estimated effect of switching as the effect of being forced to switch clinics after enrollment in a limited network plan. To address this issue, I conducted a sensitivity analysis in which I repeated the main analysis but included the voluntary switchers I did observe (i.e. enrollees who were not initially assigned to HealthPartners primary care clinics and switched clinics) in the control group. Doing so, I was able to compare the results of the main analysis with the results of this sensitivity analysis to infer whether the effect of switching clinics was different between the voluntary and non-voluntary switchers.

Second, enrollees who originally selected HealthPartners primary care clinics (i.e. the treatment group) may systematically differ from enrollees who initially selected clinics in other health systems (i.e. the control group). If these differences are unobservable and correlated with both selection into HealthPartners primary care clinics and the outcomes used as dependent variables, then they potentially create an omitted variable bias. One potential source for this type of bias is unobserved health differences between the clinic switchers and non-switchers that are not accounted for in the health risk score. Although, the health risk score is based on 23 condition categories, minor health problems (e.g. muscle sprains, colds, etc.) are excluded from the measure. In addition, because the health risk score is based on ICD-9 codes and medication prescriptions, variation in illnesses that fall under the same codes or prescriptions is not captured in the measure. Unfortunately, because these unobserved health differences likely change over time, they are difficult to control for without the use of sophisticated methodology such as an instrumental variable analysis, which I was unable to conduct in this study. Furthermore, HealthPartners is generally known for having a larger focus and commitment to strengthen the capabilities of its primary care providers compared to other health systems in the Twin Cities (Alliance of Community Health Plans 2013). This attribute could attract patients with a preference for managing conditions through primary care rather than specialty care. I used health system fixed effects to control for differences in practice style across the primary care clinics when estimating the effect of switching clinics on costs and utilization (explain in **Section 5.4.**), however these preference differences are problematic if patients are able to influence the practice style of their providers. Such an

occurrence is plausible if primary care providers rely heavily on patient-centered care. I discuss this possibility and implications of this occurrence in the results (**Section 6.**) and subsequent discussion (**Section 7.**).

5.4. Effects of Switching Primary Care Clinics on Costs and Utilization

Using a difference-in-differences approach, I compared the costs and utilization of new MEE enrollees who switched their primary care clinics in 2012 to new MEE enrollees who remained in their same clinics throughout the study period. **Figure 5-2** and **Figure 5-3** present the costs and utilization from 2008 through 2012, respectively, for MEE enrollees who switched primary care clinics in 2012 and enrollees who did not switch clinics. To correctly use a difference-in-differences approach the treatment and control groups must have parallel trends in outcomes during the pre-period in order to assume that any change in outcomes for the control group in the post-period is the correct counterfactual. This feature does not mean that the treatment and control groups must have insignificant differences in costs and utilization, but rather equal growth, as the treatment group indicator controls for the persistent differences. In my sample, the primary care clinic switchers were healthier than the non-switchers and generally had lower costs and utilization throughout the pre-period. However, the only major differences in the growth between the primary care clinic switchers and non-switchers were between 2008 and 2009, when the non-switchers had larger increases in total and non-ED outpatient expenditures as the well the percent of enrollees with a hospitalization. Given these significant growth differences, I used 2009 through 2012 as the study period and exclude all prior years. From 2009 through 2011, no significant differences in the costs or utilization trends existed between the primary care clinic switchers and non-switchers, with only one exception of a significant (p-value=0.064) decrease in the percent of enrollees with a hospitalization for non-switchers relative to clinic switchers from 2009 to 2010.

I estimated several cost and utilization outcomes from 2009 through 2012 using the same model. For brevity, I present a linear model below, although the specific regressions used were non-linear. The linear combination of right-hand side variables remained the same in all regressions. Specifically, I modeled each outcome *Y* for person *i* at time *t* as:

$$Y_{it} = \alpha + \delta_t Switcher_i * \tau_t + \beta_1 Switcher_i + \beta_2 Health_{i,t-1} + \beta_3 Female_i + \beta_4 Age_{it} + \tau_t + \epsilon_{it}$$

where *Switcher* is an indicator for whether an enrollee switched his or her primary care clinic in 2012 (equal to 1) or did not switch clinics (equal to 0). I interacted *Switcher* with year dummy variables (τ) to control for differential time trends in costs and utilization for primary care switchers and non-switchers. The interaction term, *Switcher* * τ_{2012}, captures the treatment effect of switching primary care clinics in the post-period after the UPlan dropped the HealthPartners plan, thus making the parameter δ_{2012} the difference-in-differences estimate. *Health* is the individual risk score calculated from ICD-9 diagnoses codes and prescription medications and is entered as a lag to avoid endogeneity between contemporaneous measures of utilization and health. I found that using *Health* in a continuous and linear fashion produced expenditures results that were sensitive to the inclusion and exclusion of outlier observations with very large risk scores. To avoid this issue, I used health risk quartiles (based on the full UPlan population) with quartile 1 including the healthiest enrollees and quartile 4 including the sickest enrollees. The model also controlled for differences in costs and utilization by sex and age. Year dummy variables (τ) were included in the model to control for general time trends in utilization. The year 2012 dummy variable also controlled for changes in utilization due to enrollment in the limited network plan that were the same for the primary care clinics switchers and non-switchers. Lastly, ε is an idiosyncratic error term.

Two possible reasons switching primary care clinics may affect costs and utilization are a disruption to continuity-of-care and selecting a clinic with different attributes (e.g. physician practice style, quality, etc.) than the previous clinic. To take these possible occurrences into account, I also estimated a model that included health system fixed effects and clinic performance on clinical and behavioral quality. The health system fixed

effects controlled for time-invariant attributes of primary care clinics' health systems, while the performance measures helped control for differences in quality over time. Ideally, I would have used clinic fixed effects rather than health system fixed effects, however several models were unable to converge with clinic fixed effects due to enrollees being assigned to over 200 clinics, some having only a few assigned enrollees. Given high-levels of integration exhibited by health systems in Minnesota, the attributes of primary care clinics within the same system are unlikely to greatly vary. Recent research showing that clinics within health system have similar clinical and behavioral quality for diabetes care supports this notion (Crespin et al. 2016). By adding these explanatory variables to the model, I can better infer whether any significant effect of switching primary care clinics is tied to issues of continuity-of-care versus clinic attributes. In particular, if the treatment effect is significant without the added health system fixed effects and performance measures, but insignificant with them, then the effect of switching primary care clinics is likely due to differences in clinic attributes. On the other hand if the inclusion of the health system fixed effects and performance measures has no effect on the significance or magnitude of the treatment effect, it is more likely that the effect of switching primary care clinics is associated with aspects of discontinuous care.

The effect of switching primary care providers for sicker patients is of particular concern, because they have the most to gain from sustained primary care provider relationships and receiving care at the highest quality providers (Bodenheimer 2008; Nutting et al. 2003). Therefore, I also estimated each model including triple interaction terms between *Switcher*, *Health* and the year dummy variables (τ) to determine if switching primary care clinics had different effects by health risk.

I began by estimating the probabilities of having had a hospitalization or an ED visit. I used probit regressions for these outcomes because the dependent variables are binary. A drawback of this model is that some of the health system fixed effects are perfect predictors of the outcomes because none of their assigned enrollees had a hospitalization or ED visit, which occurred at health systems with very few assigned enrollees. However,

this occurrence affected less than 1% of enrollee-year observations, which I dropped from the regressions that included health system fixed effects. In addition, no enrollees who switched primary care clinics and who were in the healthiest quartile had a hospitalization in 2012 and thus the treatment effect within the quartile was not estimable. I combined the two healthiest quartiles for the regression estimating the probability of having a hospitalization.

Second, I estimated the number of visits to primary care providers and the number of visits to specialty care providers. I used negative binomial regressions for these outcomes because the dependent variables are counts, both with a variance significantly different than its mean, thus breaking the assumptions of the Poisson model. I employed a zero-truncated regression for visits to primary care providers because all enrollees in the analytic sample had at least one primary care visit (needed to be assigned to a primary care clinic). Conversely, a truncated regression was not necessary for estimating visits with specialty care providers because 47% of enrollee-year observations did not have a visit with a specialty care provider.

Third, I estimated total, non-ED outpatient, prescription drug, hospital inpatient, and ED expenditures. Because the vast majority of enrollees had no hospital inpatient or ED costs, I elected to use a two-part model to estimate these costs, using the above utilization models to obtain the probabilities of having had a hospitalization or an ED visit. Then, I estimated hospital inpatient and ED costs using models conditional on utilization. I calculated the effect of switching primary care clinics as the predicted probability of utilization in 2012 multiplied by the cost associated with switching clinics conditional on utilization. For all cost outcomes, I follow the algorithm of Manning and Mullahy (2001) to select the functional form of the regressions for health care costs. In all cases I used generalized liner models with a logarithm link function. I used a Poisson variance structure for total, non-ED outpatient, and prescription drug expenditures. I used a gamma variance structure for hospital inpatient and ED expenditures.

The interaction terms that were used to estimate the treatment effects of switching primary care clinics are not directly interpretable, either in magnitude or significance, because I used non-linear models. Due to this non-linearity, the treatment effects vary over the different combinations of the explanatory variables. I followed the suggestion of Karaca-Mandic, Norton, and Dowd (2011) to obtain interpretable treatment effects. First, I calculated the average marginal effect of *Switcher* for each year. Then I measured the effect of switching primary care clinics as the average marginal effect of *Switcher* in 2012 minus the average marginal effect of *Switcher* in 2011. For the models with health risk interactions, I estimated a switcher-year average marginal effect for each health risk quartile to obtain a treatment effect for each quartile.

In all regressions, I clustered my standard errors by enrollee to adjust for correlation between observations from the same individual over time. These clustered standard errors are used to determine the significance of the marginal effects, with the exception of the two part models for hospital inpatient and ED costs. Due to the complexity of calculating their standard errors through conventional means, I used bootstrapping to obtain standard errors for the two-part models. I drew random samples (equal to the full sample size) with replacement and re-estimated the model and expected cost calculations 200 times. I used the standard deviations from those 200 calculations as the standard errors of expected costs.

5.5. Difference in Quality After Switching Primary Care Clinics

I compared the performance of the primary care clinics chosen by the new MEE plan enrollees who switched clinics to their previous clinics under the HealthPartners plan. This analysis gives an estimate of the level of quality enrollees who switched primary care clinics would have received if they could have kept their original clinics. For this analysis, I employed performance measures for clinical and behavioral quality as well as patient experience as reported by MNCM for services obtained in 2012. For each measure, I used a paired t-test to determine if a significant difference existed in the

performance of enrollees' new clinics relative to their previous clinics. Enrollees in worse health may be more likely to seek out higher quality primary care clinics compared to relatively healthy enrollees, thus I also report these statistics stratified by health risk quartile.

5.6. Clinic Attributes Associated with Primary Care Clinic Choices

In my last analysis I describe the characteristics of the primary care clinics chosen by the new MEE plan enrollees who switched clinics. The particular focus of this analysis is to understand the relative magnitudes of the associations between primary care clinic attributes and clinic choices. Economists have commonly used random utility theory to describe consumers' discrete choices of goods and services (Greene 2012). In this application, enrollees associate utility with each primary care clinic based on the characteristics of each clinic. For primary care clinic *j*, enrollee *i*'s utility *u* is given by:

$$u_{ij} = X_j\beta + \varepsilon_{ij}$$

where *X* represents a vector of primary care clinic characteristics (e.g. quality, distance to the clinic, etc.) and ε is a clinic-specific error term. With two choices (Clinic A and Clinic B), the enrollee compares the utility associated with each choice and selects Clinic A if $u_{iA} > u_{iB}$ and Clinic B if $u_{iB} > u_{iA}$. Assuming that ε have standard Type I extreme value distributions with density:

$$f(\varepsilon_{ij}) = e^{-e^{-\varepsilon_{ij}}}$$

then the probability enrollee *i* chooses clinic *j* from *m* clinics is given by:

$$P_{ij} = \frac{e^{X_j\beta}}{\sum_{m=1}^{J} e^{X_m\beta}}$$

which may be estimated with maximum likelihood estimation. This model is commonly known as the conditional logit model. The magnitudes of the parameters (β) represent the relative utility associated with each primary care clinic characteristic.

However, the conditional logit model is held to the restrictive assumption of independence of irrelevant alternatives. In other words, the clinic-specific errors terms must be independent from one another, such that the removal of any one choice does not influence the estimated odds of selecting any other choice (Greene 2012). Correlation of the clinic-specific error terms can arise when a subset of choice are close substitutes for one another. In this study, enrollees may view primary care clinics in the same health system as substitutes because they have the same brand name and offer integrated, system-wide care. In addition, the eight HealthPartners primary care clinics that remained in-network under the MEE plan may be close substitutes with one another, because they offered enrollees the benefit of staying within the same health system.

To relax the assumption of independence of irrelevant alternatives, I estimated two nested logit models alongside the non-nested conditional logit model. The first nested logit model is a two-branch model allowing HealthPartners to have its own branch. For the second model, I allowed one branch for each large health system in the Twin Cities, while grouping the smaller systems into their own branch. These large health systems include HealthPartners along with Allina Health (46), Fairview Health Services (39 clinics), HealthEast Care System (14), Park Nicollet Health Services (19), and University of Minnesota Physicians (6). The primary care clinics of these health systems accounted for 90% of all primary care clinics choices. The nested logit model estimates the probabilities of choosing each health system and the conditional probabilities of choosing each primary care clinic given the system choice. The probability of individual *i* choosing health system branch *l* of *n* branches is:

$$P_{il} = \frac{e^{Z_{il}\gamma+\theta I_l}}{\sum_{n=1}^{N} e^{Z_{in}\gamma+\theta I_n}}$$

where Z represents variables that explain the health system branch choice. In this study, these variables were enrollee demographic indicators for age, sex, and health risk. The indicator I is the inclusive value and it, along with its parameter (θ), corresponds to the expected utility enrollees derived from the primary care clinic choices in health system branch l and was used to scale the parameters to take into account individuals' preference over each system branch (Heiss 2002). By allowing enrollees to weigh their health system choices by the inclusive value, the independence of irrelevant alternatives assumption is relaxed such that it only needs to hold within each system branch. The inclusive value is defined as:

$$e^{I_l} = \sum_{n=1}^{N} e^{X_{il}\beta}$$

Then, the unconditional probability of individual i choosing primary care clinic j of m choices is:

$$P_{ijl} = P_{ij|l} * P_{il} = \frac{e^{X_{jl}\beta}}{\sum_{m=1}^{M} e^{X_{ml}\beta}} * \frac{e^{Z_{il}\gamma+\theta I_l}}{\sum_{n=1}^{N} e^{Z_{in}\gamma+\theta I_n}} = \frac{e^{Z_{il}\gamma+\theta I_l}}{\sum_{n=1}^{N}\sum_{m=1}^{M} e^{Z_{in}\gamma+X_{mn}\beta}} * \frac{e^{X_{jl}\beta}}{e^{I_l}}$$

where $P_{ij|l}$ is the probability of choosing primary care clinic j given the choice of health system branch l and P_{il} is the probability of choosing system branch l. This model may be estimated in one-step using full information likelihood estimation. If θ is not significantly different than one, then enrollees weigh each health system equally and the model collapses to the non-nested version.

Estimation of the nested logit models produced parameter estimates for the primary care clinic attributes (β), the enrollee demographics determining health system choice (γ) and the inclusive values (θ). I used these parameters to calculate the elasticity of the probability of primary care clinic choice with respect to each clinic attribute. The elasticity of choosing primary care clinic j in health system l with respect to clinic attribute $x \in X$ is:

$$\eta_{jlx} = x_{jl}\{(1 - P_{j|l}) + \theta_l(1 - P_l)P_{j|l}\}\beta_x$$

I calculated each elasticity for each enrollee using his or her observed data for x. Then, I averaged over all enrollee-observations of the same health system to produce an average elasticity for each system. I used bootstrapping to obtain standard errors. I drew random samples (equal to the full sample size) with replacement and re-estimated the model and elasticity calculations 200 times. I used the standard deviations from those 200 calculations as the standard errors.

I included several primary care clinic characteristics in the model. Quality indicators included the clinic performance measures for clinical quality, behavioral quality, and patient experience. For the patient experience measures, the correlation coefficient for Getting Care When Needed and Overall Provider Rating was 0.80. Inclusion of both of these indicators led to issues of inconsistency due to multicollinearity and I therefore choose to exclude Overall Provider Rating. The inclusion of the performance measures excluded 7% of enrollees (N = 81) because they switched to primary care clinics that did not report to MNCM. In addition, another 7% of enrollees (N = 80) switched to primary care clinics for which no patient experience measures were reported, although clinical and behavioral performance measures were. For this reason, I ran two sets of models, one including the patient experience measures and one excluding them.

I also included several non-quality attributes that could influence primary care clinic choices. First, because individuals are likely to choose primary care clinics that require less travel, I included distance from the center of individuals' zip codes of residence to the clinic. I also included measures related to physician and patient mix. I included the number of physicians, the percent of specialty care physicians, and the percent of female physicians. Lastly, I included the percent of patients with diabetes who are enrolled in Medicare or MHCP because the privately insured enrollees of this study may have been less likely to choose primary care clinics with a high proportion of patients with public insurance. Unfortunately, the MNCM data only included the payor mix for patients with diabetes and not for all-cause patients. Thus, I worked under the assumption that the

percent of patients with diabetes by payor is the same for all-cause patients within each primary care clinic.

Estimating the model necessitated constructing the set of primary care clinics from which each enrollee could reasonably choose. I constructed the choice sets based on willingness to travel. In 2012, the Washington State Office of Financial Management surveyed individuals and asked how far they traveled for routine care (Yen 2013). The author found that urban individuals traveled approximately 7.5 miles on average while non-urban individuals traveled roughly 10.0 miles. I used these estimates to determine the radii for enrollees' clinic choice sets. Because some enrollees necessarily travel more than the average I add 5 miles for urban and 7.5 miles for rural enrollees to the average travel distance. Thus, I defined an urban (rural) enrollee's choice set as all clinic within a 12.5-mile (17.5-mile) radius from the center of his or her zip code of residence. This method excluded only 7% of enrollees, who chose a primary care clinic that was not within their defined market area (N = 81). Demographically, these enrollees were similar to the non-excluded enrollees and no clear pattern in their primary care clinic choices existed, making it difficult to determine why they choose clinics that were farther away.

6. Results

6.1. Effects of Switching Primary Care Clinics on Costs and Utilization

Table 6-1 through **Table 6-5** present the coefficients of the regression estimates predicting costs and utilization for UPlan enrollees who enrolled in the MEE plan in 2012. The interaction terms that determine the effects of switching primary care clinics are not directly interpretable, either in magnitude or significance, because I employed non-linear regression models. I present interpretable results of the effects of switching primary care clinics in corresponding figures denoted in the text (**Figure 6-1**, **Figure 6-2**, **Figure 6-5**, and **Figure 6-6**). With only two exceptions (called out in the text below), I found little difference in the effect of switching primary care clinics when I included health system fixed effects and clinic performance measures. To avoid redundancy, the figures and text present results from the full model that includes the health system fixed effects and the clinic performance measures unless otherwise noted.

I found no evidence that switching primary care clinics had an effect on the probabilities of having a hospitalization or an ED visit (**Table 6-1** and **Figure 6-1**). **Figure 6-1** shows that none of the average marginal effects of switching primary care clinics on these outcomes were statistically significant, either for the overall study population or within each individual health risk quartile. For enrollees in the sickest health risk quartile, the effect of switching primary care clinics on the probability of having a hospitalization was large in terms of magnitude (6.8 percentage points (95% Confidence Interval (CI): -8.2 to 15.7)) but imprecisely estimated (p-value = 0.367), producing little confidence that it was a true effect.

Switching primary care clinics did affect the number of visits with primary care and specialty care providers. Coefficients for the models predicting visits with primary care and specialty care providers are presented in **Table 6-2**. Without controlling for health system fixed effects and clinic performance, I found that switching primary care clinics was associated with an average increase of 0.22 (95% CI: -0.02 to 0.46) primary care

visits per year. However, this effect was insignificant when I included the health system fixed effects and clinic performances (**Figure 6-2**), suggesting that the increase in primary care visits after switching primary care clinics likely was due to differences in clinic attributes between enrollees' new and previous clinics rather than a disruption of continuity-of-care. In part, the increase in primary care visits after switching primary care clinics may have been due to the quality of the new clinic choices. The regression results indicate that enrollees assigned to primary care clinics with lower clinical performance had more primary care visits (0.03 visits per 1 percentage point decrease in clinical performance (95% CI: 0.01 to 0.05)). If enrollees switched to primary care clinics of lower clinical quality (which on average they did, see **Section 6.2.**) then they would have had an increase in primary care visits associated with the quality of the clinics. When I estimated the marginal effect of switching primary care clinics for each health risk quartile (**Figure 6-2**) I found that for the sickest health risk quartile, enrollees who switched clinics had 1.01 (95% CI: 0.08 to 1.95) more primary care visits than enrollees who did not switch clinics. This result held with and without the health system fixed effects and clinic performance, suggesting that it was tied to discontinuous care rather than clinic attributes. No significant effect of switching primary care clinics on primary care visits existed for the other health risk quartiles.

I found that enrollees who switched primary care clinics had fewer visits with specialty care providers than enrollees who did not switch clinics. Without controlling for health system fixed effects or clinic performance, enrollees who switched primary care clinics had on average 0.33 (95% CI: 0.14 to 0.52) fewer visits with specialty care providers than enrollees who did not switch clinics. The magnitude of the effect size increased to 0.50 (95% CI: 0.22 to 0.78) fewer visits when the health system fixed effects and clinic performance were included (**Figure 6-2**). Because the effect remained significant, this result suggests that the decrease in specialty care provider visits for enrollees who switched primary care clinics is associated with disruptions to continuity-of-care. The change in magnitude of the effect with the inclusion of the health system fixed effects and clinic performance implies that enrollees switched to primary care clinics that used more specialty care than their previous clinics. While enrollees did have fewer specialty

care provider visits after switching primary care clinics, my result indicate that these enrollees would have had even fewer visits if they had switched to clinics with the same attributes as their previous clinics. The quality of the primary care clinics may play a role in the effect size change. Enrollees at primary care clinics with lower behavioral performance had more visits with specialty care providers (0.020 visits per 1 percentage point decrease in behavioral performance (95% CI: 0.006 to 0.034)). Because enrollees switched to primary care clinics with lower behavioral performance and behavioral performance was negatively correlated with specialty care provider visits, the exclusion of behavioral performance leads to an upward omitted variable bias on the effect of switching clinics (-0.33 > -0.50). However, clinical quality was positively correlated with specialty care provider visits (0.015 visits per 1 percentage point increase in clinical performance (95% CI: 0.003 to 0.027)) and thus its omitted variable bias would be downward. Given the similarity in the magnitude of the marginal effects for behavioral and clinical quality, but opposite signs, the influence of these two measures could cancel out when determining the omitted variable bias, therefore, other attributes of enrollees' new primary care clinics likely are associated with more utilization of specialty care.

I found a similar decrease in specialty care provider visits after switching primary care clinics among the middle two health risk quartiles (**Figure 6-2**). Here, I present results from the full model including health system fixed effects and clinic performance. For the 2nd quartile switching primary care clinics was associated with a 0.77 (95% CI: 0.46 to 1.07) decrease in visits with specialty care providers and for the 3rd quartile switching clinics was associated with a 0.48 (95% CI: -0.10 to 1.07) decrease in visits. For the 4th quartile (sickest enrollees), the average marginal effect was of similar magnitude (0.50 visits), however the preciseness of the estimate was slightly outside conventional significance levels with a p-value of 0.178 and 95% CI of -0.23 to 1.23.

I examined the change in the timing of visits with primary care and specialty care providers to better understand how enrollees' utilization changed after switching primary care clinics. **Figure 6-3** presents the change from the previous year in the number of primary care visits by month for enrollees in the sickest health quartile who switched

primary care clinics compared to enrollees who did not switch clinics. Overall, the increase in primary care visits after switching primary care clinics occurred from February through April. **Figure 6-4** shows the timing of visits with specialty care providers for enrollees in the three sickest health risk quartiles. As expected, because the enrollees moved from a broad to limited network plan, both enrollees who switched primary care clinics and enrollees who did not switch had fewer visits with specialty care providers in the beginning of 2012 relative to 2011. However, enrollees who switched primary care clinics had fewer specialty care visits in every month in the year (except for a tie in October) after switching clinics compared to the previous year, while enrollees who did not switch clinics were at or near their 2011 level (including have more specialty care provider visits in 4 months) starting in March. The largest difference for this disparity occurred from February through July, with the exception of April. The increase in specialty care provider visits in April for enrollees who switched clinics is driven by enrollees in the sickest quartile who also experienced their increase in primary care visits at that time. These results suggest that enrollees were not accessing specialty care providers in early 2012, either due to difficulty in obtaining care or choosing to not seek specialty care during this time. The increase in primary care visits among the sickest enrollees may be, in part, a substitution for specialty care provider visits.

The timing of these visits bolsters the evidence that these effects are tied to disruptions in continuity-of-care rather than the attributes of the primary care clinics or unobserved enrollees characteristics. As noted in **Section 5.3.** a potential source of selection bias in this analysis is that enrollees who originally selected HealthPartners primary care clinics may systematical differ from enrollees who initially selected clinics in other health systems, for example, by having a preference to have illnesses managed through primary care rather than specialty care. However, if systematic differences between the switchers and non-switchers drove these results, then I would expect that the differences in visits, particularly for visits with specialty care providers, would have been persistent throughout the entire year after switching primary care clinics rather than only during the first-half of the year.

In **Table 6-3**, I explore differences in visits with specialty care providers by specialty type. I present these data in two ways, both corresponding to differences that occurred in the first 7 months of 2012, when the largest decrease in specialty care provider visits occurred. The first column simply shows the difference in visits between the first 7 months of 2012 and the first 7 months of 2011 for enrollees who switched primary care clinics. The second column presents a differences-in-differences statistic taking the difference in visits per enrollee for the clinic switchers and subtracting from it the difference in visits per enrollee for the non-switchers. The cell sizes within each specialty are quite small (between 10 to 75 visits per group for each 7 month period) and thus caution must be taken in generalizing these results. Using either statistic in **Table 6-3**, the largest decrease in specialty care provider visits was for dermatology, for which clinic switchers (N = 823) had 33 fewer visits in the first 7 months of 2012 relative to 2011. Other specialties with potentially large health implications among the specialties with the largest differences included oncology (25 fewer visits) and general surgery (23 fewer visits).

I found little evidence suggesting that switching primary care clinics had an effect on expenditures of any type. I report the coefficients for the expenditure regressions in **Table 6-4** (Total), **Table 6-5** (Non-ED Outpatient and Prescription Drug) and **Table 6-6** (Hospital Inpatient and ED) with the average marginal effect of switching clinics presented in **Figure 6-5** (Total, Non-ED Outpatient and Prescription Drug) and **Figure 6-6** (Hospital Inpatient and ED). The only significant effects of switching primary care clinics on expenditures were on total and non-ED outpatient expenditures for enrollees of the 2nd health risk quartile (**Figure 6-5**). Enrollees in the 2nd health risk quartile who switched primary care clinics had $1,593 (95% CI: $88 to $3,275) less in total expenditures and $1,458 (95% CI: $246 to $2,670) less in non-ED outpatient expenditures, on average, compared to enrollees who did not switch clinics (**Figure 6-5**). The closeness of these two estimates implies nearly the entire increase in total expenditures was the increase in non-ED outpatient expenditures. However, these enrollees experienced an increase in non-ED outpatient expenditures in 2011 relative to enrollees who did not switch clinics. For enrollees in the 2nd health risk quartile in 2011,

enrollees who switched primary care clinics had $1,055 (95% CI: $233 to $1,878) more in non-ED outpatient expenditures compared to enrollees who did not switch clinics (data not shown). Together, the positive effect in 2011 (before switching primary care clinics) and the negative effect of similar magnitude in 2012 (after switching clinics), make it unlikely that the effect in 2012 was completely due to switching clinics. A potential explanation is that these enrollees could have received additional care in late-2011, knowing that some of their providers would become out-of-network in the following year and thus would have received less care in 2012. However, if this scenario had occurred then I would have expected to observe increases in visits with primary care and specialty care providers in late-2011, which did not happen (see **Figure 6-4** for specialty care provider visits), as well as a similar pattern for enrollees of the other health risk quartiles, which also did not occur. Given that these patterns did not exist, this result likely is attributable to statistical noise or regression to the mean for this subset of enrollees. Interestingly, the magnitude of the effect of switching primary care clinics for enrollees in the sickest health risk quartile on total expenditures was large ($1,471 (95%: -$6,108 to $9,052)), although it was very imprecisely estimated (p-value = 0.704) due to imprecision in the estimation of hospital inpatient expenditures (**Figure 6-6**). Overall, these results provide little evidence that switching primary care clinics had an effect on expenditures.

I repeated the full analysis including the voluntary switchers who were originally assigned to non-HealthPartners primary care clinics in the control group. I conducted this sensitivity analysis to infer whether the presence of enrollees in the treatment group who would have voluntarily switched primary care clinics, regardless of their enrollment in the MEE plan, biases the interpretation of the results as the effect of being forced to switch clinics. Like the main analysis, no significant differences in the probabilities of having had a hospitalization or an ED visit, or any of the expenditures measures existed between the enrollees formerly assigned to HealthPartners primary care clinics and the enrollees who were assigned to clinics that they could remain in. Because these effects remained insignificant from zero, they imply that both voluntary and non-voluntary switching had no effect on these outcomes. If voluntary switching was associated with

changes in these outcomes, then significant differences between the former HealthPartners utilizers and the enrollees initially assigned to clinics in other health systems likely would have arisen from the influence of the voluntary switchers in the control group.

Similar to the main analysis, the only significant results of this sensitivity analysis were for the counts of primary care and specialty care provider visits. For enrollees in the sickest health risk quartile, having been assigned to a HealthPartners primary care clinic was associated with 1.05 (95% CI: 0.23 to 1.87) more primary care visits after enrollment in the MEE plan. Compared to only non-switchers (from the main analysis), the former HealthPartners utilizers had 1.01 (95% CI: 0.08 to 1.95) more primary care visits. Because this estimated effect remained nearly the same with the inclusion of the voluntary switchers in the control group, it is likely that voluntary switching was not associated with an increase in primary care visits. If the voluntary switchers had an increase in primary care visits, then their inclusion in the control group likely would have driven the estimated effect in the sensitivity analysis toward zero. Additionally, having been a HealthPartners utilizer was associated with a decrease in visits with specialty care providers. On average, enrollees who were initially assigned to HealthPartners primary care clinics had 0.32 (95% CI: 0.09 to 0.55) fewer visits with specialty care providers than enrollees who were initially assigned to clinics in other health systems. Like the main analysis, this effect was attributed to the three sickest health risk quartiles (0.60 (95% CI: 0.34 to 0.86) fewer visits for enrollees in the 2nd health risk quartile, 0.28 (95% CI: -0.02 to 0.58) fewer visits for enrollees in the 3rd health risk quartile, and 0.31 (95% CI: 0.03 to 0.59) fewer visits for enrollees in the 4th (sickest) health risk quartile). This effect was smaller than the 0.50 (95% CI: 0.22 to 0.78) decrease in visits found in the main analysis. The attenuation of the effect size towards zero with the inclusion of the voluntary switchers implies that the voluntary switchers also experienced a decrease in visits with specialty care providers after enrollment in the MEE plan. To arrive at the 0.32 effect size of the sensitivity analysis, the voluntary switchers included in the control group would needed to have had a similar decrease in specialty care provider visits compared to the enrollees who switched out of the HealthPartners primary care clinics.

Expressing the 0.32 effect size as the average of the differences in visits (relative to non-switchers) for the enrollees initially assigned to HealthPartners primary care clinics, enrollees originally assigned to non-HealthPartners clinics who did not voluntary switch, and enrollees originally assigned to non-HealthPartners clinics who did voluntary switched gives the following:

$$0.32 = \frac{\begin{array}{c}(\Delta Visits_{treatment} * \#Treatment) + \\ \left(\Delta Visits_{control,switch=0} * \#Control, Switch = 0\right) + \\ \left(\Delta Visits_{control,switch=1} * \#Control, Switch = 1\right)\end{array}}{(\#Treated + \#Control, Switch = 0 + \#Control, Switch = 1)}$$

$$0.32 = \frac{\begin{array}{c}(0.50 * 1151) + \\ (0 * 916) + \\ \left(\Delta Visits_{control,switch=1} * 651\right)\end{array}}{(1151 + 916 + 651)}$$

Solving this equation yields $\Delta Visits_{control,\ switch=1} = 0.45$.

With the exception of the difference in primary care visits among enrollees in the sickest health risk quartile, this sensitivity analysis implies that the effect of switching primary care clinics with enrollment in the limited network MEE plan was similar for both voluntary and forced switchers.

6.2. Difference in Performance after Switching Primary Care Clinics

On average, enrollees who switched primary care clinics obtained care at clinics with lower performance pertaining to clinical and behavioral quality as well as patient experience than if they had been able to keep their 2011 primary care clinics. **Figure 6-6** presents the differences in 2012 performance for clinical and behavioral quality between enrollees' new primary care clinics and their previous clinics. On average, enrollees switched to primary care clinics whose clinical quality performance was 1.3 percentage points (95% CI: 0.9 to 1.7) lower than their previous clinics. Similarly, enrollees

switched to primary care clinics with 1.1 percentage points (95% CI: 0.8 to 1.6) worse performance pertaining to behavioral quality. These results were similar for all health risk quartiles.

Results pertaining to patient experience are presented in **Figure 6-7**. The largest difference was for Getting Care When Needed. Enrollees switched to primary care clinics where the percent of patients rating the clinics most favorably was 5.4 percentage points (95% CI: 4.9 to 5.9) lower on average than their previous clinics. I found smaller differences for Provider Communication (0.8 percentage points (95% CI: 0.6 to 1.1)) and Courteous and Helpful Staff (1.4 percentage points ((95% CI: 1.2 to 1.6)). I found no significant difference between enrollees' new primary are clinics and their previous clinics for Overall Provider Rating, which measures the percent of patients giving the clinic an overall rating of 9 or 10 out of 10. These results generally hold for all health risk quartiles.

6.3. Clinic Attributes Associated with Primary Care Clinic Choices

Table 6-7 presents the coefficients of the multinomial logit models predicting primary care clinics choices. The magnitudes of the coefficients are not directly interpretable, but their signs indicate the direction of their influence, and the order of the magnitudes reflects the relative influence of each explanatory variable. For each of the nested logit models, the parameters on the health system inclusive values had a joint significance that was different than one, suggesting that enrollees displayed preference heterogeneity over the characteristics of primary care clinics by health system. This result implies that the non-nested conditional logit model violates the independence of irrelevant alternatives assumption and is inconsistent. Changes in the significance and magnitude of the coefficients on clinic performance across the different models (**Table 6-6**) highlight the importance of using the nested model. Most prominently, while the coefficients on clinical and behavioral performance are strongly significant in the non-nested model, their significance decreases in the nested models. When I included a nest for each large

health system, I found that clinical performance had no significant effect on the probability of choosing a specific primary care clinic. These results suggest that including a branch for each large health system is optimal.

HealthPartners had the largest inclusive value in all the models, ranging from 1.25 to 1.57 (**Table 6-7**). Intuitively, all of the enrollees had chosen HealthPartners primary care clinics under their previous health plan, suggesting they would receive more utility from HealthPartners clinics than of clinics in other health systems. However, only 10.7% of enrollees chose a HealthPartners primary care clinic in 2012. Comparatively, Allina Health and Fairview Health Services had the most assigned enrollees at 28.2% and 24.5%, respectively, of all enrollees who switched primary care clinics.

The probability of choosing one of the in-network HealthPartners primary care clinics increased with health risk as evident by the positive and significant coefficients on the health risk quartiles for HealthPartners in the health system choice equation. Using the parameter estimates from the last column of **Table 6-6**, which include a nest for each large health system and the patient experience measures as explanatory variables, enrollees in the three sickest quartiles were approximately 10 percentage points more likely to choose a HealthPartners primary care clinic compared to enrollees in the healthiest quartile, at least in reference to the base branch of clinics not in large health systems.[11] HealthPartners was the only large health system with more than one significant health risk quartile coefficient, suggesting that the probability of choosing a HealthPartners primary care clinic increased with health risk relative to clinics in the other large systems as well. This result may imply that healthier patients are more difficult for health systems to retain compared to sicker patients.

Table 6-8 shows the primary care clinic choice probability elasticity with respect to clinic performance and other clinic attributes. These estimates are from the full model that included a nest for each large health system and the patient experience measures as

[11] This statistic is the average of the marginal effects of increasing from the healthiest quartile to each of the three sickest quartile on the probability of choosing a primary care clinic from within the HealthPartners clinics, calculated at the observed values of all enrollees who switched clinics.

explanatory variables. I found similar results when I excluded the patient experience measures. Because each health system had a different inclusive value, each system has its own elasticity set. I found no significant effect of clinics' clinical or behavioral quality on primary care clinic choice. The elasticity for each patient experience measure is surprisingly negative, likely implying that enrollees were choosing clinics based on attributes other than reported patient experience and by chance selected clinics with lower performance, perhaps because they were unaware of how patient experience varied across the clinics. The large negative elasticity for Provider Communication is likely reflective of low variation in the measure across primary care clinics (range:83% to 95%). I ran additional regressions without Provider Communication as an explanatory variable and I found that the elasticity with respect to the other explanatory variables did not significantly change with its exclusion.

Among the non-performance attributes, distance was a strong predictor of primary care clinic choice. A 1% decrease in distance from a primary care clinic was associated with a 3.0% to 3.7% increase in probability of choosing it, depending on its health system. Enrollees tended to select primary care clinics with a higher percentage of specialty care physicians. A 1% increase in the percent of specialty care physicians at a primary care clinic was associated with between a 0.2% and 0.3% increase in the probability of choosing it. In addition, enrollees were more likely to select primary care clinics where the patient mix had a lower percentage of patients enrolled in Medicare or MHCP, implying enrollees were more likely to choose clinics with a higher percentage of patients enrolled in private insurance. Overall, these results suggest that enrollees did not emphasize quality when selecting primary care clinics and were influenced by distance to the clinic, physician specialty mix, and payor mix.

7. Discussion

Employers are increasingly offering their employees limited, or narrow, network health plans. These health plans attempt to reduce medical expenditures and plan premiums by restricting enrollees' access to specific providers, typically high-cost hospitals and specialty care providers, similar to Health Maintenance Organizations and other managed care plans that preceded them. Because limited network plans eliminate entire health systems and physician practices from their provider networks, enrollees also can lose access to primary care providers. In this study, I analyzed the effects of switching primary care clinics on costs, utilization, and quality of care after enrollment in a limited network plan through the employee benefits plan of the University of Minnesota.

Switching primary care clinics did not affect expenditures of any type or the probabilities of having a hospitalization or an ED visit. This result implies that employers offering limited network plans may be unlikely to face higher financial costs associated with some enrollees switching primary care providers with enrollment in these types of plans. Switching primary care clinics after enrollment in the limited network plan did affect the amount of enrollees' outpatient E&M visits with primary care and specialty care providers. For enrollees in the three sickest health risk quartiles, switching primary care clinics was associated with approximately 0.50 fewer visits with specialty care providers in the following year compared to enrollees who did not switch clinics. This effect held after controlling for primary care clinic attributes including performance, implying that this effect was associated with disruptions of continuity-of-care. For enrollees in the sickest health risk quartile, switching primary care clinics also was associated with, on average, 1.01 (95% Confidence Interval (CI): 0.08 to 1.95) additional primary care visits. I found no similar increase in primary care visits for the remaining health risk quartiles With the exception of the effect of switching clinics on primary care visits for the sickest enrollees, these effects held for both enrollees who switched out of clinics that were excluded in the limited network plan as well as enrollees who voluntarily switched out of non-excluded clinics.

In general, my results contrast with findings reported in previous literature examining costs and utilization after switching providers. Gruber and McKnight (2016) found that limited network plan enrollees who switched primary care physicians had, on average, less visits with primary care providers, more visits with specialty care providers, and higher hospital inpatient expenditures relative to enrollees who kept their primary care physicians, although the authors did not investigate heterogeneity by health risk. Differences in the study settings used in this analysis and Gruber and McKnight (2016) may have generated these differences. Gruber and McKnight's (2016) setting employed a premium holiday that created a large financial incentive to encourage enrollment in limited network plans and also did not drop any of their broad network plans. These attributes may be atypical of the environments found at most employers and create a selection bias that would limit the generalizability of their results. Knowledge pertaining to the timing of specialty care provider visits in their population would be beneficial in understanding if their results are tied to easier access to specialty care providers compared to the enrollees who switched primary care clinics in this study. Furthermore, the differences in results may simply be due to using different health plans with different provider networks. This occurrence would highlight the difficulty in generalizing studies of limited network plans, especially due to variations in provider networks.

My results also generally contrast with the continuity-of-care literature that has found individuals who switch providers have more utilization and higher costs, generally through increases in hospitalizations and ED visits. The only increase in utilization in this study was for primary care visits among the sickest enrollees, which is similar to Raddish et al. (1999) and Hennelly and Boxerman (1979) who found individuals had more outpatient visits when they switched providers, although the authors did not distinguish between primary care and specialty care visits or by health risk. The majority of the continuity-of-care literature is based on cross-sectional data and may be susceptible to selection bias due to variation in health risk. Individuals who switch providers in these studies may appear to have more utilization and worse outcomes not because they switched providers but because they are persistently sicker than patients who remain with the same providers. In addition, the continuity-of-care literature does not explicitly

examine provider changes that occur due to changing health plans. Thus, continuity-of-care studies may be less likely to examine populations where individuals experience provider network changes that limited their access to specific providers.

Enrollees who switched primary care clinics had their largest decrease in specialty care visits in the first half-year of enrollment in the limited network plan. This occurrence may suggest that primary care providers have a large amount of control over their patients' specialty care utilization, including which providers their patients see, and that a continuous primary care physician and patient relationship helps facilitate the process of obtaining specialty care. Although enrollees in this study did not have to obtain a referral to receive specialty care, primary care providers are frequently responsible for recommending specialty care providers to their patients. Large integrated health systems dominate the study area of this analysis, and it is likely that primary care providers refer their patients to specialty care providers within their own system. On the other hand, if the use of specialty care providers was equally distributed among primary care clinics, then one would expect that both enrollees who switched clinics and who did not switch clinics would have had an equal decrease in specialty care provider visits with enrollment in the limited network plan. Thus, two plausible mechanisms for the decrease in specialty care visits after switching primary care clinics are: 1) enrollees had difficulty obtaining appointments with specialty care providers utilized by their new primary care providers, perhaps due to long wait times and 2) primary care providers were reluctant to refer some new patients to specialty care providers until after they attempted to manage illnesses through primary care. The increase in primary care visits that occurred in early in 2012 for enrollees in the sickest health risk quartile may be evidence of primary care providers substituting primary care for specialty care. Of course, a third possibility is that enrollees who switched primary care clinics simply choose to wait to seek specialty care after losing access to their usual providers.

The decreased utilization of specialty care providers is a potential negative implication of limited network plans for enrollees who must switch primary care providers. Past research has found patients often receive higher quality care from specialty care providers

for several conditions including diabetes (McAlister et al. 2007), asthma (Schatz et al. 2005; Vollmer et al. 1997), and drug therapy for myocardial infarction (Ayanian et al. 1994). My regression results corroborate these studies, indicating that enrollees assigned to primary care clinics with higher clinical performance for diabetes and vascular disease care had more specialty care visits (0.01 visits per 1 percentage point increase in clinical performance (95% CI: 0.0 to 0.03)) and less primary care visits (0.03 visits per 1 percentage point increase in clinical performance (95% CI: 0.01 to 0.05)). Delayed specialty care has also been linked to higher costs for some episodes of care, such as musculoskeletal conditions (Nyman et al. 1998). In this analysis, the decrease in specialty care visits occurred across multiple specialties and oncology as well as general surgery, for which delayed or missed care could have potentially large health consequences, were among the specialties with the largest decreases.

Aside from effects tied to disruptions in continuity-of-care, limited network plan enrollees who switch primary care providers may receive lower quality of care because they switch to relatively low-quality primary care providers, either due to network exclusions of high-quality providers or enrollees selecting new providers based on other considerations than quality. Although individuals state that they place importance on quality of care when selecting providers, they often have difficulty choosing high-quality providers (Victoor et al. 2012). On average, enrollees who switched primary care clinics in this study obtained care at clinics with lower performance on clinical and behavioral quality as well as patient experience than if they had been able to keep their previous clinics. However, these differences were relatively small, with the exception of a 5.4 percentage point average decrease in performance regarding patients' satisfaction with timeliness of care. Of enrollees who switched primary care clinics, distance, payor mix, and the percent of specialty physicians had the largest effects on their choices. The quality measures had little association with primary care clinic choice. Given that the exclusion of the HealthPartners primary care clinics from the limited network plan did not have a substantial impact on the average performance of clinics available, these results suggest that enrollees did not emphasize quality of care when choosing primary

care clinics, perhaps because they were not well informed when making their selections or had the perception that all providers in the study area are of high quality.

This analysis may also be applicable to non-employer settings including the widespread use of limited network plans in the health insurance marketplaces created as part of the ACA. One major concern in the ACA Marketplaces is the tying of cost-sharing subsidies for low-income families and individuals (with income at 100% to 250% of the Federal Poverty Level) to the second-lower cost tier (i.e. Silver Plans). Sixty-eight percent of individuals (8.5 million people) who enrolled in a health plan during 2016 open enrollment selected a Silver Plan (ASPE 2016) with 57% of these plans including less than 40% of their market areas' primary care physicians (Polsky and Weiner 2015). Furthermore, because of consumers' price sensitivity and year-to-year changes in which insurer offers the lowest cost plan in each state, inertia is relatively low in the ACA Marketplaces. In 2016, 43% of all continuous ACA Marketplace enrollees changed plans (ASPE 2016) compared to only 13% of individuals with employer-sponsored insurance in 2010 (Cunningham 2013). The desire for lower premiums could make primary care provider switching a recurrent event for price sensitive consumers in these markets.

The results of this study support the need to provide individuals with information pertaining to the characteristics of provider networks and the possible consequences of switching primary care providers. In particular, it will be important to notify potential limited network plan enrollees that they may be less likely to obtain specialty care if their current clinics or health systems are excluded. Consumers often have difficulty comparing provider networks across health plans (Peters and Holahan 2014) due to low health insurance literacy and an inability to access up-to-date provider directories (AcademyHealth 2014). For these reasons, consumers may select a limited network plan without realizing a commonly visited provider will be out-of-network. Finding new methods of displaying provider network information will be beneficial. Behavioral economic experiments have been useful in determining how to properly display quality and cost ratings to best inform consumers (Greene, Hibbard, and Sacks 2016). Similar experiments focusing on network availability could benefit marginal consumers in

making well-informed decisions, while still keeping limited network plans available as low-cost options.

7.1. Limitations

This study has limitations that constrain it scope and generalizability. First, I was limited to one employer and one limited network plan, Minnesota is dominated by large, integrated delivery systems and is generally considered to be one the top-ranking states in terms of quality of care and integration (Moody and Silow-Carroll 2009). Although I found that enrollees switched to primary care clinics of lower quality than their original clinics, their new clinics often were still in large, integrated health systems, which may have been of relatively high quality. This aspect may limit this study's external validity when compared to areas of relatively lower quality or lower states of integration. However, recent trends have shown an increase in the rates of mergers and acquisitions throughout the U.S. leading to more integrated health systems and concentrated markets, especially in urban areas (Baker, Bundorf, and Kessler 2014; Christianson, Carlin, and Warwick 2014). The recent proliferation of accoutable care organizaitons may have accelerated this integration between hospitals and physicians. These trends suggest that other markets are becoming more like the Twin Cities, thus allowing for the results of analyses conducted in the Twin Cities to be applicable to other areas.

Second, the health system exclusion of the limited network plan in this study raises questions pertaining to the external validity. In this study, the exclusion was of a large, integrated health system, and thus this analysis is most generalizable to limited network plans with a similar exclusion and may be less generalizable to plans with even narrower provider networks. The exclusion of a large health system is becoming more commonplace as employers aim to curb their administrative health plan costs. The Kaiser Family Foundation reported that 9% of employers (with 50 or more employees) offering health insurance had an insurer drop a hospital or health system in 2015 to reduce costs (KFF/HRET 2015), up from 6% in 2014 (KFF/HRET 2014). In addition, the external

validity of this study is potentially diminished because the health system excluded is not considered a high-cost system. Enrollees who had been utilizing the excluded primary care clinics may have switched to clinics in health systems with similar or even higher prices. In particular, this feature could place an upward bias on the result that switching primary care clinics was not associated with an increase in expenditures, at least in comparison to limited network plans that specifically exclude high-cost health systems. However, similar effects existed between enrollees forced out of the excluded primary care clinics and enrollees who voluntarily switched out of non-excluded clinics. This result implies that the estimated effects were tied to the act of switching clinics and not driven by the price differences between the excluded and non-excluded providers. Still, one should take caution in making broad generalizations. There is no agreed upon definition of what constitutes a limited provider network and variation in the types and number of providers included as well as excluded from these networks may influence the care enrollees receive. It will be important for researchers to recognize and state these details in order to compare studies and generalize results.

Third, I was unable to determine the mechanism explaining why enrollees who switched primary care clinics had fewer visits with specialty providers. In particular, it will be important to distinguish if the decrease in visits with specialty care providers occurred because of enrollees' difficulty in obtaining appointments, they had trouble receiving referrals from primary care providers, or if patients delayed their own specialty care for other reasons, such as waiting to seeing their new primary care provider. Understanding why the decrease in specialty care provider visits occurred likely will require qualitative analysis, such as interviewing limited network plan enrollees and providers.

A fourth major limitation of this study is the lack of individual measures of quality or patient experience. While I found enrollees switched to lower quality primary care clinics, I was unable to determine if enrollees did in fact experience lower clinical quality or satisfaction. Future studies examining individual quality measures, such as Hemoglobin A1c levels for patients with diabetes, will be valuable in determine the effect of provider switching and limited networks on enrollee wellbeing.

7.2. Conclusion

In this study I estimated the effect of switching primary care clinics after enrollment in a limited network plan through the benefits plan of the University of Minnesota. Switching primary care clinics was not associated with an increase in expenditures, hospitalizations, or ED visits, implying that employers offering limited network plans may be unlikely to face higher financial costs associated with some enrollees switching primary care providers. Switching primary care clinics was associated with a decrease in specialty care provider visits, highlighting that the clinics had a large amount of control over care that occurred downstream from primary care providers. In addition, enrollees obtained care at primary care clinics with significantly worse performance on publicly reported quality measures than if they had remained in their previous clinics, although these differences were relatively small. For individuals who would have to switch primary care clinics, enrollment in a limited network plan may not be appropriate if they are in need of timely specialty care. These results support the need to provide potential enrollees of limited network plans with information pertaining to the characteristics of provider networks and the possible consequences of switching primary care providers in order to allow them to make well-informed decisions regarding their health plans choices.

8. References

Abelson R. (2016, February 28). Trying to revive HMOs, but without those scarlet letters. *The New York Times*. Retrieved from: <http://www.nytimes.com/2016/02/29/business/trying?to?revive?hmos?but?without?those?scarlet?letters.html?_r=0>

AcademyHealth. (2014). *2014 Health Plan Features: Implications for Narrow Networks and the Trade-Off between Price and Choice*. Washington D.C.

Alliance of Community Health Plans. (2013). *Strengthening Primary care for Patients: HealthPartners*. Washington D.C.

Alpert J, Robertson L, Kosa J, et al. (1976). Effective use of comprehensive pediatric care. *Pediatrics* 57: 917–30.

Assistant Secretary for Planning and Evalation. (2016). *Health Insurance Markteplaces 2016 Open Enrollment Period: Final Enrollment Report*. Washington, D.C.

Ayanian J, Hauptman P, Guadagnoli E, et al. (1994). Knowledge and practices of generalist and specialist physicians regarding drug therapy for acute myocardial infarction. *New England Journal of Medicine* 331(17): 1136–42.

Baker LC, Bundorf MK, and Kessler DP. (2014). Vertical integration: hospital ownership of physician practices is associated with higher prices and spending. *Health Affairs* 33(5): 756-763.

Bodenheimer T. (2008). Coordinating care-a perilous journey through the health care system. *New England Journal of Medicine* 358(10): 1064–71.

Bureau of Labor Statistics. (2015). Labor Force Statistics from the Current Population Survey. Washington, D.C. Retrieved from: <http://www.bls.gov/cps/demographics.htm>.

Centers for Diease Control and Prevention. (2014). Ambulatory Care Use and Physician Office Visits. Retrieved from: <http://www.cdc.gov/nchs/fastats/physician-visits.htm.>

Christianson JB. (2014). Managed Care. In A. Culyer (Ed.), *Encyclopedia of Health Economics* (1st Edition., pp. 187–94). Waltham, MA: Elsevier, Inc.

Christianson JB, Carlin C, and Warrick L. (2014). The dynamics of community health care consolidation: acquisition of physician practices. *Milbank Quarterly* 92(3): 542-67.

Crespin DJ, Christianson JB, McCullough JS, and Finch MD. (2016). Do health system

have consistent performance across locations and is consistency associated with higher performance? *American Journal of Medical Quality*. ePub ahead of print retrieved from <http://ajm.sagepub.com/content/early/2016/07/02/1062860616656251.full>

Cunningham PJ. (2013). *Few Americans Switch Employer Health Plans for Better Quality, Lower Costs*. National Institute for Health Care Reform. Washington D.C.

Damman OC, Hendriks M, Rademakers J, et al. (2009). How do healthcare consumers process and evaluate comparative healthcare information? A qualitative study using cognitive interviews. *BMC Public Health* 14: 1–14.

Davis K, Collin, K, Schoen C, and Morris C. (1995). Choice matters: enrollees' views of their health plans. *Health Affairs* 14(2): 99–112.

Donaldson MS, Yordy KD, Lohr KN, and Vanselow NA. (1996). *Primary Care: America's Health in a New Era*. Washington, D.C.: National Academy Press.

Essential Hospitals Institute. (2013). *Integrated Health Care*. Washington, D.C.

Fasolo B., Reutskaja E., Dixon A, and Boyce T. (2010). Patient dducation and counseling helping patients choose : how to improve the design of comparative scorecards of hospital quality. *Patient Education and Counseling* 78(3): 344–349.

Fox P and Kongstvedt P. (2007). An Overview of Managed Care. In Kongstvedt P (Ed.), *The Essentials of Managed Health Care* (5th Edition., pp. 1–16). Sudbury, MA: Jones & Bartlett Publishers.

Greene J, Hibbard JH, and Sacks RM (2016). Summarized costs, placement of quality stars, and other online displays can help consumer select high-value health plans. *Health Affairs* 35(4): 671–9.

Greene WH. (2012). *Econometric Analysis*. 7th Edition. Saddle River, NH: Pearson Education Inc.

Gruber J, and McKnight R. (2016). Controlling health care costs through limited network insurance plans: evidence from Massachusetts state employees." *American Economic Journal: Economic Policy*. 8(2): 219-50.

Guilliford MC, Naithani S, and Morgan M. (2007). Continuity of care and intermediate outcomes of type 2 diabetes mellitus. *Family Practice* 24: 245-51.

Harris KM. (2003). How do patients choose physicians? Evidence from a national survey of enrollees in employment-related health plans. *Health Services Research* 38(2): 711-32.

Heagarty M, Roberston L, Kosa J, and Alpert J. (1970). Some comparitive costs in comprehensive versus fragmented pediatric care. *Pediatrics* 46: 596–603.

Health Maintenance Organization Act. (1973). 42 USC §300e et seq.

Heiss F. (2002). Structural choice analysis with nested logit models. *The Stata Journal* 2(3): 227–52.

Hennelly V and Boxerman S. (1979). Continuity of medical care: its impact on physician utilization. *Medical Care* 17(10): 1012–8.

Hjortdahl P and Borchgrevink C. (1991). Continuity of care: influence of general practitioners ' knowledge. *British Medical Journal* 303: 1181–1184.

Hoerger T and Howard L. (1995). Search behavior and choice of physicians in the market for prenatal care. *Medical Care* 33(4): 332-49.

Hueston WJ. (2010). Does having a personal physician improve quality of care in diabetes? *Journal of the American Board of Family Medicine* 23(1), 82–7.

Hussey PS, Schneider EC, Rudin RS, et al. (2014). Continuity and the costs of care for chronic disease. *JAMA* 174(5): 742-8.

Jee SH and Cabana MD. (2006). Indicides for continuity of care: a systematic review of the literature. *Medical Care Research and Review* 63(2): 158-88.

Joffe G, Rodwald L, Herbert T, et al. (1999). Scattering of primary care: doctor switching and utilization of health care by children on fee-for-service Medicaid. *Journal of Urban Healt* 76(3):322-334.

Kaiser Family Foundation (2000). *The Public, Managed Care, and Consumer Protection*. Menlo Park, CA.

Kaiser Family Foundation and Health Research and Education Trust. (2014). *Employer Health Benefits 2014 Annual Survey*. Menlo Park, CA.

Kaiser Family Foundation and Health Research and Education Trust. (2015). *Employer Health Benefits 2015 Annual Survey*. Menlo Park, CA.

Kocher R and Sahni NR. (2011). Hospitals' race to employ physicians-the logic behind a money-losing propostion. *New England Journal of Medicine* 364(19):1790-1793.

Karaca-Mandic P, Norton EC, and Dowd B. (2012). Interaction terms in nonlinear models. *Health Services Research*, 47(1): 255-74.

Kronick R, Gilmer T, Dreyfus T, and Lee L. (2000) Improving health-based payments for

Medicaid beneficiaries: CDPS. *Health Care Financing Review* 21(3): 29-64.

Kupersmith J. (2005). Quailty of care in teaching hospitals: a literature review. *Academic Medicine*. 80(5): 458-66.

Lo Sasso AT, and Atwood A. (2015). The Effect of Narrow Provider Networks on Health Care Use. Working Paper. University of Illinois-Chicago. Chicago, IL.

Mainous A, Koopman RJ, Gill JM, et al. (2004). Relationship between continuity of care and diabetes control: evidence from the Third National Health and Nutrition Examination Survey. *American Journal of Public Health* 94(1): 66–70.

Manning,WG. andMullahy J. (2001). Estimaing log models: to transform or not to transform? *Journal of Health Economics* 20(4): 461-94.

McAlister F, Majumdar S, Eurich D, and Johnson J. (2007). The effect of specialist care within the first year on subsequent outcomes in 24 232 adults with new-onset diabetes mellitus: population-based cohort study. *Quality and Safety in Health Care* 16: 6–11.

McCullough JS, Crespin DJ, Abraham JM, et al. (2015). Public reporting and the evolution of diabetes quality" *International Journal of Health Economics and Management.* 15(1): 127–38.

McKinsey Center for U.S. Health System Reform. (2015). *Hospital Networks: Evolution of the Configurations on the 2015 Exchanges*. Washington D.C.

Minnesota Community Measurement. *Patient Experience of Care Data Collection Guide*. (2014). Minneapolis, MN.

Moody G and Silow-Carroll S. (2009). *Aiming Higher for Health System Performance: A Profile of Seven States That Perfrom Well on the Commonwealth Fund's 2009 State Scorecard.* The Commonwealth Fund. New York, NY.

Nutting PA, Goodwin M, Flocke S, et al. (2003). Continuity of primary care: to whom does it matter and when ? *Annals of Family Medicine* 1(3): 149–55.

Nyman J, Manning W, Samuels S, and Morrey B. (1998). Can specialist reduce costs? *Clinical Orthopaedics and Related Research* (350): 257–67.

Parchman ML and Burge SK. (2003). The patient-physician relationship, primary care attributes, and preventive services. *Family Medicine* 36(1): 22-7.

Parchman M, Pugh J, Noel P, and Larme A. (2002). Continuity of care, self-management behaviors, and glucose control in patients with type 2 diabetes. *Medical Care* 40(2): 137–144.

Patient Protection and Affordable Care Act. (2010). 42 USC §18001 et seq.

Peters R, and Holahan J. (2014). *Narrow Networks, Access to Hospitals and Premiums : An Analysis of Marketplace Products in Six Cities*. Urban Institute. Washington D.C.

Polsky D, and Weiner J. (2015). *The Skinny on Narrow Networks in Health Insurance Marketplace Plans*. University of Pennsylvania and Robert Wood Johnson Foundation. Philadelphia, PA.

Raddish M, Horn S, and Sharkey P. (1999). Continuity of care: is it cost effective? *The American Journal of Managed Care 5*(6): 727–34.

Richards T. (2013). Top Hospitals Opt Out of Obamacare. *US News and World Report*. Retrieved from: <http://health.usnews.com/health-news/hospital-of-tomorrow/articles/2013/10/30/top-hospitals-opt-out-of-obamacare>.

Rodriguez HP, Rogers WH, Marshall RE, and Safran DG. (2007). The effects of primary care physician visit continuity on patients' experiences with care. *Journal of General Internal Medicine* 22: 787-93.

Saultz JW and Lochner J. (2005). Interpersonal continuity of care and care outcomes: a critical review. *Annals of Family Medicine* 3: 159-66.

Scanlon D, Shi Y, Bhandari N, and Christianson JB. (2015). Are healthcare quality "report cards" reaching consumers? Awareness in the chronically ill population. *American Journal of Managed Care 21*(3): 236–44.

Schatz M, Zeiger RS, Mosen D, et al. (2005). Improved asthma outcomes from allergy specialist care : A population-based cross-sectional analysis. *Journal of Allergy Clinical Immunology* 116: 1307–13.

Schwartz L, Woloshin S and Birkmeyer J. (2005) How do elderly patients decide where to go for major surgery? Telephone interview survey. *BMJ* 331:821–827.

Shepard M. (2016). *Hospital Network Competition and Adverse Selection : Evidence from the Massachusetts Health Insurance Exchange*. Working Paper. Harvard University. Cambridge, MA.

Starfield B. (1992). *Primary Care: Concept, Evaluation, and Policy*. New York, NY: Oxford University Press.

Strombom BA, Buchmueller TC, and Feldstein PJ. (2002). Switching costs, price sensitivity and health plan choice. *Journal of Health Economics* 21(1): 89–116.

Tower Watson. (2014). *The New Health Care Imperative: Driving Performance,*

Connecting to Value. Arlington, VA.

University of California-San Diego. (2012). Chronic Illness and Disability Payment System. Retreived from: <http://cdps.ucsd.edu/>.

University of Minnesota Office of Human Resources. (2011). *2011 Open Enrollment Update & UPlan Changes: Calendar Year 2012*. Minneapolis, MN. Retreived from: <https://www1.umn.edu/ohr/prod/groups/ohr/@pub/@ohr/documents/asset/ohr_asset_361472.pptx>

University of Minnesota Office of Institutional Resources. (2015). *2011 University of Minnesota: Employee Head Count*. Minneapolis, MN. Retreived from: <http://www.oir.umn.edu/hr/employee_count/report?filter%5B%5D=2&filtered_values%5B2%5D=UMNTC&pivot%5B%5D=1&rows%5B%5D=3&rows%5B%5D=5&show_dimensions=0>.

van Walraven C, Oake N, Jennings A, and Forster AJ. (2010). The association between continuity of care and outcomes: a systematic and critical review. *Journal of Evaluation in Clinical Practice* 16(5): 947–56.

Victoor A, Delnoij DMJ, Friele, RD, and Rademakers, JJDJM. (2012). Determinants of patient choice of healthcare providers: a scoping review. *BMC Health Services Research* 12(1): 272.

Vollmer WM, Hollaren MO, Kenneth M, et al. (1997). Specialty differences in the management of asthma. *Archives of Internal Medicine*, 157: 1201–8.

Weiss LJ and Biustein J. (1996). Faithful patients: the effect of long-term physician-patient relationship on the costs and use of health care by older Americans. *American Journal of Public Health* 86(12):1742-747.

Yen W. (2013). *How Long and How Far Do Adults Travel and Will Adults Travel for Primary Care?* Washington State Office of Financial Management. Olympia, WA.

Table R-1 Definitions of Performance Measures

Clinic Quality	
Clinical Quality	The average clinic performance on hemoglobin A1c, blood pressure, and low-density lipoprotein-cholesterol from the diabetes care measures and blood pressure and low-density lipoprotein-cholesterol from the vascular disease care measures. Each individual measure is the percent of the relevant patient population achieving the treatment goal.
Behavioral Quality	The average clinic performance on aspirin use and tobacco free status from the diabetes care measures and aspirin use and tobacco free status from the vascular disease care measures. Each individual measure is the percent of the relevant patient population achieving the treatment goal.
Patient Experience	
Getting Care When Needed	Percent of questions pertaining to receiving timely care answered with the most favorable response from surveyed patients (all-cause).
Provider Communication	Percent of questions pertaining to provider communication answered with the most favorable response from surveyed patients (all-cause).
Courteous and Helpful Staff	Percent of questions pertaining to the courteous and helpfulness of the clinic's office staff answered with the most favorable response from surveyed patients (all-cause).
Overall Provider Rating	Percent of surveyed patients (all-cause) rating their overall provider experience a 9 or 10 out of 10.

Notes: Detailed descriptions of the reported performance measures are avaiable in **Section 4.2**. The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

Table 3-1 Health Plans Offered by the University of Minnesota UPlan, 2011

		Medica				
	HealthPartners	Elect/ Essential	Choice Insights	Choice Regional	Choice National	Health Savings Account
Campus Availability	All	Twin Cities and Duluth	All	All excluding Twin Cities and Duluth	All	All
HealthPartners Primary Care Clinics Excluded (see **Table A-1** for details)	None	18 of 26	None (all available in Tier 1)	14 of 26	14 of 26	14 of 26
HealthPartners Specialty Care Providers Excluded (see **Table A-1** for details)	None	All except eye clinics	None	All behavioral health clinics	All behavioral health clinics	All behavioral health clinics
2011 Adult Enrollment (%)	11,648 (36%)	12,162 (38%)	1,687 (5%)	2,467 (8%)	3,960 (12%)	365 (1%)
Mean Health Risk Score[a] (SD)	1.07 (1.06)	0.89 (0.83)	1.02 (0.95)	0.93 (0.86)	1.20 (1.28)	0.76 (0.62)
Individual 2-Week Pay Period Premium[b]	$264.20	$253.60	$271.80	$318.10	$274.70	$253.90
Employee Contribution	$36.00	$25.40	$43.60	$25.40	$46.50	$25.70
Family 2-Week Pay Period Premium[b]	$757.70	$728.90	$780.90	$915.10	$789.40	$729.60
Employee Contribution	$138.10	$109.30	$161.30	$109.30	$169.80	$110.00

In-Network Deductible	None	None	None	None	None	$1,500 individual/ $3,000 family
Physician Visit Co-Payment	$11	$11	Tier 1: $15 Tier 2: $30 Tier 3: $50	$11	$25	90% after deductible
Emergency Care Co-Payment	$75	$75	$75	$75	$75	90% after deductible
Hospital Care Co-Payment	100% coverage	100% coverage	Tier 1: 100% Coverage Tier 2/3: $200	100% coverage	$200	90% after deductible
Generic Drug Co-Payment	$8	$8	$8	$8	$8	90% after deductible

Abbreviation: SD, standard deviation.

[a] Health risk score calculated using the risk-adjustment algorithm of the Chronic Illness and Disability Payment System based on ICD-9 codes and prescribed medicines. The measure is indexed to be 1.00 in the full UPlan population. Larger risk scores signify greater health risk.

[b] The Medica Elect/Essential plan premiums varied by campus. Premiums shown are for the Twin Cities campuses.

Table 3-2 Difference in Performance of Primary Care Clinics in Enrollees' Market Areas by Health Plan, 2012

	Broad Network of HealthPartners	Limited Network of Medica Elect/Essential
Number of Primary Care Clinics (SD)	231.1	220.8
	(51.5)	(49.8)
Mean Performance		
Clinical Quality (SD)	72.0%	71.7%
	(0.7)	(0.7)
Behavioral Quality (SD)	91.6%	91.5%
	(0.5)	(0.5)
Getting Care When Needed (SD)	58.7%	58.3%
	(0.5)	(0.4)
Provider Communication (SD)	90.8%	90.7%
	(0.2)	(0.2)
Courteous and Helpful Staff (SD)	91.1%	91.0%
	(0.3)	(0.3)
Overall Provider Rating (SD)	79.1%	79.2%
	(0.3)	(0.4)

Abbreviation: SD, standard deviation.

Notes: Includes 1,151 UPlan enrollees who enrolled in the Medica Elect/Essential health plan in 2012 and whose previous primary care clinic is exclued in the Medica Elect/Essential plan. An urban (rural) enrollee's market area is defined as 12.5-mile (17.5-mile) radius from the center of their zip code of residence. All performance measures calculated from Minnesota Community Measurement publicly reported data. Clinical and Behavioral Quality represent the percent of patients meeting treatment goals for diabetes and vascular disease care. Getting Care When Needed, Provider Communication, Courteous and Helpful Staff, and Overall Provider Rating measures calculated from survey responses and represent the percent of patients giving the clinic the most favorable rating. Full descriptions of these measures are available in **Section 4.2.** The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

Table 4-1 Characteristics of 2012 UPlan Enrollees Unmatched to 2008 through 2011 Claims

	All 2012 UPlan Adult Enrollees	Unable to Crosswalk from 2012 to Earlier Claims
Number of Enrollees	33,366	7,113
Mean Age (SD)	42.5	37.5
	(14.3)	(12.8)
Percent Female	53.6%	49.8%
Mean Health Risk Score[a] (SD)	1.02	0.93
	(1.02)	(0.99)
Percent by Health Plan		
Medica Elect/Essential	60.1%	64.7%
Medica Choice Insights	19.4%	13.6%
Medica Choice National	11.0%	11.5%
Medica Choice Regional	8.0%	7.8%
Medica Health Savings Account	1.5%	2.6%

Abbreviation: SD, standard deviation.

[a] Health risk score calculated using the risk-adjustment algorithm of the Chronic Illness and Disability Payment System based on ICD-9 codes and prescribed medicine. The measure is indexed to be 1.00 in the full UPlan population. Larger risk scores signify greater health risk.

Table 5-1 Characteristics of New Medica Elect/Essential Enrollees, 2012

			Not Assigned to a Primary Care Clinic		Assigned to a Primary Care Clinic with Missing Data	
	New Medica Elect/Essential Enrollees	Assigned to a Primary Care Clinic in 2011 and 2012	No Primary Care Visits in 2011 or 2012	Undeterminable Assignment in 2011 or 2012	Clinical or Behavioral Performance Not Reported in 2011 or 2012	Patient Experience Performance Not Reported in 2011 or 2012
Number of Adult Enrollees	5,194	2,718	1,739	737	342	817
Mean Age (SD)	43.9 (13.5)	46.2 (12.9)	41.0 (13.6)	42.6 (13.8)	41.8 (11.9)	43.7 (12.5)
Percent Female	54.0%	62.5%	40.2%	54.1%	79.5%	62.5%
Mean Health Risk Score[a] (SD)	1.01 (0.97)	1.22 (1.10)	0.65 (0.45)	1.06 (1.09)	1.07 (0.87)	1.07 (0.98)

Abbreviation: SD, standard deviation.

[a] Health risk score calculated using the risk-adjustment algorithm of the Chronic Illness and Disability Payment System based on ICD-9 codes and prescribed medicine. The measure is indexed to be 1.00 in the full UPlan population. Larger risk scores signify greater health risk.

Table 6-1 Coefficients for Probit Models Predicting the Probabilities of Having a Hospitalization or an Emergency Department Visit

	Had a Hospitalization				Had an ED Visit			
	Base Models		Health Risk Interactions		Base Models		Health Risk Interactions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health System Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Primary Care Clinic Performance	No	Yes	No	Yes	No	Yes	No	Yes
Treatment Effect								
Switched Clinic in 2012 * Year 2012	0.08	0.23	0.08	0.22	0.17	0.08	0.08	-0.01
	(0.14)	(0.19)	(0.18)	(0.22)	(0.11)	(0.15)	(0.18)	(0.22)
Differential Treatment Effects by Health Risk Quartile (Reference = 1st Quartile (Healthiest)/2nd Quartile for Hospitalization, 1st Quartile (Healthiest) for ED Visits)								
Switched Clinic in 2012 * Year 2012 * 2nd Health Risk Quartile							0.14	0.15
							(0.18)	(0.19)
Switched Clinic in 2012 * Year 2012 * 3rd Health Risk Quartile			0.11	0.05			-0.01	-0.09
			(0.21)	(0.22)			(0.19)	(0.21)
Switched Clinic in 2012 * Year 2012 * 4th Health Risk Quartile (Sickest)			-0.06	-0.02			0.12	0.20
			(0.18)	(0.18)			(0.19)	(0.20)
Treatment Group Indicator								
Switched Clinic in 2012	-0.25**	-0.42***	-0.24**	-0.41***	-0.26***	-0.23**	-0.26***	-0.23**
	(0.10)	(0.14)	(0.10)	(0.14)	(0.08)	(0.12)	(0.08)	(0.12)
Demographics								
Age (per year)	-0.006***	-0.008***	-0.006***	-0.008***	-0.007***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Female	0.05	0.02	0.05	0.02	-0.13***	-0.13***	-0.12***	-0.13***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.04)	(0.05)	(0.04)	(0.05)
Health Risk Quartile Effects (Reference = 1st Quartile (Healthiest)/2nd Quartile for Hospitalization, 1st Quartile (Healthiest) for ED Visits)								
2nd Health Risk Quartile					0.20***	0.16**	0.22***	0.17**
					(0.06)	(0.06)	(0.07)	(0.08)
3rd Health Risk Quartile	0.32***	0.30***	0.26***	0.23***	0.35***	0.30***	0.43***	0.36***
	(0.07)	(0.07)	(0.09)	(0.10)	(0.07)	(0.07)	(0.08)	(0.09)

4th Health Risk Quartile (Sickest)	0.93***	0.94***	0.96***	1.96***	0.61***	0.58***	0.64***	0.57***
	(0.06)	(0.06)	(0.08)	(0.08)	(0.07)	(0.08)	(0.09)	(0.09)
Primary Care Clinic Performance								
Clinical Quality (per 1 percentage point)		-0.006		-0.006		-0.008		-0.008
		(0.008)		(0.008)		(0.006)		(0.007)
Behavioral Quality (per 1 percentage point)		0.01		0.01		0.004		0.004
		(0.01)		(0.01)		(0.008)		(0.008)
Year Effects (Reference = Year 2009)								
Year 2010	-0.14	-0.22	-0.14	-0.22	-0.11	-0.10	-0.11	-0.10
	(0.10)	(0.16)	(0.10)	(0.16)	(0.08)	(0.13)	(0.08)	(0.13)
Year 2011	-0.12	-0.18	-0.11	-0.17	-0.02	0.02	-0.02	0.01
	(0.10)	(0.16)	(0.10)	(0.16)	(0.07)	(0.13)	(0.07)	(0.13)
Year 2012	-0.17*	-0.27*	-0.17*	-0.27*	-0.09	-0.08	-0.09	-0.08
	(0.10)	(0.14)	(0.10)	(0.14)	(0.08)	(0.12)	(0.08)	(0.12)
Pre-intervention Treatment Group-Year Interactions								
Switched Clinic in 2012 * Year 2010	0.27*	0.37**	0.22	0.26	0.09	0.08	0.14	0.04
	(0.14)	(0.17)	(0.17)	(0.21)	(0.12)	(0.14)	(0.17)	(0.21)
Switched Clinic in 2012 * Year 2011	0.20	0.29*	0.25	0.32*	0.15	0.18	0.32**	0.32*
	(0.14)	(0.16)	(0.16)	(0.18)	(0.10)	(0.13)	(0.15)	(0.17)
Pre-intervention Treatment Group-Year-Health Risk Quartile Interactions (Reference = 1st Quartile (Healthiest)/2nd Quartile for Hospitalization, 1st Quartile (Healthiest) for ED Visits)								
Switched Clinic in 2012 * Year 2010 * 2nd Health Risk Quartile							-0.11	-0.09
							(0.18)	(0.21)
Switched Clinic in 2012 * Year 2010 * 3rd Health Risk Quartile			0.23	0.32			-0.11	0.05
			(0.20)	(0.22)			(0.20)	(0.23)
Switched Clinic in 2012 * Year 2010 * 4th Health Risk Quartile (Sickest)			-0.003	0.08			0.04	0.19
			(0.168)	(0.18)			(0.19)	(0.21)
Switched Clinic in 2012 * Year 2011 * 2nd Health Risk Quartile							-0.13	-0.09
							(0.15)	(0.16)
Switched Clinic in 2012 * Year 2011 * 3rd Health Risk Quartile			0.05	0.09			-0.31*	-0.25
			(0.19)	(0.19)			(0.17)	(0.17)
Switched Clinic in 2012 * Year 2011 * 4th Health Risk Quartile (Sickest)			-0.18	-0.02			-0.29*	0.22
			(0.16)	(0.18)			(0.17)	(0.17)

Constant	-1.52***	-2.13***	-1.52***	-2.13**	-0.91***	-1.27*	-0.94***	-1.27*
	(0.13)	(0.91)	(0.13)	(0.91)	(0.12)	(0.75)	(0.13)	(0.75)
Enrollee-year Observations	7,499	6,879	7,499	6,879	7,499	6,894	7,499	6,894
Unique Enrollees	2,067	1,879	2,067	1,879	2,067	1,885	2,067	1,885

Abbreviation: ED, Emergency Department.

Notes: Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remained in the same non-excluded clinic (N = 916). All models are probit. Table presents coefficients and not marginal effects. Standard errors in parentheses are clustered by enrollee.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-2 Coefficients for Negative Binomial Models Predicting Visits with Primary Care and Specialty Care Providers

	Primary Care Provider Visits				Specialty Care Provider Visits			
	Base Models		Health Risk Interactions		Base Models		Health Risk Interactions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health System Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Primary Care Clinic Performance	No	Yes	No	Yes	No	Yes	No	Yes
Treatment Effect								
Switched Primary Care Clinic in 2012 * Year 2012	0.17***	0.11	0.004	-0.06	-0.21**	-0.34***	-0.37**	-0.52**
	(0.06)	(0.08)	(0.105)	(0.13)	(0.09)	(0.13)	(0.18)	(0.21)
Differential Treatment Effects by Health Risk Quartile (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2012 * 2nd Health Risk Quartile			0.15	0.12			0.18	0.18
			(0.11)	(0.11)			(0.18)	(0.19)
Switched Primary Care Clinic in 2012 * Year 2012 * 3rd Health Risk Quartile			0.14	0.15			0.28	0.26
			(0.11)	(0.12)			(0.19)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2012 * 4th Health Risk Quartile (Sickest)			0.28**	0.33***			0.12	0.19
			(0.12)	(0.12)			(0.18)	(0.20)
Treatment Group Indicator								
Switched Primary Care Clinic in 2012	-0.15***	-0.10	-0.15***	-0.10	-0.00	0.18	-0.002	0.18
	(0.05)	(0.07)	(0.05)	(0.07)	(0.08)	(0.11)	(0.077)	(0.11)
Demographics								
Age (per year)	-0.005***	-0.005***	-0.005***	-0.005***	0.005**	0.004*	0.005**	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Female	0.24***	0.23***	0.24***	0.23***	0.12**	0.10*	0.12**	0.09*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)
Health Risk Quartile Effects (Reference = 1st Quartile (Healthiest))								
2nd Health Risk Quartile	0.14***	0.14***	0.12**	0.13**	0.14**	0.15**	0.05	0.07
	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.07)	(0.08)	(0.09)
3rd Health Risk Quartile	0.32***	0.32***	0.32***	0.31***	0.55***	0.58***	0.46***	0.50***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)	(0.08)	(0.09)
4th Health Risk Quartile (Sickest)	0.69***	0.69***	0.67***	0.67***	1.08***	1.09***	1.07***	1.06***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)
Primary Care Clinic Performance								

Clinical Quality (per 1 percentage point)		-0.015***		-0.015***		0.009*		0.009*
		(0.004)		(0.004)		(0.005)		(0.005)
Behavioral Quality (per 1 percentage point)		-0.004		-0.004		-0.012*		-0.012*
		(0.005)		(0.005)		(0.007)		(0.007)
Year Effects (Reference = Year 2009)								
Year 2010	-0.09**	0.10	-0.09**	0.10	0.03	0.03	0.03	0.03
	(0.04)	(0.08)	(0.04)	(0.08)	(0.06)	(0.11)	(0.06)	(0.11)
Year 2011	-0.06	0.13*	-0.06	0.13*	0.06	0.06	0.06	0.06
	(0.04)	(0.08)	(0.04)	(0.08)	(0.06)	(0.11)	(0.06)	(0.10)
Year 2012	-0.11**	0.02	-0.11**	0.02	-0.005	0.03	-0.001	0.03
	(0.04)	(0.07)	(0.04)	(0.07)	(0.066)	(0.10)	(0.067)	(0.10)
Pre-intervention Treatment Group-Year Interactions								
Switched Primary Care Clinic in 2012 * Year 2010	0.043	-0.039	0.053	-0.034	-0.020	-0.021	-0.076	-0.039
	(0.059)	(0.073)	(0.106)	(0.123)	(0.085)	(0.113)	(0.170)	(0.201)
Switched Primary Care Clinic in 2012 * Year 2011	0.081	-0.001	0.129	0.044	0.077	0.082	-0.12	-0.11
	(0.056)	(0.069)	(0.087)	(0.098)	(0.083)	(0.106)	(0.14)	(0.16)
Pre-intervention Treatment Group-Year-Health Risk Quartile Interactions (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2010 * 2nd Health Risk Quartile			0.05	0.04			0.12	0.06
			(0.11)	(0.12)			(0.18)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2010 * 3rd Health Risk Quartile			-0.01	0.04			0.14	0.10
			(0.13)	(0.13)			(0.19)	(0.21)
Switched Primary Care Clinic in 2012 * Year 2010 * 4th Health Risk Quartile (Sickest)			-0.10	-0.12			-0.05	-0.08
			(0.13)	(0.14)			(0.18)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2011 * 2nd Health Risk Quartile			-0.03	-0.04			0.34**	0.34**
			(0.09)	(0.09)			(0.14)	(0.14)
Switched Primary Care Clinic in 2012 * Year 2011 * 3rd Health Risk Quartile			-0.09	-0.07			0.27*	0.24
			(0.10)	(0.10)			(0.16)	(0.16)
Switched Primary Care Clinic in 2012 * Year 2011 * 4th Health Risk Quartile (Sickest)			-0.07	-0.07			0.05	0.06
			(0.10)	(0.10)			(0.16)	(0.16)
Constant	0.78***	0.98**	0.80***	0.85*	-0.45***	0.87	-0.39***	0.87
	(0.08)	(0.46)	(0.08)	(0.47)	(0.12)	(0.61)	(0.12)	(0.61)
Enrollee-year Observations	7,499	6,944	7,499	6,944	7,499	6,944	7,499	6,944
Unique Enrollees	2,067	1,901	2,067	1,901	2,067	1,901	2,067	1,901

Notes: Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remained in the same non-excluded clinic (N = 916). Primary care provider visits modeled using a zero-truncated negative binomial regression. Specialty care provider visits modeled using a negative binomial regression. Table presents coefficients and not marginal effects. Standard errors in parentheses are clustered by enrollee.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-3 Changes in Specialty Care Provider Visits after Switching Primary Care Clinics For Enrollees in the Three Sickest Health Risk Quartiles, by Specialty Type

Change in Visits For Enrollees Who Switched Primary Care Clinics (First 7 Months of 2012 minus First 7 Months of 2011)		Difference-in-Differences between Enrollees Who Switched Clinics and Enrollees Who Did Not Switch (First 7 Months of 2012 minus First 7 Months of 2011)	
Specialty	Change in Visits	Specialty	Change in Visits per Enrollee
Dermatology	-33	Dermatology	-0.056
Otolaryngology	-26	Podiatry	-0.038
Oncology	-25	General Surgery	-0.035
General Surgery	-23	Chiropractor	-0.029
Urology	-15	Otolaryngology	-0.024
Pulmonology	-14	Rheumatology	-0.023
Podiatry	-13	Pulmonology	-0.021
Orthopedics	-11	Allergy/Immunology	-0.015
Allergy/Immunology	-9	Oncology	-0.014
Chiropractor	-9	Ophthalmology	-0.012
Psychiatry	-8	Orthopedics	0.003
Ophthalmology	-7	Cardiology	0.005
Rheumatology	-6	Endocrinology	0.005
Endocrinology	-5	Urology	0.006
Cardiology	-4	Obstetrics/Gynecology	0.010
Neurology	4	Psychiatry	0.011
Obstetrics/Gynecology	12	Neurology	0.025

Notes**:** Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012, who were in the three sickest health risk quartiles, and who either switched primary care clinics due to network restrictions (N = 823) or who remained in the same non-excluded clinic (N = 664). Includes all specialties with at least 10 visits from January 2011 through July 2011 by enrollees who switched primary care clinics in 2012.

Table 6-4 Coefficients for Generalized Linear Models Predicting Total Expenditures

	Total Expenditures			
	Base Models		Health Risk Interactions	
	(1)	(2)	(3)	(4)
Health System Fixed Effects	No	Yes	No	Yes
Primary Care Clinic Performance	No	Yes	No	Yes
Treatment Effect				
Switched Clinic in 2012 * Year 2012	-0.10	-0.05	-0.17	-0.14
	(0.18)	(0.24)	(0.18)	(0.25)
Differential Treatment Effects by Health Risk Quartile (Reference = 1st Quartile (Healthiest))				
Switched Clinic in 2012 * Year 2012 * 2nd Health Risk Quartile			0.15	0.12
			(0.14)	(0.15)
Switched Clinic in 2012 * Year 2012 * 3rd Health Risk Quartile			0.09	0.12
			(0.15)	(0.16)
Switched Clinic in 2012 * Year 2012 * 4th Health Risk Quartile (Sickest)			0.04	0.09
			(0.20)	(0.20)
Treatment Group Indicator				
Switched Clinic in 2012	-0.26***	-0.30**	-0.26***	-0.30**
	(0.08)	(0.13)	(0.08)	(0.13)
Demographics				
Age (per year)	0.006	0.003	0.006	0.003
	(0.004)	(0.004)	(0.005)	(0.005)
Female	0.10	0.07	0.10	0.07
	(0.08)	(0.08)	(0.08)	(0.08)
Health Risk Quartile Effects (Reference = 1st Quartile (Healthiest))				
2nd Health Risk Quartile	0.34***	0.36***	0.27***	0.29**
	(0.08)	(0.09)	(0.10)	(0.11)
3rd Health Risk Quartile	0.78***	0.78***	0.75***	0.72***
	(0.09)	(0.10)	(0.11)	(0.12)
4th Health Risk Quartile (Sickest)	1.58***	1.58***	1.61***	1.59***
	(0.11)	(0.11)	(0.12)	(0.12)
Primary Care Clinic Performance				

Clinical Quality (per 1 percentage point)		-0.01		-0.01
		(0.01)		(0.01)
Behavioral Quality (per 1 percentage point)		0.02*		0.02*
		(0.01)		(0.01)
Year Effects (Reference = Year 2009)				
Year 2010	0.03	-0.02	0.03	-0.03
	(0.07)	(0.14)	(0.07)	(0.14)
Year 2011	0.05	0.001	0.05	-0.0004
	(0.08)	(0.144)	(0.08)	(0.1439)
Year 2012	0.06	-0.01	0.06	-0.01
	(0.16)	(0.18)	(0.16)	(0.18)
Pre-intervention Treatment Group-Year Interactions				
Switched Clinic in 2012 * Year 2010	0.05	0.16	0.20	0.29
	(0.10)	(0.14)	(0.22)	(0.27)
Switched Clinic in 2012 * Year 2011	0.07	0.18	-0.10	-0.04
	(0.11)	(0.13)	(0.15)	(0.18)
Pre-intervention Treatment Group-Year-Health Risk Quartile Interactions (Reference = 1st Quartile (Healthiest))				
Switched Clinic in 2012 * Year 2010 * 2nd Health Risk Quartile			-0.02	-0.02
			(0.23)	(0.27)
Switched Clinic in 2012 * Year 2010 * 3rd Health Risk Quartile			-0.09	-0.05
			(0.24)	(0.27)
Switched Clinic in 2012 * Year 2010 * 4th Health Risk Quartile (Sickest)			-0.29	-0.27
			(0.25)	(0.28)
Switched Clinic in 2012 * Year 2011 * 2nd Health Risk Quartile			0.38**	0.40**
			(0.15)	(0.16)
Switched Clinic in 2012 * Year 2011 * 3rd Health Risk Quartile			0.26	0.33*
			(0.19)	(0.19)
Switched Clinic in 2012 * Year 2011 * 4th Health Risk Quartile (Sickest)			0.01	0.08
			(0.20)	(0.20)
Constant	7.73***	5.58***	7.74***	5.54***
	(0.20)	(0.84)	(0.22)	(0.85)
Enrollee-year Observations	7,497	6,942	7,497	6,942

Unique Enrollees	2,067	1,901	2,067	1,901

Notes: Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remained in the same non-excluded clinic (N = 916). All models estimated with generalized linear models using a log link and Poisson variance structure. Table presents coefficients and not marginal effects. Standard errors in parentheses are clustered by enrollee.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-5 Coefficients for Generalized Linear Models Predicting Non-Emergency Department Outpatient and Prescription Drug Expenditures

	Non-ED Outpatient Expenditures				Prescription Drug Expenditures			
	Base Models		Health Risk Interactions		Base Models		Health Risk Interactions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health System Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Primary Care Clinic Performance	No	Yes	No	Yes	No	Yes	No	Yes
Treatment Effect								
Switched Primary Care Clinic in 2012 * Year 2012	0.02	-0.18	0.10	-0.14	0.09	0.12	-0.16	-0.11
	(0.12)	(0.28)	(0.15)	(0.28)	(0.14)	(0.19)	(0.26)	(0.32)
Differential Treatment Effects by Health Risk Quartile (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2012 * 2nd Health Risk Quartile			0.01	-0.003			0.15	0.11
			(0.13)	(0.137)			(0.27)	(0.29)
Switched Primary Care Clinic in 2012 * Year 2012 * 3rd Health Risk Quartile			-0.07	-0.01			0.18	0.15
			(0.13)	(0.14)			(0.30)	(0.32)
Switched Primary Care Clinic in 2012 * Year 2012 * 4th Health Risk Quartile (Sickest)			-0.17	-0.07			0.35	0.32
			(0.22)	(0.21)			(0.31)	(0.31)
Treatment Group Indicator								
Switched Primary Care Clinic in 2012	-0.21***	-0.03	-0.21***	-0.02	-0.36***	-0.48***	-0.37***	-0.48***
	(0.08)	(0.11)	(0.08)	(0.11)	(0.10)	(0.15)	(0.10)	(0.15)
Demographics								
Age (per year)	0.01*	0.01	0.01*	0.01	-0.01	-0.01**	-0.01	-0.01**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Female	0.14*	0.11	0.14*	0.11	-0.05	-0.05	-0.05	-0.05
	(0.08)	(0.07)	(0.08)	(0.07)	(0.10)	(0.10)	(0.10)	(0.10)
Health Risk Quartile Effects (Reference = 1st Quartile (Healthiest))								
2nd Health Risk Quartile	0.20**	0.23**	0.18*	0.21**	0.43***	0.44***	0.39***	0.38***
	(0.09)	(0.10)	(0.10)	(0.11)	(0.09)	(0.10)	(0.12)	(0.12)
3rd Health Risk Quartile	0.54***	0.55***	0.53***	0.53***	1.12***	1.12***	1.05***	1.03***
	(0.10)	(0.11)	(0.11)	(0.12)	(0.10)	(0.11)	(0.12)	(0.13)
4th Health Risk Quartile (Sickest)	1.09***	1.10***	1.17***	1.17***	2.04***	2.01***	1.94***	1.88***
	(0.11)	(0.12)	(0.11)	(0.10)	(0.12)	(0.12)	(0.12)	(0.12)

Primary Care Clinic Performance								
Clinical Quality (per 1 percentage point)		-0.002		-0.003		0.003		0.003
		(0.010)		(0.010)		(0.010)		(0.010)
Behavioral Quality (per 1 percentage point)		0.005		0.005		0.02		0.02
		(0.010)		(0.008)		(0.01)		(0.01)
Year Effects (Reference = Year 2009)								
Year 2010	0.04	0.05	0.04	0.05	-0.07	-0.24	-0.07	-0.24
	(0.06)	(0.14)	(0.06)	(0.14)	(0.05)	(0.16)	(0.05)	(0.17)
Year 2011	0.04	0.05	0.04	0.05	-0.13**	-0.31**	-0.13**	-0.30**
	(0.08)	(0.12)	(0.09)	(0.12)	(0.06)	(0.15)	(0.06)	(0.15)
Year 2012	-0.07	-0.03	-0.07	-0.04	-0.12	-0.27*	-0.12	-0.26*
	(0.10)	(0.11)	(0.10)	(0.11)	(0.09)	(0.15)	(0.09)	(0.15)
Pre-intervention Treatment Group-Year Interactions								
Switched Primary Care Clinic in 2012 * Year 2010	0.00	0.01	0.23	0.25	0.07	0.27*	-0.03	0.03
	(0.09)	(0.13)	(0.24)	(0.30)	(0.08)	(0.14)	(0.16)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2011	0.07	0.07	-0.02	-0.05	0.17	0.35**	-0.14	-0.04
	(0.11)	(0.13)	(0.14)	(0.16)	(0.11)	(0.16)	(0.17)	(0.19)
Pre-intervention Treatment Group-Year-Health Risk Quartile Interactions (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2010 * 2nd Health Risk Quartile			-0.14	-0.17			0.04	0.13
			(0.24)	(0.29)			(0.17)	(0.19)
Switched Primary Care Clinic in 2012 * Year 2010 * 3rd Health Risk Quartile			-0.15	-0.12			0.29	0.39*
			(0.27)	(0.31)			(0.21)	(0.23)
Switched Primary Care Clinic in 2012 * Year 2010 * 4th Health Risk Quartile (Sickest)			-0.42	-0.44			0.06	0.24
			(0.28)	(0.31)			(0.20)	(0.22)
Switched Primary Care Clinic in 2012 * Year 2011 * 2nd Health Risk Quartile			0.24*	0.24*			0.24	0.28
			(0.13)	(0.14)			(0.19)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2011 * 3rd Health Risk Quartile			0.21	0.26			0.19	0.25
			(0.19)	(0.19)			(0.19)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2011 * 4th Health Risk Quartile (Sickest)			-0.10	-0.05			0.43*	0.54**
			(0.20)	(0.19)			(0.24)	(0.24)
Constant	7.21***	6.49***	7.18***	6.43***	6.57***	2.54**	6.65***	2.61**
	(0.21)	(0.71)	(0.23)	(0.70)	(0.18)	(1.11)	(0.20)	(1.13)
Enrollee-year Observations	7,499	6,944	7,499	6,944	7,499	6,944	7,499	6,944

Unique Enrollees	2,067	1,901	2,067	1,901	2,067	1,901	2,067	1,901

Abbreviation: ED, Emergency Department.

Notes: Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remained in the same non-excluded clinic (N = 916). All models estimated with generalized linear models using a log link and Poisson variance structure. Table presents coefficients and not marginal effects. Standard errors in parentheses are clustered by enrollee.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-6 Coefficients for Generalized Linear Models Predicting Hospital Inpatient and Emergency Department Expenditures

	Hospital Inpatient Expenditures				ED Expenditures			
	Base Models		Health Risk Interactions		Base Models		Health Risk Interactions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health System Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Primary Care Clinic Performance	No	Yes	No	Yes	No	Yes	No	Yes
Treatment Effect								
Switched Primary Care Clinic in 2012 * Year 2012	-0.57	-0.11	-0.67	-0.34	-0.06	-0.09	-0.33	-0.34
	(0.47)	(0.36)	(0.47)	(0.42)	(0.16)	(0.17)	(0.25)	(0.26)
Differential Treatment Effects by Health Risk Quartile (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2012 * 2nd Health Risk Quartile							0.24	0.21
							(0.25)	(0.24)
Switched Primary Care Clinic in 2012 * Year 2012 * 3rd Health Risk Quartile			-0.10	0.29			0.16	0.10
			(0.38)	(0.38)			(0.25)	(0.25)
Switched Primary Care Clinic in 2012 * Year 2012 * 4th Health Risk Quartile (Sickest)			0.18	0.24			0.46	0.45
			(0.41)	(0.38)			(0.29)	(0.29)
Treatment Group Indicator								
Switched Primary Care Clinic in 2012	0.19	0.02	0.19	0.02	0.02	-0.01	0.02	-0.02
	(0.20)	(0.23)	(0.20)	(0.22)	(0.13)	(0.17)	(0.13)	(0.17)
Demographics								
Age (per year)	0.02***	0.02***	0.02***	0.01***	-0.01**	-0.01*	-0.01**	-0.01*
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	-0.01	-0.04	-0.008	-0.04	-0.01	0.02	-0.01	0.03
	(0.15)	(0.12)	(0.151)	(0.12)	(0.07)	(0.06)	(0.06)	(0.06)
Health Risk Quartile Effects (Reference = 1st Quartile (Healthiest))								
2nd Health Risk Quartile					0.08	0.10	0.04	0.07
					(0.11)	(0.11)	(0.15)	(0.16)
3rd Health Risk Quartile	-0.01	-0.05	0.14	0.06	0.19	0.16	0.16	0.14
	(0.13)	(0.14)	(0.19)	(0.21)	(0.12)	(0.12)	(0.16)	(0.16)
4th Health Risk Quartile (Sickest)	0.23*	0.16	0.23	0.15	0.45***	0.44**	0.33*	0.32*
	(0.12)	(0.13)	(0.16)	(0.15)	(0.17)	(0.18)	(0.17)	(0.18)
Primary Care Clinic Performance								

Clinical Quality (per 1 percentage point)		-0.02		-0.02		-0.01		-0.01
		(0.02)		(0.02)		(0.01)		(0.01)
Behavioral Quality (per 1 percentage point)		0.04		0.04		-0.01		-0.00
		(0.02)		(0.02)		(0.01)		(0.01)
Year Effects (Reference = Year 2009)								
Year 2010	0.37**	0.30	0.35*	0.29	0.08	0.36*	0.08	0.34
	(0.18)	(0.22)	(0.18)	(0.22)	(0.12)	(0.22)	(0.12)	(0.21)
Year 2011	0.34*	0.29	0.33*	0.28	0.12	0.38*	0.13	0.37*
	(0.18)	(0.23)	(0.18)	(0.23)	(0.14)	(0.21)	(0.13)	(0.21)
Year 2012	0.69*	0.49*	0.70*	0.50*	-0.01	0.17	-0.01	0.16
	(0.38)	(0.29)	(0.38)	(0.29)	(0.12)	(0.19)	(0.12)	(0.19)
Pre-intervention Treatment Group-Year Interactions								
Switched Primary Care Clinic in 2012 * Year 2010	-0.43	-0.32	-0.17	-0.02	0.08	-0.09	0.20	0.16
	(0.26)	(0.27)	(0.36)	(0.37)	(0.15)	(0.20)	(0.23)	(0.25)
Switched Primary Care Clinic in 2012 * Year 2011	-0.30	-0.17	-0.32	-0.25	0.05	-0.15	-0.18	-0.37
	(0.28)	(0.26)	(0.32)	(0.33)	(0.16)	(0.20)	(0.24)	(0.26)
Pre-intervention Treatment Group-Year-Health Risk Quartile Interactions (Reference = 1st Quartile (Healthiest))								
Switched Primary Care Clinic in 2012 * Year 2010 * 2nd Health Risk Quartile							-0.19	-0.28
							(0.25)	(0.28)
Switched Primary Care Clinic in 2012 * Year 2010 * 3rd Health Risk Quartile			-0.74***	-0.80***			-0.50**	-0.64***
			(0.32)	(0.34)			(0.23)	(0.24)
Switched Primary Care Clinic in 2012 * Year 2010 * 4th Health Risk Quartile (Sickest)			-0.20	-0.26			0.05	-0.10
			(0.30)	(0.30)			(0.24)	(0.25)
Switched Primary Care Clinic in 2012 * Year 2011 * 2nd Health Risk Quartile							0.18	0.14
							(0.20)	(0.20)
Switched Primary Care Clinic in 2012 * Year 2011 * 3rd Health Risk Quartile			-0.11	-0.03			0.30	0.32
			(0.28)	(0.29)			(0.23)	(0.23)
Switched Primary Care Clinic in 2012 * Year 2011 * 4th Health Risk Quartile (Sickest)			0.08	0.16			0.36	0.37
			(0.29)	(0.30)			(0.24)	(0.24)
Constant	8.84***	7.24***	8.82***	7.36***	6.89***	8.42***	6.92***	8.33***
	(0.34)	(1.48)	(0.35)	(1.52)	(0.19)	(1.28)	(0.20)	(1.24)
Enrollee-year Observations	432	403	432	403	906	838	906	838

Unique Enrollees	399	355	399	355	872	632	872	632

Abbreviation: ED, Emergency Department.

Notes: Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). All models estimated with generalized linear models using a log link and Gamma variance structure. Table presents coefficients and not marginal effects. Standard errors in parentheses are clustered by enrollee.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-7 Coefficients for Multinomial Logit Choice Models Predicting Primary Care Clinics Choices

	Excluding Patient Experience Measures			Including Patient Experience Measures		
		Nested Logit			Nested Logit	
	Conditional Logit (1)	Separate HealthPartners Branch (2)	Separate Branch for Each Large Health System (3)	Conditional Logit (4)	Separate HealthPartners Branch (5)	Separate Branch for Each Large Health System (6)
Primary Care Clinic Choice Equation						
Performance						
Clinical Quality (per 1 percentage point)	0.03***	0.02***	-0.01	0.02**	0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Behavioral Quality (per 1 percentage point)	0.05***	0.05***	-0.03*	0.07***	0.09***	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Getting Care When Needed (per 1 percentage point)				-0.02***	-0.02***	-0.01*
				(0.01)	(0.01)	(0.01)
Provider Communication (per 1 percentage point)				-0.06***	-0.08***	-0.14***
				(0.02)	(0.02)	(0.02)
Courteous and Helpful Staff (per 1 percentage point)				0.01	-0.01	-0.02
				(0.01)	(0.01)	(0.01)
Clinic Attributes						
Number of Physicians (per 10 physicians)	0.002	0.002	-0.056**	0.002	-0.0005	-0.063*
	(0.002)	(0.003)	(0.002)	(0.003)	(0.0030)	(0.003)
Percent Specialty Care Physicians (per 1 percentage point)	0.017***	0.017***	0.011***	0.019***	0.018***	0.009***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)
Percent Female Physicians (per 1 percentage point)	0.003*	0.003*	0.002	0.004*	0.004*	0.002
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Percent of Patients with Diabetes Enrolled in Medicare (per 1 percentage point)	-0.054***	-0.05***	-0.040***	-0.07***	-0.05***	-0.03***
	(0.004)	(0.01)	(0.005)	(0.01)	(0.01)	(0.01)
Percent of Patients with Diabetes Enrolled in MHCP (per 1 percentage point)	-0.033***	-0.03***	-0.035***	-0.019***	-0.011**	-0.03***
	(0.003)	(0.01)	(0.004)	(0.005)	(0.005)	(0.01)
Clinic Located in Hospital	0.27**	0.26**	0.15	0.17	0.19*	0.20*

	(0.11)	(0.11)	(0.10)	(0.11)	(0.11)	(0.12)
Distance to Clinic (per 1 mile)	-0.49***	-0.50***	-0.39***	-0.51***	-0.50***	-0.43***
	(0.01)	(0.05)	(0.02)	(0.01)	(0.05)	(0.03)
Inclusive Values						
Joint Significance of Inclusive Values	N/A	Yes	Yes	N/A	Yes	Yes
Different than 1[a]						
Allina Health			0.65			0.70
			(0.05)			(0.06)
Fairview Health Services			0.71			0.76
			(0.06)			(0.07)
HealthEast Care System			0.90			1.01
			(0.10)			(0.12)
HealthPartners		1.57	1.31		1.46	1.25
		(0.21)	(0.19)		(0.20)	(0.19)
Park Nicollet Health Services			0.84			0.92
			(0.11)			(0.12)
University of Minnesota Physicians			0.50			0.62
			(0.08)			(0.13)
Other Health System		1.01	0.75		0.95	0.79
		(0.11)	(0.07)		(0.10)	(0.09)
Health System Choice Equation (Reference = Other Health System)						
Allina Health						
Age			0.03***			0.03***
			(0.01)			(0.01)
Female			0.19			0.21
			(0.25)			(0.31)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))						
2nd Health Risk Quartile			0.50			0.72
			(0.40)			(0.50)
3rd Health Risk Quartile			1.02***			1.35***
			(0.38)			(0.52)
4th Health Risk Quartile (Sickest)			0.69			0.54
			(0.42)			(0.51)
Fairview Health Services						
Age			0.03***			0.03***

		(0.01)		(0.01)
Female		0.31		0.37
		(0.25)		(0.32)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))				
2nd Health Risk Quartile		0.03		0.16
		(0.42)		(0.51)
3rd Health Risk Quartile		0.67*		1.00*
		(0.40)		(0.53)
4th Health Risk Quartile (Sickest)		0.75*		0.60
		(0.43)		(0.51)
HealthEast Care System				
Age		0.02***		0.03**
		(0.01)		(0.01)
Female		-0.03		0.02
		(0.30)		(0.36)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))				
2nd Health Risk Quartile		-0.23		0.02
		(0.49)		(0.58)
3rd Health Risk Quartile		-0.06		0.41
		(0.47)		(0.59)
4th Health Risk Quartile (Sickest)		0.36		0.27
		(0.49)		(0.58)
HealthPartners				
Age	-0.004	0.01	0.0002	0.03***
	(0.007)	(0.01)	(0.0078)	(0.01)
Female	-0.03	0.08	0.05	0.24
	(0.22)	(0.29)	(0.22)	(0.35)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))				
2nd Health Risk Quartile	0.76*	0.87*	0.75*	1.12*
	(0.41)	(0.49)	(0.42)	(0.58)
3rd Health Risk Quartile	0.28	0.76	0.29	1.20*
	(0.41)	(0.48)	(0.42)	(0.61)
4th Health Risk Quartile (Sickest)	0.79*	1.25**	0.78*	1.17**
	(0.41)	(0.50)	(0.43)	(0.59)
Park Nicollet Health Services				
Age		0.03***		0.03***

			(0.01)			(0.01)
Female			0.21			0.10
			(0.30)			(0.36)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))						
2nd Health Risk Quartile			0.36			0.43
			(0.51)			(0.59)
3rd Health Risk Quartile			0.50			0.83
			(0.50)			(0.61)
4th Health Risk Quartile (Sickest)			0.62			0.40
			(0.53)			(0.60)
University of Minnesota Physicians						
Age			0.03***			0.04***
			(0.01)			(0.01)
Female			0.07			0.01
			(0.30)			(0.37)
Health Risk Quartile (Reference = 1st Quartile (Healthiest))						
2nd Health Risk Quartile			1.26**			1.42**
			(0.51)			(0.61)
3rd Health Risk Quartile			0.81			0.95
			(0.51)			(0.64)
4th Health Risk Quartile (Sickest)			0.75			0.64
			(0.56)			(0.64)
Enrollees	988	988	988	908	908	908

Abbreviation: MHCP, Minnesota Health Care Programs.

[a] Joint significance of inclusive values tested using a likelihood ratio test. For all nested logit models, the inclusive values were jointly signficiant different than 1 (p-value <0.05).

Notes: Includes 988 UPlan enrollees who enrolled in the Medica Elect/Essential plan in 2012 and whose previous primary care clinic is excluded in the Medica Elect/Essential plan. Enrollees assigned to primary care clinics that did not report to Minnesota Community Measurement (N=82) and enrollees assigned to primary care clinics outside their market area (N=81) are excluded. Primary care clinics assigned by pluraity of primary care outpatient evaluation and management visits. Only primary care clinics reported to Minnesota Communinity Measrument included. An urban (rural) enrollee's market area is defined as 12.5-mile (17.5-mile) radius

from the center of their zip code of residence. Table presents coefficients and not marginal effects. All performance measures calculated from Minnesota Community Measurement publicly reported data. Clinical and Behavioral Quality represent the percent of patients meeting treatment goals for diabetes and vascular disease care. Getting Care When Needed, Provider Communication, Courteous and Helpful Staff, and Overall Provider Rating measures calculated from survey responses and represent the percent of patients giving the clinic the most favorable rating. Full descriptions of these measures are available in **Section 4.2.** The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

*** p<0.01, ** p<0.05, * p<0.1

Table 6-8 Primary Care Clinic Choice Probability Elasticity with Respect to Clinic Attributes by Health System

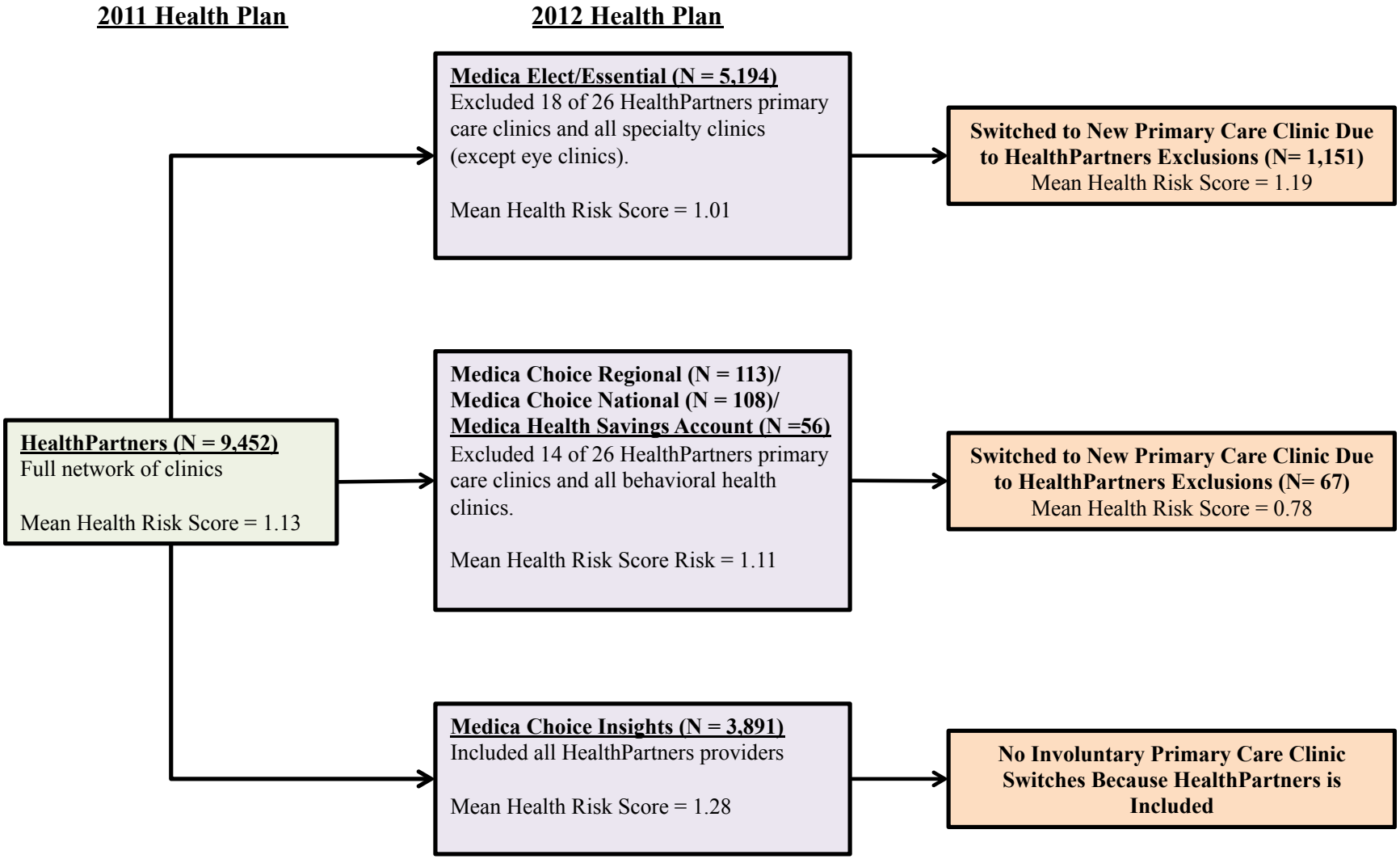
	Allina Health	Fairview Health Services	HealthEast Care System	HealthPartners	Park Nicollet Health Services	University of Minnesota Physicians	Other Health System
Performance							
Clinical Quality	-0.52	-0.50	-0.50	-0.56	-0.54	-0.37	-0.51
Behavioral Quality	2.90	2.88	2.97	3.10	2.93	2.50	2.94
Getting Care When Needed	-0.52*	-0.52*	-0.55*	-0.59*	-0.57*	-0.44*	-0.54*
Provider Communication	-12.3***	-12.2***	-12.7***	-13.6***	-12.1***	-10.7***	-12.6***
Courteous and Helpful Staff	-1.63	-1.59	-1.68	-1.80	-1.63	-1.41	-1.64
Clinic Attributes							
Distance to Clinic	-3.59***	-3.56***	-3.41***	-3.70***	-3.74***	-2.95***	-3.66***
Number of Physicians	-0.04*	-0.02*	-0.01*	-0.01*	-0.03*	-0.07*	-0.01*
Percent Specialty Physicians	0.32***	0.25***	0.22***	0.19***	0.19***	0.24***	0.14***
Percent Female Physicians	0.12	0.12	0.12	0.13	0.12	0.10	0.12
Percent of Patients with Diabetes Enrolled in Medicare	-1.17***	-1.08***	-1.16***	-0.92***	-1.07***	-0.95***	-1.22***
Percent of Patients with Diabetes Enrolled in MHCP	-0.59***	-0.42***	-0.74***	-0.35***	-0.41***	-0.71***	-0.47**

Abbreviations: MHCP, Minnesota Health Care Programs.

Notes: Average elasticity calculated over UPlan enrollees observed characteristics. Includes UPlan enrollees who enrolled in the Medica Elect/Essential plan in 2012 and whose previous primary care clinic is excluded in the Medica Elect/Essential plan (N = 988). All performance measures calculated from Minnesota Community Measurement publicly reported data. Clinical and Behavioral Quality represent the percent of patients meeting treatment goals for diabetes and vascular disease care. Getting Care When Needed, Provider Communication, Courteous and Helpful Staff, and Overall Provider Rating measures calculated from survey responses and represent the percent of patients giving the clinic the most favorable rating. Full descriptions of these measures are available in **Section 4.2.** The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

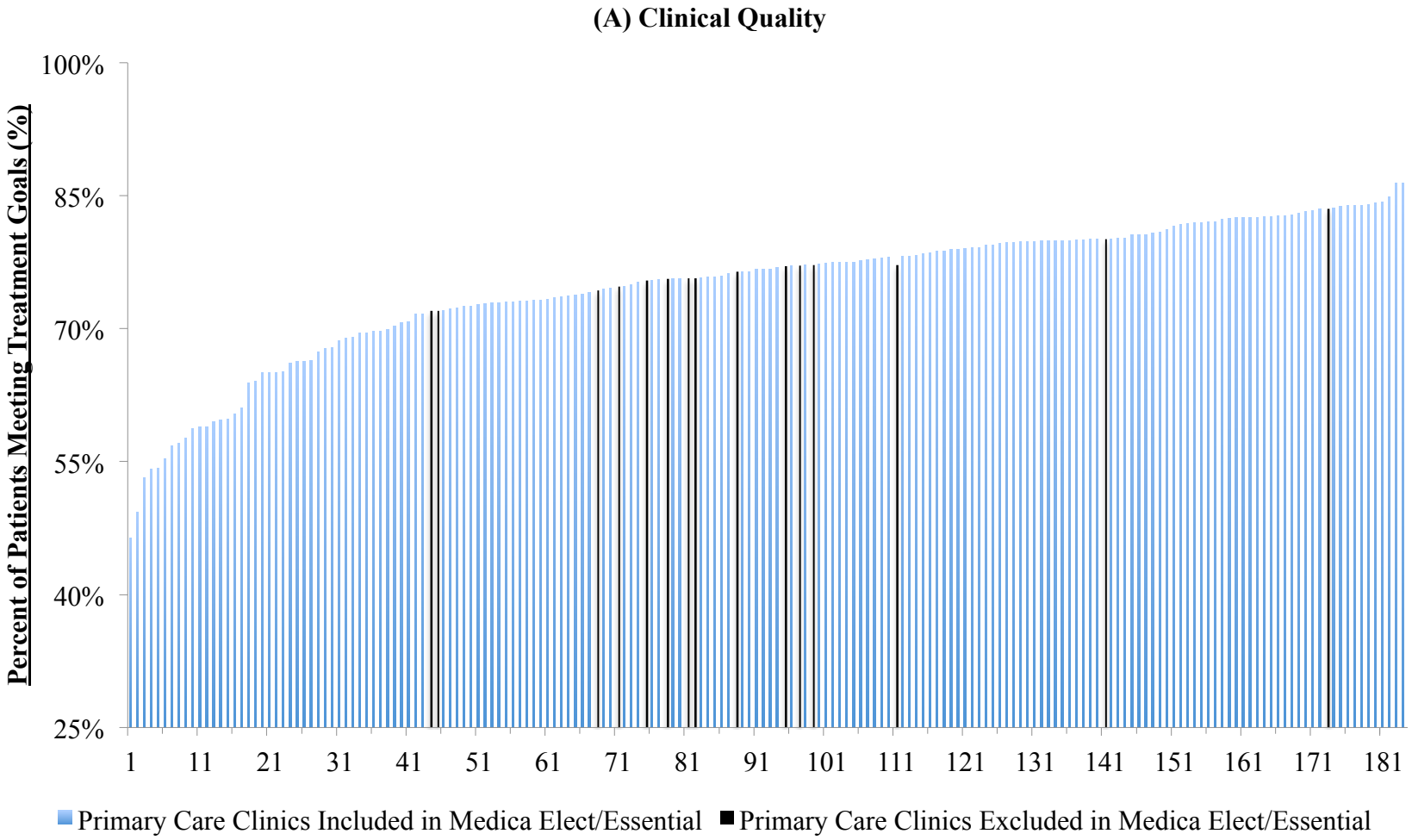
*** p<0.01, ** p<0.05, * p<0.1

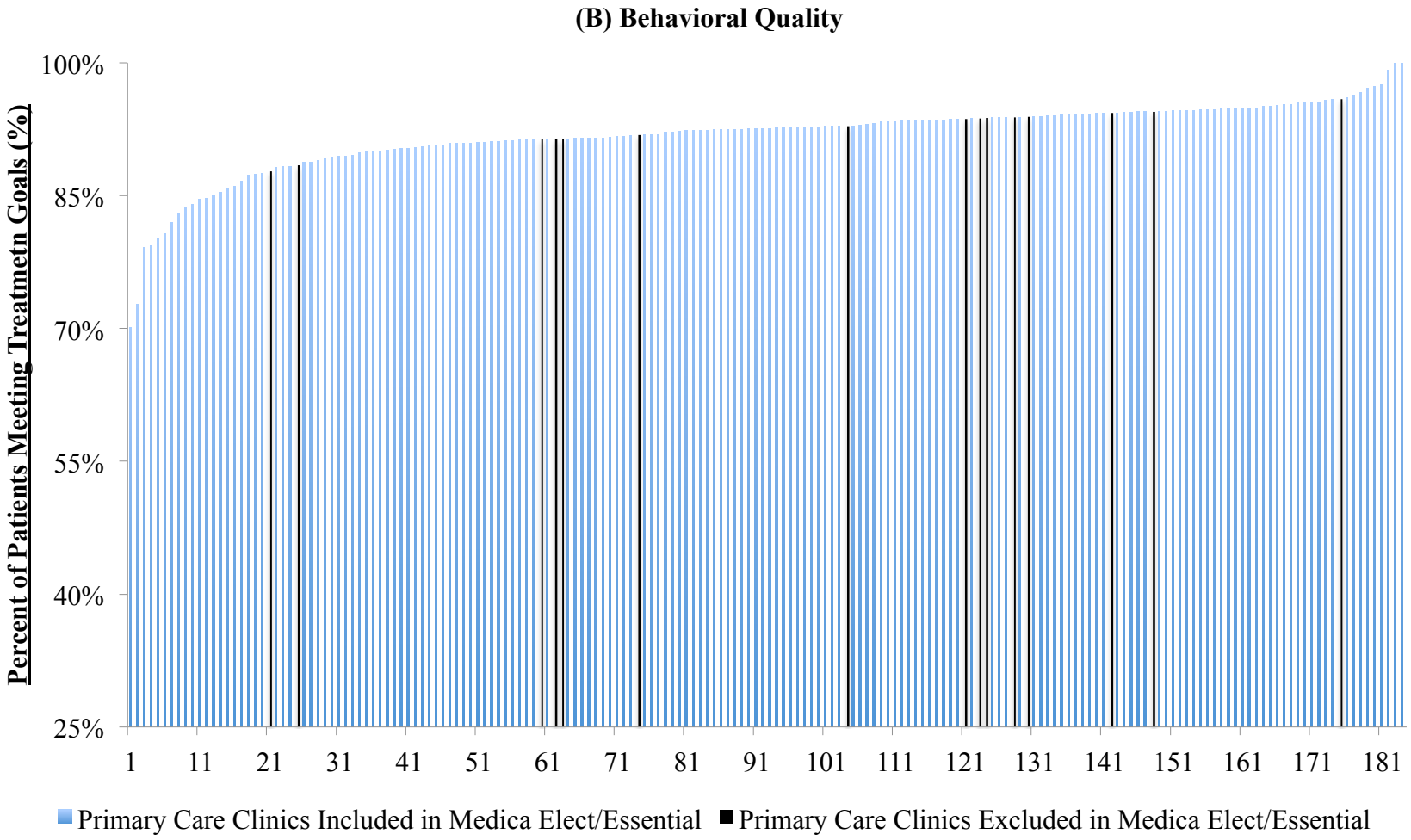
Figure 3-1 2012 Health Plan Choices of Former HealthPartners Plan Enrollees

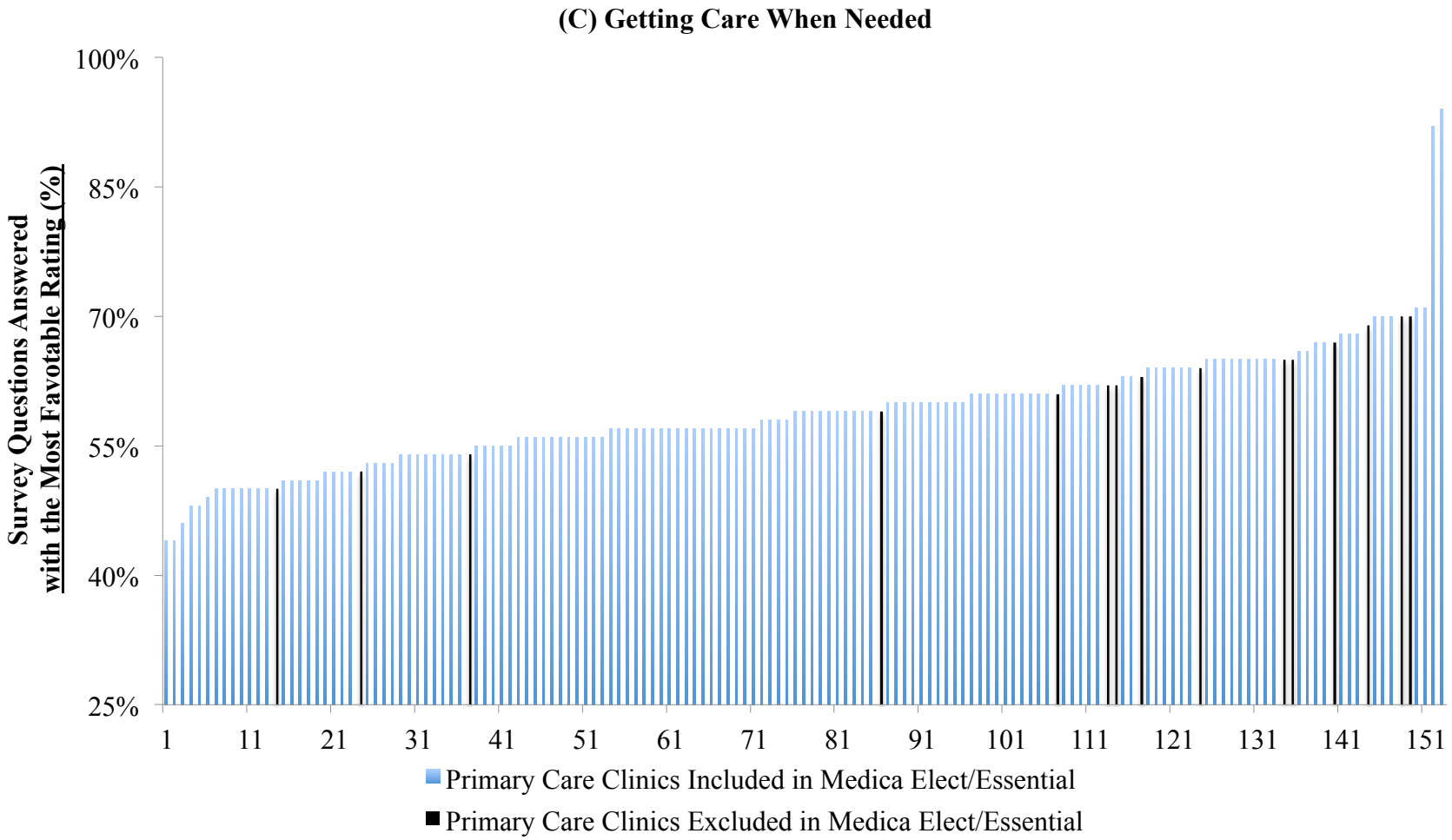


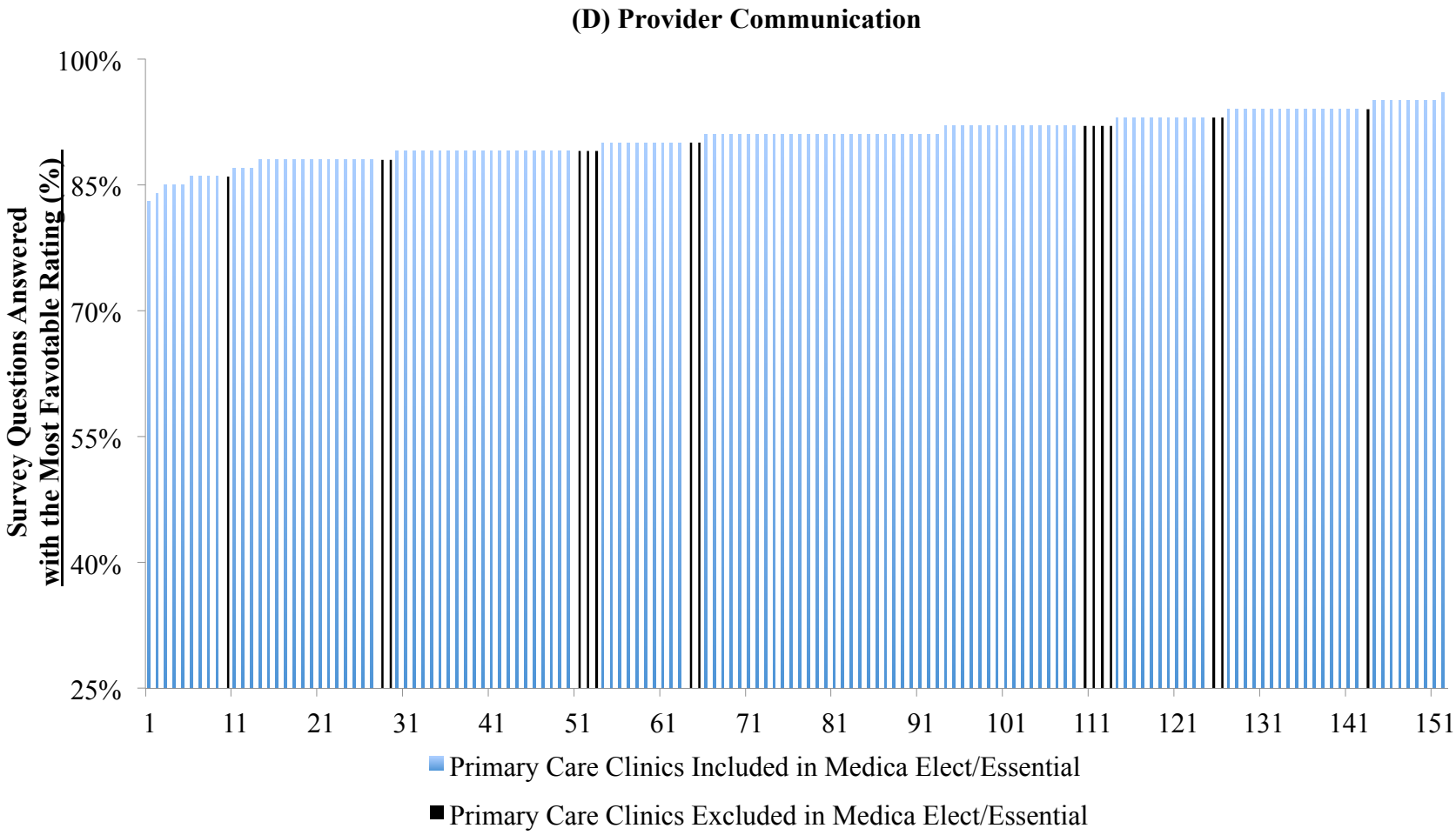
Notes: The sample of former HealthPartners plan enrollees included adults enrolled in the HealthPartners plan in 2011 and who were identified in both the 2011 and 2012 UPlan eligibility files. Approximately an additional 2,000 previous HealthPartners plan enrollees were excluded due to an inability to crosswalk 2011 individual identifiers with 2012 individual identifiers in the UPlan medical claims and eligibility files after the UPlan changed claim processers in 2012.

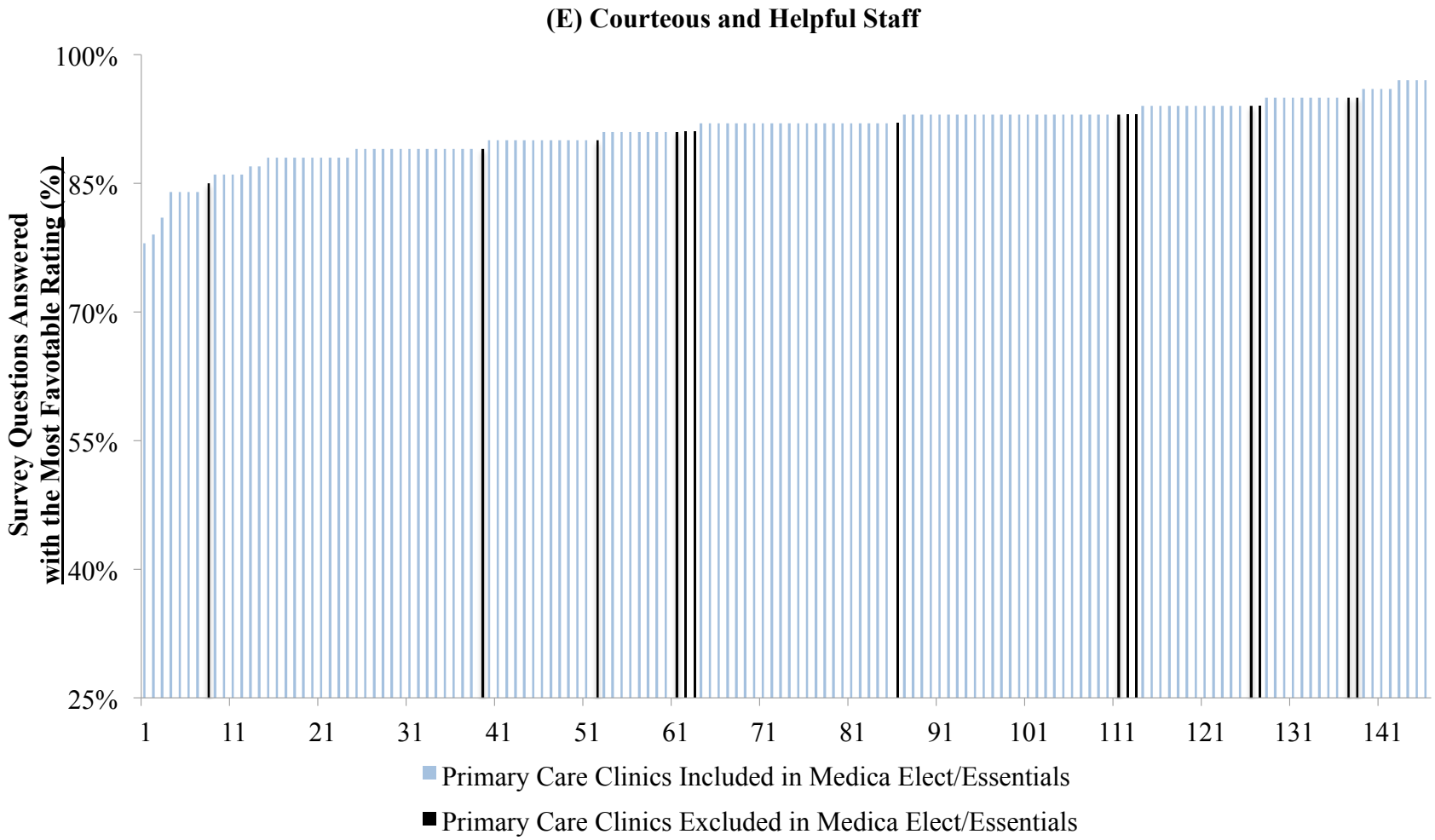
Figure 3-2 Distribution of Performance for Primary Care Clinics in the Twin Cities, 2012



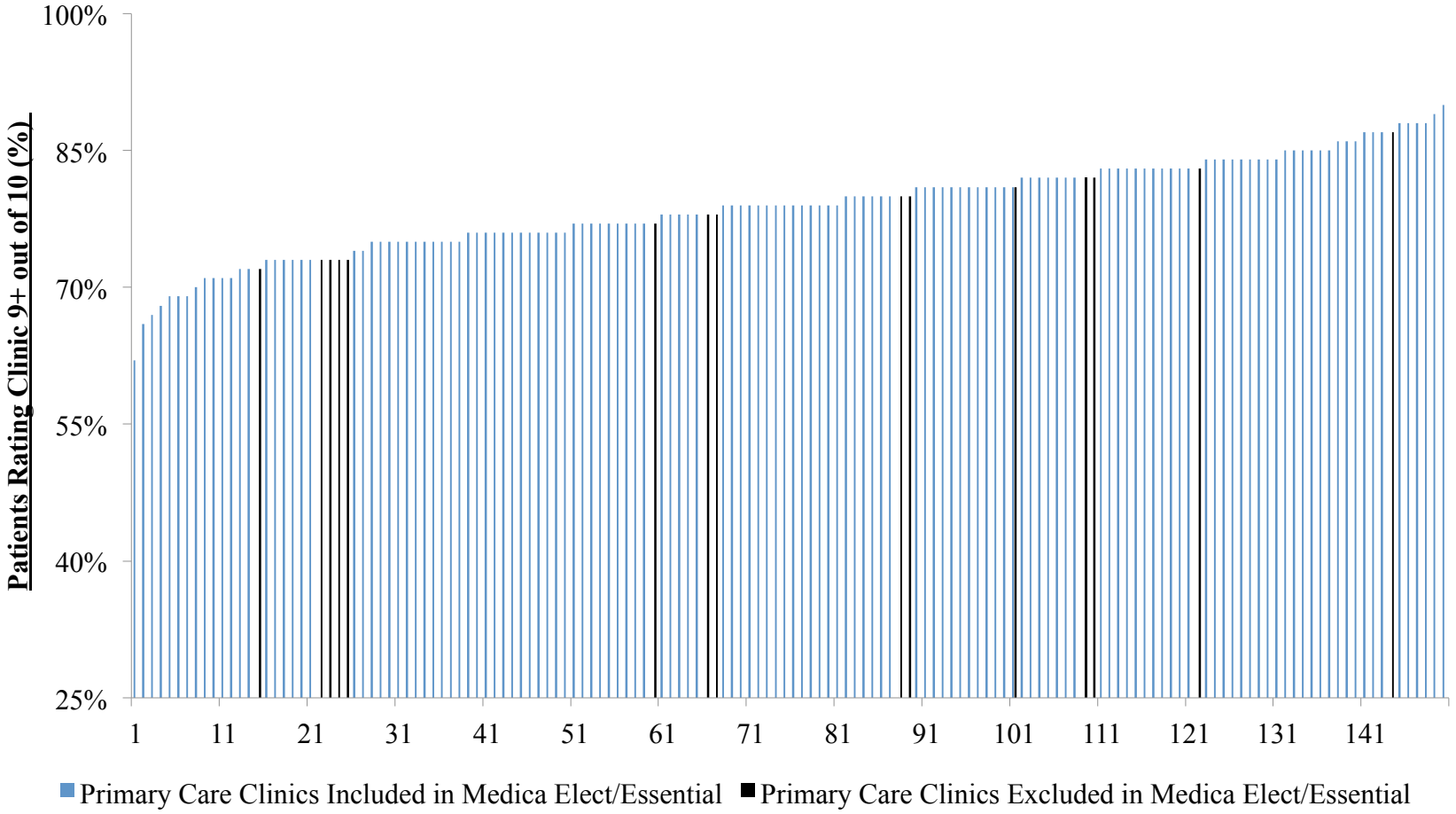

(B) Behavioral Quality
Percent of Patients Meeting Treatmetn Goals (%)
100%
85%
70%
55%
40%
25%
1
11
21
31
41
51
61
71
81
91
101
111
121
131
141
151
161
171
181
Primary Care Clinics Included in Medica Elect/Essential
Primary Care Clinics Excluded in Medica Elect/Essential


(C) Getting Care When Needed
Survey Questions Answered with the Most Favotable Rating (%)
100%
85%
70%
55%
40%
25%
1
11
21
31
41
51
61
71
81
91
101
111
121
131
141
151
Primary Care Clinics Included in Medica Elect/Essential
Primary Care Clinics Excluded in Medica Elect/Essential


(D) Provider Communication
Survey Questions Answered with the Most Favotable Rating (%)
100%
85%
70%
55%
40%
25%
1
11
21
31
41
51
61
71
81
91
101
111
121
131
141
151
Primary Care Clinics Included in Medica Elect/Essential
Primary Care Clinics Excluded in Medica Elect/Essential


(E) Courteous and Helpful Staff
Survey Questions Answered with the Most Favotable Rating (%)
100%
85%
70%
55%
40%
25%
1
11
21
31
41
51
61
71
81
91
101
111
121
131
141
Primary Care Clinics Included in Medica Elect/Essentials
Primary Care Clinics Excluded in Medica Elect/Essentials

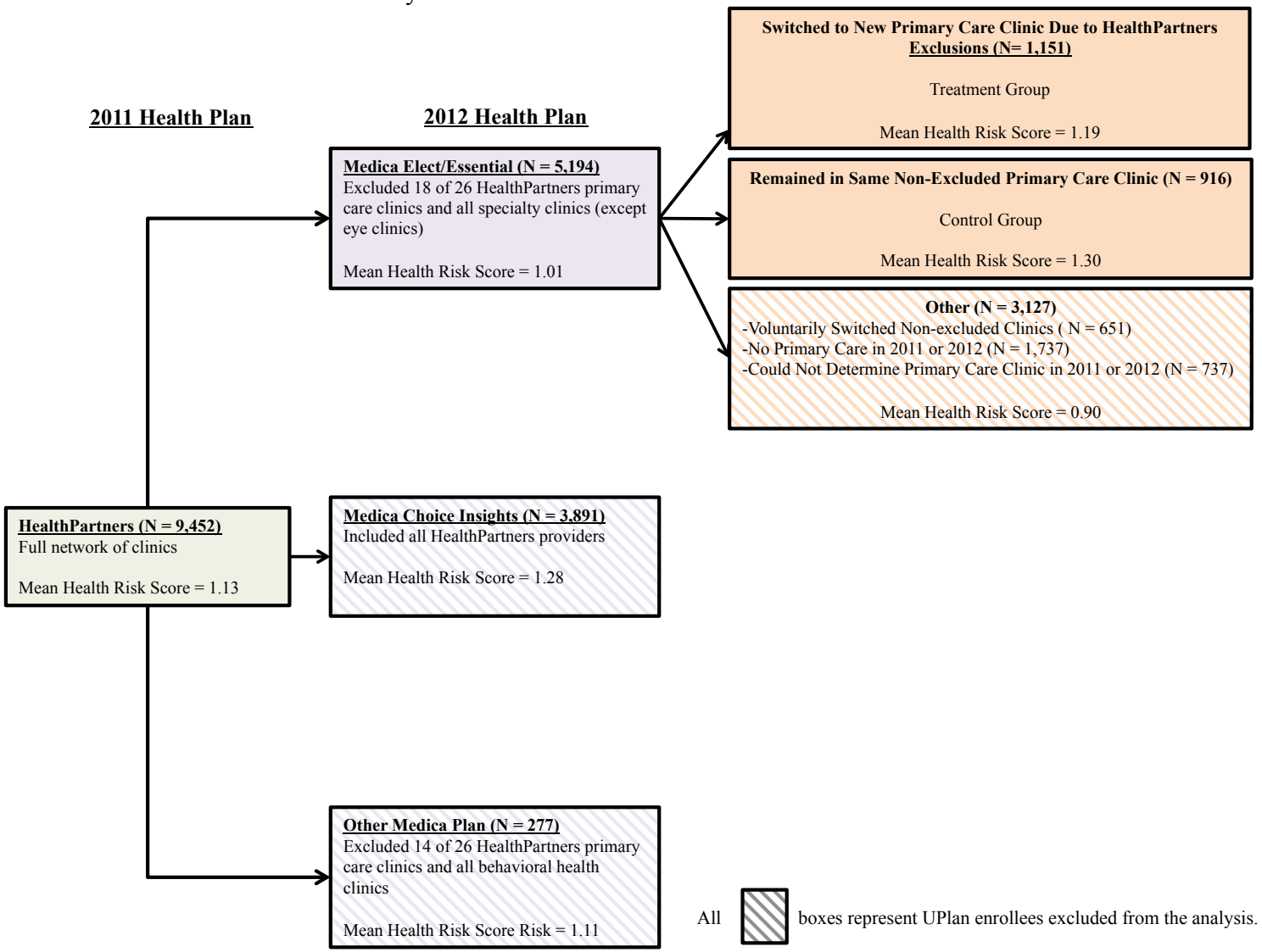
(F) Overall Provider Rating



Notes: Includes primary care clinics reporting to Minnesota Community Measurement. The Twin Cities area included Anoka, Dakota, Hennepin, Ramsey, and Washington counties. All performance measures calculated from Minnesota Community Measurement publicly reported data. Clinical and behavioral quality represent the percent of patients meeting treatment goals for diabetes and vascular disease care. Getting Care When Needed, Provider Communication, Courteous and Helpful Staff, and Overall Provider

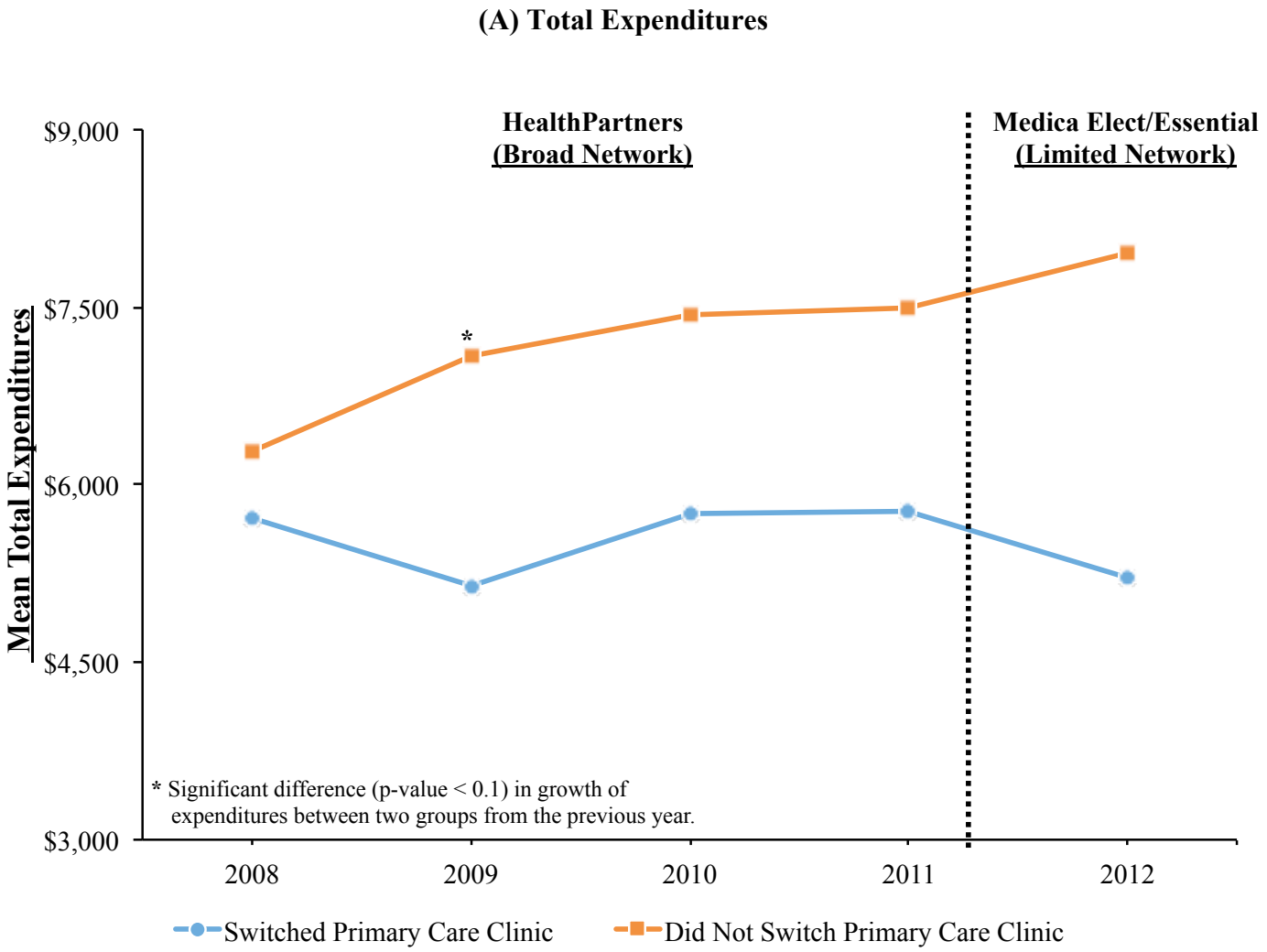
Rating measures calculated from survey responses and represent the percent of patients giving the clinic the most positive rating. Full descriptions of these measures are available in **Section 4.2.** The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

Figure 5-1 UPlan Enrollees Included in Analysis

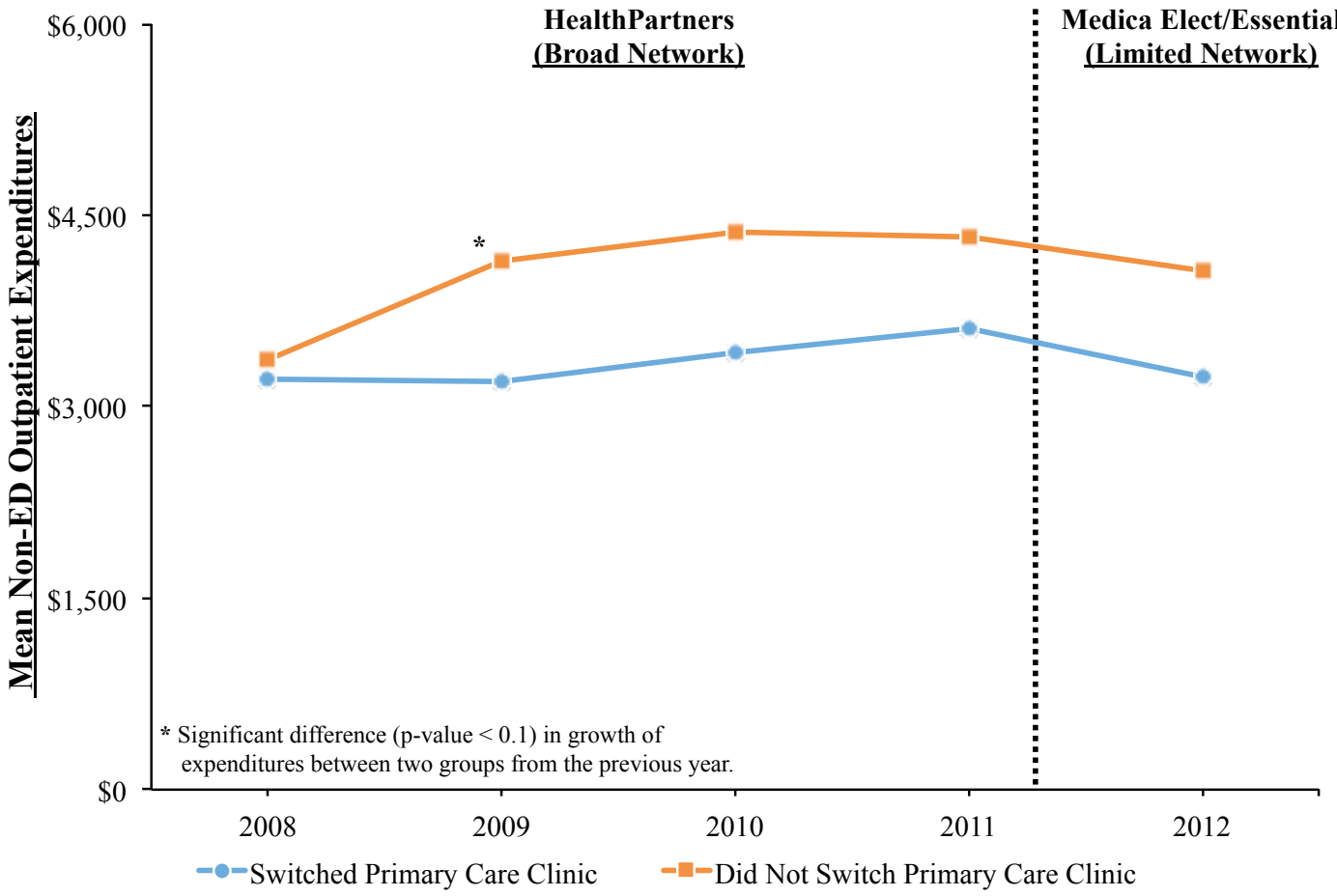


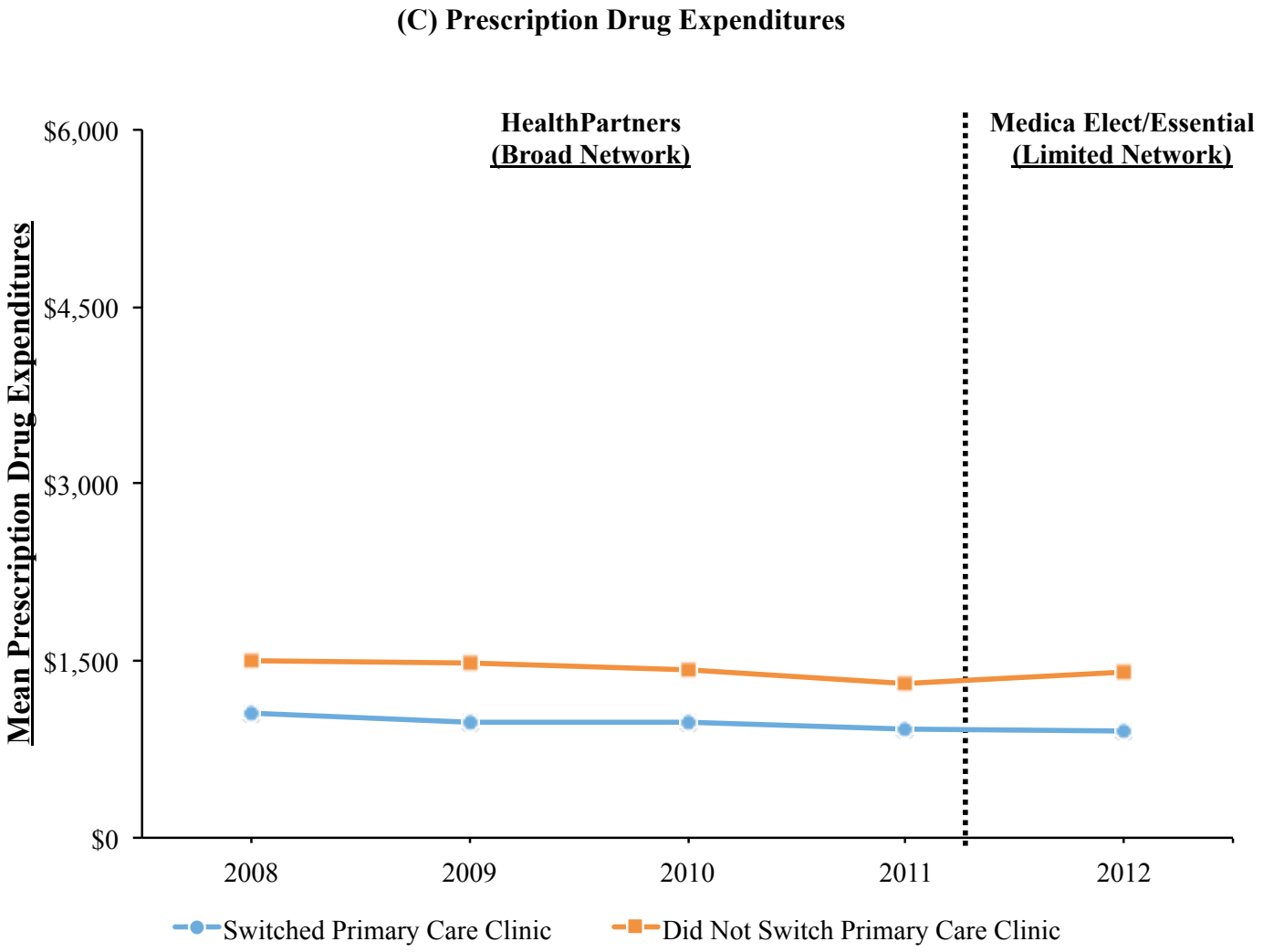
Notes: The sample of former HealthPartners plan enrollees included adults enrolled in the HealthPartners plan in 2011 and who were identified in both the 2011 and 2012 UPlan eligibility files. Approximately 2,000 previous HealthPartners plan enrollees are excluded due to an inability to crosswalk 2012 individual identifiers to 2011 individual identifiers in the UPlan medical claims and eligibility files after the UPlan changed claim processers in 2012.

Figure 5-2 Expenditures for New 2012 Medica Elect/Essential Enrollees, 2008 through 2012

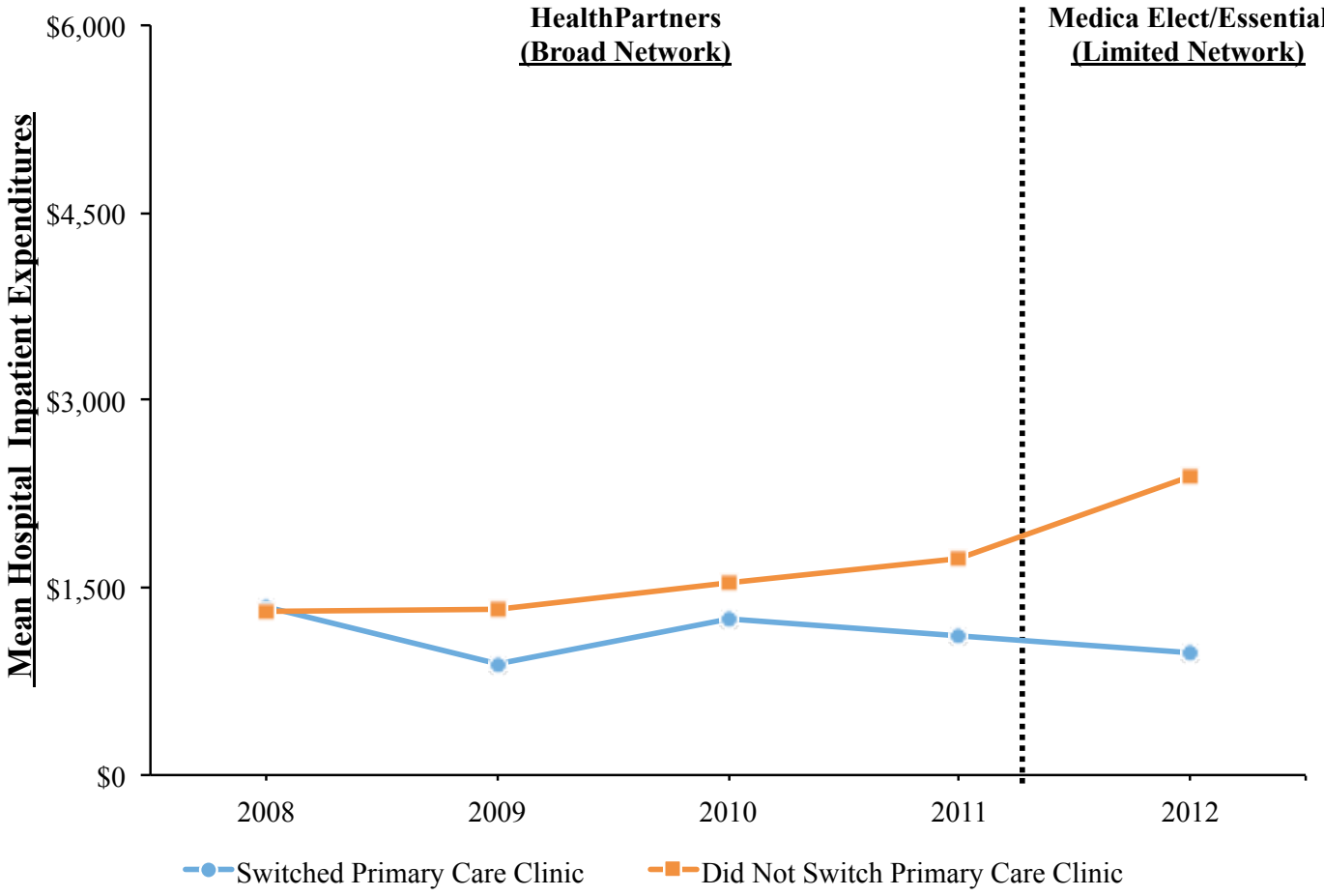


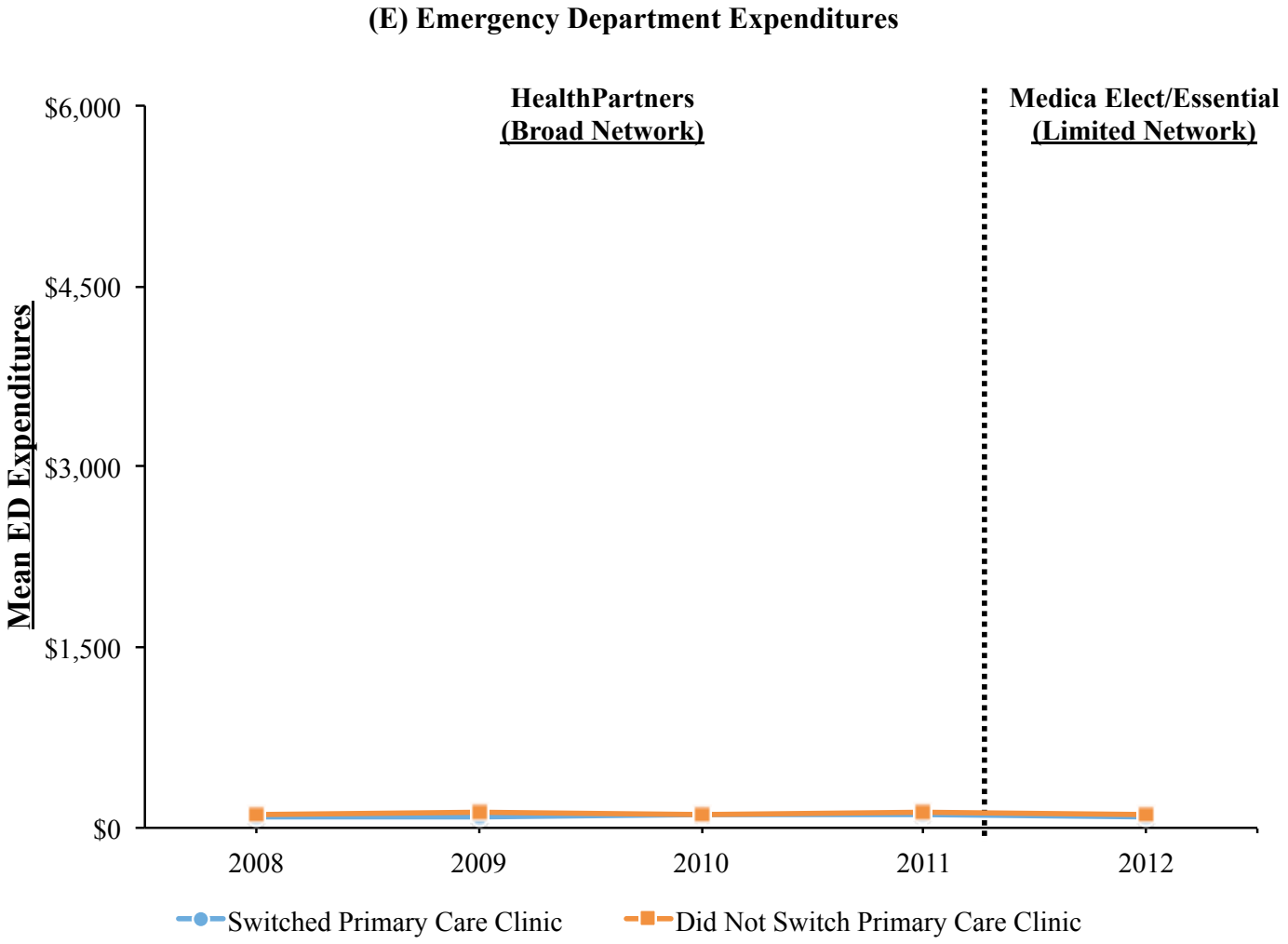
(B) Non-Emergency Department Outpatient Expenditures




(C) Prescription Drug Expenditures
HealthPartners
(Broad Network)
Medica Elect/Essential
(Limited Network)
Mean Prescription Drug Expenditures
$6,000
$4,500
$3,000
$1,500
$0
2008
2009
2010
2011
2012
Switched Primary Care Clinic
Did Not Switch Primary Care Clinic

(D) Hospital Inpatient Expenditures

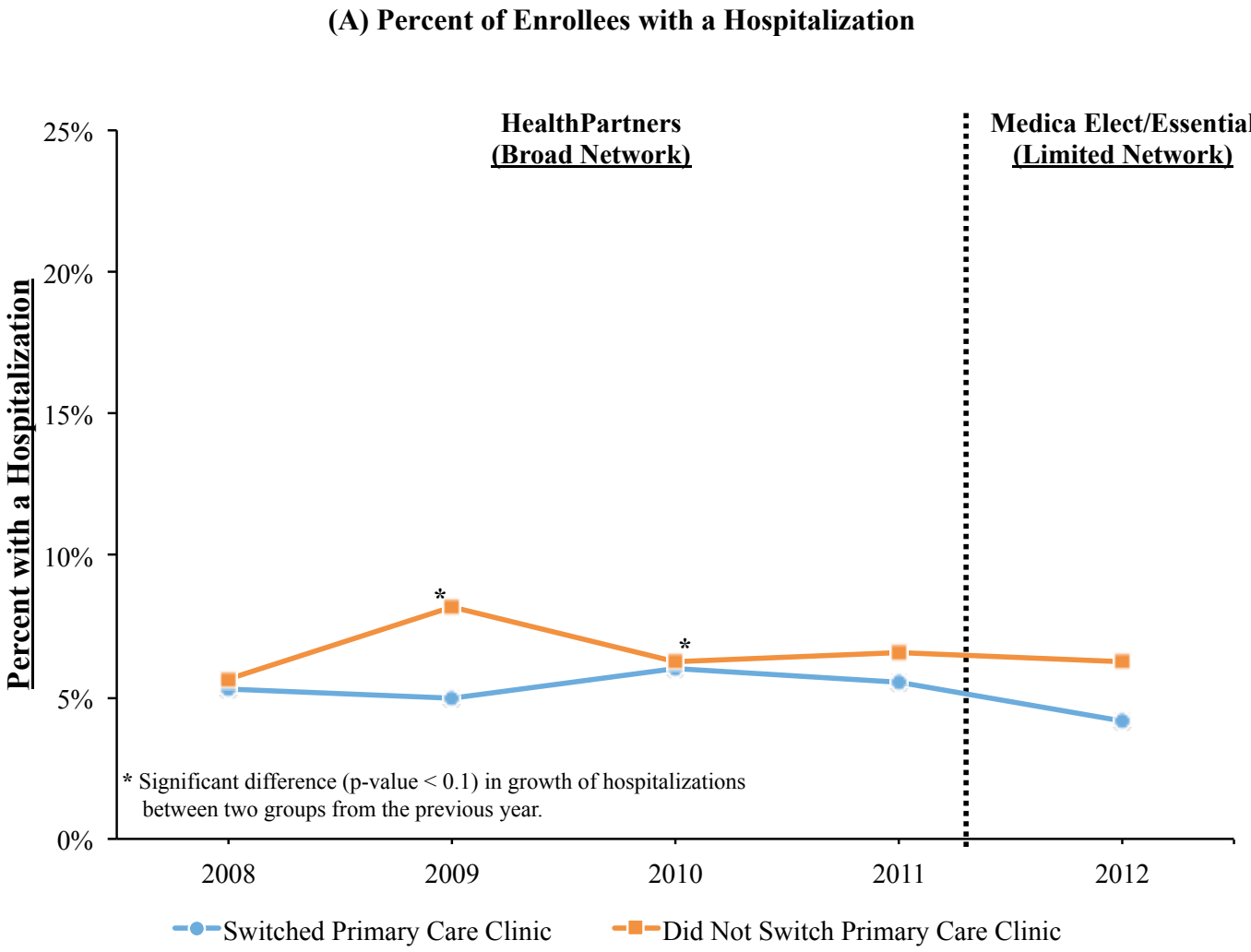




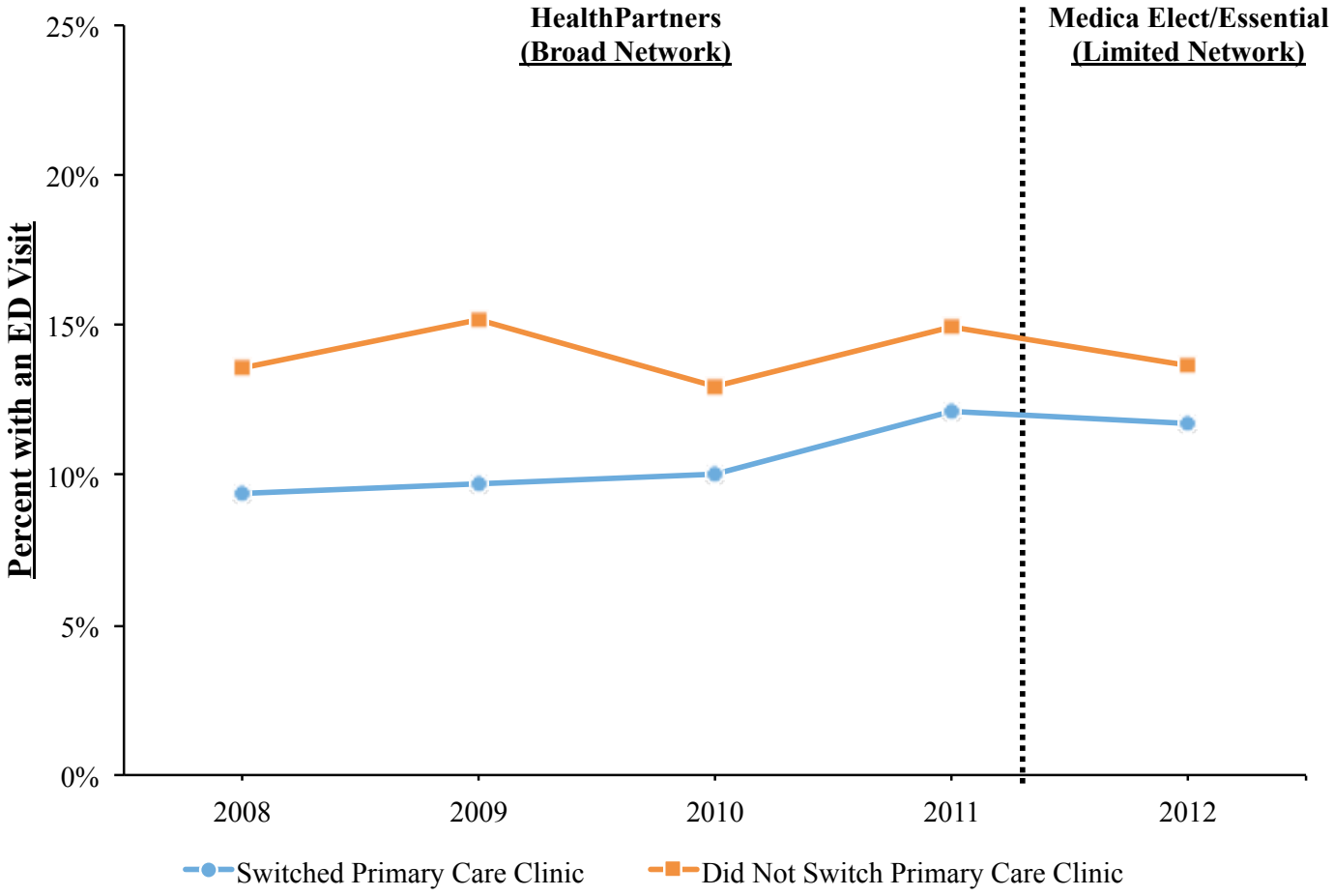
Abbreviation: ED, Emergency Department.

Notes: Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). All expenditures are adjusted to 2012 dollars and include plan payments and out-of-pocket costs.

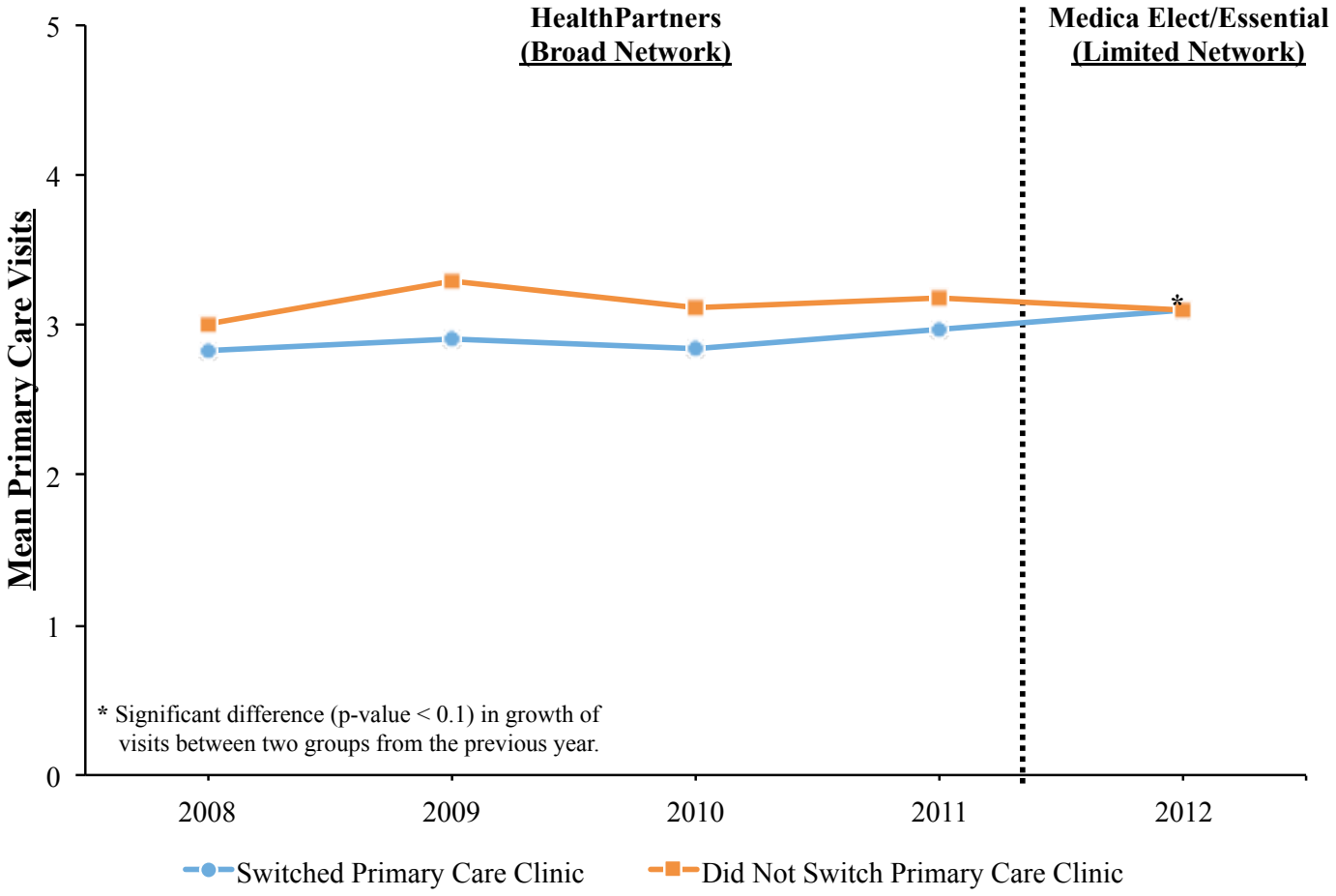
Figure 5-3 Utilization for New 2012 Medica Elect/Essential Enrollees, 2008 through 2012

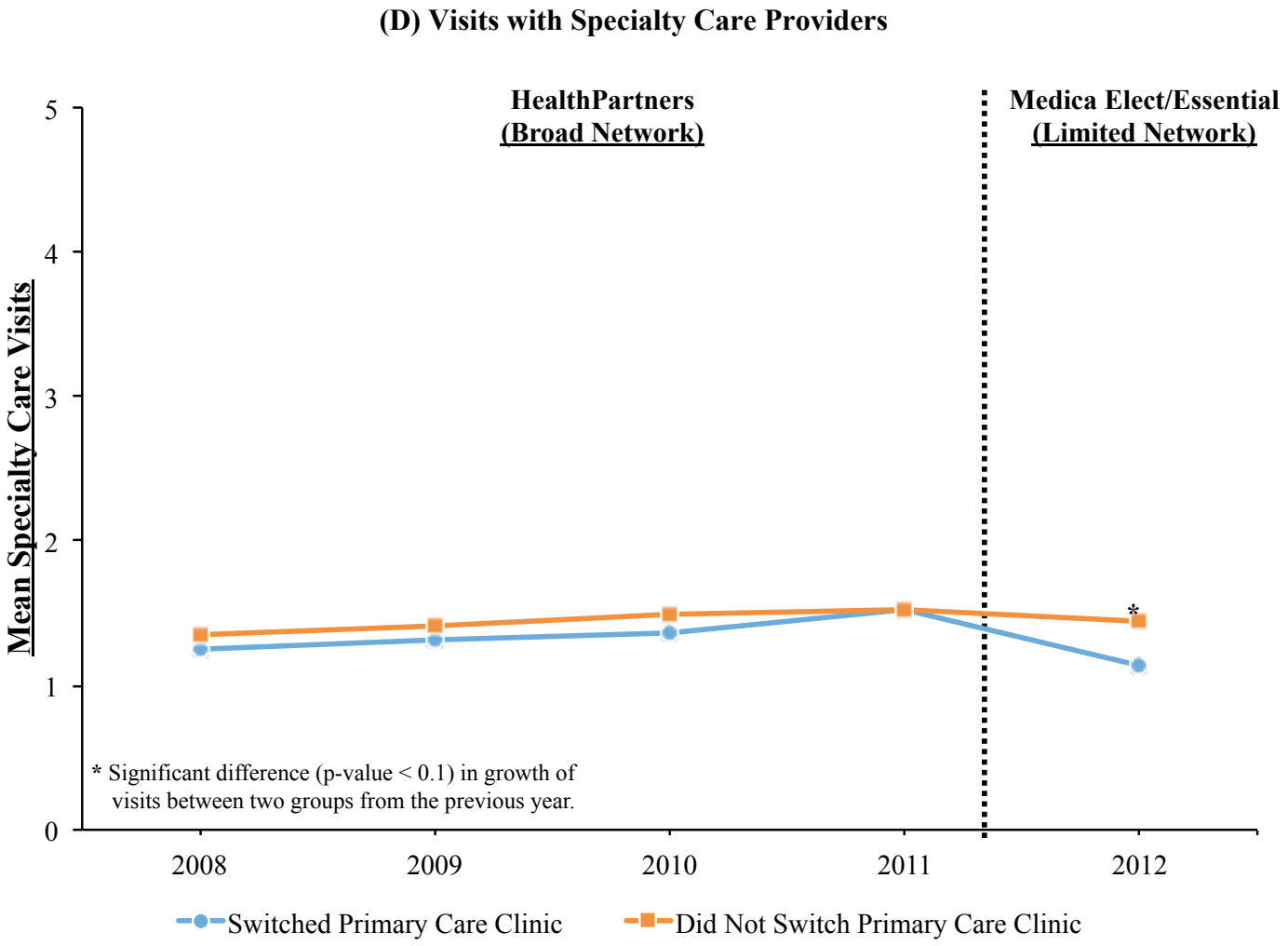


(B) Percent of Enrollees with an Emergency Department Visit



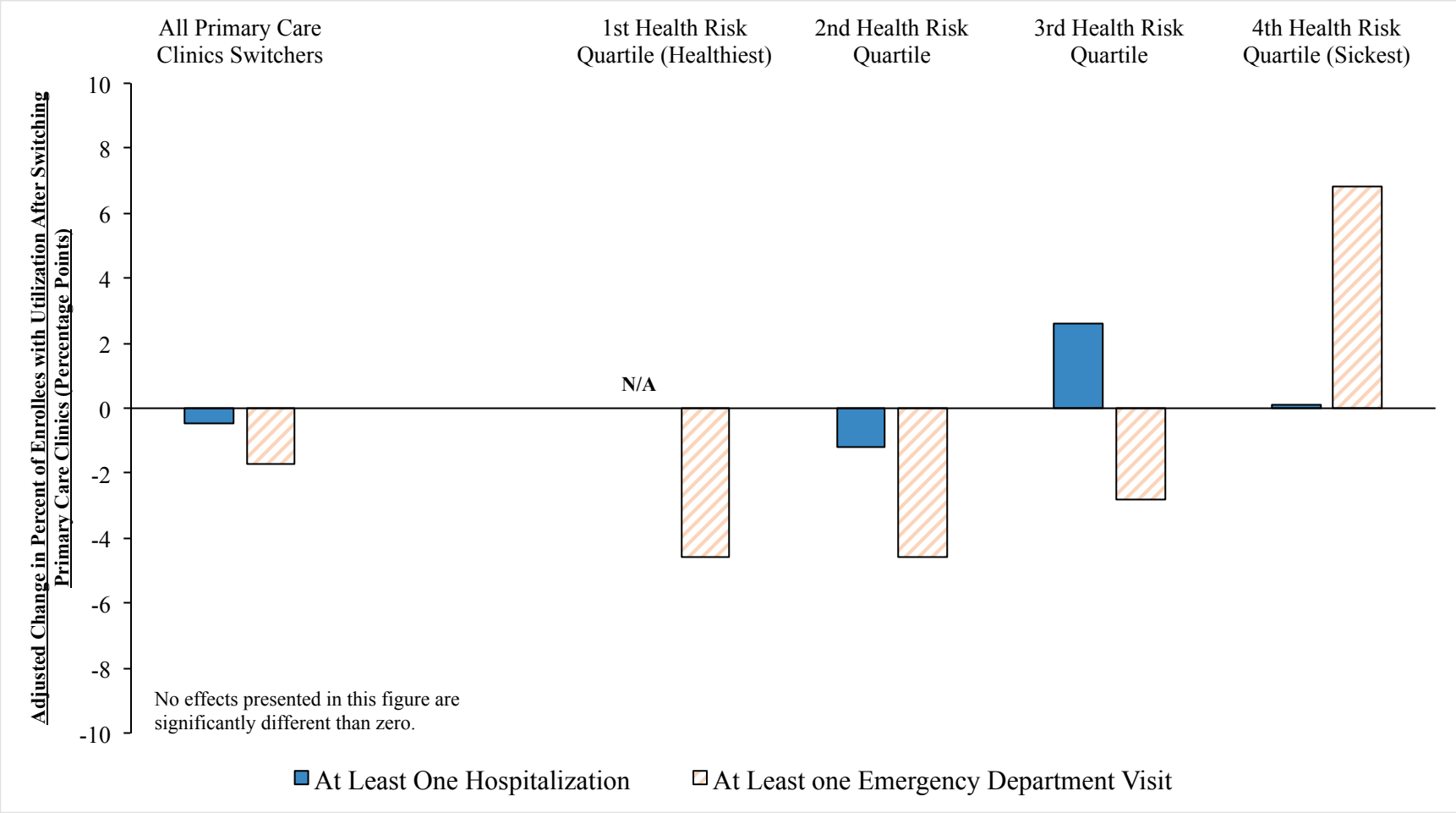
(C) Visits with Primary Care Providers





Notes: Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916).

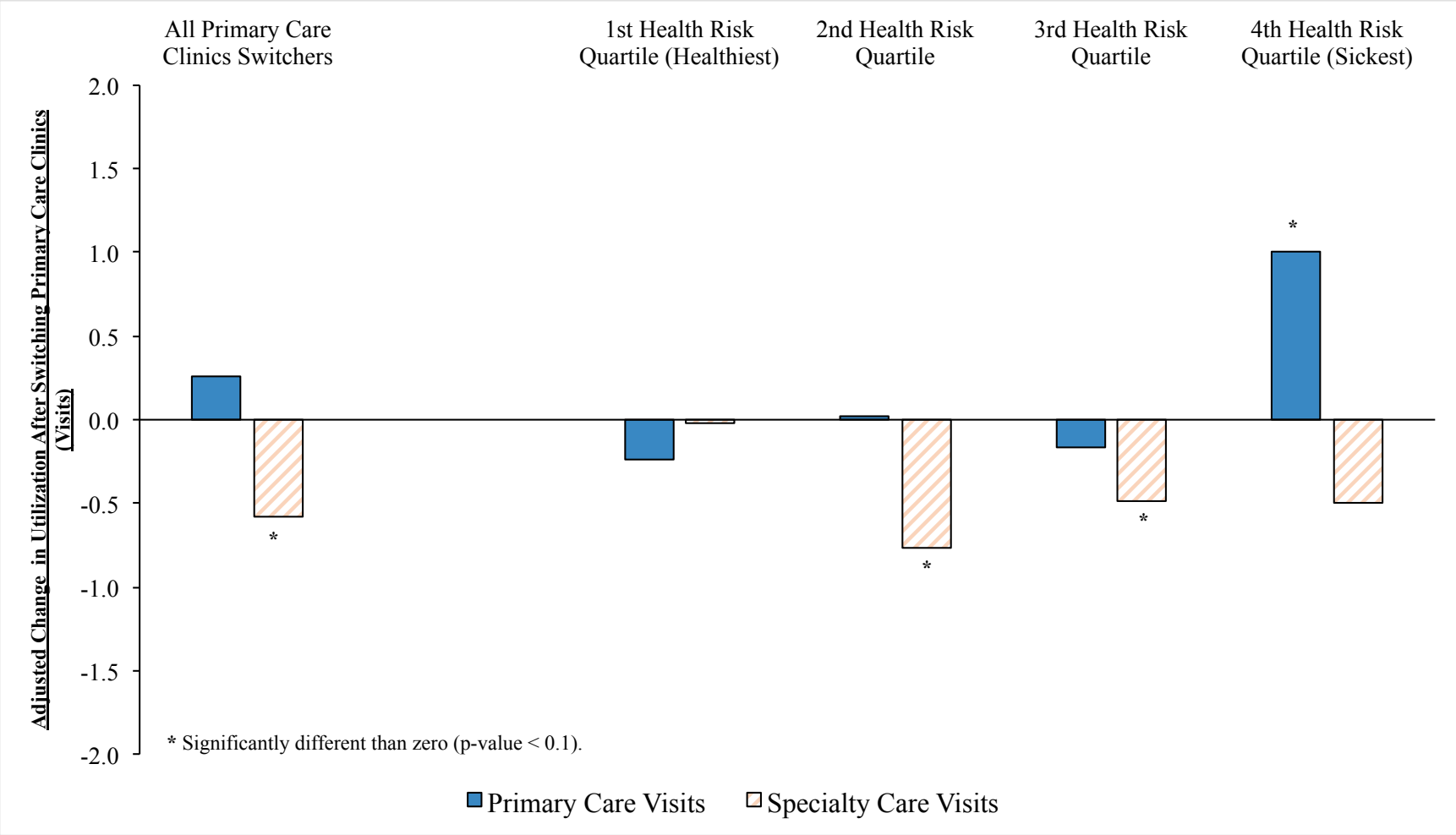
Figure 6-1 Adjusted Changes in Percent of Enrollees with a Hospitalization and Percent of Enrollees with an Emergency Department Visit After Switching Primary Care Clinics



Notes**:** Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). Table

presents average marginal effects from the difference-in-differences probit regressions presented in **Table 6-1** including health system effects and primary care clinic performance. Marginal effect of switching primary care clinics on the probability of having a hospitalization for health risk Quartile 1 could not be estimated because no enrollees who switched clinics in Quartile 1 had a hospitalization in 2012. Standard errors to determine significance clustered by enrollee.

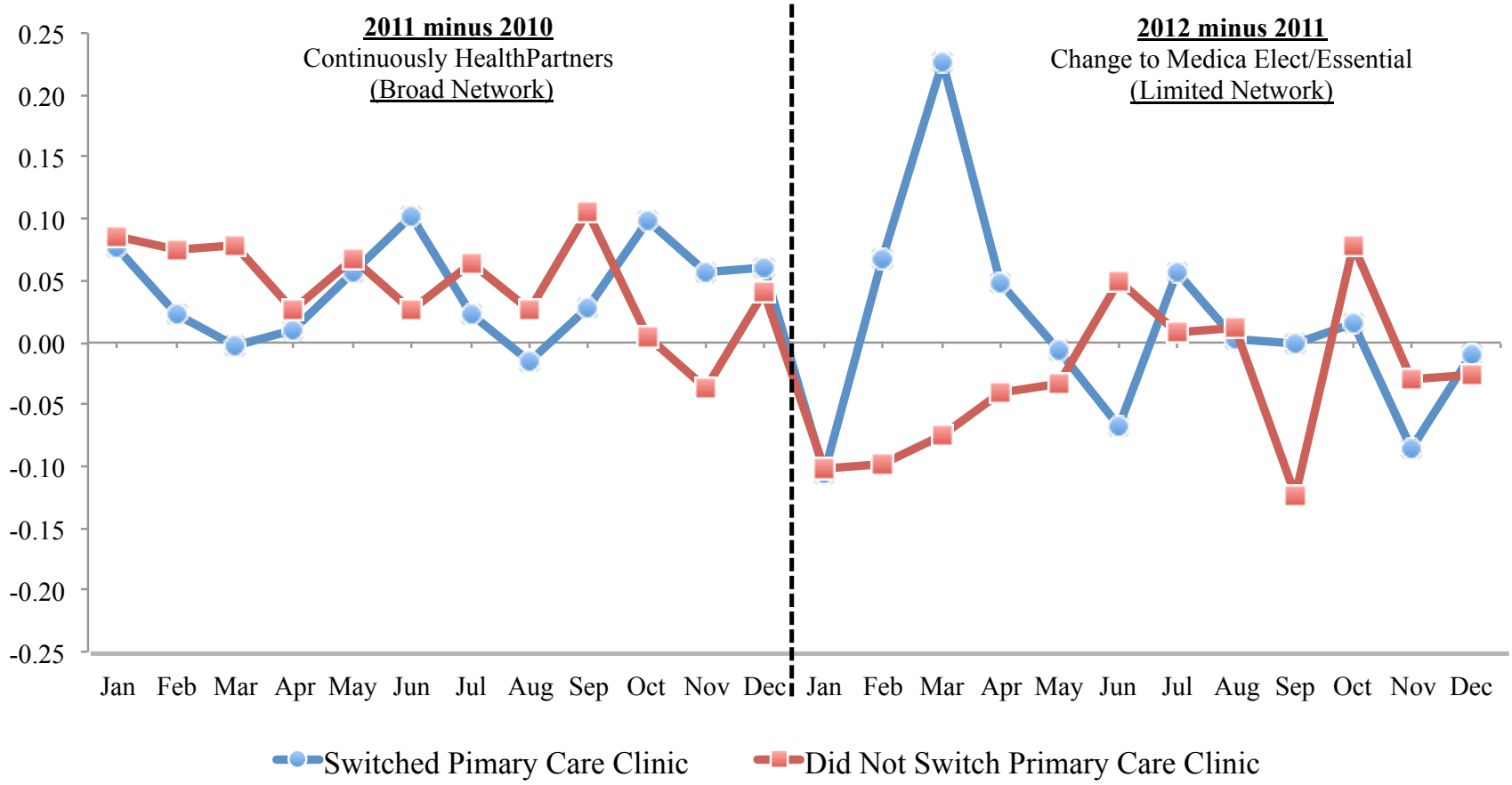
Figure 6-2 Adjusted Changes in the Number of Visits with Primary Care and Specialty Care Providers After Switching Primary Care Clinics



Notes**:** Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). Table

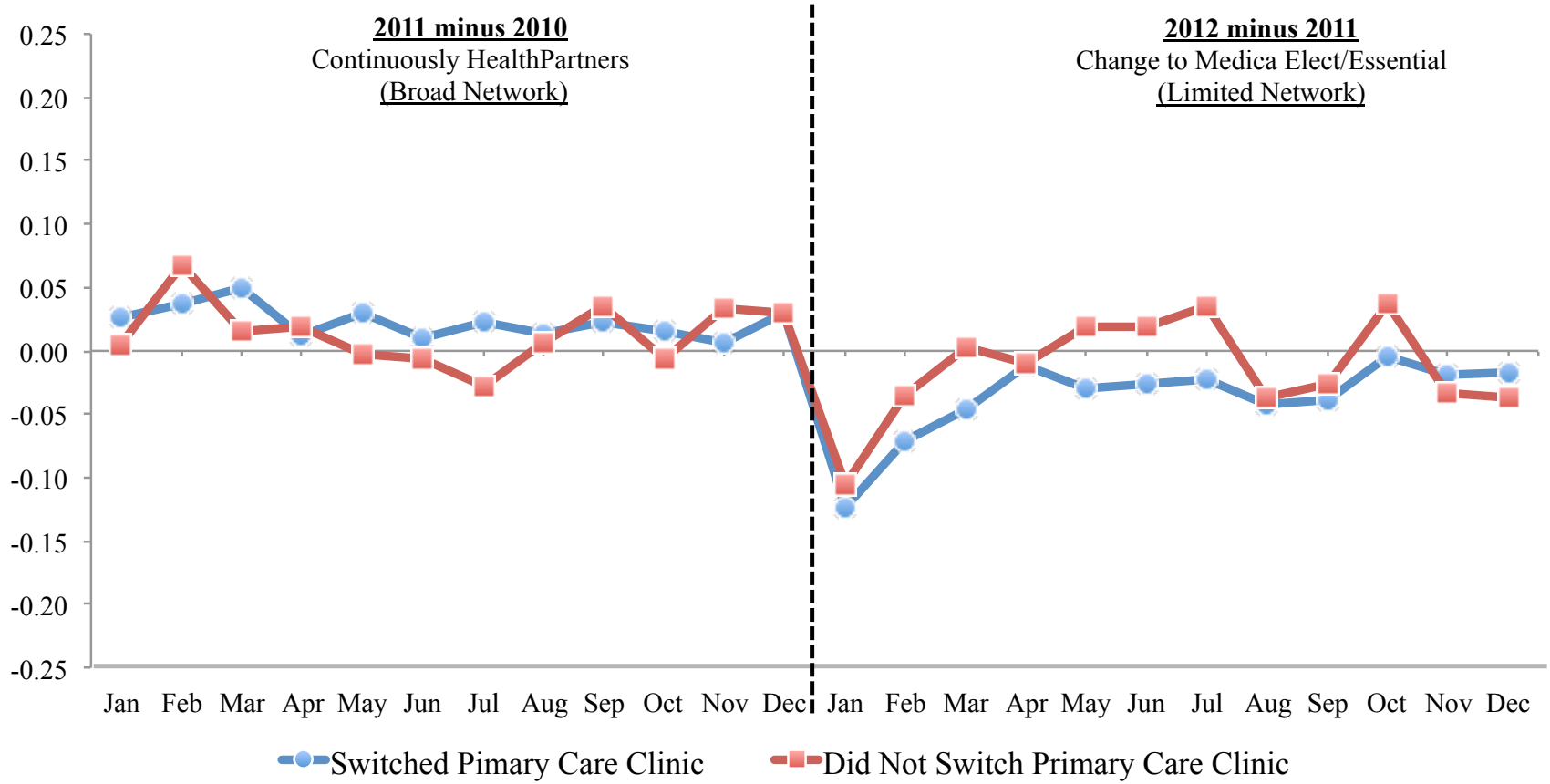
presents marginal effects at the means from the difference-in-differences negative binomial regressions presented in **Table 6-2** including health system effects and primary care clinic performance. Standard errors to determine significance clustered by enrollee.

Figure 6-3 Difference in Visits with Primary Care Providers per Enrollee from Previous Year by Month, Enrollees in the Sickest Health Risk Quartile



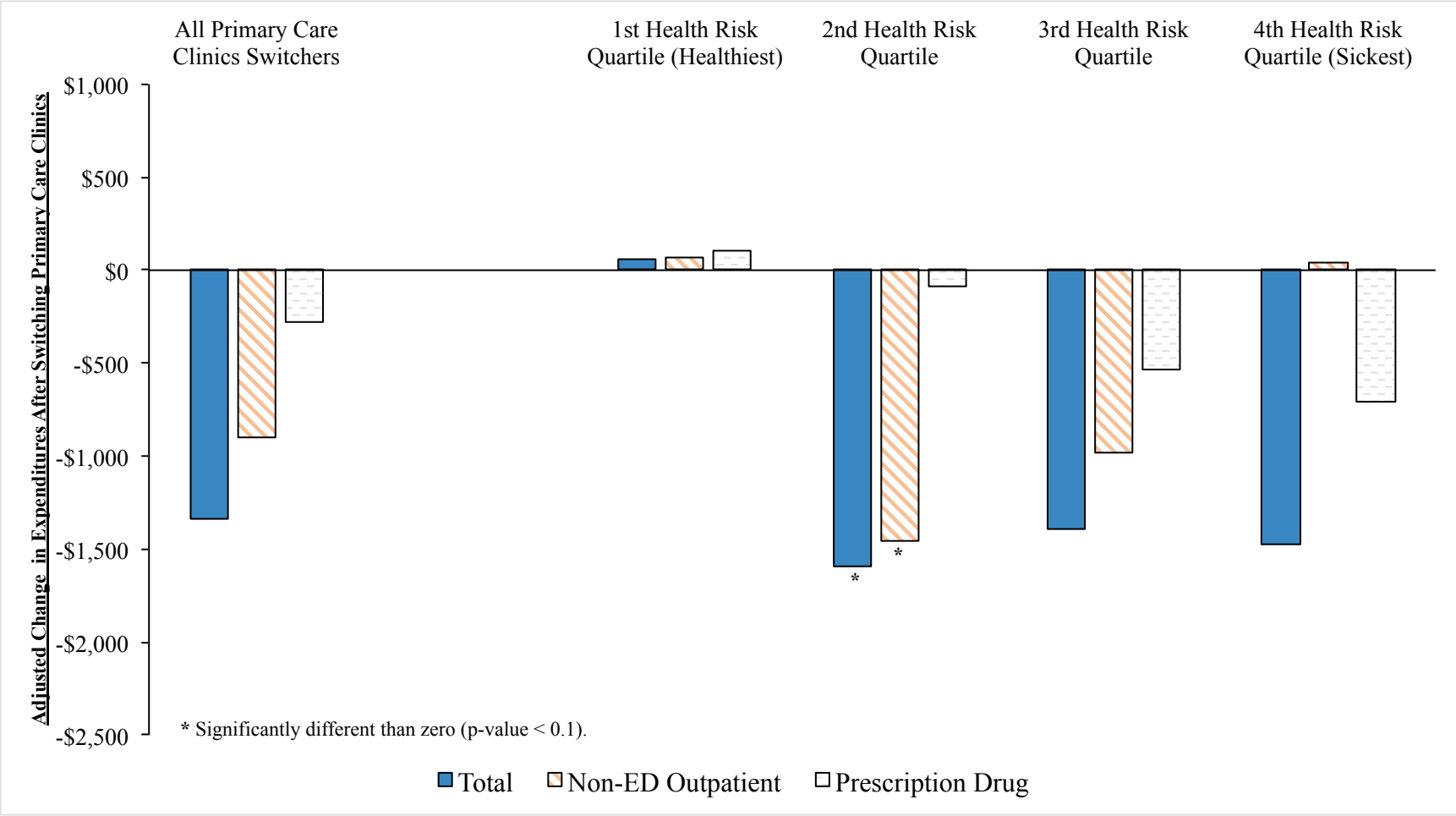
Notes**:** Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012, who were in the sickest health risk quartile, and who either switched primary care clinics due to network restrictions (N = 314) or did not switch clinics (N = 266).

Figure 6-4 Difference in Visits with Specialty Care Providers per Enrollee from Previous Year by Month, Enrollees in the Three Sickest Health Risk Quartiles



Notes**:** Includes former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012, who were in the three sickest health risk quartile, and who either switched primary care clinics due to network restrictions (N = 823) or did not switch clinics (N = 664).

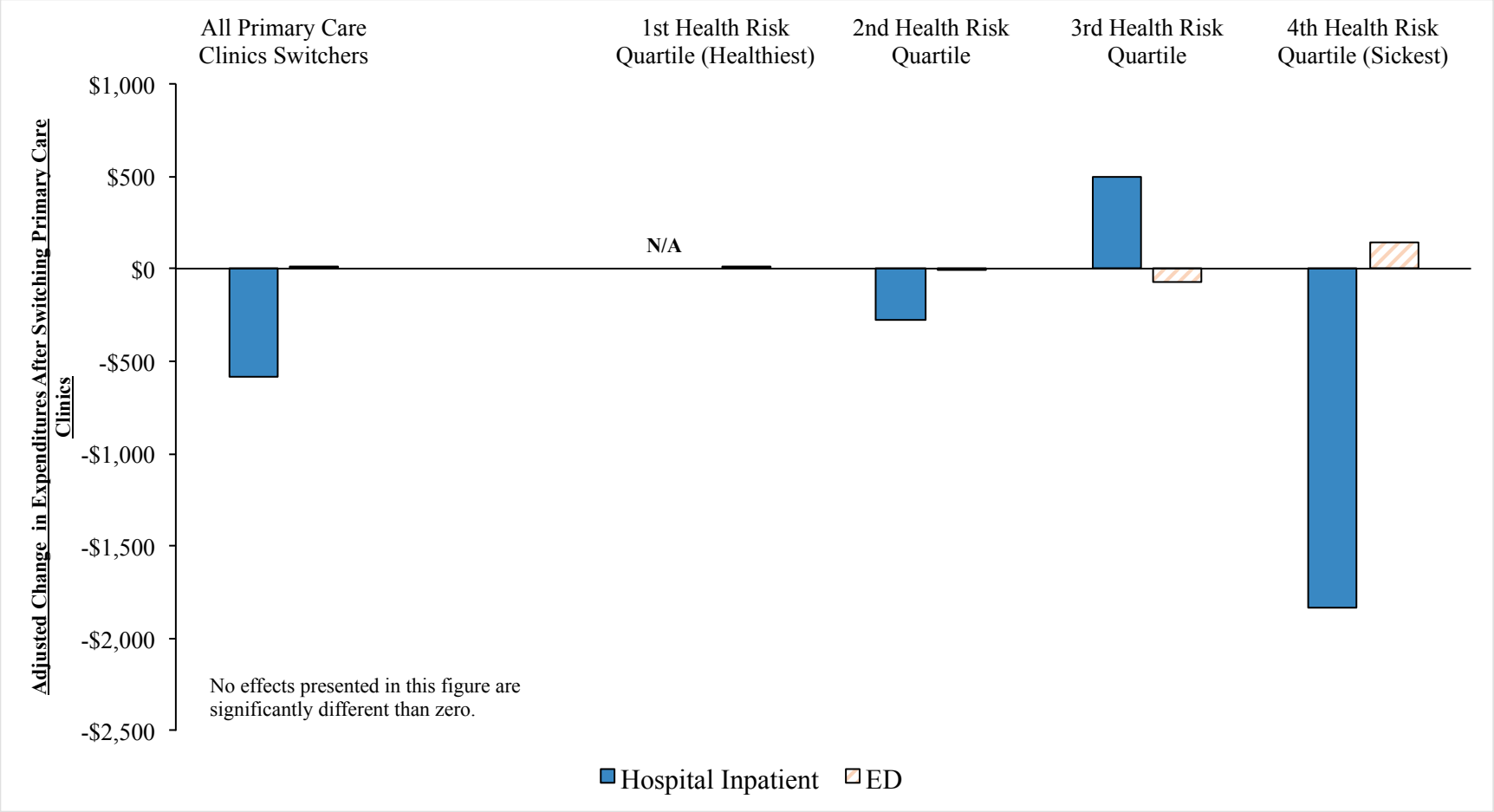
Figure 6-5 Adjusted Changes in Total, Non-Emergency Department Outpatient, and Prescription Drug Expenditures After Switching Primary Care Clinics



Abbreviations: ED, Emergency Department.

Notes**:** Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). Table presents marginal effects at the means from the difference-in-difference generalized linear model regressions presented in **Table 6-4** and **Table 6-5** including health system effects and primary care clinic performance. Standard errors to determine significance clustered by enrollee.

Figure 6-6 Adjusted Changes in Hospital Inpatient and Emergency Department Expenditures After Switching Primary Care Clinics

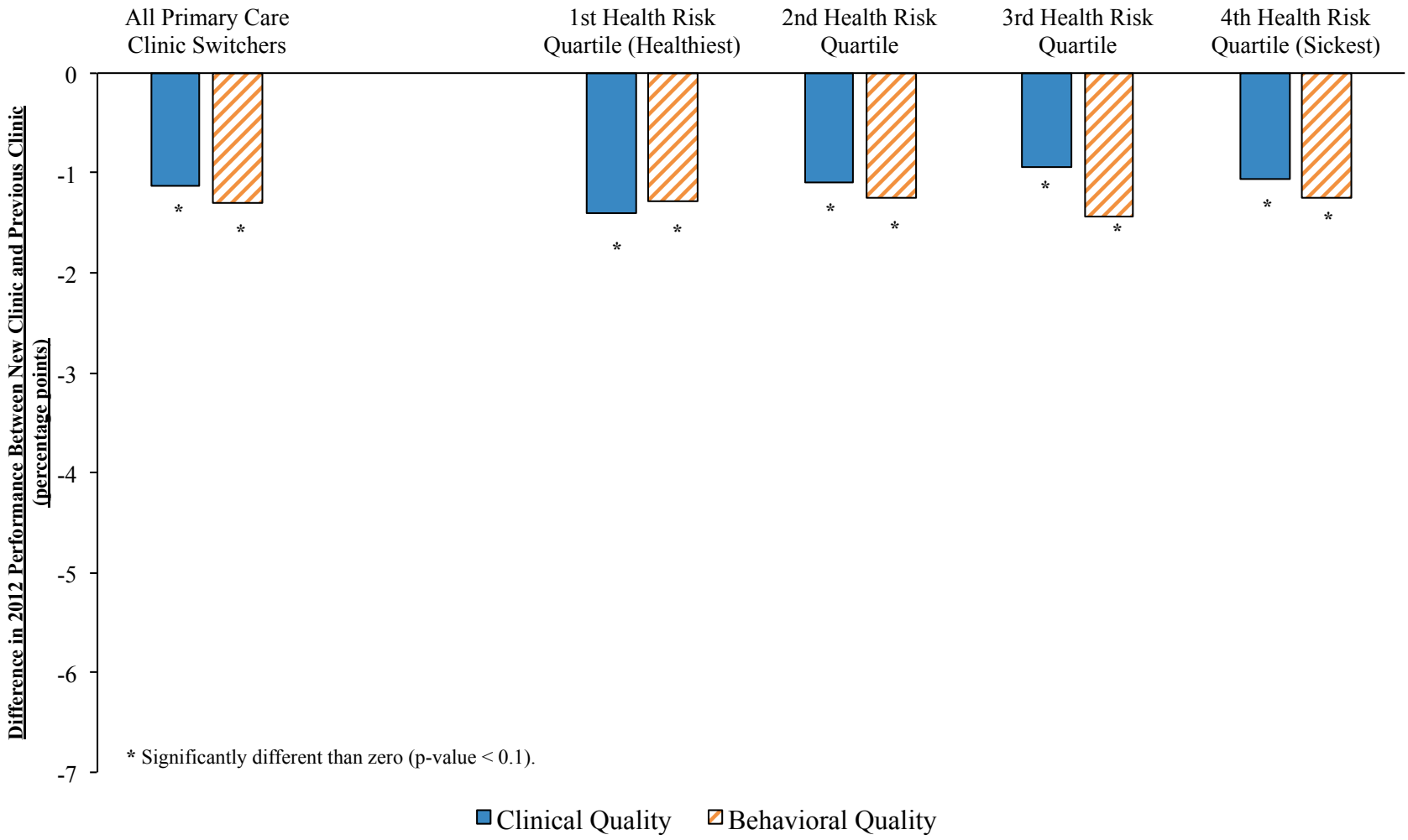


Abbreviations: ED, Emergency Department.

Notes**:** Includes 2,067 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who either switched primary care clinics due to network restriction (N = 1,151) or who remain in the same non-excluded clinic (N = 916). Table

presents marginal effects at the means unconditional on utilization. Marginal effects calculated from two-part model utilizing the difference-in-difference probit regressions presented in **Table 6-1** and the generalized linear models presented in **Table 6-6** that include health system effects and primary care clinic performance. Marginal effect of switching primary care clinics on the probability of having a hospitalization for health risk Quartile 1 could not be estimated because no enrollees who switched clinics in Quartile 1 had a hospitalization in 2012. Standard errors to determine significance bootstrapped (200 iterations).

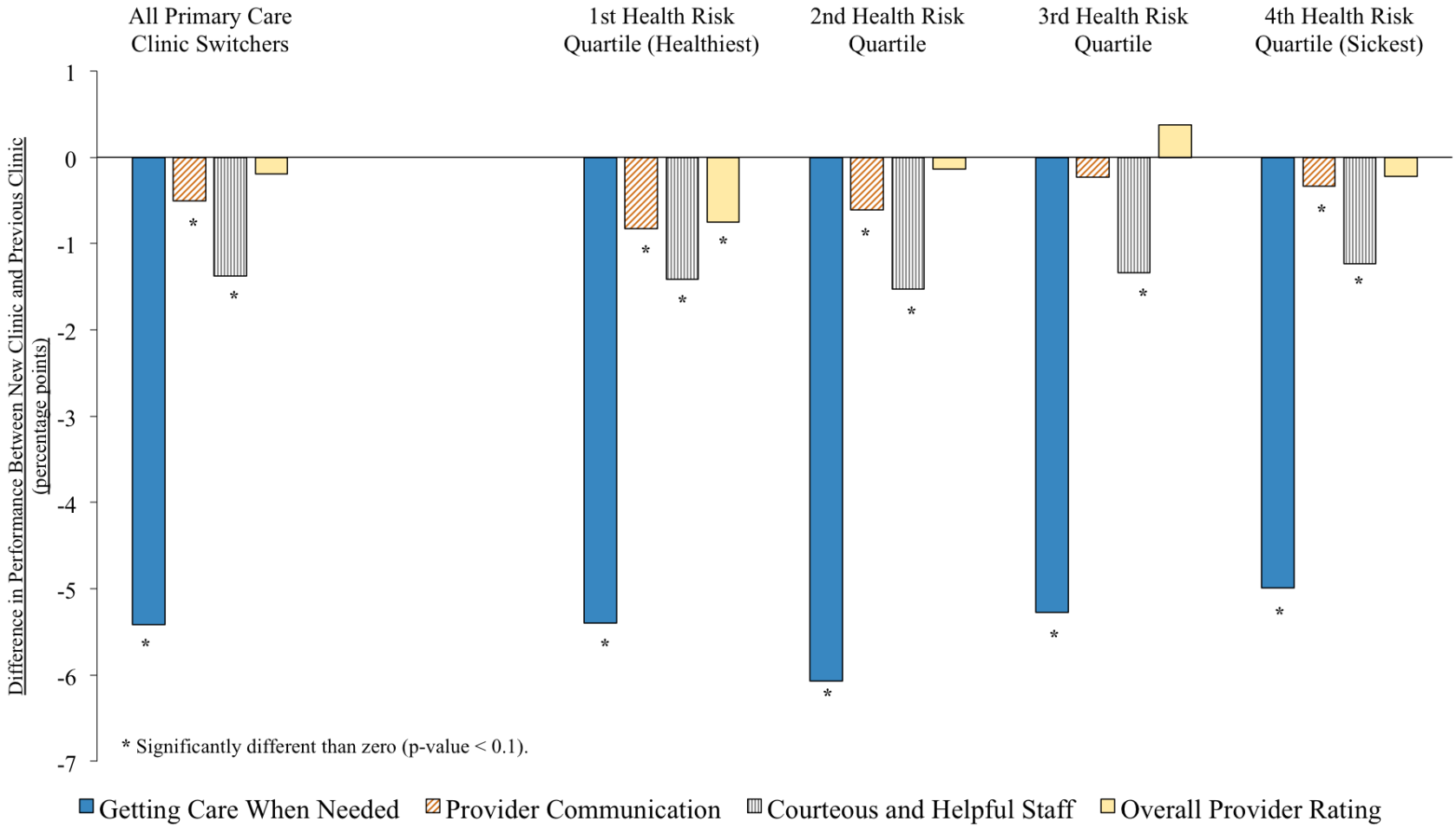
Figure 6-7 Clinical and Behavioral Performance of Enrollee's New Primary Care Clinics Relative to Their Previous Clinics



Notes**:** Includes 1,068 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who switched to a primary care clinic reporting to Minnesota Community Measurement in 2012. All performance measures calculated from Minnesota

Community Measurement publicly reported data. Clinical and behavioral quality represent the percent of patients meeting treatment goals for diabetes and vascular disease care. Full descriptions of these measures are available in **Section 4.2.**

Figure 6-8 Patient Experience Performance of Enrollee's New Primary Care Clinics Relative to Their Previous Clinics



Notes**:** Includes 977 former adult HealthPartners plan enrollees who enrolled in Medica Elect/Essential in 2012 and who switched to a primary care clinic reporting to Minnesota Community Measurement in 2012. All performance measures calculated from Minnesota Community Measurement publicly reported data. Getting Care When Needed, Provider Communication, Courteous and Helpful Staff,

and Overall Provider Rating measures calculated from survey responses and represent the percent of patients giving the clinic the most positive rating. Full descriptions of these measures are available in **Section 4.2.** The specific patient experience questions asked of survey respondents are avabile in **Table A-5**.

Table A-1 HealthPartners Providers Included in Medica Plans Offered by the University of Minnesota UPlan

	Medica Health Plan		
Location	Choice Insights[a]	Elect/Essential	Choice Regional/ Choice National/ Health Savings Account
Primary Care Clinics			
Adult Seniors Health (St. Paul)	Included		Included
Andover	Included	Included	Included
Anoka	Included	Included	Included
Apple Valley	Included		
Arden Hills	Included		
Bloomington	Included		
Brooklyn Center	Included		
Center for International Health (St. Paul)	Included		Included
Collegeville (St. Cloud)	Included		
Como	Included		
Coon Rapids	Included	Included	Included
Cottage Grove	Included		
Elk River	Included	Included	Included
Health Center for Women (St. Paul)	Included	Included	Included
Inver Grove Heights	Included		
Lino Lakes	Included	Included	Included
Maplewood	Included		
Midway	Included		Included
Regions Hospital Primary Care (St. Paul)	Included	Included	Included
Riverside (Minneapolis)	Included		
Roseville	Included	Included	Included
Sartell (St. Cloud)	Included		

St. Paul-Wabasha Street	Included		
West (St. Louis Park)	Included		
White Bear Lake	Included		
Woodbury	Included		Included
Specialty Clinics			
Arden Wood Eye Clinic	Included	Included	Included
Maplewood Behavioral Health	Included		
St. Paul Behavioral Health	Included		
Woodbury Behavioral Health	Included		
Bloomington Eye Clinic	Included		Included
Como Eye Clinic	Included	Included	Included
HealthPartners Specialty Center (St. Paul)	Included		Included
Sleep Health Center (Maplewood)	Included		Included
Parkway (Robbinsdale)	Included		
Regions Alcohol & Drug Program (St. Paul)	Included		
Regions Rehabilitation Institute (St. Paul)	Included		
Regions Specialty Clinics (St. Paul)	Included		Included
West Eye Clinic (St. Louis Park)	Included	Included	Included
Woodbury Eye Clinic	Included		Included
Hospital			
Regions Hospital	Included	Included	Included
Other	All providers included		Urgent care included at clinics except Cottage Grove All plastic surgeons included

[a] Medica Choice Insights is a tiered health plan with different copayments by tier. All HealthPartners providers were included in Tier 1, which is the cheapest tier.

Table A-2 Place of Service Codes for Outpatient and Inpatient Utilization

2008 Through 2011 Claims		2012 Claims	
Code	Place of Service	Code[a]	Place of Service
Outpatient			
0	Unknown	1	Pharmacy
2	Hospital Outpatient	11	Office
5	Ambulatory Surgical Center-Hospital	12	Home
6	Ambulatory Surgical Center-Free Standing Facility	20	Urgency Care Facility
9	Other Physicians Office	22	On Campus-Hospital Outpatient
10	Patients Home	23	Emergency Room-Hospital
11	Independent Lab	24	Ambulatory Surgical Center
12	Emergency Treatment Center	25	Birthing Center
14	Birthing Center	26	Military Treatment Facility
15	Clinic	33	Custodial Care Facility
16	Psychiatrist/Psychologist Office	34	Hospital
17	Chiropractors Office	41	Ambulance-Land
18	Podiatrist Office	42	Ambulance-Air or Water
19	Pharmacy	50	Federal Qualified Health Center
20	OB/GYN	53	Community Mental Health Center
21	Hospital Emergency Room	60	Mass Immunization Center
22	Nursing Home	62	Comprehensive Outpatient-Rehabilitation Facility
24	Dentist Office	65	End-Stage Renal Disease Treatment Facility
25	Psychiatric Facility- Outpatient	71	Public Health Clinic
26	Drug Alcohol Treatment-Outpatient	72	Rural Health Clinic
27	Medical Rehabilitation-Outpatient	81	Independent Laboratory
28	Residential Treatment Center	95	Unknown
98	Other	99	Other Place of Service

Inpatient			
1	Hospital Inpatient	21	Hospital Inpatient

[a]Place of service codes from 2012 correspond to CMS place of service codes.

Table A-3 Provider Specialty Codes for Outpatient Evaluation and Management Visits

2008 Through 2011 Claims		2012 Claims	
Claim Code	Specialty	Claim Code	Specialty
Primary Care			
1	Family Practice	200	Internal Medicine
2	General Preventive Medicine	240	Family Practice
4	Nurse Practitioner[a]	320	Obstetrics/Gynecology
7	Physician Assistant[a]	853	Registered Nurse[a]
21	Internal Medicine		
256	Obstetrics/Gynecology		
Specialty Care			
All Others Codes	All Others Specialties	All Others Codes	All Others Specialties

[a] Nurse practitioners, physicians assistants, registered nurse, and any other non-physicians determined to be working at specialty care clinics where coded as specialists.

Table A-4 Common Procedural Terminology and UB-04 Revenue Codes for Outpatient Evaluation and Management Visits and Emergency Department Visits

Outpatient Evaluation and Management Visit Codes	Emergency Department Visit Codes
New Patient Office Visit	*Common Procedural Terminology Codes*
99201	99281
99202	99282
99203	99283
99204	99824
99205	99825
Established Patient Office Visit	*UB-04 Revenue Codes*
99211	0450
99212	0451
99213	0452
99214	0456
99215	0459
	0981
New Patient Preventive Medicine Visit	
99381	
99382	
99383	
99385	
99384	
99386	
99387	
Established Preventive Medicine Visit	
99391	
99392	
99393	
99394	

99395
99396
99397

Table A-5 Minnesota Community Measurement Patient Experience Survey Tool Questions

Patient Experience Domain	Questions
Getting Care When Needed	In the last 12 months, when you phoned this provider's office to get an appointment for care you needed right away, how often did you get an appointment as soon as you needed? In the last 12 months, when you made an appointment for a checkup or routine care with this provider, how often did you get an appointment as soon as you needed? In the last 12 months, when you phoned this provider's office during regular office hours, how often did you get an answer to your medical question that same day? In the last 12 months, when you phoned this provider's office after regular office hours, how often did you get an answer to your medical question as soon as you needed? Wait time includes time spent in the waiting room and exam room. In the last 12 months, how often did you see this provider within 15 minutes of your appointment time?
Provider Communication	In the last 12 months, how often did this provider explain things in a way that was easy to understand? In the last 12 months, how often did this provider listen carefully to you? In the last 12 months, how often did this provider give you easy to understand information about these health questions or concerns? In the last 12 months, how often did this provider seem to know the important information about your medical history? In the last 12 months, how often did this provider show respect for what you had to say? In the last 12 months, how often did this provider spend enough time with you?
Courteous and Helpful Staff	In the last 12 months, how often were clerks and receptionists at this provider's office as helpful as you thought they should be? In the last 12 months, how often did clerks and receptionists at this provider's office treat you with Courteous and respect?
Overall Provider Rating	Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this provider?

Notes: All questions are from the Consumer Assessment of Healthcare Providers and Systems Clinician & Group 12-Month Survey.