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CHALLENGES AND OPPORTUNITIES IN MEETING HEALTH CARE NEEDS OF PATIENTS WITH BEHAVIORAL HEALTH AND CHRONIC MEDICAL COMORBIDITIES IN PRIMARY CARE SETTINGS

By

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ABSTRACT OF THE DISSERTATION

Challenges and Opportunities in Meeting Health Care Needs of Patients with Behavioral Health and Chronic Medical Comorbidities in Primary Care Settings

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Behavioral health disorders, comprising mental illness and behavioral health disorders, are common among adults, especially those with lower socioeconomic status, and frequently co-occur with chronic physical health conditions. Prevalence of behavioral health disorders is twice as high among Medicaid enrollees as in the general population, and of the nearly one-third of Medicaid enrollees with mental illness, more than half also have chronic medical comorbidity. It is important, thus, to identify how to provide high-quality care for this population.

Patients with behavioral health disorders often first present to primary care, and nearly one-third of adults who have a mental health visit seek care solely in primary care settings. Primary care practices provide a key opportunity to address critical patient needs but often struggle to manage these patients. Integration of behavioral health services in primary care settings along with continuity of care with primary care providers are aspects of care provision that present an opportunity to improve care. While shown to generally achieve positive clinical outcomes and reduce cost, there is lack of research on how these aspects of primary care practices might improve care for patients with behavioral health and other chronic medical comorbidities seeking care in primary care.

Focusing on New Jersey (NJ), this study examines state-wide data to analyze how provider effort to locally integrate care relates to utilization of costly inpatient services for low-resource patients across diverse primary care practices. We will specifically look at whether primary care practice efforts to co-locate behavioral health providers, such as psychiatrists, or psychologists, improves care for NJ Medicaid enrollees with behavioral health and other chronic conditions. Additionally, this dissertation will also investigate how continuity of care with primary care providers relates to use of hospital services along with Medicaid spending for patients with behavioral health and chronic physical conditions. Overall, I hope to shed light on how to improve care in primary care settings for patients with behavioral health disorders and other chronic comorbidities.

ACKNOWLEDGEMENTS

The process of getting a doctorate is certainly a long, difficult, and sometimes lonely journey but is also one marked by moments of immense satisfaction. I am thankful and blessed to have completed that journey and would like to take this opportunity to acknowledge those who made the journey possible and one marked by happiness and growth. First and foremost, I would like to thank God for giving me the strength, ability, and patience to persevere, and for bringing into my life the very best people, without whose support this endeavor might not have been possible.

My mother was born in a small village of less than 200 people near Sialkot in the province of Punjab, Pakistan. When she was around four years old, my grandmother went around to the village households to inquire if someone would send their daughter to school so that my mother might have company. One family agreed, and thus my mother became one of the first girls to attend school from her village. She tells me stories of how they wrote on takhtis, sat on the ground, recited their lessons, and journeyed daily for miles through fields and rivers. Those journeys, which have become the subject of memes, are hard for us to understand and imagine, but the paths created by their feet across unpaved land paved the way for this moment.

I am especially thankful to my dissertation committee members including Joel Cantor, Thomas Mackie, Andrea Hetling, and Dawne Mouzon for their help and kindness throughout this process. Their comments, questions, and insights helped me refine my ideas and pushed me to think about my work in a way that sharpened my skills as a researcher. My committee believed in me, and that encouraged me to believe in myself when the days got long and difficult. I must especially thank my dissertation committee chair, Joel Cantor. From the very beginning of process when we brainstormed the research question to discussing the data, methods, and

subsequently results, Joel's guidance and insights helped me learn how to focus on the details while also keeping the big picture in mind.

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None of this would have been possible without the love and support of my mom, family, and friends. It might take another hundred pages to express how much gratitude I feel towards them all. They say it takes a village, and I have the most incredible village!

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BACKGROUND

Behavioral health (BH) disorders, comprising mental health (MH) disorders and substance use disorders (SUD), impact people in nearly all age groups and life circumstances, serving as a leading cause of disability globally (1). Between 1990 and 2010 there was a shift in a greater share of the burden of disease from disability rather than from premature death. According to findings from the Global Burden of Diseases (GBD) study from 2010, Major Depressive Disorder (MDD) is a leading cause of global Disability Adjusted Life Years. In the United States (US), nearly one in every five adults (46.6 million) aged 18 and older suffered from a mental illness in 2017, with 4.1% having a serious mental illness (SMI) (2).

Medical and psychiatric comorbidities are very common, and patients with comorbid conditions have worse medical prognosis and higher symptom burden and functional impairment(3). Behavioral health conditions are disproportionately represented in patients who rely extensively on hospital-based services, accounting for a high share of spending on health care in the US (4-6). Public payers bear majority of the spending burden with Medicaid accounting for more than a quarter of spending on behavioral health services nationally, a key driver of Medicaid costs (7).

Despite the need for better management of behavioral health conditions, the mental healthcare system does not reach many people who need services and often provides uncoordinated care to those who do have access (8, 9). Behavioral health and medical providers have historically worked in silos, with limited coordination and communication, which further hampers provision of quality services. However, there have been considerable advances in our ability to identify, diagnose, and treat BH conditions, and there are opportunities to improve

healthcare system aspects to pursue the aim of improving quality and access for services for patients.

From a health care system perspective, improving management of BH disorders in primary care settings can address some of the shortcomings in meeting patient needs. As many as 70% of visits to primary care providers might be from underlying BH issues triggering physical complaints (10, 11). An increasing numbers of people with mental illness are being treated in the general medical sector (12). Further, nearly one-third of adults who have a MH-related visit, especially for mood disorders including depression and anxiety, seek care solely in primary care settings (13, 14). Primary care settings, thus, present an opportunity to assess and treat behavioral disorders and to sufficiently address patient's psychosocial needs (12, 15).

This dissertation investigates the challenges and possible opportunities in effectively and efficiently meetings needs of people with BH and chronic medical conditions (CC) in primary care settings in New Jersey. I study how aspects of primary care, including continuity of primary care or BH provider integration in primary care settings, might influence care for patients with BH and CC. Specifically, I analyze whether these features of primary care practices reduce utilization of health care services involving emergency department (ED) or hospital use among Medicaid enrollees in New Jersey (NJ).

EPIDEMIOLOGY OF BEHAVIORAL HEALTH DISORDERS

Whereas there are many broad definitions of BH some of which include overall health and well-being as well as consideration of health behaviors, I adopt the widely used conceptualization of BH disorders as those classified clinically as either mental illness or substance use disorders. Often lacking distinct biomarkers, defining and identifying mental illness poses unique challenges. Though it is standard today to use a more medical approach to diagnosing and treating mental illness, there is often much discussion and disagreement over

what to include in the psychiatric diagnosis manual known as the *Diagnostic and Statistical Manual (DSM) of Mental Disorders,* with the most recent version, DSM-5, being published as recently as 2013 (16). The epidemiologic debates about identifying and measuring psychiatric disease in the population has shifted over time from favoring more theoretical and the personality-related descriptions to categories which are more medical using signs and symptoms in descriptions (16). Mental illness, or MH disorders, refers to a wide range of disorders than can affect mood, thinking, or behavior with examples including depression, anxiety, or addictive disorders (17). SUD are a class of disorders which can affect a person's behavior and lead to inability to control use of the medication or drugs, medication, or alcohol among other substances which in turn can lead to issues related to health or functioning (18). SMI, including disorders such as schizophrenia and psychoses, is defined as a mental illness that results in severe functional impairment interfering with major life activities (19).

In the US, two of the earliest studies that helped assess that prevalence of various mental disorder include the Epidemiologic Catchment Area (ECA) study conducted in the early 1980s and the first of the National Comorbidity Survey (NCS) conducted a decade later. When considering prevalence of mental illness, it is important to consider that estimates are sensitive to changing diagnostic criteria. Using presence of signs and symptoms as criteria, overall these studies found that nearly 28-30% of adults meet the criteria for having a diagnosable mental illness over a twelve-month period (one-year prevalence) with lifetime prevalence ranging from 32% (ECA) to 38% (NCS) (16). Whereas the ECA used the 1979 DSM criteria, the NCS used the revised 1987 DSM criteria which led to differences in prevalence of some anxiety disorders which might have been reflective largely of changing diagnostic criteria rather than prevalence. Other researchers subsequently found that using the impairment criteria reduces the one year mental illness prevalence to 20-22.5% (16).

Kessler and colleagues used data from the 2001-2003 National Comorbidity Survey Replication (NCSR) to estimate that lifetime prevalence of BH disorders is as high as 57.4% (20). Lifetime prevalence of MH disorders ranges from nearly 30% for anxiety disorders, 20% for mood disorders, and 15% for substance use disorders, with half of all cases beginning by age 14 and 75% have onset by 24 years of age (20). The most widely-used current estimates of mental illness and SUD prevalence derive from the National Survey on Drug Use and Health (NSDUH), directed by the Substance Use and Mental Health Services Administration (SAMHSA). In the United States, nearly one in every five adults (46.6 million) aged 18 and older suffered from a any mental illness (AMI)[1] in 2017, with 4.2% having a SMI[2] (2, 21). Additionally 8% of people aged 12 or older had a substance use disorder in 2017 (21).

The etiology of BH disorders is multidimensional with risk determined by genetics, environment, and social factors. There is significant demographic variation prevalence of mental illness as per the most recent NSDUH findings. In 2017, prevalence of AMI was highest (8.6%) among people identifying with two or more races, followed by whites (20.4%), native Hawaiian or other Pacific Islander (19.4%), blacks or African American (16.2%), Hispanic (15.2%), and Asians (14.5%) (21). Prevalence of mental illness also varies by age with young ages 18-25 having the highest prevalence (25.8%) followed by adults ages 26-49 (22.2%) and adults aged 50 or above (14.5%). Prevalence of AMI in 2017 was found to be higher among women (22.3%) as compared to men (15.1%) (21). The gender difference in rates of MH has also been consistently highlighted by most studies finding higher rates of mental illness, not including substance use

[1] Any mental Illness (AMI) is defined as respondent-reported diagnosable mental, behavioral, or emotional disorder regardless of whether there was functional impairment. Developmental or substance use disorder not included in AMI.

[2] Serious mental illness (SMI) includes persons with any mental disorder that resulted in serious functional impairment.

and antisocial disorders, among women, with findings not found to be due to differences in sociodemographic factors (22).

Just as with non-communicable diseases, social determinants play a significant role in burden of mental illness. Many studies, dating back to 1939, have shown a strong inverse correlation between MH status and socioeconomic (SES) status. The association between lower socioeconomic status and higher risks of mental illness holds up regardless of SES indicator used or types of mental illness examined (23). Lower SES groups have higher rates of psychiatric risk factors including exposure to stress, weak social supports, and poor coping styles among others (24). Using survey results of adults in primary care, Mauksch et al. show that low-income and uninsured members of the primary care population have nearly twice the prevalence of psychiatric disorders with twice the prevalence of depression and three times the prevalence of anxiety disorders (25). A recent meta-analysis of nearly 60 studies by Lorant and colleagues showed that low socioeconomic status was associated with nearly twice as high odds of being depressed (26). According to most recent NSDUH results, adults with household income below Federal Poverty Line (FPL) have higher prevalence of AMI (25.6%) and SMI (7.3%) in 2017 relative to those above FPL with adults making more than 200% of FPL having AMI prevalence of 16.8% and SMI prevalence of 3.6% (21).

Additionally, 2017 NSDUH survey respondents without health insurance had 50% higher prevalence of mental illness relative to those with Medicaid or private coverage in 2017 (21). Substance use follows a similar general patterns with nearly 30% of uninsured patients and Medicaid recipients has SUD in 2017, compared to 16% of people with private insurance (21). Nearly twice the percentage of people who work part-time (5.4%) or are unemployed (6.5%) have mental illness relative to those who work full-time (3.1%), with a similar overall trend for SMI (21). Prevalence of substance use disorder is twice as high among those are unemployed

relative to people who work full time.

BEHAVIORAL HEALTH AND COMORBIDITY

Impacting over 25% of the US population as mentioned, mental illness often co-occurs with other medical conditions connected through complex and bidirectional pathways to comorbidity(27). Based on early studies of comorbidity using nationally representative data from 2001-2003, researchers estimated that nearly 17% of the US adult population had comorbid mental illness and some chronic medical comorbidity over a 12 month time period (10). Among those with a mental illness identified through a structured clinical interview, 68% also had a general medical condition, and among those with a medical disorder, nearly 30% reporting having a psychological illness (28). Studies using national representative Medical Expenditure Panel Survey (MEPS), Behavioral Risk Factor Surveillance Survey (BRFSS), and National Epidemiologic Survey on Alcohol and Related Conditions have found that patients with diabetes, asthma, and cardiovascular disease are more likely to have depression and anxiety compared to patients without those CC (29, 30). Depression rates in adults with comorbid medical conditions can be as high as 20-50% (31). Identified mental illness significantly adversely affecting outcomes in patient with other CC Patients with comorbid conditions have worse medical prognosis and higher symptom burden and functional impairment (3, 32). This can be due to the medical illness affecting patients' understanding of disease or their ability to be compliant or take care of their conditions

Further, medical comorbidities are disproportionately represented in those with SMI and often associated with premature death (33). Some studies have found life expectancy of those with SMI to be nearly 25-30 years less than for those in the general population, with researchers attributing the premature death to the high prevalence of chronic medical comorbidities including heart disease, cancer, and respiratory and metabolic disorders among

others, in this population (34, 35). People with SMI die nearly 25 years younger than the general population, largely due to preventable commodity from obesity, smoking, diabetes, and hypertension (36). Whereas it is hard to tease apart the BH and chronic medical concerns within a patient, the structure of the health care system has forced separation of care for people's BH and other medical concerns. This has led to inefficiencies in the system and in turn to unmet need for services and poor access and quality of care (37).

ACCESS TO SERVICES/TREATMENT AND UNMET NEED

Our knowledge of the underlying medical, environmental, and social aspects of mental illness has significantly progressed over last decades. With development of psychotherapies, pharmacotherapies, and psychosocial services, we can now support and treat many conditions previously understood to be untreatable. Despite such advances, however, the healthcare system often fails to provide treatment for behavioral disorders to a substantial number of adult patients (38-40). Using data from World Health Organization's (WHO) World Mental Health (WMH) Survey of 15 countries, Wang et al. find that the proportion people making treatment contact during year of disorder contract is less than 50% for anxiety, mood, and SUD, underscoring the global pervasiveness of delay in getting care (40). Using NCSR data, Kessler and colleagues find that whereas prevalence of mental disorders did not change significantly between 1990 and 2003 in US, rates of treatment among people with a MH disorder increased from 20.3% in 1990-1992 to 32.9% in 2001-2003 (38). Between 2009 and 2011, only two-thirds of people with mental illness with severe functional impairment, half of people with moderate functional impairment, and one-third of people with mild functional impairment received any MH treatment (41).

Most recently, there remains significant unmet need for MH services with 2017 NSDUH results showing that only 42.6% of people with AMI, 66.7% of those with SMI, and 10% of those

with SUD received any treatment[3] (21). There are many sociodemographic differences between rates of services. Among those with perceived need, African Americans and Hispanics are less likely to have access to treatment or get delayed care relative to whites, with African Americans reporting the poorest quality of life (42-44). These patterns of access disparities consistent and persistent; bases on survey results from 1997-98, whereas 36% of whites might get appropriate care for depression and anxiety, only 24% of Hispanics and 17% black got appropriate treatment (45). According to 2017 NSDUH findings, whereas approximately 30% of African Americans and Hispanic/Latino with AMI received MH treatment in 2017, nearly 50% of whites were able to receive MH services; the same trend was present for those with SMI (21). Minority groups have lower treatment rates than whites for obsessive compulsive, generalized anxiety, personality, and nicotine use disorders among other (46).

As many as 7.8% of people with household incomes below the Federal Poverty Line (FPL) reported perceiving unmet MH needs[4] in 2017, relative to 6.1% of people between 100% and 199% of FPL and 4.8% of the people with income greater than 200% of the FPL (21). Nearly half of the people with unmet need for mental healthcare indicate that cost of care is a significant barrier. There are also variations in outcomes with lower SES groups having poorer disease prognosis and more disability for similar level of disease severity (47, 48). Additionally, a higher percent of people who are uninsured (6.3%) or receive Medicaid (8.5%) perceived an unmet need relative to the those with private insurance (4.9%) (21).

[3] The NSDUH defined treatment or services as inpatient treatment/counseling or outpatient treatment/counseling or having used prescription medication for problems with emotions, nerves, or mental health.

[4] Perception of need was asked of all respondents regardless of disorder status, and perceived unmet need for services is defined as a perceived need for treatment/counseling that was not received.

CHALLENGES AND OPPORTUNITIES

Challenges in Meeting Behavioral Health Needs

The challenges in meeting people's BH needs derive from the diverse reasons for unmet needs. Many factors at the individual and interpersonal levels might account for differences in treating BH disorders. A 2001 US Surgeon General's report examined the impact of culture, race, and ethnicity on MH and highlighted the disparities in MH treatment (49). Racial and ethnic minorities are less likely to seek treatment or professional care even when recognizing that there is a problem, often seeking help only with intense symptom severity (50). The 1999 Surgeon General report on mental health identified lack of trust and fear of treatment and hospitalization as significant barrier to care-seeking for racial and ethnic minorities (50, 51). Stigma associated with mental illness and substance use disorders can also be a significant barrier and can lead patients to conceal symptoms and delay care. Such stigma is particularly hindering in care-seeking experiences of African Americans and Latinos (52). Using NCSR data from 2001-2003, Mojtabai and colleagues find that attitudinal reasons are a stronger deterrent to care than structural barriers, with limited insight into symptoms and lack of perceived need for treatment being primary reasons for failure to seek help (53). Even among those who identify a need for services, more than two-thirds felt they might deal with the problem without professional help.

Along with individual and cultural influences, there are many structural barriers including cost, reimbursement, and lack of providers among other factors might hinder access to BH services for certain groups of people. One long-standing barrier to delivering equitable MH services is restrictive reimbursement procedures that have been the focus of federal and state policies over the last few decades. On uphill policy battles in mental health has been over MH parity to ensure coverage of MH services on par with reimbursement for medical services.

Insurance benefits have historically been much more limited for MH than for general medical services. Additionally, services for BH disorders span different sectors and are usually more complex, posing additional challenges for reimbursement. Lack of parity poses significant challenges for reimbursement for evidence-based models of care such as case management, patient-provider interaction, and linkages to specialists has been a significant barrier to care (54). In terms of financing MH services, both public and private payers have largely utilized managed care as the primary MH financing scheme (55). Whereas managed care is intended to contain cost while improving access, coordination, and the quality, there is some evidence that it might be perceived by patients as imposing limitations on care (56).

The organization of the health care system with separate delivery systems for care of medical and BH conditions has also contributed to access and quality of care problems. The MH delivery system in the US is highly fragmented and disjointed, posing particular challenges for patients with complex needs and limited resources such as low-income and racial/ethnic minority groups. A report by the President's New Freedom Commission on MH identified the fragmented MH service delivery system as one of the three primary obstacles to getting excellent care (57). Mental health services are delivered in specialty mental health settings, general medical and primary care settings, and human services sectors, supplemented by voluntary support networks; the separate delivery systems create and exacerbating access problems (51). Coordination between these sectors has traditionally been through the referral process, navigating which is often more challenging for patients with limited resources. Studies show that racial/ethnic minorities are more likely to seek care in primary care settings, but as few as 19% of people with depression or anxiety might get the necessary care in primary care settings (45, 58).

Opportunities in Meeting Behavioral Health Needs: Comprehensive and Care Continuity in Primary Care

When seeking to increase access to services for groups of people, it is important to consider the two dimensions of access, potential and realized access. Potential access comprises enabling factors, such as health insurance, socioeconomic factors, insight into symptoms, and overcoming stigma etc., that might allow a person in need to seek care. Realized access is the actual use of services by patients and is partially determined by provider availability and system-level factors and availability of providers which allows for patients to receive treatment.

Various recent initiatives and policies improve people's potential access to services. Passage of the Mental Health Parity and Addiction Equity Act of 2008 (MHPAEA) was an essential step in increasing access to services by requiring parity in coverage of BH services (59). The law goes further than previous efforts by requiring that managed care non-quantitative treatment limitations such as prior authorization and utilization reviews also be subject to same strategies as those used for medical benefits. Augmenting the effects of the MHPAEA, the Patient Protection and Affordable Care Act (ACA) also had many provisions to improve access to services (60). Through expansion of Medicaid, employer and individual mandates, and subsidies through insurance exchanges, many previously uninsured people would now have access to services (61). Additionally, including BH services in essential minimum benefits, supporting rehabilitative and facilitative services, requiring coverage of preventive services such a depression screens, and prohibiting denial based on preexisting mental health conditions also extends necessary services.

While there might be many other ways, one critical opportunity in improving care for patients with BH and chronic medical comorbidity exists in the delivery system at the primary care interface, which for decades has served as the "de factor" mental health system providing

(62). As previously mentioned, most patients with mental illness, especially those with mild to moderate BH problems, including mood or anxiety disorders, come into contact with the healthcare system through the general medical sector (10-12, 63). As many as 70% of the visits to primary care providers might be for underlying BH issue (10, 11). Further, nearly one-third of adults who have a mental health visit, especially for mood disorders including depression and anxiety, seek care solely in primary care settings (13). Additionally, most people usually have routine visits to a primary care providers for preventive services such as vaccinations and annual physical exams, and such opportunities provide a great opportunity to recognize new or recent-onset behavioral disorders (64). Recognizing the opportunity to meet patients' needs for services at points of their interaction with the health care system, there has been a growing push to improve treatment of mental health conditions in primary care (57). Since the patients continue to seek care in these settings, primary care setting provide an opportunity to meet both patients' mental health and other medical needs.

The Johns Hopkins Primary Care Policy Center generally defines primary care as a set of providers and health service that manage patients new, non-urgent, health care needs, provide patient-centered longitudinal care for a large range of common health care issues rather than providing more disease-oriented care, and coordinate and integrate care across health care providers and sectors (65). Many health care system reform strategies rely on primary care, including private and hospital-based physician practices and community health centers among other practice arrangements, to achieve rapid improvements for patients with complex conditions (66, 67). A strong primary care base is essential for high quality and cost-effective health care delivery; relative to people who do not have access to primary care, those who do are more likely to receive timely care, have better disease management, and have less preventable ED visits (68-70). In much of the literature related to primary care, provision of

quality care is defined on the basis of certain pillars of care including comprehensiveness, continuity, coordination, and access to first contact care (71). In this dissertation, I investigate whether aspects of care including comprehensiveness, through integration of BH providers in primary care settings, and continuity improve care for patients with BH disorders and chronic medical comorbidity.

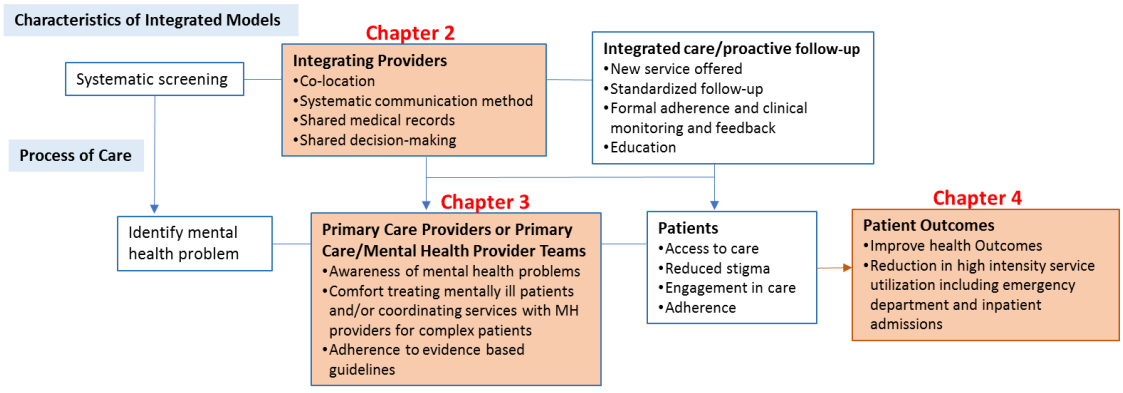
Comprehensiveness relies on evaluation of the person including attention to the whole range of physical, mental, and BH issues. One way to offer comprehensive care delivery for patients with BH and CC in primary care settings can be through integration of BH services, which would allow people who access the healthcare system through primary care settings to receive comprehensive treatment for their BH and other medical conditions. (72, 73) One way to meet such needs is through improvements in service integration, which would allow people who access the healthcare system through primary care settings to receive comprehensive BH treatment (72, 73). While many models of integrating have emerged in the last two decades in order to meet patients' mental health needs, the common underlying intent is usually to bring system elements together to make care available when and where people come into contact with the health care system (57).

Integration of BH and medical services has been shown to reduce system fragmentation which can help improve access, reduce unnecessary and redundant services, improve efficiency, and create a more equitable health care system (74). Bartels et al. find that having BH service co-location in primary care settings improves patient access to BH services by 50% as compared to a referral model and also increases engagement in treatment (74). Additionally with shared accountability promoted through integration, there might be increased shared decision-making and ownership of care, facilitating a more team-based approach to provision of health care services. Along with improved access to BH services, provision of mental health care in primary

care settings is associated with improvements in processes of care as well as patient health outcomes (75-77). One primary benefit of co-location might be shifting away from the siloed health care system with primary care and BH providers having easy access to each other allowing for more meaningful and frequent engagement to review candidates for interventions in addition to personally handing off patient (78). Additionally such system reforms help alleviate patient resistance and reduce stigma associated with visiting BH providers if those providers (78). Overall, integration is in line with the recent move towards the focus on patient-centeredness of healthcare with issues of physical and mental health not considered separate but as a part of the same spectrum of problems requiring a comprehensive care plan.

There have been various attempts to conceptualize how integrating providers might affect process and quality outcomes, but I use the framework in Figure 1-1, adapted from an Agency for Health Care Research and Quality (AHRQ) evidence report on integration (77). The figure also lays out the roadmap for the next three chapters. In chapter 2 I look at the primary care practice characteristics associated with co-location and integration of BH providers in New Jersey (NJ) primary care practices. In chapter 3, I investigate the association between co-location of BH providers in NJ primary care practices and physician perception regarding ease of getting MH services for patients in need or timeliness of obtaining information from MH providers regarding shared patients. In chapter 4, I analyze the association between BH

Figure 1-1: Characteristics of integration linked to process of care and outcomes



provider co-location or integration in primary care practices in NJ and patient level health care services utilization outcomes.

As chapter 4 wraps up the three chapters on BH provider co-location and integration in primary care, in Chapter 5 and 6 of the dissertation I shift focus to investigating a different aspect of primary care, continuity of care. In chapter 5, I examine how experiences of continuity with primary care providers might be influenced by patients' BH status among adult NJ Medicaid enrollees. In chapter 6, I assess that association between continuity of care and patients' utilization of health care services and associated Medicaid spending among adult NJ Medicaid enrollees with BH disorders and CC. Continuity of care is considered by the Institute of Medicine (IOM) to be a defining aspect of primary care, and involves building long-term connections between providers and patients, and over time, these connections can facilitate trust, a sense of responsibility, and understanding between provider and patient which in turn allows for higher quality care (79). Continuity of overall care comprises continuity of information, relationships, and management; with providers having continuous knowledge of patients' medical and social history as well as continuity of management of patients, the longitudinal relationship with primary care providers is likely to be one of the most important factors in helping patients with complex health needs (80). Continuity of care with a primary care provider has been shown to improve patient satisfaction while also reducing utilization of high cost-cost services including ED and inpatient hospitalizations (81-83). While continuity of primary care is important for all patients in primary care, it is likely most important for patients with complex health needs including those with BH disorders and CC. Often patients with BH disorders and CC have compounded complexities with BH conditions exacerbating morbidity associated with CC and vice versa. In such cases, continuous relationships with same providers is necessary to allow for

providers to be invested in and accountable for patients and to encourage patients to focus their own care which in turn would support patient compliance with care plan.

THE CASE FOR STUDYING THE MEDICIAD-INSURED ADULTS IN NEW JERSEY

Many features of NJ and its Medicaid program make it an important case to study. Medicaid is the dominant program serving low-income patients with both mental health and medical diagnoses. Medicaid is the main source of coverage for low-income individuals, who are also more likely to have higher rates of psychiatric risk factors including exposure to stress and weak social supports (24). Mental illness is two times as high in Medicaid beneficiaries as in the general population, and nearly one-third of beneficiaries have a mental illness with more than half of those having an accompanying comorbid medical condition (7, 84). Mental health disorders are disproportionately represented among Medicaid beneficiaries in the top percentiles of the spending distribution. In NJ, 86% of Medicaid beneficiaries in the top 1% of spending distribution have a behavioral health diagnosis, with many having persistently high spending from year to year (85).

Additionally, NJ is racially and ethnically as well as geographically diverse. NJ is also a Medicaid expansion state, experiencing a 37% increase in enrollment between 2013 and 2017 (86). With high prevalence of behavioral health conditions among enrollees, care delivery is an important area for state policymakers and this work will be of value when considering how to improve services for Medicaid enrollees.

The primary care features I study for the population of interest are also of importance to policymakers nationally. A 2012 50-state Medicaid survey conducted by the Kaiser Commission on Medicaid and the Uninsured found that a majority of the states were pursuing policy initiatives to coordinate care between behavioral health and medical sector with Medicaid directors considering such initiatives a top priority. Coordination and continuity of care are two

of five metrics based on which Medicaid conducted care management audits, underscoring the importance of these aspects of care for policy makers (87). Though ensuring continuity of care for Medicaid enrollees likely refers to avoiding the constant cycling of enrollees in and out of Medicaid as income and eligibility changes, the idea behind is similar in that patients should have

Chapter 2: Primary care practice characteristics associated with behavioral health provider co-location and integration in primary care practices, results from New Jersey Primary Care Physician Survey, 2015

This chapter comprises analysis to study the following research question: What is the association, if any, between primary care practice structural and organizational characteristics and behavioral health provider co-location and record-sharing between medical and behavioral health providers?

ABSTRACT

The co-location and integration of medical and mental health care tries to reduce the fragmentation in health care service delivery and facilitate improved access to services. Increasing rates of co-morbid mental health and chronic medical conditions further highlight the need such system-level changes. The second chapter of this dissertation explores the role of structural, organizational and contextual factors in the ability of primary care practices to co-locate and integrate behavioral health care providers. The study uses data from a 2015 survey of primary care practices in New Jersey. Co-location and integration (operationalized by record-sharing between medical and BH providers) of behavioral health providers in primary care settings are the dependent variables. Independent variables includes various practice structural features such as practice size and location as well as measures of practice culture using as proxies practice participation in Accountable Care Organizations and certification as Patient Centered Medical Homes. Bivariate and multivariate regression models are used to test hypotheses. Results show that large practices, compared to smaller ones, and those situated in community health centers or hospital clinics have significantly higher odds having co-located behavioral health providers. Additionally, larger practices with more health information technology functionalities have significantly higher odds of having record sharing between

providers. Pediatrics practices are found to have low rates of co-location and integration of BH provider in the respective primary care practices.

BACKGROUND

Behavioral health(BH) disorders, comprising mental illness and substance use disorders, impact people in nearly all age groups and life circumstances, serving as a leading cause of disability globally (1). In the US, Nearly one in every five adults (43.6 million) aged 18 and older suffered from a mental illness in 2014, with 4.1% having a serious mental illness (SMI) (2). The mental healthcare system, however, does not reach many people who need services and often provides uncoordinated care to those who do have access (8).

Patients with mental BH disorders are consistently observed to have worse health outcomes compared to those without mental illness partially due to the lack of understanding of how mental and physical health are interrelated, which has led to the historically separate BH and medical sectors (88). Medical and psychiatric comorbidities are very common, however, with as many as half of patients with some chronic medical illness having a BH condition as well, but majority of those patients' BH conditions go untreated or do not receive care in a timely way (89). Lack of treatment for comorbid BH conditions is associated with medical illness persistence, increased complications, disability, and service utilization (89).

While there are many factors which contribute to the inadequacies of the BH care system, one critical shortcoming is the fragmentation between the providers, leading to uncoordinated care, duplicated services, or lack or service provision (88). The primary care setting, however, presents an opportunity to address such unmet needs of complex patients while reducing fragmentation of care. An increasing numbers of people with mental health illness are being treated in the general medical sector (12). With nearly one-third of adults who have a mental health visit, especially for mood disorders including depression and anxiety,

seeking care solely in primary care, these settings present an opportunity to meet patient's needs when they interface with the health care system (10, 11, 13, 14, 90). A recent World Health Organization (WHO) report indicated that a weak primary care case is one of the 10 main threats to global health, and it can be argued that a primary care system that does not adequately meet patients' mental health needs is indeed weak (91).

Whereas historically, BH and medical providers have worked in silos with limited coordination and communication, one reform initiative that is being undertaken across the country to increase access to BH services is to implement delivery system processes that effectively integrate BH and medical services (92). Some integration models bring primary care services into specialty mental health settings to better meet needs of patients with serious mental illness. Conversely, other integration models focus on bringing BH services into primary care settings to better meet needs of patients with less severe mental illness. This paper and the dissertation is concerned with the later models. The few studies looking at rates of co-location in primary care settings across the nation have found that there is significant variation across the country with the national co-location rate of BH providers around 44%, and rate in NJ of 33-38% (93, 94).

I use a statewide survey of primary care practice in New Jersey (PCP Survey) to look at primary care practice organizational context and structural characteristics which are associated with whether practices have co-located BH providers. Because of the historically siloed nature of the two sectors, integration efforts are not always simple and streamlined due to challenges posed by medical and BH practices having different approaches, philosophies, and structural elements. While some studies have looked at how such factors might impede or support integration as a practice transformation, most of the studies on the subject have focused on practice culture, policy, regulatory, licensure, and reimbursement barriers (95-97). Additionally,

while most of the work on studying co-location and integration has been done in large health care organizations, the efforts to integrate care more locally in smaller practices has been accelerated in the past decade, driven largely by the changes in payment structures and health care services delivery (97, 98). I am able to identify only two other studies looking at association of practice characteristics with co-location using national level data, but both of the studies were limited in terms of practice characteristics which only included gender, specialty, year of medical school graduation, practice size, and rurality (93, 94). This study is more comprehensive and include a diverse set of practice features including financing, patient mix, and location among others. Additionally while those studies were not able to look beyond whether provider were co-located in the same building, I am also able to look at whether providers have access to each other's medical records.

DEFINING AND OPERATIONALIZING CO-LOCATION AND INTEGRATOIN

Brief Review of Approaches

The primary care and BH interface has historically been characterized by medical providers and BH providers trying to coordinate services through the referral process. Nearly 20 years ago, the Institute of Medicine published a report on the future of primary care, highlighting the need for bringing together BH and primary care services (99). With greater push for collaboration, many models of more cooperative and integrated care have come about which are based on a few general frameworks. In this chapter, and in the rest of the dissertation, the terms co-location and integration are used frequently, and thus it is important to have a discussion of what the terms mean and equally important what they don't mean. Whereas integration can be financial ("carve-ins", shared risk pools, etc.), structural (co-location of providers), and/or at the level of clinical practice (same care plan, etc.), this dissertation focuses on structural integration. Clinical integration is the ultimate goal, but it is difficult to

achieve without financial and structural integration supporting the required and necessary collaboration.

Researchers have been grappling with frameworks and how to define the terms "integrated care" and "collaborative care" since the late 1990s. Some of the seminal work in the area was done by Doherity et al. who envisioned the five levels of collaboration in their Levels of Systemic Collaboration Model to capture the extent of occurrence of, and capacity for, collaboration at a system level on a continuum from Level 1 to Level 5 as depicted in Figure 2-1 (100, 101). This was some of the first effort to think about how to classify collaboration not as specific interactions between practitioners but at a practice or system level, while accounting for the complexity and variation that might exist. Thinking about collaboration as such would allow for focusing on systematic and organizational issues that might facilitate or impede system-level collaboration. The underlying implication of the model was that as the level of collaboration increased, so too would the capability of the practice and providers to handle increasingly complex patients.

Figure 2-1: Levels of Systemic Collaboration
Level 1: Minimal Collaboration
Level 2: Basic Collaboration at a Distance
Level 3: Basic Collaboration Onsite
Level 4: Close Collaboration in a Partly Integrated System
Level 5: Close Collaboration in a Fully Integrated System

Source: Adapted from Doherty et al. (73)

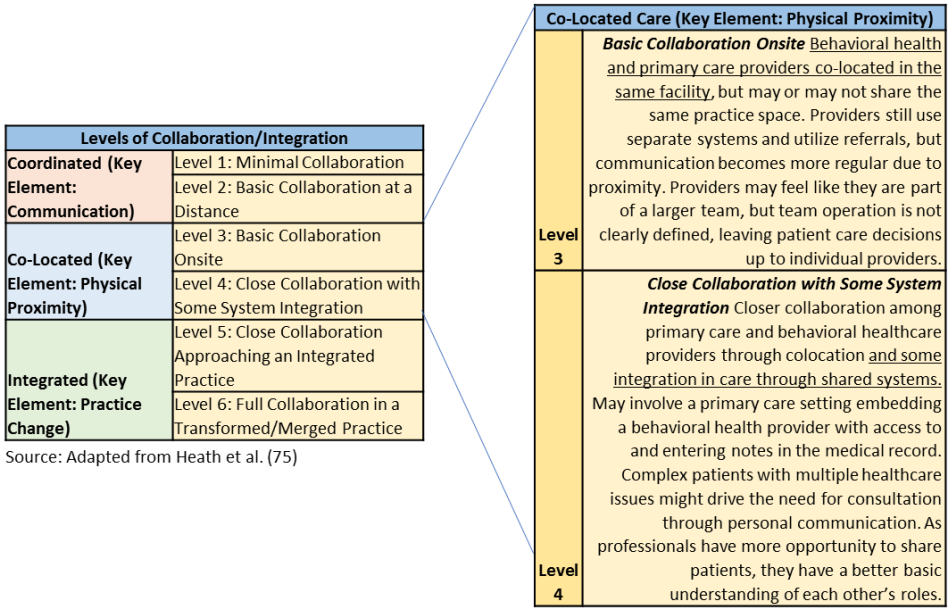
Alexander Blount provided an alternative way to think about dimensions of integration by conceptualizing it within three types of practice structures allowing for respectively increasing collaboration; coordinated, co-located, and integrated care (15). Within a framework of care coordination, extra effort is made to ensure timely information exchange between different care settings and with the patients. The care coordinator does not have to be a medical professional but someone whose role it is to facilitate communication and coordination. Services can also be collocated, with BH and medical professionals sharing space and staff. Even with collocation, there might still be a process of referral to BH providers for patients for whom

medical providers anticipate BH services need. Because they share the same space, however, co-location fosters and supports communication between BH and medical services providers, facilitating timely and efficient exchange of information. There might also be consultation through unscheduled and informal exchange allowing providers to learn from each other. Medical providers might also be less hesitant in addressing mental health issues if a BH provider is in the vicinity. Behavioral health and medical services can also be integrated, which implies a move towards having a practice team comprising the various providers dedicated to each patient as per patients' needs. Integration requires a move towards the medical and BH treatment plans being a part of the same care plan (15).

Blount's categorization framework subsequently proved very important in the efforts by Agency for Healthcare Research and Quality (AHRQ) to develop a common conceptual system for collaborative care (73). Even though there is increasing consensus that some level of system-level service (BH and medical) integration is essential for improving care, there is still much variation in the practice models of integration. Drawing primarily from the work of previous researchers, an expert panel for the Substance Abuse and Mental Health Services Administration (SAMHSA) and the Health Resources and Services Administration (HRSA) Center for Integrated Health Solutions (CIHS) provides a more nuanced framework for conceptualizing levels of service integration as compared to previous work to allow for easier translation into practice models (102). The framework includes six levels of collaboration and integration within three main categories (coordinated, collocated, and integrated) and two levels of differing degrees within each category as depicted in Figure 2-2, which gives the basic overview of the model (the report provides much more detail regarding how models can be distinguished by their approach to the process of care provision). The SAMHSA/HRSA report provides a way to think about integration or collaboration on a continuum from minimum collaboration to full

collaboration in a transformed/merged practice while still maintaining Blount's overall framework of coordination, co-location, and integration. The different levels/models of integration have the common element of enhanced communication, collaboration, and coordination between providers, facilitated by system-level linkages, to sufficiently meet patients' mental health and medical care needs (102).

Figure 2-2: SAMHSA/HRSA Framework Six Levels of Collaboration/Integration

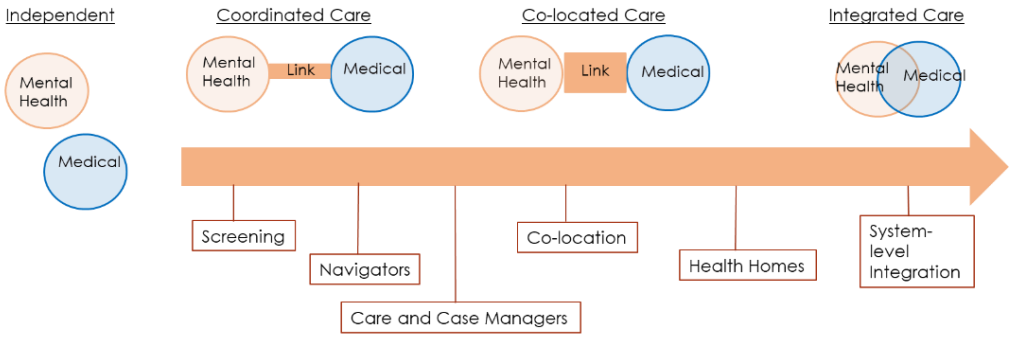


Source: Adapted from Heath et al. (75)

With the key aspect of integration being increasingly improved and close linkages between primary care and specialty mental health providers, the continuum of integration can also be conceptualized as progressively stronger system-level links as depicted in Figure 2-3. There are variations in the strengths and types of linkages ranging from 1) weak links in a coordinated care model where providers practice independently and patients navigate between then through referrals, 2) strong links in a co-location model where providers are co-located and care is enhanced through formal and informal consultations, and 3) strongest linkages in integration models where the systems are integrated and the patients have a single treatment plan. As shown in Figure 2-3, different practice models (above arrow) lend themselves to

allowing for different levels of integration on a continuum of increasing collaboration (below arrow) towards the right (103). Throughout this discussion and in most of literature, strategies might appear mutually exclusive but that is not the case at all. It is important to keep in mind that strategies can be used in combination and coordination with each other and the same strategy can be used in different practice models.

Figure 2-3: Continuum of Physical and Behavioral Health Care Integration



Source: Adapted from Nardone et al. (76) and Collins et al. (43)

Operationalizing Integration

This study specifically focuses on BH provider co-location and record-sharing in primary care settings. Though there are many ways to realize enhanced collaboration and integration at the practice level as discussed, the minimum threshold for moving towards true clinical integration in primary care requires BH provider co-location (102). Co-location represents a significant departure from the historically independent medical and BH practice models and allows for increased and more structured collaboration between primary care providers without psychiatric expertise. With distance between providers serving as a barrier to coordinated care, co-location potentially resolves a critical barrier to access. When there is co-location, BH and medical professionals share space and sometime even staff. Even with co-location, there might still be a process of referral to BH providers, but because of proximity, co-location fosters and supports communication between providers, facilitating timely and efficient exchange of information (15). There might also be consultation through unscheduled and informal exchange

allowing providers to learn from each other (104). As mentioned previously, medical providers might also be less hesitant in addressing mental health issues if a BH provider is in the vicinity. Given the primary data source, the PCP Survey, I am able to assess whether primary care practices have a BH provider on site, which is in line with the SAMHSA/HRSA framework co-located care of Level 3 type as per Figure 2-2, basic collaboration on site with BH and primary care providers co-located in the same facility (102).

Along with co-location I can also determine whether BH and medical providers have access to each other's clinical records for shared patients. With full collaboration within the context of a transformed or merged practice being considered to be the highest level of integration, it is important to acknowledge that full integration is preceded by many smaller practice transformation efforts. In moving from co-location as realized by only sharing space to integration as realized by sharing systems and care plans (Figure 2-2), one critical barrier that practices must overcome includes providers sharing information including medical records. As conveyed by researchers looking at barriers to sharing patient information between providers in New Jersey, "the sharing of patient records by coordinating providers is central to integration efforts" and overcomes a critical barrier between co-location and integration (96). Though I recognize that the terms "integration" and "record-sharing" are not synonymous, for the purposes of this dissertation in order to create the distinction from co-location, I conceptualize integration as record-sharing between providers. Record-sharing is likely to be a reasonable marker of true integration, for sharing of patient information is a key element in moving from just sharing space to a truly integrated model. In thinking of where the operationalized variable as such would fit into existing frameworks, it might fit into Level 2 of the co-location category in the SAMHSA/HRSA framework (Figure 2-2) with embedding of BH provider in primary care setting with access to information in the medical record (102).

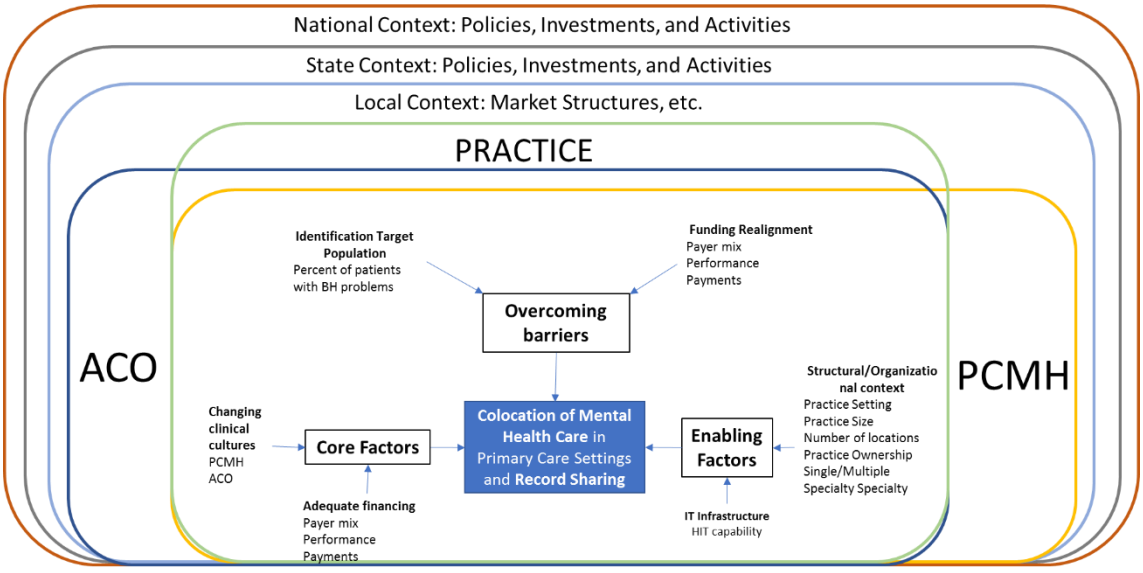
THEORETICAL FRAMEWORK

Now that I have discussed some of the general frameworks of integration to give an idea of what the words integration and co-location might mean, I proceed to provide more context for this chapter about practice characteristics that are associated with BH provider co-location and integration in primary care settings. Over the last two decades as integration models have been translated from theory into practice, researchers have identified broad categories of enablers and barriers to moving towards co-located or integrated models. These barriers might derive from local, state, or national level policies and procedures including operational complexity, regulatory and licensure challenges, and financial hurdles among many others (77, 105). A study of integration in New Jersey found that exchange of health information as well as licensing and reimbursement hurdles can serve as a critical barrier (96). As mentioned previously, very few studies have looked at the how practice structural and organizational factors might influence efforts to transform. There is consensus among researchers that integration takes place at many levels including organizational and financial systems, thus underscoring the importance of structural factors and organizational context in integrating (106, 107).

In order to think about how practice related, and other, factors might be associated with the practice decision to co-locate BH providers in primary care practices, I draw from various frameworks. If I conceptualize a medical practice as an entity the characteristics of which can partially be determined exogenously, then I might be able to contextualize it in an ecological framework such as Figure 2-5. Recently, aided by organizational science, researchers studying practice variation have made efforts to integration the various levels of analysis by considering influential factors at different levels from individual to situational. Whereas traditionally organizations were viewed as closed-system entities with no interaction with their environments, more recent definitions situate organizations in an open-system perspective with

organizations having interdependent activities with shifting coalitions. Such an open system outlook allows for taking into account the different levels at which stakeholders and systems can interact including "sociopsychological (the behaviors of individuals), organizational structure (the structural features that characterize the organization) and ecological (the organization viewed as an entity operating in a larger system of relations)" levels. (108) I borrow from Hogg et al. to create the framework in Figure 2-5, which situates the practice in a structural environment including a national, state, and local context while also focusing specifically on the importance of practice organizational factors. When considering organization-specific features, I use a framework by Maruthappu et al. who identify three categories of factors including enabling factors, core factors, and barriers to be overcome when considering successful implementation of integrated care (109). Though the authors had focused on the integration of medical and social care, the factors that enable or hinder integration of services are likely common to most types of service integration.

Figure 2-5: Framework for Understanding Behavioral Health Provider Co-location



Source: Adapted from Hoggs et al. (81) And Maruthappu et al. (94)

Local Context and Clinical/Practice Culture (Core Factor)

Different national, state, and local factors and policies might influence a practice's ability and decision to co-locate or integrate BH providers. Since all of the practices in the PCP Survey are within New Jersey, they are subject to similar national and state environments and policies. Existing research on looking at primary care provision in different settings has shown that context can have significant effect on medical practices (110). In order to account for local influences, county fixed effects and Zip Code level density and income is included in the models along with practice specific variables.

Additionally, with the advent of other practice transformations such as the Accountable Care Organization (ACO) and Patient Centered Medical Homes (PCMH), the primary care practice might also be exposed to other very immediate local influences that come about due to being part of such organizations. ACO status along with PCMH designation by the National Committee for Quality Assurance (NCQA) is included in the model to look at influence on primary care practice transformation. ACOs are group of providers who are jointly held accountable for the quality and total cost of care delivered for a defined patient population. Given the challenges inherent in practice transformation, ACOs, with their alternate reimbursement structures and commitment to care coordination, might be better positioned to have practices with integrated care. Whereas there are examples of a few comprehensive and successful models of ACOs facilitating BH integration in their primary care practices, findings from the National Survey of ACOs reveal low integration of BH and primary care with the organizations continuing to rely on more traditional fragmented approaches to addressing unmet needs (111-113).

Research looking at practice-specific barriers and enablers of BH integration have identified supportive culture to be crucial to implementing change especially in allowing "flexibility for professional to identify issues in quality of care, provide feedback, and refine

practices" which is required for successful integration models at both the clinical and management levels (114, 115). I use participation in ACOs or certification as PCMH as proxies for having a supportive culture that can facilitate practice changes (116). ACO participation and PCMH accreditation can also stand as proxies for organizational structure supportive of change, for these practice transformations require extensive commitment to being willing to change various aspects of practices including payment and delivery mechanisms. Practices that participate in integrated delivery systems might be more likely to have an existing culture that is conducive to making other practice changes as well such as integrating BH providers. Practices that are already engaged in delivery system reform might be more likely to provide flexibility and freedom for providers to take initiative and participate in decision-making, which is an essential component of facilitating change.

Organization of the Practice

Implementing changes in health care organizations requires the mobilization of organizational resources including financial, social, and administrative among others (117). Organizations which are sufficient resources and inclination towards quality improvement practices might be more likely to invest in integrated practices (118, 119).

Adequate Financing and Financial Realignment (An important Core Factor in Overcoming Barriers)

Adequate financing and funding realignment are core factors and are essential for overcoming barriers to integration. Financial barriers are a major obstacle to integration, especially for smaller practices, as many of the activities associated with integration such as consultation and communication between providers are not typically reimbursed under traditional fee-for-service payment schemes (77, 120). Additionally, carve-out payment mechanisms for BH have served to exacerbate the soiled nature of the sectors. For integration to be implemented successfully, funding should be realigned to support integration activities

and the most effective policies might be those that encourage practices to adopt integration through incentive payment contracts (121). The association between reimbursement system and co-location has not been extensively studied with evidence that financial support for integration activities supports integration implementation (77). Shifting to more value-based programs or payment mechanisms that reward performance might be more in-line with meeting the goals of integrated system. With payment systems increasingly shifting towards paying for value rather than rewarding volume of services, it is likely that payment mechanisms that reward performance might increase the likelihood of co-location or integration. look at whether increasing share of revenue from performance payments might be associated with co-location or integration. Additionally, with different payers offering different types of payment schemes, whether certain payer mix might be more or less conducive to integration is something I investigate.

Structural/Organizational Components (Enabling Factors)

When considering the practice specific structural and organizational characteristics which might be associated with hindering or facilitating co-location of BH providers, I draw from frameworks combining organizational theory with concepts of service delivery and clinical care (108). Internal practice factors such as group composition and capacity can be very influential in practices implementing changes. Many researchers have recognized the importance of office infrastructure and technical aspects including composition and utilization of electronic medical records in affecting service delivery changes (108, 122). Additionally, other practice factors such as number of providers has also been shown to be important when considering that practices cannot successfully implement changes if providers are “struggling to manage schedules and heavy workloads” (123). Previous research looking at co-location using national level Centers for Medicare and Medicaid (CMS) National Plan and Provider Enumeration System (NPPES) data

has indeed found practice size to be an important correlate of co-location with larger primary care practices being more likely to have co-located BH providers (105, 109).

METHODS

Sample

The primary data source is a statewide probability sample survey of PCPs in New Jersey conducted by Rutgers Center for State Health Policy (CSHP) in 2015. Survey questionnaire is provided in Appendix A. New Jersey PCPs, defined as those specializing in family medicine, internal medicine, obstetrics/gynecology (OB/GYN), and pediatrics, were surveyed between September 8 and December 10, 2015. Using the American Medical Association (AMA) Masterfile list of all active PCPs in New Jersey (n=7,834), a probability sample of 2,500 providers was chosen using a two-stage cluster sampling design, limited to one physician per practice location (124). In the first stage, physicians were grouped by practice which yielded 6,515 practices with at least one physician, from which a probability sample of 2,500 practices was selected. There were a total of 3,002 physicians in the 2,500 selected practices. In the second stage, if there was only once physician in a practice, the physician was included in the sample, but if there was more than one physician at a practice, then one physician was selected with equal probability to be in the sample. The final sample comprised 2,500 physicians from 2,500 separate practices.

The survey included questions about PCP agreement with statements related to health system changes, availability of Health Information Technology (HIT), engagement in specific financing and delivery system reforms, and practice and physician characteristics. Surveys were completed (defined as completion of at least 70% of items) by 698 physicians (557 by mail and 141 on the Web), with an overall response rate (AAPOR RR3) of 36.4% (124). Data were weighted to adjust for the probability of selection of the practice location and the physician within the practice location. Additionally, adjustments were made to match distributions of PCP

specialty and other selected respondent characteristics available in the AMA Masterfile. Study methods were reviewed and approved by the Rutgers University Institutional Review Board (IRB).

Measures

Outcomes

As per discussion above, this chapter looks at two outcome variables including co-location of BH providers in primary care settings and whether BH and medical providers share health records (hereafter, "integration").

Co-location of BH providers in primary care settings is included in analysis as a binary variable (1: co-location; 0: no co-location). Question 18 on the PCP survey asks providers to identify the number of full- and part-time patient care BH care staff at the particular practice location on a typical work day. Practices are asked to list the number of full and/or part-time BH providers. I define co-location as presence of at least one part-time mental health staff member at a practice location on a typical work day. In question 19 on the PCP survey respondent were subsequently asked to indicate whether medical and BH providers at the practice location have routine access to each other's clinical records; respondents were instructed to skip this question if there were no BH providers at practice location. I consider that any practice that answered the question about medical and BH record sharing as having co-located care as well, whether they answered staffing question or not. Information from the question regarding record sharing is then used to build the variables for BH integration. If, as per question 19, BH and medical providers have access to each other's records, then I consider there is practice integration with the reference group being practices that do not share records or do not have a BH provider on site. Integration of BH providers in primary care settings is included in analysis as a binary variable (1: integration; 0: no integration or co-location).

Independent Variables

Various practice characteristics are included as covariates as informed by the framework in Figure 2-5. All of the practice-related variables are obtained from the PCP Survey. The contextual variables, zip-code level income and population density, variables are obtained from the 2010-2014 census. Since I am using 2015 survey data, it is suitable to use data from years prior to that for those are the conditions which existed as co-location happened or as decisions to co-locate might have been considered.

Financing

Survey questions inquiring about percent of patients with specific primary payment sources were used to build a variable for payment source used for greater than 50% of patient and included as a categorical variable. Since most practices had private payers as the largest category, the public payers were collapsed into one category with the final categorical variable for payer mix having two categories including 1) private and 2) Public (Medicare, Medicaid, or other).

With payment reform increasingly shifting towards paying for performance rather than for volume of services, having an increasing proportion of revenue from performance payment might drive practice delivery system changes. One survey question asked respondent about the percent of practice's annual revenue composed of performance payments from plans based on performance on patient satisfaction, clinical quality measures, reporting of clinical quality measures, patient utilization or cost, or meaningful use of information technology. The variable was included in analysis as a categorical variables with the three categories 0-3%, 1-4%, or 5-75% representing total percent of revenue coming from performance payments.

I hypothesize that practices with larger proportion of revenue from performance payments and those with more than 50% of their payments from public payers are more likely to have co-location and integration of BH providers in practice.

Practice Adaptability

Participation in ACOs or certification as PCMH are used as proxies for practice adaptability towards and investment in alternate delivery systems. A survey question inquires about whether practice participates in Medicare ACO Shared Savings Program, NJ Medicaid ACO demonstration or Commercial ACO. Based on this question, I build a variable for whether a practice participates in any ACO with the two categories of 1) practice participates in at least one ACO and 2) practice does not participate in any ACOs. Additionally, a separate survey question asks if practice is recognized by the National Committee of Quality Assurance (NCQA) as a Level 1, Level 2, or Level 3 Patient-Centered Medical Home (PCMH). Based on this question, I build a binary variable for whether practice participates in any PCMH mechanism with the two categories of 1) practice is NCQA certified as Level 1, Level 2, or Level 3 PCMH 2) practice is not PCMH certified. I hypothesize that practices that participate in ACO or are certified as PCMHs are more likely to co-locate and integrate BH providers.

IT infrastructure

Survey questions inquiring about various aspects of practice's implementation of electronic health information technology (HIT) are used to construct one variable that counts the number of practice's HIT functionalities. Each of the following is counted as an item in the total number of IT functionalities 1) practice having electronic access to clinical information about patient's ED visits, 2) practice having electronic access to hospital discharge summaries for patients, 3) practice having electronic access to reports from specialist physicians, 4) practice having electronic access to records of prescriptions filled by patients, 5) if all, most, or some patients' can communicate with provider electronically through secure web portal, 6) if practice

can easily generate an electronic list of patients needing care for a specific chronic conditions, or 7) if practice uses electronic reminders at time of patient's visit about recommended tests or treatment for patients with chronic medical conditions. The number of IT functionalities is included in analysis as a categorical variables with the following categories: 0-1, 2-3, or 4 or more IT functionalities. I hypothesize that practices with higher number of HIT functionalities are more likely to have provider integration, as it might be easier to overcome barriers in sharing records between providers in a system that already supports information having access to hospital discharge summaries or specialist repots.

Patient Population Served

I use the survey question inquiring about percent of patients who have a chronic or severe BH diagnosis to build a categorical variable with three categories 0-10%, 11-25%, and greater than 25% representing the proportion of patients who have BH. I hypothesize that practices with a higher proportion of patients with BH disorders are more likely to co-locate and integrate BH providers.

Other Organizational and Structural Characteristics

Other practice structural and organizational aspects that are included in analysis include practice size, location, and number of primary care locations, practice ownership, physician specialty, and whether practice is single or multi-specialty. Practice size is calculated using information from a question asking about the number of full-time physicians (MD or DOs) at the practice location on a typical work day. A categorical variable is constructed with three categories 1, 2-3, 4 or more, representing the number of physicians. A question asking respondents regarding what best describes their practice location is used to build a binary variable with the categories for private office and other clinic (includes Federally Qualified Health Center (FQHC), hospital based clinic or outpatient department, other health center/clinic

(not hospital based or FQHC), medical school/faculty practice plan). With nearly 80% of the sample representing private offices, the other categories each make up a very small proportion of total and thus were collapsed into a category representing clinics. Though they might see different patient populations, conceptually clinic settings are likely to be more similar to each other structurally and organizationally. A survey question asking respondents about number of total primary care locations in practice organization is used to build a binary variable with the categories for ≤2 location and ≥ 2 locations. Physician specialty is reported by survey respondent and included in model as 4 categories including Internal Medicine (IM) or IM-Geriatrics, Family or General Practice, Obstetrics and Gynecology, or Pediatrics. I hypothesize that larger, community health center or clinic based and those with multiple locations are more likely to have co-location and integration.

Analysis

Only observations with valid, non-missing values for all variables of interest were included in the analysis. I use the chi-square test to examine whether there were differences in the distributions of covariates by outcome status (Table 2-1). Subsequently, multivariate logistic regression [Equation 2-1] models with odds ratios [Equation 2-2] and 95% confidence intervals were estimated for whether practice had co-location of BH providers (Table 2-2) or sharing of records between medical and BH providers (Table 2-3) using Stata 15 (StataCorp, College Station, TX). All hypotheses regarding odds ratios are tested at the p=0.05 significance level in the bivariate and multivariate comparisons.

Practice characteristics discussed above were included as covariates. All of the independent variables were categorical and included in the model as dummy variables. Logistic regression was carried out because it provides a nonlinear functional form to model the binary outcome. Weighting procedures accounted for the probability of selection of the practice

location from the frame and of the physicians from the practice. The functional form of the logistic regression is as follow with xβ representing a vector of independent variables and estimated coefficients.

$$\ln\left(\frac{pr(Y=1)}{1-pr(Y=1)}\right) = \beta 0 + x\beta \quad [\mathbf{2-1}]$$

$$\text{Odds Ratio: } \left(\frac{pr(Y=1)}{1-pr(Y=1)}\right) = e^{\beta} \quad [\mathbf{2-2}]$$

RESULTS

Using list-wise deletion, the final sample size is 670 practices, for which information for all variables of interest is included. There are no variables for which more than 5% of the observations are missing values; practice size is missing for 3.3% of the overall sample. Overall 28.4% of primary care practices have at least one BH provider collocated and 17.2% have integration as operationalized through record-sharing between medical and BH care providers (Table 2-1). Table 2-1 shows results from bivariate tests with p-values reported for chi-square tests of significance. Nearly twice the percentage of providers who have greater than 25% of patients with chronic or severe BH diagnosis have co-location relative to providers with less than 10% of such complex patients; first order relationship is statistically significant. Practice ownership is significantly associated with having co-located providers with nearly 43% of hospital, non-profit, government, or state university owned practices having co-located providers relative to only 22% of physician owned practices. Similarly practice location is also significantly associated with co-location with nearly twice as many practices that are located in a community health center (CHC) or hospital outpatient settings (48%) have at least one part-time BH provider compared to practices that operate as private offices (23%). A statistically significant higher percentage of primary care practices that participate in ACOs have co-located BH providers relative to practices that don't participate in ACOs. Interestingly, there is no statistically significant association between being PCMH

certified and having co-located BH providers. Being a multi-specialty practice is also statistically significantly associated with the co-location with 39% of multi-specialty practices and only 25% of single specialty practices have co-location. A significantly greater percentage of larger practices with four or move medical practitioners (43.2%) have BH providers than smaller practices (23%). Type of primary care specialty is also associated with co-location with Internal Medicine practices (34.7%) more likely to have co-located providers relative to Family Practice (26.9%), Obstetric Gynecology (28.6%), and Pediatrics (20.77%).

Whereas nearly 21.7% of practices that participate in ACOs have co-located BH providers, only 12.35% have integration, as operationalized by record sharing between BH and medical providers and discussed above. A statistically significant smaller percentage of single specialty practices (15.1%) have integration compared to multi-specialty practices (24.6). Whereas the number of HIT capabilities is not associated with having provider co-location, it is associated with BH provider integration with higher percentages of practices with more HIT functionalities having integration relative to those with fewer HIT capabilities. Of practices with four or more HIT capabilities, 22% have integration as compared to 16.9% of practices with 2-3 HIT functionalities and 11.1% of practices with one or less. Similar to the observation for co-location, a greater proportion of larger practices have integration but association is only marginally significant. Nearly twice as many practices that are located in a CHC or hospital outpatient settings (27.4%) have BH integration compared to practices that operate as private offices (15.0%). Along with having low rates of co-location, pediatrics practices also have low rates of integration at only 10% of practices as compared to Internal Medicine (19.0%), Family Medicine (18.6%), or Obstetrics/Gynecology (25.4%).

Table 2-2 gives the odds ratios from unadjusted and adjusted logistic regression on co-location. Unadjusted coefficient is result of regression between the covariate and outcome, and

fully adjusted models include all covariates in table 2-2 as well as county fixed effects and zip-code level income and population density (not reported). Only practices with complete information for all variables were included for a total sample size of 620. Many of the bivariate relationships observed in the bivariate analysis in do not hold after adjusting for covariates. After adjusting for other practice characteristics, practice size is significantly associated with having BH provider co-location with practices with 4 or more practitioners having nearly two times the odds of co-location (OR: 1.88; CI: 1.05, 3.37) relative to solo practices. Additionally practices that are located in a CHC or hospital outpatient settings are more likely to have co-location with such practices having two times the odds (OR: 1.98; CI: 3.89) of having at least one part time BH provider relative to practices based in private offices. Having the lowest rates of co-location among any type of primary care practices, pediatrics practices have nearly half the odds of co-location relative to their Internal Medicine counterparts (OR: 0.56; CI: 0.32,0.96).

Table 2-3 presents the unadjusted (regression between the covariate and outcome only) and adjusted (regression including all covariates as well as county fixed effects and zip-code level income and population density (not reported)) odds ratios for regression on integration. Only practices with complete information for all variables were included for a total sample size of 620. When considering factors that are significantly associated with having BH provider integration, practices with 4 or more HIT functionalities have nearly twice the odds of having BH integration (OR: 1.97; CI: 1.60, 3.78). Additionally, practices with 4 or more HIT functionalities have 2.19 times the odds (CI: 1.30, 4.68) or having integration relative to practices that lack any HIT.

DISCUSSION

The main goal of this chapter was to assess what types of practice characteristics are associated with co-location and integration. Practice location and size are the only covariates I

find to be significantly associated with co-location in multivariate regression. Practices with more than 4 primary care providers have nearly two times the odds of have co-located BH providers and sharing of records between BH and medical providers compared to solo practices. This practice size effect is after adjusting for the various other practice characteristics, and thus there is something else captured in size than can be accounted for by other included practice characteristics. This finding is especially concerning as nearly 50% of practices in the sample are solo providers. Smaller practices might disproportionately be affected by barriers to integration including administrative challenges (125). A similar finding regarding larger practices being more likely to have co-location has been made by other researchers using national level data from 2013 as well as 2018 (93, 94). Separate groups of researchers used national level CMS NPPES data to look at characteristics of primary care physicians working in the same practice as BH providers and found that larger practices are more likely to co-locate BH providers. While one study was only descriptive, the other study found that the differences across specialty types and even rurality were eliminated in regression including practice size (94).

Additionally, practices situated in hospital clinics or CHCs are much more to have co-located and integrated care relative to private practices in clinics. This finding is not surprising as co-location has been particularly favored in health centers. With the significant investment in Federally Qualified Health Centers (FQHC) through the Affordable Care Act setting up a 5 year $11 billion trust fund for CHCs to meet needs with growing demand due to coverage expansion, health centers have invested heavily in expanding their BH services. Even as early as 2010, nearly 70% of health centers provided mental health services with 65% providing some type of integrated care, such as a shared treatment plan (126). It is important to note that in this sample, even though hospital clinics and health centers are more likely to have co-located care, they do not have increased odds of sharing records. It might be of interest to payers and other

stakeholders, especially Medicaid due to the high rate of Medicaid patients seeking care in CHCs, to offer assistance in helping CHCs in New Jersey have more integrated care. The finding that practices that have higher HIT capacity have higher odds of integration is in-line with previous research including qualitative works indicating lack of HIT to be a big barriers to integration. Providing HIT support might be one mechanism to help practices implemented integration.

One particularly concerning study finding is that pediatrics practices have the lowest rates of co-location and integration of any primary care practice type and have reduced odds of co-location and integration in adjusted models as well. With nearly 40% of youth and adolescents in the US having a mental health disorder and only 30% of them receiving care, there is significant unmet need (127). Despite the challenges due to the various barriers including stigma along with lack of pediatric mental health specialists nationally as many as 52%-60% of pediatrics practices nationally have co-location, remarkably higher than these finding of about 20% of practices in New Jersey having co-location and 10% having integration (93, 127, 128). Though it is possible that part of the difference could be attributed to differences in measurement or data source, the low level of co-location and integration is nevertheless concerning and warrants further investigation.

In this sample of New Jersey providers 28.4% of primary care practices have co-location, which is slightly lower than the others' findings of NJ having 33-38% of primary care practices with co-location (93, 94). The difference is not large and might arise from the different methodology of assessing co-location; whereas I use survey data, others have used CMS NPPES data with using provider specialty and location to assign co-location status. It is noticeable, however, that by others' as well as my estimation, the rate of co-location in NJ is far below the national average of 44% (93, 94).

LIMITATIONS

There are several important limitations which must be considered when interpreting chapter 2 findings. The cross-sectional nature of the PCP Survey data does not allow for isolating causality or directionality of relationships nor does it allow me to study practice changes over time. That being said, it is important to acknowledge that the variable I include in the model and which are significantly associated with co-location or integration such as practice size, location, and HIT capability, are unlikely to suffer from directionality issues. These practice characteristics are structural in nature and conceptually it is unlikely that co-location or integration influence these factors but more so that these aspects of the practice would facilitate or hinder implementation of co-location or integration.

One additional limitation of the study is the modest survey effective response rate of 38%. Though it is not possible to confirm that this sample is representative in terms of every variable, it is perhaps most important to confirm that the sample is representative in terms of my variable of interest. In 2018, researchers at University of Michigan used the National Provider Identifier Data to map national co-location trends in the US as in Figure 2-6. These researchers found that in New Jersey, 33% to 38% of primary care physicians co-located with BH providers. Since my sample has nearly 30% of providers with co-location, I assume that there is not a large bias in my sample for the main variable of interest (93).

One additional limitation is that of being a single-state study. Because I use only New Jersey data, the results cannot be generalized to other places. With many of the policies that affect medical practice being made at the state level, however, it is important to look within the states to see how to improve care. Even though my results cannot be generalized to other states, with the sampling framework used, the results should be generalizable to New Jersey and can thus shed light on how primary care practices are organized and can be improved in NJ.

Table 2-1: Characteristics of Primary Care Providers in New Jersey by Behavioral Health Provider Co-Location Status and Record Sharing, Results from Primary Care Physician Survey 2015

	Co-Location				Access to Medical Records			
	Total		Have at Least one Full or Part time BH provider		Total		Behavioral Health Providers have Access to Medical Records	
	%	n	Row %	P-Value	%	n	Row %	P-Value
Total	100.0%	698	28.4%		100.0%	580	17.2%	-
Payment Source for Over 50% Patients				0.08				0.95
Public	49.9%	345	31.8%		47.0%	267	17.1%	
Private	50.1%	353	25.0%		53.0%	313	17.3%	
Percent of Annual Revenue from Performance or Value Based Payments				0.26				0.37
0% or don't know	52.4%	373	28.8%		51.8%	303	18.4%	
1-4%	26.4%	175	23.9%		27.9%	152	13.1%	
5-75%	21.2%	150	33.1%		20.3%	125	19.7%	
Percent of Patients with Chronic/ Severe BH Diagnosis				0.03				0.84
0-10%	60.0%	426	25.4%		63.5%	374	17.7%	
11-25%	26.4%	166	29.3%		26.2%	135	15.6%	
Greater Than 25%	13.6%	99	41.0%		10.3%	65	18.2%	
Practice Ownership				<0.01				0.07
Physician	70.0%	485	22.3%		73.4%	421	15.2%	
Hospital (Non-Profit, Government, State University)	30.0%	203	43.1%		26.6%	150	23.1%	
Practice Participates in ACO				0.04				0.02
No	53.2%	375	24.8%		53.9%	314	13.3%	
Yes	46.8%	323	32.5%		46.1%	266	21.7%	
Practice recognized by NCQA as PCMH				0.29				0.32
Not a PCMH or Don't Know	75.3%	537	27.2%		76.1%	450	16.1%	
Level 1, 2, or 3 PCMH	24.7%	161	32.2%		23.9%	130	20.6%	
Single Specialty Practice				<0.01				0.03
No	22.4%	146	38.7%		21.2%	114	24.6%	
Yes	77.6%	542	25.2%		78.8%	462	15.1%	
Number of HIT Capabilities				0.18				0.03
0-1	32.2%	236	24.6%		33.2%	203	11.1%	
2-3	25.4%	182	26.6%		23.6%	142	16.9%	
4 or more	42.5%	280	32.4%		43.3%	235	22.0%	
Number of Practice Locations				0.34				0.64
1-2	78.7%	550	27.5%		79.4%	465	16.6%	
3 or more	21.3%	136	32.1%		20.6%	106	18.8%	
Number of Medical Providers				<0.01				0.07
Solo	49.2%	355	23.8%		50.7%	308	13.8%	
2-3	25.8%	162	23.0%		27.0%	138	16.9%	
4 or more	25.0%	153	43.2%		22.3%	114	24.8%	
Practice Location				<0.01				0.01

Private office	78.1%	543	23.0%		81.8%	472	15.0%	
Community health center or hospital/ outpatient clinic	21.9%	153	47.6%		18.2%	107	27.4%	
Primary Specialty				0.04				0.03
IM and IM-Geriatrics	37.6%	231	34.7%		34.5%	177	19.0%	
FP, General Practice	24.2%	183	26.9%		25.1%	157	18.6%	
OB/Gyn	11.03%	77	28.6%		11.5%	67	25.4%	
Pediatrics	29.65%	207	20.77%		30.86%	179	10.5%	

Notes: ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, FP: Family Practice, OB/Gyn: Obstetrics and Gynecology ,HIT: Health Information Technology, BH: Behavioral Health. The differences between total number of observations within a category might not align with overall total due to dataset missing values for observations for certain variables. P-Value based on Chi-Squared tests. Source: NJ Primary Care Physician Survey, 2015

Table 2-2: Association Between Primary Care Practice Characteristics and Behavioral Health Provider Co-Location, Results from New Jersey Primary Care Physician Survey 2015

	Unadjusted		Adjusted	
	OR	**95% CI**	**OR**	**95% CI**
Payment Source for Greater Than 50% Patients				
Public	1.00	Reference	1.00	Reference
Private	0.71*	0.49, 1.04	1.06	0.69, 1.64
% Annual Revenue from Performance or Value Payments				
0% or don't know	1.00	Reference	1.00	Reference
1-4%	0.78	0.49, 1.24	0.78	0.46, 1.32
5-75%	1.22	0.77, 1.95	1.01	0.60, 1.72
Percent of Patients with Chronic/Severe BH Diagnosis				
0-10%	1.00	Reference	1.00	Reference
11-25%	1.22	0.76, 1.96	1.07	0.66, 1.73
Greater Than 25%	2.04***	1.25, 3.33	1.28	0.71, 2.31
Practice Ownership				
Physician	1.00	Reference	1.00	Reference
Hospital (Non-Profit, Government, State University)	2.64***	1.79, 3.89	1.20	0.62, 2.31
Practice Participates in ACO				
No	1.00	Reference	1.00	Reference
Yes	1.46**	1.00, 2.12	1.17	0.77, 1.77
Practice recognized by NCQA as PCMH				
Not a PCMH or Don't Know	1.00	Reference	1.00	Reference
Level 1, 2, or 3 PCMH	1.27	0.82, 1.99	0.96	0.55, 1.68
Single Specialty Practice				
No	1.00	Reference	1.00	Reference
Yes	0.53***	0.35, 0.82	0.83	0.47, 1.47
Number of HIT Capabilities				
0-1	1.00	Reference	1.00	Reference
2-3	1.11	0.69, 1.80	0.90	0.53, 1.53
4 or more	1.47*	0.95, 2.28	1.03	0.62, 1.71
Number of Practice Locations				
1-2	1.00	Reference	1.00	Reference
3 or more	1.24	0.79, 1.96	0.76	0.43, 1.36
Number of Medical Providers				
Solo	1.00	Reference	1.00	Reference
2-3	0.96	0.59, 1.55	1.00	0.58, 1.70
4 or more	2.43***	1.54, 3.85	1.88**	1.05, 3.37
Practice Location				
Private office	1.00	Reference	1.00	Reference
Community health center or hospital/outpatient clinic	3.04***	2.02, 4.59	1.98**	1.01, 3.89
Primary Specialty				
Internal Medicine and IM-Geriatrics	1.00	Reference	1.00	Reference
Family Practice, General Practice	0.69	0.42, 1.15	0.76	0.43, 1.31
Obstetrics and Gynecology	0.74	0.37, 1.38	0.63	0.38, 1.04
Pediatrics	0.49***	0.31,0.78	0.56**	0.32,0.96
Constant			0.59	0.12, 2.82
Observations			638	

Notes: ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, HIT: Health Information Technology, BH: Behavioral Health. Adjusted model includes county fixed effects and zip-code level income and population density. Source: NJ Primary Care Physician Survey, 2015. Significance level: *** p<0.01, ** p<0.05, * p<0.1

Table 2-3: Association Between Primary Care Practice Characteristics and Behavioral Health and Medical Provider Record Sharing, Results from New Jersey Primary Care Physician Survey 2015

	Unadjusted		Adjusted	
	OR	**95% CI**	**OR**	**95% CI**
Payment Source for Greater Than 50% Patients				
Public	1.00	Reference	1.00	Reference
Private	1.02	0.61, 1.68	1.24	0.69, 2.22
Percent of Annual Revenue from Performance or Value Based Payments				
0% or don't know	1.00	Reference	1.00	Reference
1-4%	0.67	0.35, 1.29	0.51	0.25, 1.06
5-75%	1.09	0.60, 2.00	0.72	0.36, 1.44
Percent of Patients with Chronic/Severe BH Diagnosis				
0-10%	1.00	Reference	1.00	Reference
11-25%	0.86	0.47, 1.57	0.75	0.40, 1.41
Greater Than 25%	1.03	0.51, 2.09	0.85	0.37, 1.93
Practice Ownership				
Physician	1.00	Reference	1.00	Reference
Hospital (Non-Profit, Government, State University)	1.67*	0.96, 2.90	0.83	0.31, 2.20
Practice Participates in ACO				
No	1.00	Reference	1.00	Reference
Yes	1.80**	1.09, 2.97	1.57*	0.93, 2.62
Practice recognized by NCQA as PCMH				
Not a PCMH or Don't Know	1.00	Reference	1.00	Reference
Level 1, 2, or 3 PCMH	1.35	0.75, 2.46	0.91	0.43, 1.90
Single Specialty Practice				
No	1.00	Reference	1.00	Reference
Yes	0.55**	0.31, 0.95	0.81	0.37, 1.78
Number of HIT Capabilities				
0-1	1.00	Reference	1.00	Reference
2-3	1.62	0.83, 3.19	1.38	0.68, 2.77
4 or more	2.26***	1.26, 4.06	1.97**	1.60, 3.78
Number of Practice Locations				
1-2	1.00	Reference	1.00	Reference
3 or more	1.16	0.62, 2.18	0.78	0.37, 1.68
Number of Medical Providers				
Solo	1.00	Reference	1.00	Reference
2-3	1.27	0.70, 2.32	1.56	0.74, 3.28
4 or more	2.07**	1.09, 3.94	2.19**	1.30, 4.68
Primary Specialty				
IM and IM-Geriatrics	1.00	Reference	1.00	Reference
Family Practice, General Practice	0.97	0.50, 1.90	1.34	0.67, 2.66
Obstetrics and Gynecology	1.47	0.71, 3.05	1.19	0.47, 2.97
Pediatrics	0.44**	0.23, 0.86	0.44**	0.21, 0.95
Practice Location				
Private office	1.00	Reference	1.00	Reference
Community health center or hospital/outpatient clinic	2.14**	1.20, 3.84	1.36	0.48, 3.87
Constant			0.44	0.06, 3.01
Observations			527	

Notes: ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, HIT: Health Information Technology, BH: Behavioral Health. Adjusted model includes county fixed effects and zip-code level income and population density. Source: NJ Primary Care Physician Survey, 2015. Significance level: *** p<0.01, ** p<0.05, * p<0.1

Chapter 3: Behavioral Health Provider Colocation in Primary Care Settings in New Jersey and Physician Perception of Ease of Getting Behavioral Health Services for Patients and Receiving Timely Information from Behavioral Health Providers, Results from Primary Care Physician Survey 2015.

This chapter addresses the following research question: What is the association, if any, between behavioral health provider co-location[5] and primary care physician perception regarding ease of getting mental health services for patients and getting timely information regarding patients from behavioral health providers?

ABSTRACT

The third chapter of this dissertation explores whether behavioral health (BH) provider co-location in primary care practices is associated with improved physician perception regarding ease of getting mental health (MH) services for patients and timeliness of getting information from MH providers. The study uses data from a 2015 survey of primary care practices in New Jersey. Physician Perception regarding ease of getting MH services for patients and receipt of timely information from MH providers are the dependent variables and co-location of BH providers in primary care settings is the independent variable of interest. Other primary care practice characteristics including practice size, location, specialty, and presence of care manager are included as covariates. Bivariate and multivariate regression models are used to test hypotheses. Results show that co-location of BH providers in primary care settings is strongly associated with positive physician perception regarding ease of getting BH services (OR: 2.16; CI: 1.19, 3.90) for patients but is not associated with perception regarding receiving timely information from MH providers. Instead, presence of care managers is found to be associated

[5] We were unable investigate association between integration and outcomes due to sample size limitations with estimate largely being unstable with large standard errors

with improved physician perception regarding receiving timely information from BH provides (OR: 2.30; CI: 1.13, 4.68). Additionally, having private payment source for majority of practice's patients is associated with reduced odds of physicians agreeing that it is easy to get BH services for patients (OR: 0.35; CI: 0.18, 0.71).

BACKGROUND

Behavioral health (BH) disorders, comprising mental health (MH) and substance use disorders (SUD) are some of the most pervasive causes of disability worldwide (1). Lifetime prevalence of BH disorders in the United States is as high as 57.4%, with lifetime prevalence of MH disorders ranging from nearly 30% for anxiety disorders, 20% for mood disorders, and 15% for substance use disorders (10, 20). Despite improvements in our ability to treat MH conditions, it is estimated that only about one-third of patients with MH conditions receive treatment (129).

Mental illness and other chronic medical conditions frequently co-occur; based on 2001-2003 NCS-R results, nearly 30% of people with a clinical medical condition had at least one MH condition, and 70% of adults with a mental illness had a comorbid medical condition (130). Patients with comorbid conditions have higher symptom burden and functional impairment as well as lower quality of life with mental illness significantly affecting associated morbidity and mortality (3, 131).

Patients with moderate mental illness, including mood or anxiety disorders, usually engage with the healthcare system by first presenting to primary care or general medical settings making these settings a sort of de factor MH system (10-12). As many 70% of visits to primary care Physicians (PCPs) might be from underlying BH issues including anxiety, panic, depression, and stress triggering physical complaints such as non-specific gastrointestinal

symptoms and pain (10, 11). Primary care physicians face various challenges in treating patients with complex health care needs.

Despite the high prevalence of mental illness in primary care, as many as two-thirds might report that that they have trouble finding outpatient MH services for their patients, which is two times as high as for other specialty services (132). Along with health plan barriers and lack of coverage, physicians have identified lack of MH resources and fragmentation of health care system as primary barriers in meeting patient's needs and have expressed that more onsite MH support might address system shortcomings (133, 134). In the following quote from a qualitative study, a physician conveyed her lack of satisfaction with the overall system in providing timely treatment for patients in need.

> *And I am talking about the system globally … access to care for mental health is different than our access to care for medical health. It's just preposterous. And it is really frustrating, because it really affects a lot of people (p.32) (133).*

For almost two decades now, the Institute of Medicine (IOM) claimed that primary and BH are inseparable and 16th US Surgeon General indicated that dealing with mental health care must rely on coordinated treatment ensured by improvements in partnerships between PCPs and MH centers (135). The Agency for Health care Research and Quality (AHRQ) along with other state and national agencies has also advocated for delivery system transformation to integrate services. High-quality evidence from randomized controlled trials has elucidated that integrated care improves the process of care along with clinical outcomes of patients with common medical and BH conditions (136, 137).

Accelerated by the Affordable Care Act (ACA), as integration scales up with more local solutions to co-locate BH providers in primary care settings, still little is known about the provider perception regarding how such practice transformations are facilitating improvements in care provision (138). For integration to be successful, it must be informed by perceptions of

its effectiveness for patients as well as for PCPs. From a policy perspective, gauging provides engagement in and perception of how BH integration might improve care processes might allow for a more efficient and clear approach in directing support and funding. Using a 2015 survey of primary care practices in New Jersey (PCP Survey) I assess whether co-location of BH providers in primary care practices improves PCPs' perceptions of mental health care access for their patients. Existing studies of provider perception when caring for patients with BH and chronic medical comorbidities show that providers "felt that co-location of specialty MH providers would be more effective than increased coordination of care or access to consultation with off-site MH specialists" (133). Whereas most of the current work in this area, which I discuss shortly, has been qualitative and limited by sample size, I look at a diverse set of practices which vary in size, geography, and the primary care specialty to assess whether the observations from the qualitative studies regarding usefulness of co-location holds across varied primary care practices in New Jersey. Additionally, while most of the studies have been limited in terms of sample size and have not been able to isolate the association between co-location and physician perception from the effect of other practice transformations that might influence physician perceptions as well.

CURRENT STATE OF EVIDENCE AND CONCEPTUAL FRAMEWORK

As I discussed in Chapter 2, co-location in primary care refers to the physical presence of BH providers in primary care practices; office staff and waiting facilities might be shared or separate, and BH providers might be part of the care team or patient referral might still occur through a referral process. Theoretically, the proximity of being co-located might at least foster more frequent communication between providers than would occur if located in separate settings with co-location allowing for medical providers becoming more "attuned to what BH providers can provide" (p.6) (15). Much of the initial evidence on feelings of PCPs regarding BH

provider co-location in primary care setting was largely anecdotal with providers reporting easier and more frequent collaboration than occurred in separate settings. The first full scale HMO implementation of co-located care found that physical proximity allowed for more unscheduled short consultations which facilitated communication and information exchange (104).

A previous study of PCPs (11 providers in integrated care settings were interviewed) in five community health centers with co-located BH providers found that having BH providers on-site in primary care settings improves PCP perception regarding the access to services for patients (138). The researchers found that whereas only about 10% of PCPs indicated that they would refer over 40% of patients to a specialty MH provider located elsewhere, almost half conveyed that they would refer over 40% of eligible patients to co-located MH specialists. Study participant PCP providers reported that time interval between PCP referral and visit to BH provider is much shorter for co-located providers compared to external MH providers. Additionally, co-location was also shown to facilitate improvement in communication between providers with majority of PCP respondents reporting that in more than 80% of instances, the co-located MH provider "clarified diagnosis and recommended treatment plans for referred patients, and provided adequate responses to referral questions" (138). Another study looking at staff perceptions of integration of MH/SUD services in Federally Qualified Health Centers in California found that PCPs and MH/SUD providers strongly agreed that consultation with each other was beneficial for patients' care (139). PCPs rated very high their satisfaction level with the flow of information from the MH/SUD providers to the PCP.

Various studies have shown that PCPs have generally favorable attitudes towards BH provider co-location with physicians who interact more with BH providers being more comfortable addressing their patients' health care issues (140). Both the number of patients

receiving BH services as well as the quality of the delivered services is higher in practices with co-location (141). A study of nearly 400 PCPs who participated in a multisite randomized controlled trial of a collaborative care disease management program (Improving Mood, Promoting Access to Collaborative Treatment for late-life depression (IMPACT)) for late-life depression showed improvement in overall physician satisfaction with resources to treat patients with depression (142). The researchers found that whereas before intervention nearly half of physicians conveyed satisfaction with resources to treat depression, after intervention more than 90% said the intervention was helpful in treating patients and 82% felt that patient's clinical outcomes were improved (142). Though the researchers had a relatively large sample size, they used only bivariate analyses to look at changes in physician perceptions before and after the intervention.

One qualitative study looking at challenges faced by PCPs in treating patients with multiple chronic medical and BH conditions found that while PCPs share a significant burden of treating BH conditions, they report not feeling adequately prepared with lack of confidence in treating conditions "accentuated by the clinical settings and overall health care system in which they worked" (133). These providers felt that clinical context was not conducive to taking care of complex patients due to "1) lack of MH resources 2) the separation of mental and physical health care, 3) clinic procedures, and 4) the US healthcare system as a whole." (133). Even when they were able to consult with MH specialists, PCPs conveyed that there were many communication challenges due to separate clinical settings and that proximity would resolve many communication barriers. Though the study was limited to 15 Internal Medicine doctors from two University-based primary care settings and three community health centers, almost all of the physicians agreed that additional support from MH providers in the primary care settings "as the primary change" that would improve care for patients, with one provider conveying the

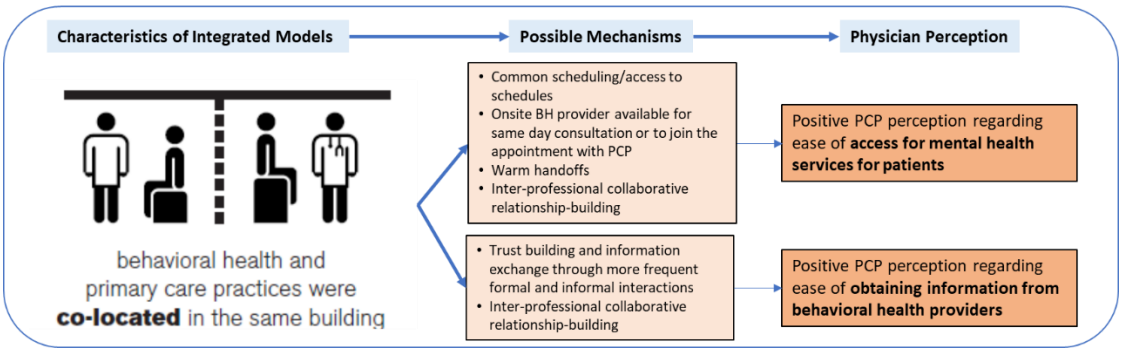
following: "So co-location of mental health in primary care is clearly the answer. That would allow me … not to have to communicate through some HIPPA secure portal to a provider in another location … I could just walk down the hall and talk to somebody" (133) Interestingly, increased coordination with MH specialists off-site was not considered to be beneficial (133).

The relationship between PCPs and MH providers has historically been very poor which hinders patient access to services and the results in poor communication between providers as well as lack of understand of each other's roles in taking care of patient's health care needs (143). In order to better understand how fragmentation disrupts communication or hinders care provision, a Canada-based research group used grounded theory methods and found that PCPs and MH providers report fragmentation leads to poor inter-professional relationships, which can lead to poor communication between providers and create access issues for patients in a fragmented system (144). A strong collaborative inter-professional relationship can develop in the context of co-Location through more frequent interactions including informal hallway conversations or discussion of patient referral forms as well as through timely delivery of both primary care and mental health services (145). One PCP describes how more frequent formal and informal interaction lead to increasing provider familiarity and trust: *"we've said over and over again that's been a huge part …you literally can talk to somebody in the hallway … just that physical presence is helpful … a huge part for us "* (145). By moving through the stages of developing inter-professional collaborative relationships in the context of co-location, providers should eventually move to a stage of growing reciprocity that is characterized by comfort and flexibility with one study respondent claiming that *"sometimes I will go there or they will go here or we'll meet in the corridor and say I'd like to talk about so and so and it's a very comfortable relationship"* (145).

One key barrier to getting timely care for BH problems had been coordinating services located in different places through the referral process. Though co-location might not eliminate that process, studies have shown that patients are more likely to keep their first appointment with the BH specialist if the PCP makes the initial introduction, a gesture not easily made without co-location (146). Even when the referral process is in place, warm handoffs are shown to be a common feature of co-located care and can help improve access to providers. During such a warm handoff, primary care clinician directly introduce patient to the BH provider, something which would be impossible without the physical proximity. Facilitating such interaction between patient and BH provider can help overcome critical barriers to access by helping build patients' trust in BH clinicians and reducing patients' stigma about receiving BH care services (146, 147). Additionally, it is also possible that proximity of BH provider might allow for easier scheduling with provider or office staff being able to facilitate making and confirming appointments with BH provider.

In most studies of physician perception regarding BH services for patients, providers identify system fragmentation and shortages of mental health care providers as key barriers to caring for patients (132, 133). From the discussion of previous studies that have looks at physician perception in caring for patients in BH disorders, I extrapolate possible mechanisms for how co-location of BH providers in primary care settings might improve provider perceptions

Figure 3-1: Characteristics of integration linked to Physician Perceptions



regarding access to services and communication with BH providers such as in Figure 3-1. I look at provider perception regarding access to BH services for their patients as well perceptions regarding information reception from mental health provider regarding shared patients. The variables are discussed in detail in the methods section.

While I expect that co-location of BH providers influence provider perception of processes involved in caring for patients, PCP perceptions might also be informed by various things including personal characteristics or experiences as well as by patient-, practice-, and health care system- related factors. Studies have found that the probability of having MH access problems for PCPs can vary by physician practice, health system, and various policy factors (133, 138). For example, prior research looking at PCP perception of handling complex patients found that providers were very aware of challenges patients faced in negotiating complex systems of payments with BH care contracted to systems separate from the medical system (133). While most of the existing qualitative studies have gathered physician and practice related data, the data has been presented in a descriptive way; studies have not looked at how other practice and physician features might influence perceptions or might influence the association between co-location and physician perception regarding care processes. Most of the studies have not been able to isolate the association between co-location and physician perception from the effect of other practice transformations that might influence physician perceptions as well. Practices that have co-located or integrated care might also implement other mechanisms such as care managers or have other characteristics such as participation in performance based payments or alternate delivery systems, Accountable Care Organizations (ACOs) or Patient Centered Medical Homes (PCMHs) which might also influence physician perceptions regarding access to care. Many projects that have tested integration, for example, have at the same time provided other personnel and structural supports to facilitate better provision of MH services and thus studies

of physician perceptions within the context of those projects might be subject to some bias. (77) Given the range of practice and provider characteristic variables in the PCP survey, I adjust for other factors to isolate the association between co-location and physician agreement that it is easy to obtain MH services for patients and that they receive timely information from MH providers.

In addition to including various practice-related variables, I also take into account physician gender and age, which might also affect how physicians perceive challenges in caring for their patients. Contextual variables including county, zip-code level income, and population density are also included to account for market or supply/demand differences that might exist in different parts of the state.

METHODS

Sample

The primary data source is a statewide probability sample survey of PCPs in New Jersey conducted by Rutgers Center for State Health Policy (CSHP) in 2015. Survey questionnaire is provided in Appendix A. New Jersey PCPs, defined as those specializing in family medicine, internal medicine, obstetrics/gynecology (OB/GYN), and pediatrics, were surveyed between September 8 and December 10, 2015. Using the American Medical Association (AMA) Masterfile list of all active PCPs in New Jersey (n=7,834), a probability sample of 2,500 providers was chosen using a two-stage cluster sampling design, limited to one physician per practice location (124). In the first stage, physicians were grouped by practice which yielded 6,515 practices with at least one physician, from which a probability sample of 2,500 practices was selected. There were a total of 3,002 physicians in the 2,500 selected practices. In the second stage, if there was only once physician in a practice, the physician was included in the sample, but if there was more than one physician at a practice, then one physician was selected with

equal probability to be in the sample. The final sample comprised 2,500 physicians from 2,500 separate practices.

The survey included questions about PCP agreement with statements related to health system changes, availability of Health Information Technology (HIT), engagement in specific financing and delivery system reforms, and practice and physician characteristics. Surveys were completed (defined as completion of at least 70% of items) by 698 physicians (557 by mail and 141 on the Web), with an overall response rate (AAPOR RR3) of 36.4% (124). Data were weighted to adjust for the probability of selection of the practice location and the physician within the practice location. Additionally, adjustments were made to match distributions of PCP specialty and other selected respondent characteristics available in the AMA Masterfile. Study methods were reviewed and approved by the Rutgers University Institutional Review Board (IRB).

Measures

Outcomes

Physician attitudes regarding satisfaction with various practice elements and potential practice changes were measured using the Likert scale. Providers were presented with various statements in question two of PCP Survey to assess their attitudes regarding a practice factor and were asked to rank their agreement or disagreements with the statement using the following Likert Scale (1) strongly agree, (2) agree somewhat, (3) neither disagree nor agree, (4) disagree somewhat, and (5) strongly disagree. There were two statements that dealt with issues relevant to caring for patients with BH disorders in primary care settings. These statements include 1) it is easy to secure MH services for my patients if needed and 2) I received timely information I need from MH provider my patients visit. For analysis, the Likert scale responses for those two items were dichotomized into agreement (Likert scale items (1) and (2)) or disagreement/neutral (Likert scale items (3), (4), and (5)) with individual statements. All

outcomes, thus, were modeled as binary variables (0: disagreement with statement; 1: agreements with statement). I use agreement with statements regarding ease of getting services for patients or timeliness of getting information from MH providers about patients as physicians having positive perception regarding those statements. Neutral or disagreement are taken as negative perception regarding things in those statements. Additionally, I also confirm that these results are robust by using ordinal logit with three outcome categories: 1) agreement combining Likert items 1 and 2, 2) neutral which is Likert item 3, and 3) disagreement combining Likert items 4 and 5.

Co-Location of BH Providers: Independent Variable of Interest

Co-location of BH providers in primary care settings are included in analysis as a binary variable (1: co-location; 0: no co-location). Question 18 on the PCP survey asks providers to identify the number of full- and part-time patient care BH care staff at the particular practice location on a typical work day. Practices are asked to list the number of full and/or part-time BH providers. I define co-location as presence of at least one part-time MH staff member at a practice location on a typical work day. In question 19 on the PCP survey respondent were subsequently asked to indicate whether medical and BH providers at the practice location have routine access to each other's clinical records; respondents were instructed to skip this question if there were no BH providers at practice location. I consider any practice that reported that they had medical-BH record sharing as having co-located care as well even if they did not answer the staffing question.

Other Covariates

Various practice and physician characteristics are included in the model. Survey question inquiring about percent of patients with specific primary payment sources were used to build a variable for payment sources for greater than 50% of patient and included as a categorical variable in regression with two categories including 1) private and 2) Public

(Medicare, Medicaid, or other). A variable was included for percent of each practice's annual revenue composed of performance payments from plans based on patient satisfaction, clinical quality measures, reporting of clinical quality measures, patient utilization or cost, or meaningful use of information technology. The variable was included in analysis as a categorical variables with the categories 0-3%, 1-4%, or 5-75% revenue coming from performance payments.

Based on the survey question inquiring about whether practice participates in Medicare ACO Shared Savings Program, NJ Medicaid ACO demonstration or Commercial ACO, I build a variable for whether a practice participates in any ACO. Additionally, based on a question asking if practice is recognized by the National Committee of Quality Assurance (NCQA) as a Level 1, Level 2, or Level 3 Patient-Centered Medical Home (PCMH), I build a binary variable for whether practice participates in any PCMH mechanism. I use the survey question inquiring about percent of patients who have a chronic or severe BH diagnosis to take into account the complexity of the patients serviced by the provider.

Other practice structural and organizational aspects that are included in analysis include practice size, location, and number of primary care locations, practice ownership, physician specialty, and whether practice is single or multi-specialty. Practice size is calculated using information from a question asking about the number of full-time physicians (MD or DOs) at the practice location on a typical work day. A categorical variable is constructed with three categories 1, 2-3, 4 or more, representing the number of physicians. A question asking respondents regarding what best describes their practice location is used to build a binary variable with the categories for private office and other clinic (includes Federally Qualified Health Center (FQHC), hospital based clinic or outpatient department, other health center/clinic (not hospital based or FQHC), medical school/faculty practice plan). With nearly 80% of the sample representing private offices, the other categories each make up a very small proportion

of total and thus were collapsed into a category representing clinics. Though they might see different patient populations, conceptually clinic settings are likely to be more similar to each other structurally and organizationally. A survey question asking respondents about number of total primary care locations in practice organization is used to build a binary variable with the categories for ≤2 location and ≥ 2 locations. Physician specialty is reported by survey respondent and included in model as 4 categories including Internal Medicine (IM) or IM-Geriatrics, Family or General Practice, Obstetrics and Gynecology, or Pediatrics.

The variable for presence of care managers was built using two items from PCP Survey question 17 which is a 5-part question inquiring about whether various types of staff work at the practice in a typical work day. The items inquiring about whether there are nurse care managers/care coordinators or social workers/case managers are used to build a binary variable for inclusion as covariate with the following categories: 1) nurse care managers/care coordinators or social workers/case managers and 2) no nurse care managers/care coordinators or social workers/case managers. The contextual variables, zip-code level income and population density, variables are obtained from the 2010-2014 census. Additionally I also use physician characteristics including physician gender and age to take into account years of physician practice, for example, which might be associated with a larger referral network and influence perception of ease of getting care for patients.

Analysis

Only observations with valid, non-missing values for all variables of interest were included in the analysis (there are no variables for which more than 5% of the observation have missing values). I use the chi-square test to examine whether there were differences in the distributions of covariates by outcomes status (Table 3-1). Subsequently, multivariate logistic regression [3-1] models with odds ratios [3-2] and 95% confidence intervals were estimated for

physician agreement that it is easy to get MH services for patients (Table 3-2) or agreement that they receive timely information from MH provider regarding patient (Table 3-3) using Stata 15 (StataCorp, College Station, TX). All hypotheses regarding odds ratios are tested at the p=0.05 significance level in the bivariate and multivariate comparisons.

Various practice characteristics discussed above are used as covariates and included in the models as categorical (dummy) variables, except for provider age which is included as continuous. Logistic regression was carried out because it provides a nonlinear functional form to model the binary outcome. Weighting procedures accounted for the probability of selection of the practice location from the frame and of the physicians from the practice. The functional form of the logistic regression is as follow with xβ representing a vector of independent variables and estimated coefficients where $x1$ is co-location of BH providers and $x2$ is the vector of the relevant provider and practice-level covariates.

$$\ln\left(\frac{pr(Y=1)}{1-pr(Y=1)}\right) = \beta 0 + \beta 1 * x1 + \beta 2 * x2 \quad [\mathbf{3-1}]$$

$$\text{Odds Ratio: } \left(\frac{pr(Y=1)}{1-pr(Y=1)}\right) = e^{\beta} \quad [\mathbf{3-2}]$$

RESULTS

Overall, 12.7% of providers agree that is easy to secure MH services for patients and 16.2% agree that they receive timely information from MH providers regarding shared patients (Table 3-1). According to bivariate analysis in, there is a statistically significant relationship between PCPs agreeing that it is easy to secure MH services for patients and co-location, having care managers in practice, percent of revenue from performance/value based payments, and practice location (Table 3-1). Whereas only 9.8% percent of providers in practices that do not have a BH provider agree that it is easy to find MH services, nearly twice the percentage (19.8%) of physicians in practices with co-located providers agree (Figure 3-2). Nearly twice the percentage of practices that have a care manager (20.3%) agree that it is easy to have access to MH for patients relative to practices without a care manger (8.1%). Having a high percentage of

annual revenue from performance based payments is inversely related to agreement regarding ease of getting MH services for patients. Additionally nearly twice the percentage of providers based in practices that are based in Community health center or hospital/ outpatient clinic (20.5%) agree that it is easy to get MH services for patients, compared to providers in private clinics (10.3%).

The other outcome of interest in this analysis is PCP agreement that they receive timely information from MH providers regarding shared patients. As per Table 3-1, there is significant relationship between physician agreement regarding timely receipt of information from MH provider and co-location, having care managers in practice, percent of revenue from performance/value based payments, number of HIT functionalities, and practice location. Nearly twice the percentage of physicians from practices with co-located BH providers (23.4%) agree that they receive timely information from MH providers compared to physicians in practices without co-location (13.3%) (Figure 3-3). Additionally, almost three times the percentage of practices that have care managers (26.5%) convey that it is easy to obtain information from BH providers relative to practices without care managers (10.0%). Having a high percentage of annual revenue from performance/value based payments is inversely related to agreement regarding receiving timely information from MH providers with 21% of providers from practices without such revenue agreeing regarding receiving timely information compared to about 10% of providers from practices with any percentage of revenue s from such payment sources. Having more HIT functionalities in the practice is associated with agreement regarding receipt of timely information from MH health provider with 21.2% of providers in practices with at least four functionalities agreeing regarding receipt of timely information as compared to 16.1 of providers in practices with at most one HIT functionality. Providers in practices based in

community health center or hospital/ outpatient clinic are more likely to agree that they receive timely information from MH providers about shared patients.

Table 3-2 presents the unadjusted (regression between the covariate and outcome only) and adjusted (regression including all covariates as well as county fixed effects and zip-code level income and population density (not reported)) odds ratios for regression on physician agreement that it is easy to secure MH services for patients. Only practices with complete information for all variables were included for a total sample size of 623. Providers in practices with co-located BH providers have significantly higher odds (OR: 2.14; CI: 1.34, 3.87) of agreeing that is easy to secure MH services for patients relative to providers in practices without co-location. Interestingly providers in practices who obtain greater than 50% of their revenue from private payment sources have 65% reduced odds of agreeing that it is easy to secure MH services for patients relative to providers for whom majority of revenue is public sources such as Medicare or Medicaid (OR: 0.35; CI: 0.18, 0.66).

Table 3-3 presents the unadjusted (regression between the covariate and outcome only) and adjusted (regression including all covariates as well as county fixed effects and zip-code level income and population density (not reported)) odds ratios for regression on physician agreement that they receive timely information form MH providers regarding shared patients. The total number of practices with information available for all variables in the model was 620. Interestingly, BH provider co-location is not associated with improved odds of physician agreeing that they receive timely information from MH providers. However, having care managers in the practice on a daily basis is associated with nearly two times the odds (OR: 2.30; CI: 1.20, 4.88) of having positive perception regarding receiving timely information from MH providers. Further providers in pediatrics practices have significantly reduced odds (OR: 0.41; CI: 0.19, 0.90) of agreeing that they receive timely information from BH providers.

As mentioned, I also used ordinal logistic regression with separating neural from disagree categories to regress the independent variables on a three-category outcomes (results not presented here). There was no difference in overall conclusions with providers in practices with co-location having lower odds of being in the neutral of categories. Additionally, I am unable investigate association between integration and outcomes due to sample size limitations with estimate largely being unstable with large standard errors.

DISCUSSION

In line with previous research, PCPs in practices with co-located BH providers are more likely to report that it is easier to gain access to MH services for their patients; PCPs in co-located practices have 2.14 (CI: 1.34, 3.87) times the odds of agreeing that it is easy to find MH services for patients compared to PCPs in practices without BH providers. Though my results show that co-location and presence of care managers are associated with more positive provider perceptions regarding access to MH care for patients and receipt of timely information from MH providers, respectively, it is concerning that overall, only 12.7% of PCPs agree that it is easy to secure MH services for patients and 16.2% agree that they receive timely information form MH providers. Though higher than in practices without co-location (9.8%), even in practices with co-location only about 20% of physicians agree that they can find MH services for patients. This observation is especially concerning when we consider that more than 50% of treatment for mental illness takes place in primary care settings and as many as one-third of the patients in primary care might be suffering from depression other mental illnesses with the psychiatric conditions exacerbating the chronic medical comorbidities (148). Even with co-location there might still be significant barriers to getting treatment for patients.

As discussed earlier, one of the challenges in identifying the role of integrated BH is isolating the primary effect of having a BH provider in the practice from other features of co-

located practices that might also facilitate improving quality of care. Practices that have co-located care might also implement other mechanisms to improve care such as care managers to facilitate coordination. Many intervention studies that have tested integration have at the same time provided other personnel and structural supports to facilitate better provision of MH services (77). By including care managers in my regression models, I sought to isolate the association between co-location and PCP perception. After adjusting for presence of care managers and other practice characteristics, co-location continues to be associated with increased odds of physicians agreeing that it is easy to find MH services for patients. However, after adjustment, co-location is not associated with increased odds of physicians agreeing that it is easy to get information regarding patients from MH providers. Having a care manager in the practice, however, more than doubles the odds of physicians agreeing that it is easy to get timely information from MH providers. This finding especially underscores the importance of the role that care coordinators can play in facilitating information exchange even among providers who might be co-located.

While most structural practice characteristics are not statistically significantly associated with out outcomes of interest, there is a strong negative association between having private payers as payment source of majority of patients and agreeing that it is easy to secure MH services for patients. This is especially concerning as nearly half of the practices report that private payers make up the payment source of more than 50% of their patient population. As mentioned before researchers have found that providers taking care of patients with BH and chronic medical problems were very aware of challenges patients faced in negotiating complex systems of payments (133). My results confirm that providers continue to acknowledge health care financing as a primary barrier in caring for patients in primary care settings. In order to

improve access to BH services for patients, not only the delivery system, must the payment systems must also be considered.

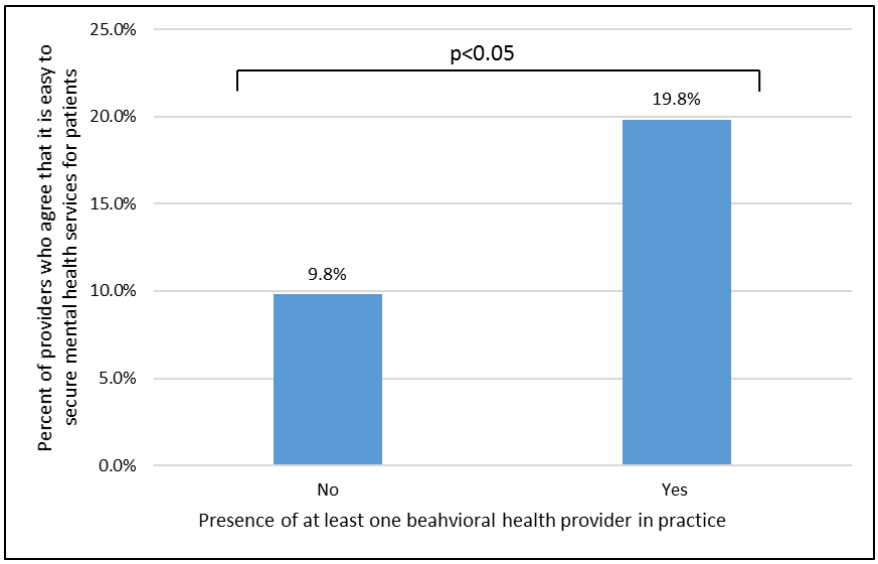
LIMITATIONS

There are several important limitations which must be considered when interpreting chapter 3 findings. The cross-sectional nature of the PCP Survey data does not allow for isolating causality or directionality of relationships nor does it allow me to study practice changes over time. I cannot, thus, conclude that BH provider co-location improves provider perception regarding getting BH care access for patients but only that the two are associated.

Similar to Chapter 2, one additional limitation of the study is the modest survey effective response rate of 38%. Though it is not possible to confirm that my sample is representative in terms of every variable, it is perhaps most important to confirm that the sample is representative in terms of my variable of interest. In 2018, researchers at University of Michigan used the National Provider Identifier Data to map national co-location trends in the US as in Figure 2-6. These researchers found that in New Jersey, 33% to 38% of primary care physicians co-located with BH providers. Since my sample has nearly 30% of providers with co-location, I can assume that there is not a large bias in my sample for the main variable of interest (93).

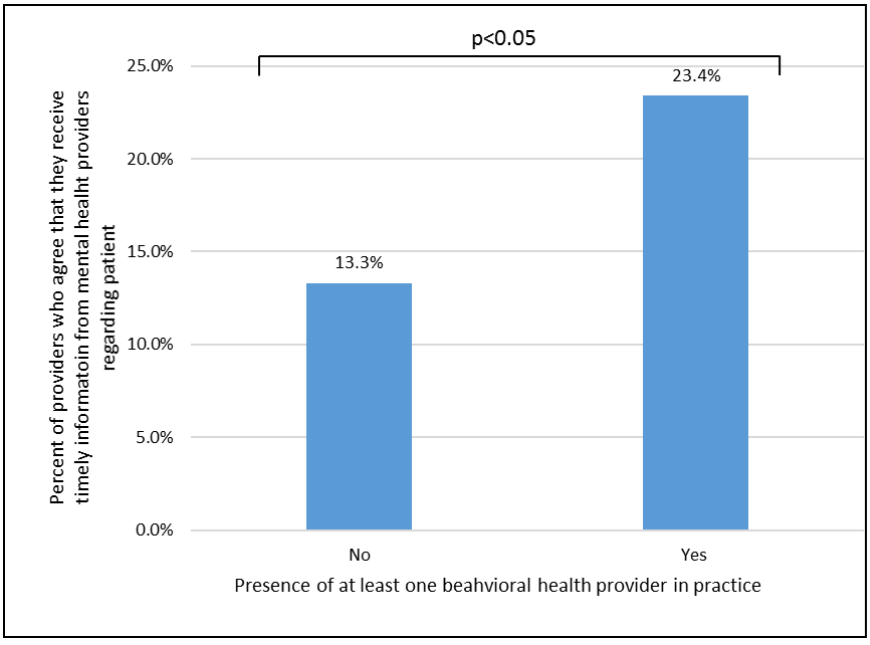
Similar to chapter 2, one additional limitation is that of being a single-state study. Because I used only New Jersey data, the results cannot be generalized to other places. With many of the policies that affect medical practice being made at the state level, however, it is important to look within the states to see how to improve care. Even though these results cannot be generalized to other states, with the sampling framework I used, the results should be generalizable to New Jersey and can thus shed light on how primary care practices are organized and can be improved in NJ.

Figure 3-2: Provider Perception Regarding Ease of Securing Mental Health Services for Patients by Status of Behavioral Health Provider Co-location in practice.



Source: Primary Care Physician Survey 2015. Notes: Presented rates are unadjusted.

Figure 3-2: Provider Perception Regarding Timely Receipt of Information From Mental Health Provider by Status of Behavioral Health Provider Co-location in practice.



Source: Primary Care Physician Survey 2015. Notes: Presented rates are unadjusted.

Table 3-1: Characteristics of Primary Care Practices by Physician Perception Regarding Ease of Securing Mental Health Services and Timely Receipt of Information from Mental Health Providers, Result from Primary Care Physician Survey, 2015

	Ease of Securing Mental Health Services for Patients				Receipt of Timely Information from Mental Health Providers			
	Total		Providers Agree that easy to secure MH services for patients		Total		Providers Agree that receive timely information from MH providers	
	%	n	Row %	P-Value	%	n	Row %	P-Value
Total	100.0%	698	12.7%	-	100.0%	695	16.2%	-
BH Provider at Practice Location				0.01				0.02
No	71.6%	505	9.8%		71.6%	503	13.3%	
Yes	28.4%	193	19.8%		28.4%	192	23.4%	
Care Manager in Practice				<0.01				<0.01
No	67.5%	466	8.1%		67.5%	463	10.0%	
Yes	32.5%	224	20.3%		32.5%	224	26.5%	
Payment Source for Greater Than 50% Patients				0.09				0.38
Public	49.9%	345	16.5%		49.6%	342	18.1%	
Private	50.1%	353	8.8%		50.4%	353	14.3%	
Percent of Annual Revenue from Performance or Value Based Payments				0.04				0.04
0% or don't know	52.4%	373	16.2%		52.6%	372	20.9%	
1-4%	26.4%	175	6.9%		26.3%	174	10.5%	
5-75%	21.2%	150	11.2%		21.1%	149	11.5%	
Percent of Patients with Chronic/Severe BH Diagnosis				0.32				0.12
0-10%	60.0%	426	10.5%		59.9%	424	12.9%	
11-25%	26.4%	166	15.5%		26.4%	165	21.8%	
Greater Than 25%	13.6%	99	17.7%		13.7%	99	20.6%	
Practice Ownership				0.16				0.27
Physician	70.0%	485	11.1%		69.8%	482	15.1%	
Hospital (Non-Profit, Government, State University)	30.0%	203	16.5%		30.2%	203	19.6%	
Practice Participates in ACO				0.98				0.30
No	53.2%	375	12.7%		53.4%	374	18.1%	
Yes	46.8%	323	12.7%		46.6%	321	14.0%	
Q26, Practice recognized by NCQA as PCMH				0.12				0.21
Not a PCMH or Don't Know	75.3%	537	14.0%		75.2%	534	17.5%	
Level 1, 2, or 3 PCMH	24.7%	161	8.5%		24.8%	161	12.1%	
Single Specialty Practice				0.60				0.30
No	22.4%	146	13.2%		22.5%	146	19.0%	
Yes	77.6%	542	11.5%		77.5%	539	14.4%	
Number of HIT Capabilities				0.19				0.01
0-1	32.2%	236	10.0%		32.3%	236	16.1%	

2-3	25.4%	182	10.4%		25.0%	179	7.7%	
4 or more	42.5%	280	16.0%		42.7%	280	21.2%	
Number of Practice Locations				0.54				0.71
1-2	78.7%	550	10.7%		78.6%	547	14.3%	
3 or more	21.3%	136	12.7%		21.4%	136	15.9%	
Number of Medical Providers				0.19				0.27
Solo	49.2%	355	8.7%		49.2%	353	12.5%	
2-3	25.8%	162	15.9%		25.9%	162	19.0%	
4 or more	25.0%	153	16.0%		24.8%	152	20.0%	
Practice Location				0.01				0.02
Private office	78.1%	543	10.3%		78.0%	540	13.8%	
Community health center or hospital/ outpatient clinic	21.9%	153	20.5%		22.0%	153	24.3%	
Primary Specialty				0.58				0.081
IM and IM-Geriatrics	33.1%	231	13.2%		32.9%	229	0.2	
FP, General Practice	26.2%	183	15.3%		26.3%	183	0.185	
OB/Gyn	11.0%	77	13.5%		11.1%	77	0.181	
Pediatrics	29.7%	207	8.9%		29.6%	206	0.075	

Notes: ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, FP: Family Practice, OB/Gyn: Obstetrics and Gynecology ,HIT: Health Information Technology, BH: Behavioral Health. The differences between total number of observations within a category might not align with overall total due to dataset missing values for observations for certain variables. P-Value based on Chi-Squared tests. Source: NJ Primary Care Physician Survey, 2015

Table 3-2: Association Between BH Provider Co-Location in Primary Care Practices and Physician Perception Regarding Ease of Securing Mental Health Services for Patients, Result from New Jersey Primary Care Physician Survey 2015

	Unadjusted		Adjusted	
	OR	**95% CI**	**OR**	**95% CI**
BH Provider in Practice				
No	1.00	Reference	1.00	Reference
Yes	2.27**	1.18, 4.38	2.14**	1.34, 3.87
Care Manager in Practice				
No	1.00	Reference	1.00	Reference
Yes	2.90	1.50, 5.60	1.59	0.75, 3.70
Payment Source for Greater Than 50% Patients				
Public	1.00	Reference	1.00	Reference
Private	0.49*	0.21, 1.14	0.35***	0.18, 0.66
Percent of Annual Revenue from Performance or Value Based Payments				
0% or don't know	1.00	Reference	1.00	Reference
1-4%	0.38**	0.18, 0.82	0.44*	0.20, 1.03
5-75%	0.65	0.31, 1.36	1.10	0.53, 2.27
Percent of Patients with Chronic/Severe BH Diagnosis				
0-10%	1.00	Reference	1.00	Reference
11-25%	1.57	0.62, 3.97	0.74	0.36, 1.51
Greater Than 25%	1.83*	0.96, 3.51	1.49	0.66, 3.36
Practice Ownership				
Physician	1.00	Reference	1.00	Reference
Hospital (Non-Profit, Government, State University)	1.57	0.83, 2.98	0.80	0.35, 1.83
Practice Participates in ACO				
No	1.00	Reference	1.00	Reference
Yes	1.00	0.52, 1.93	1.03	0.56, 1.91
Practice recognized by NCQA as PCMH				
Not a PCMH or Don't Know	1.00	Reference	1.00	Reference
Level 1, 2, or 3 PCMH	0.57	0.28, 1.16	0.47	0.19, 1.15
Single Specialty Practice				
No	1.00	Reference	1.00	Reference
Yes	0.85	0.43, 1.68	0.73	0.40, 1.91
Number of HIT Capabilities				
0-1	1.00	Reference	1.00	Reference
2-3	1.05	0.53, 2.07	0.87	0.37, 2.05
4 or more	1.73	0.85, 3.51	1.12	0.54, 2.34
Number of Practice Locations				
1-2	1.00	Reference	1.00	Reference
3 or more	1.22	0.65, 2.28	1.51	0.68, 3.33
Number of Medical Providers				
Solo	1.00	Reference	1.00	Reference
2-3	1.98	0.76, 5.18	0.92	0.42, 2.01
4 or more	2.00**	1.09, 3.65	1.16	0.52, 2.55
Primary Specialty				
IM and IM-Geriatrics	1.00	Reference	1.00	Reference
Family Practice, General Practice	1.19	0.44, 3.25	1.01	0.38, 2.64
Obstetrics and Gynecology	1.02	0.43, 2.24	1.63	0.63, 4.21

Pediatrics	0.65	0.33, 1.27	1.07	0.47, 2.40
Practice Location				
Private office	1.00	Reference	1.00	Reference
Community health center or hospital/outpatient clinic	2.25**	1.19, 4.23	1.53	0.64, 3.66
Provider Gender				
Male	1.00	Reference	1.00	Reference
Female	1.77	0.95, 3.33	1.15	0.61, 2.17
Provider Age	0.97	0.93, 1.02	0.99	0.96, 1.02
Constant			0.05***	0.01, 0.43
Observations			629	

ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, HIT: Health Information Technology, BH: Behavioral Health, MH: Mental Health. Adjusted model includes county fixed effects and zip-code level income and population density. *** p<0.01, ** p<0.05, * p<0.1

Table 3-3: Association Between BH Provider Co-Location in Primary Care Practices and Physician Perception Regarding Getting Timely Information from MH Providers, Result from New Jersey Primary Care Physician Survey 2015

	Unadjusted		Adjusted	
	OR	**95% CI**	**OR**	**95% CI**
BH Provider in Practice				
No	1.00	Reference	1.00	Reference
Yes	1.99**	1.12, 3.54	1.56	0.89, 2.71
Care Manager in Practice				
No	1.00	Reference	1.00	Reference
Yes	3.25***	1.80, 5.86	2.30**	1.20, 4.88
Payment Source for Greater Than 50% Patients				
Public	1.00	Reference	1.00	Reference
Private	0.76	0.40, 1.42	1.02	0.55, 1.79
Percent of Annual Revenue from Performance or Value Based Payments				
0% or don't know	1.00	Reference	1.00	Reference
1-4%	0.45**	0.21, 0.96	0.61	0.28, 1.32
5-75%	0.49*	0.22, 1.09	0.57	0.28, 1.15
Percent of Patients with Chronic/Severe BH Diagnosis				
0-10%	1.00	Reference	1.00	Reference
11-25%	1.88	0.88, 4.00	1.07	0.56, 2.06
Greater Than 25%	1.74*	0.94, 3.24	1.25	0.59, 2.66
Practice Ownership				
Physician	1.00	Reference	1.00	Reference
Hospital (Non-Profit, Government, State University)	1.38	0.78, 2.42	0.55	0.22, 1.39
Practice Participates in ACO				
No	1.00	Reference	1.00	Reference
Yes	0.742	0.42, 1.30	0.78	0.44, 1.39
Practice recognized by NCQA as PCMH				
Not a PCMH or Don't Know	1.00	Reference	1.00	Reference
Level 1, 2, or 3 PCMH	0.645	0.32, 1.29	0.63	0.28, 1.39
Single Specialty Practice				
No	1.00	Reference	1.00	Reference
Yes	0.717	0.38, 1.34	0.82	0.39, 1.72
Number of HIT Capabilities				
0-1	1.00	Reference	1.00	Reference
2-3	0.43**	0.22, 0.86	0.40**	0.17, 0.94
4 or more	1.40	0.75, 2.64	0.90	0.45, 1.77
Number of Practice Locations				
1-2	1.00	Reference	1.00	Reference
3 or more	1.13	0.60, 2.15	0.93	0.43, 2.02
Number of Medical Providers				
Solo	1.00	Reference	1.00	Reference
2-3	1.64	0.69, 3.90	1.09	0.53, 2.23
4 or more	1.74*	0.97, 3.13	1.74	0.85, 3.56
Primary Specialty				
IM and IM-Geriatrics	1.00	Reference	1.00	Reference
Family Practice, General Practice	0.912	0.38, 2.18	0.61	0.26, 1.40
Obstetrics and Gynecology	0.88	0.43, 1.83	0.98	0.41, 2.35

Pediatrics	0.32***	0.17, 0.62	0.41**	0.19, 0.90
Practice Location				
Private office	1.00	Reference	1.00	Reference
Community health center or hospital/outpatient clinic	2.01**	1.13, 3.55	2.62	0.93, 6.71
Provider Gender				
Male	1.00	Reference	1.00	Reference
Female	1.39	0.77, 2.49	1.08	0.61, 1.91
Provider Age	0.99	0.95, 1.03	1.01	0.98, 1.04
Constant			0.64	0.07, 5.89
Observations			626	

ACO= Accountable Care Organization, NCQA=National Committee for Quality Assurance, PCMH= Patient Centered Medical Home, IM= Internal Medicine, HIT: Health Information Technology, BH: Behavioral Health, MH: Mental Health. Adjusted model includes county fixed effects and zip-code level income and population density. *** p<0.01, ** p<0.05, * p<0.1

Chapter 4: Association Between Co-location and Integration of Behavioral Health Providers in Primary Care Settings and Health Care Services Utilization for New Jersey Medicaid Enrollees With Behavioral Health and Chronic Medical Conditions.

This chapter addresses the following research question: Does behavioral health provider co-location or integration in primary care practices reduce utilization of emergency department and inpatient health care services for adult Medicaid Enrollees with behavioral health disorders and other chronic medical comorbidities in New Jersey 2015-2016?

ABSTRACT

This dissertation chapter looks at quality of care for patients with behavioral health disorders and chronic medical comorbidities in primary care settings in New Jersey. I use multi-level modeling to look at whether patients who get majority of their care in primary care practices with behavioral health provider co-location or integration have reduction in reduction in ED or inpatient utilization, 30-day all-cause readmission, and preventable hospitalization. Results show that there is no statistically significant association between co-location or integration and utilization of these services. Patients with severe mental illness and those with higher burden of comorbidity have higher odds of outcomes.

BACKGROUND

Behavioral health (BH) disorders, comprising mental health (MH) disorders or substance use disorders (SUD) are common among adults, especially those with lower socioeconomic status, and frequently co-occurs with chronic physical health conditions with comorbidity contributing to poor health outcomes and high service utilization and cost (129, 149, 150). Prevalence of BH disorders is twice as high in Medicaid beneficiaries as in the general population, and Medicaid accounts for more than a quarter of national spending on BH

disorders (151). Of the nearly one-third of Medicaid beneficiaries with mental health disorders, more than half also have chronic medical comorbidity (CC) (152). Despite availability of effective treatments, there is still significant unmet needs for treatment of behavioral health disorders (14). With nearly one-third of adults with a mental health visit seeking care solely in primary care practices, these settings provide a key opportunity to address critical patient needs, but there is often a struggle to manage patients with BH disorders and especially those with other chronic medical comorbidities (12, 13).

Integration of mental and physical health services in primary care settings presents an opportunity to improve care for patients with behavioral health disorders including the subgroup with behavioral health disorders and chronic medical comorbidities. Improving care for patients with chronic physical and behavioral health conditions through service integration and disease management is a central goal of healthcare financing and delivery system reforms (153). Reform provisions encourage providers to be innovative in delivering care, to invest in infrastructures improvements such as informational technology systems, and to integrate primary care with other health services including behavioral health services (61, 67, 154, 155). With the Affordable Care Act (ACA) offering opportunities for states to improve care for Medicaid beneficiaries through payment and delivery system reform part of which includes improving access to behavioral health services, co-location and integration has become primarily over recent years (156, 157). While shown to achieve positive clinical outcomes and reduced cost, most research on integration has focused on targeted initiatives for specific diseases in large organization or programs (15, 158-160). There is less evidence describing how co-location or integration of behavioral health services in primary care settings might improve quality of care for low-resource, high-need populations such as Medicaid beneficiaries with comorbid BH disorders and chronic physical illness (161, 162).

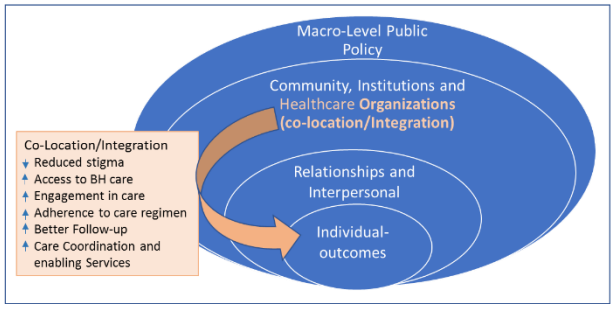
Focusing on New Jersey (NJ), this study addresses a gap in the literature by examining state-wide data to analyze how provider efforts to locally integrate care relate to utilization of hospital-based health care service utilization across patients in diverse primary care practices. Nearly half million additional beneficiaries in NJ have been covered by Medicaid between 2013 and 2017, increasing total enrollment by 37%. That the gain has largely been driven by enrollment of adults made newly eligible which underscores the importance of examining a substantial post-expansion period to study how to improve delivery and coordination of behavioral health and primary care services for existing and new beneficiaries (86). Drawing on timely, comprehensive NJ Medicaid data (2015-2016) and linking it to a survey of NJ primary care provides (PCP Survey), (conducted in 2015) that contains rich details about practice organization, I propose to investigate how primary care practice features affect overall as well as avoidable utilization as well as hospital readmissions for patients with mental illness and chronic medical comorbidities. I hypothesize that patients with behavioral health and other chronic comorbidities who are attributed to practices with co-located behavioral health providers have lower rates of hospitalizations for ambulatory care sensitive conditions, lower rates of readmission, and overall lower inpatient and emergency department (ED) use along with reduced cost.

CONCEPTUAL FRAMEWORK

The utilization of health services can be affected by multiple factors including patient, family, communities, health care providers and organizations, and policies (reimbursement, regulatory, etc.) among many other factors. The health care utilization outcome is usually the results of multiple actors and processes functioning at different levels. Overall this study utilizes a modified integrative framework of the Socio-Ecological Model, Andersen/Aday Behavioral Model of Health Services Utilization (Andersen Model), and Donabedian framework for

understanding the relationship between structure, process, and health care outcomes to examine health services utilization (163-165).

Figure 4-1: Ecological Perspective of Role of Co-location or Integration in Health Care Outcomes.



Recognizing the various levels of influence on health behaviors, the Socio-Ecological Model looks at the relationship between interpersonal, organizational, community, and policy levels in influencing the individual's health behavior and outcomes (163, 166). Conceptualizing the individual as nested within different layers of influences (proximal and distal), the Socio-Ecologic Model can highlighted the importance of environmental influences including interfacing with healthcare system in settings with readily available health care services in influencing health behaviors and outcomes, especially for patients with behavioral health and chronic medical conditions. Making behavioral health services available in primary care settings where patients seeks care can reduce the barriers to care, such as stigma, and can improve healthcare outcomes through better patient engagement in care, adherence to care regimen, or follow-up along with other potential mechanisms highlighted in Figure 4-1. Though it can inform an overall comprehensive approach and lend itself to my methodological approach of multilevel modeling (discussed in Methods section), the model does not specify the individual constructs which can influence outcomes such as health care service utilization. In order to inform model specification I draw from Andersen Behavioral Model of Health Services Utilization (Andersen Model).

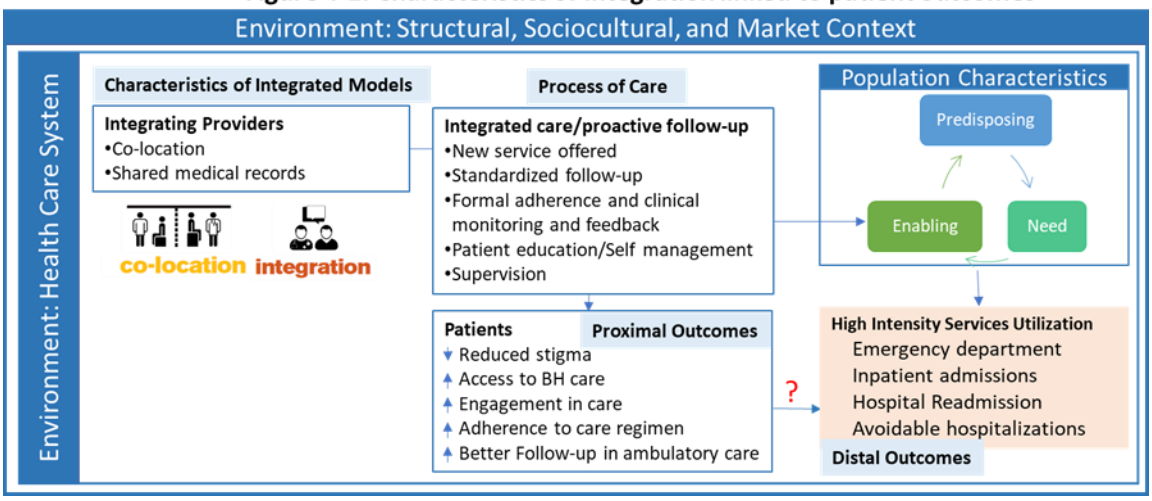
Since its development in 1960s, the Andersen Model has gone through various iterations and has many years of empirical support becoming one of the most popular models used to predict and explain health care use (167-170). The Andersen Model regards the use of

Table 4-1: Population Characteristics
Predisposing Factors
Age
Gender
Race/Ethnicity
Enabling Factors
Area Socioeconomic Status
Medicaid Eligibility Category
Enrollment Duration
Need Factors
Severe Mental Illness
Elixhauser Comorbidity index
Individual clinical comorbidities

health services as determined by factors that predispose individual to use services (individual characteristics including demographics, social structures, health beliefs), by individual's need for services, and by factors that enable (or hinder) use of services (personal/ family, community, or system or structural elements) (167, 171). The model has been used extensively in literature as the framework to understand utilization metrics I focus on in this study including emergency room utilization, hospital admission, avoidable hospital admission, and 30-day all-cause hospital readmission (172-174). I use the predisposing, enabling, and need factors listed in Table 4-1 which have been identified in prior work as some of the factors which are associated with utilization of inpatient and ED services I look at (173, 175-177). Though the Andersen model does not provide a hierarchal approach of the socio-ecologic model, overall model is evolving over time to also include health care system and external environmental factors in explaining health services utilization with Anderson agreeing with critics of the earlier models that "going beyond knowing whether or not a person has a regular source of care to understand how medical care is organized should improve our ability to explain and predict use" (167).

Incorporating the hierarchical approach of socio-ecologic and the constructs from the Andersen Models into one conceptual framework in Figure 4-2 provides a useful way to look at how aspects of health care system, such as co-location or integration of behavioral health services in primary care settings, might be associated with high-intensity health care service use (ED utilization, hospital admission, avoidable hospital admission, and 30-day all-cause hospital readmission). Interactions between predisposing, enabling, and need factors contribute to utilization in the context of various environments. The larger structural, socio-cultural, and

Figure 4-2: Characteristics of integration linked to patient outcomes



market contexts represent the external environmental forces which can influence service utilization; I account for these factors by adjusting for the state region and zip-code level population density. Additionally, health care system elements can also influence service utilization, with structural changes in the system causing changes in processes of care which can in-turn influence health care behaviors and service utilization (171). A general discussion of frameworks of behavioral health integration is provided in Chapter 2; at the very core, integration must include some type of enhanced linkage between primary care and behavioral health providers, but the nature, strength, and strategies underlying those linkages can vary widely. The health care system panel in Figure 4-2 is modified from the work of Butler et al. who provided the framework for linking structural elements of integration to the process of care translating into provider and patient level changes (77). Though the researchers did not mention it, their framework for how certain structural elements integration can improve patient outcomes is in-line with the Donabedian framework, highlighting the important role of structural elements (physical facility, equipment, human resources, etc.) in facilitating certain processes (how care is delivered) which can promote certain outcomes (symptom reduction, improved quality of life, etc.) (165, 178, 179). The Donabedian framework is useful in explaining interactions between different hierarchical levels in the Socio-Ecologic framework to

affect patient outcomes. Integration models might result in practices incorporating certain care process such as clinical monitoring or standardized follow-up which can link structural elements of integration to certain patient outcomes (77). Proximal patient-level outcomes resulting from changes in processes of care might include reduction in patient stigma in seeing behavioral health providers, improved access to behavioral health care, improved engagement in care, increased adherence to care regimen, and better follow-up. I extended the Butler et al. framework by including how these proximal outcomes might in-turn be associated with further downstream improved system-level outcomes including reduction in inpatient and emergency room based health care services utilization. This extension is especially relevant in light of my interest in patient with comorbid behavioral health and chronic medical comorbidities, who have a very high rate of high-intensity health services utilization (180).

CURRENT STATE OF EVIDENCE

There is much evidence underlying the linkage between integration and processes of care and patient health and service utilization outcomes (181-183). Given the general frameworks of integration, many practice models and programs have emerged and been tested for effectiveness in terms of their ability to improve access and quality of care for patients. Local implementation of care strategies is subject to locally available resources, limitation, and conventions. When looking through these models it is worthwhile to have a reminder that the underlying driving force behind integration is that in order to meet patients' mental health needs but first recognizing and then treating disorders, it is important to make care available when and where people come into contact with the health care system (57).

Patient-Level Health, Access, and Other Quality Outcomes

Much compelling evidence in favor of integration comes from randomized trials (RCTs) which have shown that integration can lead to improvements in health outcomes and experiences of care along with reduction in costs. Most of the experimental evidence showing

that integration improves health outcomes and quality of care has come from evaluating programs targeting patients with specific disorders, particularly depression and anxiety (158, 184). Additionally, most randomized trials have been conducted within the context of Health Maintenance Organizations (HMOs), Academic Family or Internal Medicine departments, or Veterans Affairs (VA). It is notable that there is large variation between interventions in terms of the types of behavioral health specialists, ranging from onsite depression care manager, psychiatrist, PhD level mental health specialists, clinical psychologists, and mental health service clinical nurse specialists. At minimum, however, studies looking at co-location have involved at least a psychiatrist of clinical psychologist who is available for consultation on site with other providers such as mental health therapists including masters or doctoral level psychologists, clinical nurses with behavioral health training, or social worker.

Some early studies for patients with major and minor depression show that psychiatric consultation and collaborative care models was associated with significant increase is use of and adherence to medication regimen as well as reduction in depressive symptoms and severity (141, 185-188). Intervention patients were also significantly more likely to rate quality of care as excellent or high. Whereas most studies have been done for patients with depression, some studies conducted in primary care clinics in Colorado and Washington have shown the models with co-location of mental health providers in primary care can result in improvements for patients with anxiety (189, 190). In one study co-location of PhD level mental health specialists who participated in both patient treatment and collaborative activities was associated with significant reduction in patient anxiety symptoms with lower mean anxiety score as well as improvement in patient satisfaction with care (189).

Most models in which behavioral health services were incorporated into primary care settings showed improvement in clinical outcomes with reduction in depression severity (137,

186, 190-192). One meta-analysis of 79 RCTs of collaborative care for patients with depression or anxiety show significant short-, medium-, long-term improvement in clinical outcomes for adults with depression and anxiety (193). Researchers have also sown demonstrably better quality of care with better rates of adequate medication use and improved adherence to medication (186, 190, 192). Studies looking at patient satisfaction have found that patients getting care in co-located models are more satisfied with care relative to comparison groups getting care as usual (186, 189). Studying a collaborative care program in a VA system in Washington, researchers find that the co-location is associated with increase in the number of mental health related primary care visits with the intervention group much more likely to have documented diagnosis of depression (63% vs 33%, p=0.003) and more likely to be referred to a psychiatrist or a mental health clinic (27% vs 9%, p=0.019) (194).

Whereas there is strong evidence from randomized controlled trials that integration of behavioral health providers in primary care settings improves quality of care and health outcomes, most of the primary care is delivered in community settings and thus is it important to know efficacy and effectiveness of how co-location and integration play out in these environments. The Advancing Care Together (ACT) was a 4-year demonstration project from 2010-2014 that allowed for integration practices to be adapted to local contexts in 11 primary care practices in diverse geographic area in Colorado (195). In adapting integration to local contexts, practices went through extensive system redesign with changes in team compositions, use of space, and operations, showing that evidence-based practices are usually adapted to local context within community settings (196). Of the 5 practices that implemented the 9-item Patient Health Questionnaire (PHQ-9) as a measure of depression severity, researchers found statistically significant reductions in mean PHQ-9 scores with 50% of patients having greater than five point reduction and 32% having greater than 50% reduction. Patient interview

corroborated the findings, demonstrating positive experiences with behavioral health providers (197). Another study comprising qualitative interviews of 24 patients seeking care in ACT practices found that patients felt that issues related to their physical, emotional, and social circumstances were addressed with interactions with integrated team members helping patients improve coping skills with provider proximity, continuity of care, and free initial BH appointments improved patients' engagement with and access to care (198).

Though there is evidence to support co-location of mental health services in primary care settings, more evidence from population-based, real-world settings for patients in low resources and clinically complex populations such as Medicaid enrollees with BH disorders and CC is needed. Much of the research on integration and co-location has been on organized coordination efforts implemented in large organizations (92, 199-201). This study focuses on the extent to which co-location is associated with quality and outcomes in local contexts with diverse primary care practice types and for patients with various complex medical and social contexts. Many primary care provider practices, both large and small, are working to integrate care independently, but there is less work that looks at whether locally adapted approached to co-locate are associated with improved outcomes (202). Additionally I look at a range of metrics (discussed in detail in Methods section) representing utilization of high-intensity health care services which are of interest to various stakeholders including providers, hospitals, and state and federal agencies and policymakers.

High-Intensity Service Utilization

Emergency Department and Overall Inpatient Utilization

Presence of BH conditions have been shown to be highly correlated with high rates of inpatient and ED utilization. Nationally, as many as one in eight visits to the ED in 2019 might have been related to underlying MH disorder or SUD (203). Researchers looking at California ED records find that along with other factors such as high levels of ED use and hospitalization during

prior year, mental health diagnosis is significantly and strongly associated with having frequent ED use (4 visits in the 1-year follow-up) (204). Researchers looking at 13 low-income areas in New Jersey (2008-2011) using hospital discharge data find that behavioral health diagnoses are disproportionately higher among patients who are in the 94th percentile for hospital admissions with 75% of these patients having a BH disorder and 25% having Severe Mental Illness (SMI) (205). Among Medicaid enrollees with inpatient utilization in the 94th percentile, 81% have a BH disorder. Additionally Among patients who are in the 96th percentile of ED utilization, nearly half have a BH disorder and 14% have SMI (205). With BH conditions being highly prevalent in ED and inpatient utilization, it is likely that addressing patient's behavioral health needs in the community might reduce utilization of these high-intensity services.

Researchers using a novel social network analysis method to look at how degree of BH provider integration in community find that the more integrated providers are, the less that patients rely on hospital based care or utilize emergency rooms for all-cause or BH-related issues (206). Though this study looked at behavioral health provider availability in the community and not co-location in the practice, I believe that co-location or integration facilitates the same processes through which ED and inpatient utilization can be reduced. Other researchers looking at integrated team-based care (TBC) practices vs traditional practice management (TPM) in Intermountain Healthcare Medical Group have found significant reduction in ED visits and inpatient utilization in group exposed to integrated care (207, 208). I hypothesize that improvement in provision of services through co-location and integration of behavioral health services for patients with behavioral health and chronic medical conditions reduces avoidable hospitalizations for these patients.

Ambulatory Care Sensitive (ACS) Inpatient Hospitalizations

Some hospital admission are considered to be preventable or avoidable in many cases by adequate provision of health care services in the community to address patient needs. Preventable hospitalizations were defined using the idea of ambulatory care sensitive conditions (ACSCs) (209). ACSCs are a set of acute and chronic conditions including asthma, complications of diabetes, gastroenteritis, congestive heart failure (CHF), bacterial pneumonia, urinary tract infection, and hypertension, for which inpatient admissions are considered to be avoidable. Measuring the hospitalization rates for these conditions is sometimes used as a proxy for poor quality of ambulatory services in the community (210). With patient needs for such chronic conditions not adequately met in outpatient office-based primary care health care settings, resulting health complications can lead to hospitalizations, which is measured through a preventable hospitalization metrics.

Researchers looking at 13 low-income areas in NJ (2008-2011) using hospital discharge data find that as many as 40% of claims for preventable hospitalizations have behavioral health diagnoses indicated; among Medicaid enrollees in NJ, as many as 48% of avoidable hospitalizations might have associated BH conditions (85). Using 2007-2008 multi-state Medicaid claims data, other researchers have found that ACSC-related hospitalizations to be higher among those with schizophrenia (211) These observations are very much in line with other research which reveals that BH conditions exacerbate the comorbidities associated with the chronic medical conditions.

In meeting the needs of patients with BH and CC in primary care settings might improve rates of avoidable hospitalizations about these patients. Studies have found that more resources for patients with BH disorders in the community reduce preventable hospitalizations among patients with comorbid BH and CC. One study looking at role of expansion of Local Health Departments (LHDs) to offer mental health prevention and health promotion found

improvement in rates of avoidable hospitalization among patients with BH and CC who were exposed to coordinated and integrated care (212). The study mentioned previously using 2007-2008 multi-state Medicaid claims data to identify factors associated with avoidable hospitalizations found that residents in counties that have a community mental health center have 12% reduced odds of having and ACSC-related hospitalization (211). One study of adults in 113 practices comprising the Intermountain Healthcare Group from 2003-2005 finds that patients receiving integrated team-based care have reduction in ambulatory care sensitive visits and admissions compared to patients receiving care as usual (208). I hypothesize that improvement in provision of services through co-location and integration of behavioral health services for patients with behavioral health and chronic medical conditions reduces avoidable hospitalizations for these patients.

30-day All Cause Readmission

The validated 30-day readmission metrics can be used to broadly measure the quality of care of care coordination in the community after hospital discharge. Poor quality ambulatory or transitional care after inpatient admission can result in patients being readmitted to the hospital within a short time after being discharged. With policies such as the Hospital Readmission Reduction program (HRRP) having been passed into law in 2010 and acute care hospitals at risk for incurring financial penalties for 30-day readmission rate in excess of expectation, reducing readmissions is a federal, state, and local priority (213). Individuals with comorbid BH disorders are at increased risk of hospital readmission after index admission associated with a medical conditions including CHF, acute myocardial infarction (AMI), pneumonia, chronic obstructive pulmonary disease (COPD), coronary artery bypass graft (CABG) surgery, and hip or knee replacement (214-216). Depression has been identified as being associated with readmission among people admitted to heart failure or COPD (91). Using 2009-2011 data from the HMO Research Network Virtual Data Warehouse of nearly 160,000 patients, researchers find that

nearly 30% of patients that have 30-day all-cause readmission after hospitalization for HF, AMI, and pneumonia had a mental illness diagnosis during the year prior to index admission (217). Depression is also associated with increased risk of 30-day all-cause readmission after a medical hospitalization (217). Individuals with clinical depression prior to surgery are much more likely to be readmitted after a range of procedures including coronary artery bypass surgery or joint arthroplasty, among others (214, 215). Patients who are hospitalized with for a physical health issues who also have depressive symptoms are less likely to adhere to treatment or care regimen including medication compliance after discharge (218). With mental health adversely affecting recovery after discharge from hospital, addressing patient's behavioral health needs in the community is likely to reduce hospital readmission.

Providing mental health resources in the community can reduce hospital readmissions among patients with BH disorders. Researchers looking at expansion of mental health services at the level of LHDs show that provision of mental health preventive services in the community can reduce 30-day all-cause readmissions among patients with mental illness and among those with SUD (219). Studies of interventions targeting patients after discharge from the hospital have found BH interventions, including individual and group psychotherapy, to be effective in reducing readmissions for patients who were initially admitted for HF or AMI (220). Additionally, for patients with depression, nurse-driven depression care management at patient's home after discharge from the hospital has been found to be effective in reducing readmissions for patients initially admitted for any physical health condition (221). It is important to highlight, however, that whereas some studies of intervention have shown improvements, dozens of intervention studies have found no improvement in readmissions (220). Two groups of researchers looking at impact of BH provider integration in primary care settings serving low-income patients found no improvement in readmission rates for

intervention patients who saw a provider teams with BH providers compared to only medical providers (222, 223). Other studies of collaborative care interventions with both inpatient and post–discharge enhanced monitoring, education and, other psychosocial support for patients with positive depression, anxiety, or panic disorder screens admitted for cardiac conditions found no improvements in the 6-month readmission rates for cardiac conditions (224). The evidence for how BHI in primary care settings might affect 30-day all-cause readmission, thus, is mixed, highlighting the need to continue to look at different populations and interventions in order to understand associations and best practices. I hypothesize that patients who are attributed to primary care practices with behavioral health co-location and integration are less likely to have 30-day all-cause readmission.

METHODS

Study Design

This study was conducted using retrospective NJ Medicaid enrollment and claims data for Jan 1, 2015 to December 31, 2016 containing patient demographic, diagnosis, and service utilization information. Using National Provider Identifier (NPI) numbers, I link patient claims to a survey of NJ primary care practices (September-December 2015) to obtain records for patients who sought care at practices that completed the survey containing information about organizational factors including number of behavioral health providers.

Linking patient information from Medicaid to practice information from the survey allows for investigation of how co-location is associated with cost, quality, and health care service utilization for patients with behavioral health and chronic medical disorders. I draw on established outcomes including measures of avoidable service use such as hospitalization for ambulatory care sensitive conditions, 30-day all-cause readmission, and measures of utilization including overall inpatient and ED utilization.

Data

NJ Medicaid Administrative Data

This analysis uses NJ Medicaid enrollment and fee-for-service (FFS) claims and managed care organization (MCO) encounter data for 2015-2016. The dataset provides enrollee-level demographic, diagnosis, and service utilization information. Outpatient and inpatient claims files included information on claims for services provided in ambulatory and inpatient settings and contained International Classification of Diseases, 9th and 10th editions, Clinical Modification (ICD-9-CM and ICD-10-CM) codes.

Primary Care Physician Survey (PCP Survey)

The primary data source is a statewide probability sample survey of PCPs in New Jersey conducted by Rutgers Center for State Health Policy (CSHP) in 2015. Survey questionnaire is provided in Appendix A. New Jersey PCPs, defined as those specializing in family medicine, internal medicine, obstetrics/gynecology (OB/GYN), and pediatrics, were surveyed between September 8 and December 10, 2015. Using the American Medical Association (AMA) Masterfile list of all active PCPs in New Jersey (n=7,834), a probability sample of 2,500 providers was chosen using a two-stage cluster sampling design, limited to one physician per practice location (124). In the first stage, physicians were grouped by practice which yielded 6,515 practices with at least one physician, from which a probability sample of 2,500 practices was selected. There were a total of 3,002 physicians in the 2,500 selected practices. In the second stage, if there was only once physician in a practice, the physician was included in the sample, but if there was more than one physician at a practice, then one physician was selected with equal probability to be in the sample. The final sample comprised 2,500 physicians from 2,500 separate practices.

The survey included questions about PCP agreement with statements related to health system changes, availability of Health Information Technology (HIT), engagement in specific

financing and delivery system reforms, and practice and physician characteristics. Surveys were completed (defined as completion of at least 70% of items) by 698 physicians (557 by mail and 141 on the Web), with an overall response rate (AAPOR RR3) of 36.4% (124). Data were weighted to adjust for the probability of selection of the practice location and the physician within the practice location. Additionally, adjustments were made to match distributions of PCP specialty and other selected respondent characteristics available in the AMA Masterfile. Study methods were reviewed and approved by the Rutgers University Institutional Review Board (IRB).

Census

Zip-code level income and population density variables are obtained from the 2010-2014 census. Since I am using Medicaid data from 2015 and 2016, it is suitable to use data from years prior to that for those are the conditions which existed as prior to patient the patient level outcomes I am interested in looking at.

Study Population

Attributing Patients to Primary Care Providers Who Complete PCP Survey

This study is limited to adults who are 18 years or older, are enrolled in Medicaid for at least 13 months over the study period (2015-16), and have at least two primary care visits during the study time period. In order to identify primary care visits, I first identified claims for which the provider type for the visit was indicated as physician, claims type was indicated as physician and Professional crossover[6][7], and specialty was indicated as general practice, family practice, internal medicine, pediatrics, and obstetrics-gynecology. Each claim has service and

[6] 1% of claims the linked to the PCP survey indicated the provider type 0. For attribution, provider type 0 was also included

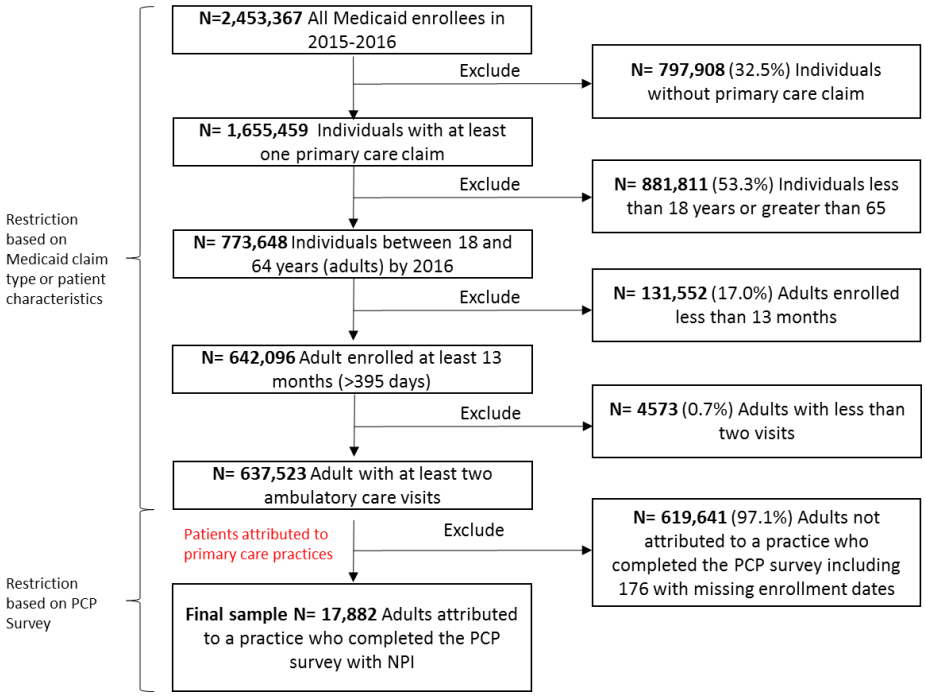
[7] If have FFS Medicaid but also have Medicare (Dual Eligible), then Medicare pays first so shows up in this category of claims type. Only specific for FFS Medicaid not for managed care so less and less people are showing up here as more people shift to managed care

procedural codes, Current Procedural Terminology (CPT®) Healthcare Common Procedure Coding System (HCPCS), which identify the type of service rendered by the provider. Only claims with service and procedure codes identified as Evaluation and Management (E&M) and Preventive Medicine claims were included. I defined E&M codes using a slightly modified version of the American College of Physicians Medicare Shared Savings/Accountable Care Organization Final Rule Summary (225). E&M codes include primary care services (HCPCS codes 99201-99215, 99304-99350), annual wellness visits (HCPCS codes G0402, G0438, G0439), and preventive medicine services (HCPCS codes 99381-99397). The details of the codes used to identify primary care claims can be found in Appendix B.

Medicaid recipients who meet the above inclusion criteria were attributed to providers from whom they had the plurality of their primary care visits. Attribution was done using methodology used by Centers for Medicare & Medicaid Services (CMS) Value-Based Payment Modifier (Value Modifier) Program, which has been adopted in NJ for assigning patients to Medicaid ACOs and has also been extensively utilized in empirical work to attribute patients to provider group (226, 227). Each patient was retrospectively attributed to a single primary care providers (identified using provider NPI based on the plurality of Primary Care E&M and Preventive Medicine visits. In the case where patients saw two providers at the same rate, the patient is attributed to the provider who was visited most recently. In the case the patient saw two providers at the same rate with the same date of last submitted claim, the highest NPI was chosen to make the assignment so that each patient would be attributed only to one provider. The last criteria of choosing the highest NPI number was used to attribute only 32 patients. Since only one physician was sampled from each practice, attributing patients to providers using NPI numbers is analogous to attributing them to a certain practice.

Subsequently, only enrollees who were attributed to providers who completed the PCP survey were included in analysis. The sample selection schematic is shown in Figure 4-3. Of the 2,453,367 Medicaid Enrollees between 2015 and 2016, 1,655,459 have at least one primary care visit, and of these patients, 773,648 are 18 years or older (adults). Among adults (18-64 years), 637,523 are enrolled for at least 13 months and have at least two ambulatory care visits to primary care providers. Of this sample of adults, 2.8% (17,882) enrollees were attributed to 253 practices who completed the PCP survey (matched using provider NPI).

Figure 4-3: Sample Selection for Chapter 4



Defining Sample Clinical Criteria

I look at subgroups of varying clinical severity or complexity as outlined in Table 4-2. When looking at ED use, inpatient admission, and 30-day all-cause readmission, patients are included in analysis if along with a chronic medical comorbidity they have accompanying 1) one BH diagnosis over two years, 2) two behavioral health diagnoses over two years (in 2015 and 2016), or 3) one SMI diagnosis over 2015 or 2016. When looking at ACSC-related hospitalization, patients are included in analysis if along with an ACSC they have one

accompanying BH diagnosis over two years. I am unable to look at ACSC-related hospitalization for patients of varying BH complexity, as I do for the other outcomes, because of sample size limitations.

Table 4-2: Samples based on Behavioral Health and Chronic Medical Conditions

Analytic sub-group	Clinical Definition	Outcome Investigated
BH 2015 or 2016 and ACSC	At least one claims with a relevant BH diagnosis code over 2015 and 2016 with at least one claim with a diagnosis code for ACSC	Avoidable Hospitalization
BH 2015 or 2016 and CC	At least one claims with a relevant BH diagnosis code over 2015 and 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016	ED Visits Inpatient Admission 30-Day All-Cause Readmission
BH 2015 and 2016 and CC	At least one claims with a relevant BH diagnosis code in 2015 as well as in 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016	
SMI 2015 or 2016 and CC	At least one claims with a relevant SMI diagnosis code in 2015 or 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016	

Increasing Severity

Notes: BH: Behavioral Health; ACSC: Ambulatory Care Sensitive Condition; SMI: Severe Mental Illness; CC: Chronic Medical Condition

Given the diversity in conditions and severity, there can be different ways to conceptualize patients with BH disorders and CC. While there are established benefits of integrated care, most studies focus only on specific disease conditions, especially depression (15, 158-160). A 2008 Agency for Health Care Research and Quality (AHRQ) Evidence Report highlighted that "inclusion criteria should be broadened to include patients with multiple mental health conditions"(158). This study includes patients with multiple mental health conditions. Rather than focusing on specific conditions, I defined cohorts by varying levels of severity. A Patient who has one BH claims over two years likely has psychosocial issues but it might be the case that the diagnosis is not established or that issue is not persistent. A patient who has two BH claims over two years likely has more severe diseases than someone who experiences depressive symptoms once. I refer to the different groups defined in the Table 4-2 as increasing in severity of BH symptoms from top to bottom.

To define the clinical conditions on which I base selection criteria of including patients with behavioral health chronic conditions, I use the AHRQ Clinical Classification Software (CCS) (228, 229). The software collapses information from ICD 9 (CM) and ICD 10 (CM) diagnosis codes into a number of clinically meaningful disease categories (CCS categories). The current version of the CCS includes an updated section on mental health and substance abuse, Clinical Classifications Software for Mental Health and Substance Abuse (CCS-MHSA), and allows separate identification of these behavioral health conditions (230). Mental health conditions fall under CCS single-level software category 5. Substance abuse is a subcategory of mental health conditions identified by CCS multi-level software CCS-MHSA specific categories 5.11, 5.12, and 5.14.2 (ICD-9) and includes alcohol and substance-related disorders. For a complete list of what is included in the definition of MH, substance abuse (SA), and behavioral health (BH) indicators please refer to Appendix C, which lists all of the AHRQ CCS category codes for MH, SA, and BH. Although dementia (CCS 653), intellectual/developmental disorders (CCS 654), and disorders usually diagnosed in infancy, childhood, or adolescence (CCS 655) are listed in the Diagnostic and Statistical Manual mental health conditions sections, these disorders are not included in my behavioral health conditions metric. These conditions often require extensive medical as well as psychiatric treatment and are likely to have specialized settings or specialty providers as their usual source of care rather than the usual primary care settings.

I identify patients who are severely mentally ill based on findings from the national comorbidity survey – replication and subsequent work by groups at AHRQ (10, 231). These patients experienced functional and social impairment and had a diagnosis of psychoses, bipolar disorder, drug dependence, obsessive compulsive disorder, dysthymia (chronic depression), or related diagnoses. The severe mental illness indicator (SMI) utilizes diagnoses which cross CCS categories. See Appendix D below for the ICD-9 codes used to create the SMI indicator. To

identify SMI in ICD-10 claims, I applied the General Equivalence Mappings available from the Centers for Medicare & Medicaid Services to the ICD-9 SMI diagnoses (232). Also, it's important to note, that anyone with an SMI diagnosis was also coded into the MH or SA indicators, even if their diagnosis did not put them in one of the CCS categories that define MH or SA. Additionally, I also included conditions which qualify adults for treatment in New Jersey Division of Mental Health and Addiction Services' (DMHAS) behavioral health home (BHH) initiative even if those conditions were not identified by first set of criteria (233). The BHH initiative is meant to integrate primary care services in specialty mental health care settings for patients with severe mental illness and thus eligible diagnoses are inclusive of the most debilitating mental health disorders (233).

To specify presence of chronic conditions I use the CMS Chronic Conditions Warehouse (CCW) chronic conditions indicators for 26 chronic conditions and 22 other chronic or potentially disabling conditions as per Appendix E (234, 235). Since I am only interested in looking at chronic medical comorbidity, I modified the CMS CCW indicator to not include behavioral health conditions which might otherwise have been included in the indicator as per the CMS specifications.

For most of the outcomes, I use a broad definition of chronic conditions as defines by the CCW definition. However, when looking at the preventable hospitalizations, I define the sample by using a subset of chronic conditions which are considered ACSC. This specification allows me to look at preventable hospitalizations in patients who have conditions (including diabetes, COPD, asthma, angina, hypertension, CHF) for which hospitalizations are considered avoidable.

Metrics

Behavioral Health Integration

Behavioral health integration is conceptualized around two metrics, co-location and integration. Co-location of BH providers in primary care settings are included in analysis as a binary variable (1: co-location; 0: no co-location). Question 18 on the PCP survey asks providers to identify the number of full- and part-time patient care BH care staff at the particular practice location on a typical work day. Practices are asked to list the number of full and/or part-time BH providers. I define co-location as presence of at least one part-time mental health staff member at a practice location on a typical work day. In question 19 on the PCP survey respondent were subsequently asked to indicate whether medical and BH providers at the practice location have routine access to each other's clinical records; respondents were instructed to skip this question if there were no BH providers at practice location. I consider that any practice that answered the question about medical and BH record sharing as having co-located care as well, whether they answered staffing question or not. Information from the question regarding record sharing is then used to build the variables for BH integration. If, as per question 19, BH and medical providers have access to each other's records, I say there is practice integration with the reference group being practices that do not share records or do not have a BH provider on site. Integration of BH providers in primary care settings are included in analysis as a binary variable (1: integration; 0: no integration or co-location). In order to ensure that findings are not subject to how I operationalize the exposure variables, I also do sensitivity analyses by defining co-location as presence for at least one full-time BH provider in primary care practice.

Outcome Metrics

Outcome metrics were picked carefully to represents utilization of high- intensity health care services. All outcome metrics all listed in Table 4-3 and discussed below.

Utilization Metrics: Inpatient Utilization and Emergency Department Visits

Table 4-3: Outcomes (Dependent Variables)
Utilization Measures
Inpatient Admission (90th Percentile)
Emergency Department Visit (95th Percentile)
Coordination Measures
Hospital-wide 30-day all cause readmission
Ambulatory Care Quality Measures
Ambulatory-care sensitive condition related admission: PQI Overall composite (PQI-90)
Ambulatory-care sensitive condition related admission: PQI Chronic composite (PQI-92)

ED visit metric assesses whether patients get ambulatory care services in the ED. ED visits which result in inpatient admission are not included in the ED utilization measure. ED visits are identified using ED specific Medicaid claims. For analysis, a dichotomous variable was created for 5 or more visits over 2015-2016, representing 95th percentile of sample[8] distribution (1: at least 5 ED visits; 0: less than 5 ED visits). I refer to having at least 5 ED visits as high ED utilization and to the patients who fulfill that criteria I refer to as high users of ED services. Defining the variable as such allows me to analyze whether co-location contributed to reducing high levels of ED utilization.

The inpatient hospital utilization metric was constructed based on all inpatient Medicaid claims. In creating this measures I consider inpatient utilization to be at any general acute care hospital, either in or outside of New Jersey. For analysis, a dichotomous variable was created for 2 or more visits over 2015-2016, representing 90th percentile of sample (see footnote 4) distribution (1: at least 2 hospitalizations; 0: less than 2 hospitalizations). I refer to having at least 2 inpatient as high inpatient utilization and to the patients who fulfill that criteria I refer to as high users of inpatient services.

Measures of Avoidable Utilization: Ambulatory Care Sensitive (ACS) Inpatient Hospitalizations

The outcome variable is whether there was a preventable hospitalization during the study time period for ACSC, measured using the AHRQ Prevention Quality Indicators (PQI) software, developed for AHRQ by investigators from Stanford University and the University of

[8] The sample used to obtain the criteria for high ED utilization includes patients ages 18-64 who are enrolled for at least 13 months over 2015-2016, have at least two primary care visits during study period, and are attributed to practices that completed the PCP survey.

California (236, 237). The PQIs are a set of measures which can be used with inpatient data to identity ACSC, and for this study I use overall composite (PQI #90) and chronic composite (PQI #92) indicators. AHRQ provides validated statistical programs to calculate rates of PQI™ for adults (ages 18 plus) (237). The latest version (version 6.0) of the software accommodated ICD-10 codes and was used to calculate PQI based on any claims submitted after October 1, 2015. Using PQI software, patients with hospitalizations for specific ACSCs listed in Appendix F were identified during the study time period. In creating these measures I consider inpatient utilization to be at admission in any general acute care hospital, either in or outside of New Jersey. Overall or Chronic Composite PQI during the study time period are included in analysis as a binary variable (1: had preventable admission; 0: no preventable admission).

Measures of Care Coordination: 30-day All Cause Readmission

I use the hospital-wide readmissions (HWR) metric that is endorsed by the National Quality Forum (NQF) and adapted from the 2014 Centers for Medicare and Medicaid Services methodology available at QualityNet (238). While used primarily in the Medicare population, there is evidence for successfully using this metric in the Medicaid population (239). Such readmission are considered potentially avoidable and are defined as readmission for any cause within 30 days after discharge for index hospitalization, excluding a set of planned readmissions. This specific metric excludes psychiatric admissions as index hospitalization. Since there was a transition from ICD-9 to ICD-10 in October 2015, diagnoses on claims from last quarter of 2015 were mapped back to the ICD9-CM system using crosswalks from CMS's general equivalence mappings prepared by the National Bureau of Economic Research (2016). Index admissions and readmissions are at any general acute care hospital, inside or outside of New Jersey.
30-day all-cause readmission during the study time period are included in analysis as a binary variable (1: had readmission; 0: no preventable admission).

Covariates

Integrating the data from Medicaid and PCP survey enables me to examine association of practice level structural characteristic and patient level outcomes while considering patient socioeconomic, demographic, and health needs factors as well as contextual factors that might relate to health status and outcomes for patients with behavioral health disorders. When considering which factors to adjust for, I draw on the Andersen Model including predisposing (gender, age, and race/ethnicity), health needs (SMI, Elixhauser Comorbidity Index), and enabling factors (ZIP-Code level household income, Medicaid eligibility category, enrollment duration) (167). These covariates have significant evidence base in being important in explaining outcomes of interest in patients with behavioral health disorders (204, 211, 220, 240).

Table 4-4: Overview of Individual and Practice Level Independent Variables
Individual-Level Covariates
Predisposing Factors
Age
Gender
Race/Ethnicity
Enabling Factors
Area Socioeconomic Status (ZIP-code household income)
Medicaid Eligibility Category
Days enrolled in Medicaid over 2015-2016
Need Factors
Severe Mental Illness
Elixhauser Comorbidity index
Practice-Level Covariates
Health Information Technology Capability
Number of non-behavioral health providers
Single/Multispecialty
Number of Practice Locations
Percent of Patients with Chronic Behavioral Health Conditions
Percent of Patients with Medicaid or Uninsured
Provider Specialty
Provider Age
Provider Gender
Contextual Factors
Area Population Density (ZIP-code population/sqmi)

Comorbidities can be a significant contributor in contributing to utilization of high-intensity health care services in patients (240). Rather than including individual clinical comorbidities, I used Elixhauser Comorbidity Index to create a measure of overall comorbidity. Using AHRQ's Elixhauser Comorbidity Software, Version 3.7 and Beta Elixhauser Comorbidity Software for ICD-10-CM, comorbidities are first defined based on using diagnosis codes from hospital discharge records, and then summed to create the index score for each observation (241-243). The software assigns 0/1 indicators to inpatient records to indicate presence or absence of a series of 29 comorbidities and then creates an in-hospital mortality score for reach

inpatient record. At the patient level, the comorbidity score is obtained by getting the weighted sum of the comorbidity variables (237).

Various practice and physician characteristics are included in the model. There are seven separate survey items inquiring about various aspects of practice's implementation of electronic health information technology (HIT), all of which are used to construct one variable that counts the number of practice's HIT functionalities. The number of HIT functionalities is included in analysis as a categorical variable. Single or multi-specialty practice status is included as a binary variable indicating whether the practice is single specialty. Practice size is calculated using information from a question asking about the number of full-time physicians (MD or DOs) at the practice location on a typical work day and is included in model as a continuous variable. A survey question asking respondents about number of total primary care locations in practice organization is used to build a variable with the categories for 1, 2-3, 4 or more. A question asking respondents regarding what best describes their practice location is used to build a binary variable with the categories for private office and other clinic (includes Federally Qualified Health Center (FQHC), hospital based clinic or outpatient department, other health center/clinic (not hospital based or FQHC), medical school/faculty practice plan). I use the survey question inquiring about percent of patients who have a chronic or severe BH diagnosis to build a categorical variable with two categories < 25% and ≥ 25%. Additionally, I also include physician specialty, gender, and age.

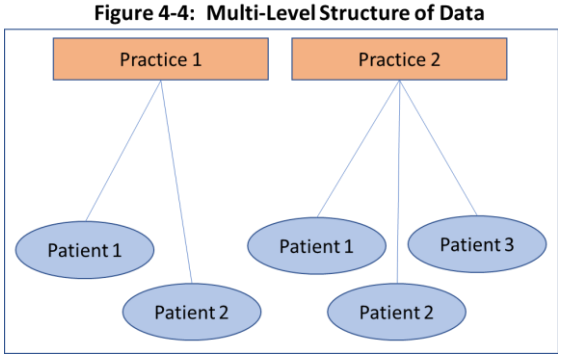
I also include zip-code level household income and population density in the models (obtained from the 2010-2014 census).

Analytic Approach

Once patients have been attributed, Chi-square tests of independence were used for categorical variables and *t*-tests for continuous variables (allowing unequal variances across

groups) to assess the statistical significance of unadjusted associations between patient-level and practice-level characteristics and outcomes. As discussed earlier, situating the patient in a Socio-Ecologic framework supports using modeling techniques that allows for consideration of how factors at different levels might influence outcomes at other level of hierarchy. The hierarchical nature of the data, with patients nested within primary care practices such as in Figure 4-4 (17,882 patients within 253 practices), lends itself to estimating multilevel, or random effects, models to examine whether co-location or integration of BH services in primary care settings might be associated with reduction in ED visits, any hospitalization, avoidable hospitalization, and all-cause 30-day readmission.

Figure 4-4: Multi-Level Structure of Data

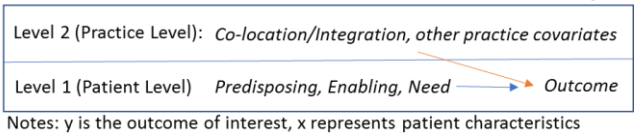


In random effects models, relationships can be investigated between variables that are measured at different hierarchical levels without aggregating or disaggregating these variables to a single level (244). Variables, thus can be analyzed at the level at which they are measured and defined. When comparing patients' outcomes across practices, multi-level modeling allows for risk adjustment to be done at the patient level without aggregating risk factors at the cluster-level, allowing for more precise and accurate assertions to be made at the patient-level. Additionally, whereas adjusting for practice fixed effects would require inclusion of a dummy variable for each practice when using conventional regression methods, multilevel regression only includes one random parameter for all of the level 2 primary care practices and allows for simultaneous estimation of associations between variables art different hierarchical levels.

Multilevel models also allow for accounting for the clustering of subjects within higher-level units of analysis when looking at the association between individual and cluster-level

characteristics by incorporating cluster-specific random effects, allowing for more precise estimation of parameter estimates between individuals within cluster (245). When data have a multi-level structure, subjects within the same cluster (such a primary care practice) may be correlated in terms of their characteristics or outcomes which would violate the requirement for independent outcomes across subjects that conventional regression methods require. If all observations are not independent, then effective sample size and standard errors are smaller and failure to account for within-cluster correlation and variance might inflate estimates of the true relationship between variables (246). Employing multi-level methods allows for accounting for variance at both individual and cluster-levels.

FIGURE 4-5. The structure of a multilevel set-up



Notes: y is the outcome of interest, x represents patient characteristics (demographics, adverse health conditions), and Z represents primary care practice characteristics (co-location/integration)

I use two-level multilevel models with structure such as that in Figure 4-5, allowing intercept to vary across practices, to examine association between cluster level (Level 2) characteristics, co-location/integration, and individual level (Level 1) health care services utilization outcomes (listed in Table 4-3) while adjusting for other Level 1 and 2 covariates. Because all of the outcomes of interest are dichotomous, multilevel logistic models are estimated with (Y_{ij} = 1 referring to service utilization and Y_{ij} = 0 referring to lack of service utilization). I estimate a series of two-level random intercept logistic models as per equation 4-1 and models 1-3 (named differently to facilitate following along in results tables). Equation 4-1 is the null model and has no predictors. Model 1 has one predictor, either co-location or integration. Model 2 includes either co-location or integration and a series of patient-level covariates. Model 3 includes either co-location or integration, a series of patient-level covariates, and a series of practice-level covariates. For each model I also calculated an

interclass correlation coefficient as per equation 4-2 which expressed the percentage of variability in outcome variable by between-practice variation (247).

$$\ln\left(\frac{pr(Yij=1)}{1-pr(Yij=1)}\right) = \beta_0 + u_j \quad \textbf{[4-1]}$$

$$\text{ICC}=\text{Variance}_{\text{level2}}/\ \text{Variance}_{\text{level2}}+ (\pi^2/3) \quad \textbf{[4-2]}$$

$$\ln\left(\frac{pr(Yij=1)}{1-pr(Yij=1)}\right) = \beta_0 + \beta_1 X_{1j} + u_j + e_{ij} \quad \textbf{[Model 1]}$$

$$\ln\left(\frac{pr(Yij=1)}{1-pr(Yij=1)}\right) = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2ij} + u_j + e_{ij} \quad \textbf{[Model 2]}$$

$$\ln\left(\frac{pr(Yij=1)}{1-pr(Yij=1)}\right) = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2ij} + \beta_3 X_{3j} + u_j + e_{ij} \quad \textbf{[Model 3]}$$

Y_{ij} is the outcome variable for the i^{th} patient in the j^{th} cluster, X_{1j} is co-location or integration, X_{3j} is the vector of provider-level covariates, and X_{2ij} represents a vector of patient-level covariates. The random terms u_j represents random effect of practice (Level 2 residual) on outcome variable and e_{ij} represents the unexplained variation for patients (Level 1 residual) within a practice in outcome variable.

The results of the null two-level model as per equation 4-1 which allows me to see the amount of variance in respective outcomes that be explained at the practice level are included in Appendix J. Separate models were estimated for the groups in Table 4-2, and within each group I estimated four models, results from three of which are reported in tables 4-7, 4-9, and 4-11; Model 1 regresses outcome on either co-location or integration, Model 2 adds in patient-level covariates, and Model 3 includes patient, provider, and contextual covariates. All analysis was conducted using Stata 15 (StataCorp, College Station, TX). All hypotheses regarding odds ratios are tested at α=0.05 significance level in the bivariate and multivariate comparisons. For the multivariate analysis, odds ratios are presented.

RESULTS

Distribution of patient and practice characteristics by attribution status

Among all adult Medicaid enrollees who were enrolled for at least 13 months over 2015 and 2016 and who have at least two primary care visits, only 2.8% are attributed to 253 providers who completed the PCP Survey. Along all the variables included in analysis, there are no variables for which more than 3% of the observations have missing values. In Appendix G, I used bivariate analyses to compare Medicaid enrollees who were attributed to practices who completed the PCP Survey with those who met other selection criteria but were not attributed to providers in the PCP Survey by various sample characteristics. Though most of the comparisons are significant, I am not too concerned for in such a large starting sample, even a small difference can translate into a significant chi-squared there. Though differences are significant, there are not any comparisons where the difference between categories is so drastic as to alarm me to the existence of selection at this level.

Additionally, in Appendix H, I look at the differences in primary care practice characteristics (among the 390 practices for which the NPI number is available out of total 698 practices) to assess if there are any systematic differences between practices who do and do not have any attributed Medicaid Patients. Of all practices (390), nearly 70% have Medicaid enrollees who were attributed to these practices using provider NPI numbers. A statistically significant higher percentage of practices that have more than 20% of patients uninsured or on Medicaid (88.03%) were attributed compared to practices with less than 20% of such patients (62.27%). This difference is expected considering I linked the PCP survey practices to Medicaid records. Further, a higher percentage of larger practices (4 or more providers) have attributed patients, which might also be expected as those practices probably have a larger volume of patients and thus are more likely to have attributed patients.

Distribution of Patient Characteristics by BH Provider Co-Location Status

Appendix I shows the distribution of the patient characteristics based on their attribution to practices which have BH provider co-location or integration. Among the Medicaid eligibility categories, a statistically significantly higher percentage of patients in the blind/disabled category (19.47%) are attributed to practices with co-located BH providers compared to patients in the NJ Family Care/Children's Services category (11.93%) and general assistance category (15.20%). Patients who are attributed to practices with co-location or integration appear to have a higher chronic medical and behavioral health disorder burden. Whereas only 12.49% of patients without SMI are attributed to co-located practices, nearly 20% of patients with SMI have plurality of visits in co-located practices (trend similar for practices with BH provider integration). I also looked at the percentage of patients with one or two BH diagnoses who attribute to practices with co-location. Nearly twice the percentage of patients with at least one diagnosis in each study year at attributed to co-located practices relative to patients with only one or no diagnoses over 2015-2016. Even among patients with only one diagnosis per year, where 16.6% are attributed to co-located practices, only 12.52% of patients without any diagnoses are attributed to practices with co-location. The same general trends apply to practices with integration. Additionally, even the chronic medical comorbidity burden is higher among patients attributed to co-located or integrated practices. Among patients with at least one CC, 14.82% are attributed to practices with co-location, significantly higher than among patients without CC (12.21%). Among those with an ACSC, nearly 15% are attributed to practices with co-location, compared to 13.01% among patients with an ACSC. In terms of overall comorbidity burden measured by the Elixhauser Mortality Score, comorbidity burden is higher among those attributed to co-located practices (Average Elixhauser Mortality Score: 3.23) compared to those attributed to practices without co-location (Average Elixhauser Mortality

Score: 2.31 (not reported in table)). The same pattern holds for practices with integration in terms of distribution of comorbidity score.

Multivariate Findings

I estimated multilevel models of high-intensity service utilization for subgroups discussed in Table 4-2. I look at the odds of having high ED use, high inpatient utilization, at and at least one 30-day all-cause readmission separately among patients with CC and either one BH diagnosis over 2015-2016, one BH diagnosis in 2015 as well as in 2016, or one SMI diagnosis over the study time period. I look at the odds of having an ACSC admission, PQI overall and PQI chronic composite, among patients with CC and at least one BH diagnosis in 2015 or 2016.

Before specifying the multilevel models with variables of interest, first I looked at the intercept-only model to see if there is any variance in level 1 outcomes which can be explained at Level 2 (practice-level). The table in Appendix J, reports the results of the null two-level models (random intercept variance component models) including the log-odds of the outcome in an "average" practice (one in which $u_j=0$) along with the variance and standard error. Additionally, I also calculated the measure for the amount of variability in the outcome which can be explained at the practice level (ICC). It is worthwhile to highlight here that anywhere from 3% to 10% of the variation in different outcomes is explained by Level 2 differences between practices. Even though the ICC is low, the p-value is associated with the likelihood ratio test statistic which tests the null hypothesis that between community variance is zero by testing the logistic regression with the null-two level model. There is significant higher-order variation for all of the outcomes, which supports use of multi-level modeling techniques. The following three sections discuss the results of bivariate and multilevel multivariate models for the outcomes in Table 4-3.

Inpatient Utilization and Emergency Department Visits

As per Table 4-5, as the potential severity of BH disorders increases, so does the prevalence of having high ED utilization. Among patients with CC and at least one BH disorder claim over the study period, prevalence of high ED utilization is 17.21%. Among patients with CC and at least two BH disorder claims over the study period, prevalence of high ED utilization is 23.33%. Among patients with CC and SMI, prevalence of high ED utilization is 22.23%.

Table 4-5 also shows the bivariate associations between most covariates and having high ED utilization. A statistically significantly higher percentage of patients in practices with BH provider colocation have high ED utilization across all groups (Table 4-5 and Figure 4-6) except for the SMI-only cohort. There is no bivariate association between having high ED use and patient attribution to practice with BH provider integration. In fully adjusted multi-level models (Table 4-7), however, there is no significant association between being attributed to a practice with BH provider co-location or integration and having high ED utilization. Though results for association between high ED utilization and variables other co-location and integration are not presented in Table 4-7, SMI status and Elixhauser Mortality Score are significantly associated with ED utilization across all groups in all fully-adjusted models. When discussing associations which are not model specific but hold true for different subgroups across the fully-adjusted models, the interval estimates are not provided because they differ slightly. However, the p-value provided is stable across all models. Among the subgroups with patients with BH conditions (not SMI only), having SMI is associated with nearly two times the odds ($p<0.01$) of having high ED utilization. Across all subgroups analyzed, one unit increase in Elixhauser mortality score increases the odds of having high ED utilization by approximately 20% ($p<0.01$). Additionally, across all groups, compared to multi-specialty practices, patients attributed to single specialty practices have nearly 30%-40% ($p<0.05$) reduced odds of having high ED use

consistent across all fully adjusted models (there was some variation in the parameter estimate due to model specification with co-location or integration and subgroup difference).

As per Table 4-6, prevalence of high inpatient utilization among patients with Among patients with CC and SMI (36.62%) as compared to those with one BH diagnosis (28.95%) or two BH diagnoses (34.98%) over the study period. As Table 4-6 and Figure 4-7 show, a statistically significantly higher percentage of patients who are attributed to practices with BH co-location or are high utilizers of inpatient services across all cohorts of patients. A higher percentage of patients with CC and one BH diagnosis over study period attributed to integrated practices have high inpatient use relative to those attributed to practices without integration. In fully adjusted multilevel models, however, there is no significant relationship between patient attribution to practices with BH co-location or integration and having inpatient utilization. Though results for association between high inpatient utilization and variables other co-location and integration are not presented in Table 4-7, across all fully-adjusted models and subgroups, being female is associated with 30% ($p<0.05$) increased odds relative to males, having SMI is associated with 30%-40% ($p<0.05$) increased odds of having high inpatient use relative to those without SMI, and having a one unit higher Elixhauser Comorbidity Index score is associated with 10% ($p<0.05$) increased odds of high inpatient use. Additionally patients who have the plurality of their primary care visits in CHCs or other outpatient settings have 20-30% ($p<,0.05$) higher odds of having high inpatient use relative to patients attributed to practices operating in private office. I included cross-level interactions between BH co-location or integration and patient-level characteristics; none of the interaction effects were significant.

There were no differences in conclusions relating to association between co-location and utilization of ED or inpatient services if co-location was defined as presence of at least one full-time BH provider instead of one part-time provider in the analysis above.

30-day All Cause Readmission

Table 4-8 gives the prevalence of having a readmission among the different subgroups along with bivariate associations between most covariates and having a readmission. After exclusion criteria there were 1,589 patients with CC and one BH diagnosis over study period, among whom 12.34% had at least one readmission. Among patients with CC and at least two separate claims with BH diagnoses, 15.56% have at least one readmission. Among patients with SMI and CC, overall percentage of patients with at least one readmission is highest of all groups at 16.15%. Across all subgroups, Medicaid eligibility category and SMI were statistically significantly associated with readmissions in this groups. The blind/disabled category had highest percentage of patients with readmissions, followed by general assistance category and by NJ Family Care/Children's Services category, in that order. Additionally across the subgroups, the comorbidity index score statistically significantly associated with readmission and is higher among patients with readmission compared to those without readmission. Across all subgroups, nearly ten percentage points more patients in practices with co-location have at least one readmission relative to patients attributed to practices without co-location (Table 4-8 and Figure 4-8). Association between being attributed to practice with or without integration is not significantly associated with having a readmission (Table 4-8 and Figure 4-8).

As per Table 4-9, in fully-adjusted multi-level models, there is no statistically significant association (at α=0.05 significance level) between having a readmission and being attributed to a practice that has BH provider co-location or integration. In all fully-adjusted models, for subgroups other than that which only includes SMI, having SMI is associated with 55%-70% ($p<0.05$) increased odds of having at least one readmission relative to those without SMI. Additionally, across all subgroups a one unit increase in comorbidity score is associated with 10% ($p<0.01$) increased odds of having readmissions. These estimates are stable across all fully-

adjusted models. I included cross-level interactions between BH co-location or integration and patient-level characteristics; none of the interaction effects were significant.

There were no differences in conclusions relating to association between co-location and readmission if co-location was defined as presence of at least one full-time BH provider instead of one part-time provider in the analysis above.

Ambulatory Care Sensitive (ACS) Inpatient Hospitalizations

Table 4-10 presents the rate of avoidable hospitalizations (PQI#92: Chronic Composite and PQI#90: Overall Composite) for patients with an ACSC and one BH diagnosis over 2015-2016 (as a reminder, I am unable to investigate preventable hospitalizations in other groups due to sample size limitations with estimates become unstable for most variables) along with bivariate association between outcome and most covariates. Overall rate of PQI chronic composite is 12.32% and PQI overall composite is 17.56%. Having a preventable hospitalization is not significantly associated with the BH provider co-location or integration status of practice to which patient is attributed (Table 4-10 and Figure 4-9) nor with most other covariates except for Medicaid Eligibility Category. Higher percentage of blind and disabled patients have a preventable hospitalization relative to other categories (NJ Family Care/Children's Services and General Assistance). Additionally, the average Elixhauser Comorbidity Score is higher among those with an avoidable hospitalization relative to those without any preventable hospitalization (not reported) for PQI overall and chromic composite.

Results of multilevel models (Table 4-11) indicate that having an avoidable hospitalization is not statistically significantly associated with the BH provider co-location or integration status of the practice to which patients are attributed. Though following results are not reported in tables, in fully adjusted models (adjusted for individual, practice, and contextual factors) across the different subgroups, people with SMI have nearly 40% ($p<0.05$) increased

odds of having a avoidable overall or chronic composite hospitalization (OR: 1.70-2; $p<0.05$) compared to those without SMI. Additionally, for every unit increase in Elixhauser Mortality Score, odds of having a preventable hospitalizations increased by nearly 30% ($p<0.01$) across either outcome in most models.

There were no differences in conclusions relating to association between co-location and avoidable hospitalization if co-location was defined as presence of at least one full-time BH provider instead of one part-time provider in the analysis above.

DISCUSSION

With the significant burden of the behavioral health problems in patients with high-intensity health care service utilization, I hypothesized that improving provision of behavioral health services through BH provider co-location and integration in primary care settings would reduce ED and inpatient utilization along with avoidable utilization and readmissions for those with BH disorders and CC (4, 6). I observe, however, that there is no association in the sample between co-location or integration and high-intensity health care service utilization. Whereas in the unadjusted models, across the different groups I see that patients in practices with BH provider co-location and integration have higher rates of health care service utilization, the association dissipates in the adjusted models. In thinking through why my hypotheses were not supported, it might be important to consider the distribution of patient characteristics across practices with and without co-location. According to the table in Appendix I and as per discussion in results section, patients who are attributed to practices with BH provider co-location and integration have a higher burden of behavioral health as well as clinical medical comorbidities. Even though I adjust for eligibility category and comorbidity, there might be burdens associated with caring for these patient population which these models might not

account for, which might prevent realization of all benefits in a co-located or integrated delivery system model.

Although the BH provider co-location and integration did not significantly reduce high-intensity service utilization, there is still likely value in these interventions. As discussed previously, there is more than enough evidence in literature to support system level integration reduces patient symptom burden, improves access to behavioral health services, and improves patient perception of care (158). Only a few studies of co-location or integration, however, have shown reduction in more downstream/distal outcomes such as ED, inpatient, and avoidable utilization, and the only studies I can able to identify for readmission showed that there was no improvement (220). Most of the studies that have shown improvements in system-level outcomes have been for interventions such as the ACT program and which have very high-level clinical integration which, though locally adapted, has some consistent features across practices involved (195, 208). Looking across a very diverse set of practices, I do not know or control, the role of those providers in care processes as is the case with most other studies of the subject. That there is diversity in findings across studies reveals that despite the attempts to create uniform terminology and criteria, there can still challenges in conceptualizing and operationalizing interrogation not only for researchers but also for practitioners. As primary care practices continue to bring behavioral health reason more work is still required to understand how practice transformation is happening locally. Many large health systems with dozens of practices can implement standardized processes, but the challenges are unique especially in New Jersey where nearly 50% of primary care practices are solo (Table 2-1).

Despite lack of findings of co-location or integration reducing hospital-related service utilization, I believe these initiatives are still have value. One of the primary limitations of this study is that I do not know when co-location or integration took place. The movement in health

care to bring BH services into primary care settings, however, did not pick up pace before the ACA. Thus it might be safe to say that co-location or integration I measured in PCP survey were likely to have happened relatively recently. For smaller practices, it might take even longer than a few years to observe benefits of such practice transformation. It would be useful to conduct a qualitative study of practices to look at local models of practice transformation.

Consistent with prior literature, these results show that having higher chronic disease burden along with behavioral health disorder is consistently associated with higher high-intensity service utilization. Additionally, in those with BH disorders, having SMI is associated with higher service utilization.

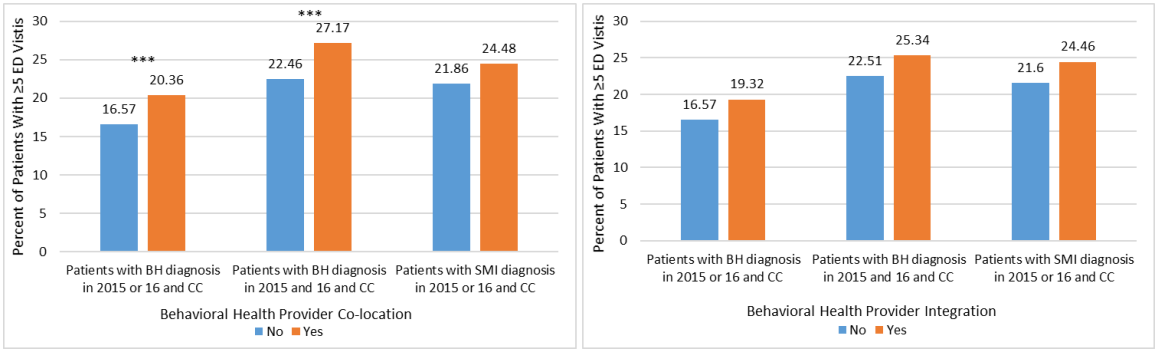
LIMITATIONS

There are several important limitations which must be considered when interpreting chapter 4 findings. The cross-sectional nature of the PCP Survey data does not allow for isolating causality or directionality of relationships nor does it allow me to study practice changes over time. Second, whereas I did not observe any significant associations in the groups studied, I considered that there might be significant association in subgroups, but I could not test due to sample size issues. Further, I only included one year of Medicaid data after the survey. Including another year of data, such as 2017, might allow for more nuanced analysis including racial/ethnic subgroups but also might change some findings.

Similar to chapters 1 and 3, one additional limitation is that of being a single-state study. Because I used only New Jersey data, the results cannot be generalized to other places. With many of the policies that affect medical practice being made at the state level, however, it is important to look within the states to see how to improve care. Even though these results cannot be generalized to other states, with the sampling framework I used, the results should be

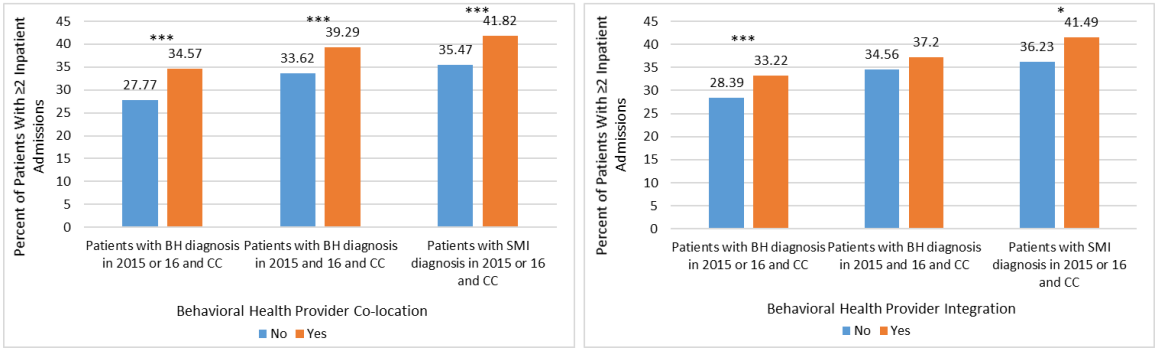
generalizable to New Jersey and can thus shed light on how primary care practices are organized and can be improved in NJ.

Figure 4-6: Percent of Patients with at Least Five Emergency Room Visits in 2015-2016 by Behavioral Health and Chronic Condition Severity and Practice Co-Location or Integration Status



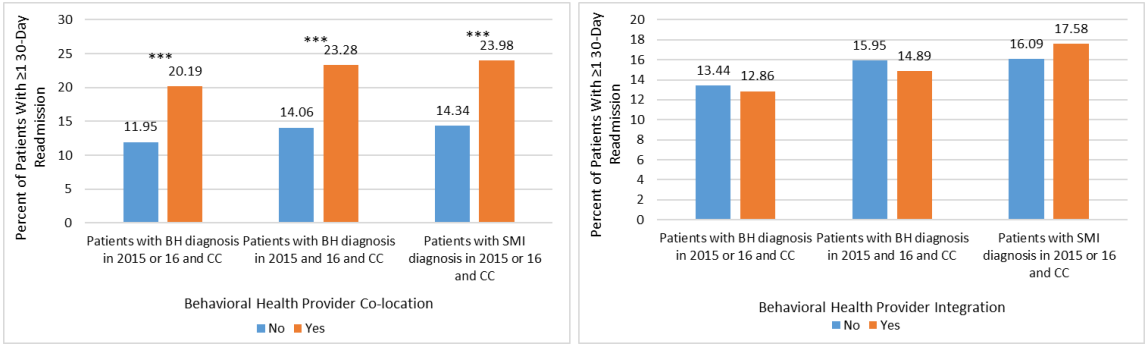
Source: Primary Care Physician Survey 2015, NJ Medicaid claims and enrollment data from 2015-2016. Notes: ***=p<0.01; **=p<0.05; *=P<.01; BH=Behavioral Health; CC: Chronic Medical Comorbidity; SMI: Severe Mental Illness. Presented rates are unadjusted.

Figure 4-7: Percent of Patients with at Least Two Hospitalizations in 2015-2016 by Behavioral Health and Chronic Condition Severity and Practice Co-Location or Integration Status



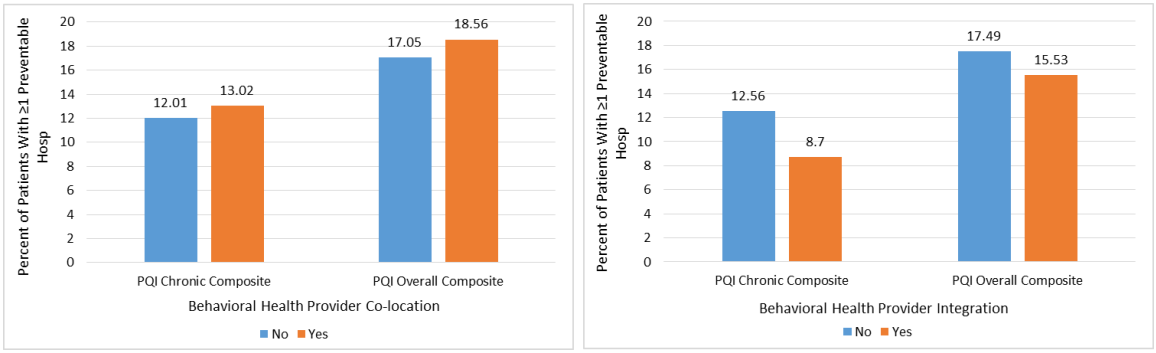
Source: Primary Care Physician Survey 2015, NJ Medicaid claims and enrollment data from 2015-2016. Notes: ***=p<0.01; **=p<0.05; *=P<.01; BH=Behavioral Health; CC: Chronic Medical Comorbidity; SMI: Severe Mental Illness. Presented rates are unadjusted.

Figure 4-8: Percent of Patients with at Least One 30-Day Readmission in 2015-2016 by Behavioral Health and Chronic Condition Severity and Practice Co-Location or Integration Status



Source: Primary Care Physician Survey 2015, NJ Medicaid claims and enrollment data from 2015-2016. Notes: ***=p<0.01; **=p<0.05; *=P<.01; BH=Behavioral Health; CC: Chronic Medical Comorbidity; SMI: Severe Mental Illness. Presented rates are unadjusted.

Figure 4-9: Percent of Patients with at Least One Avoidable Hospitalization in 2015-2016 by Behavioral Health and Chronic Condition Severity and Practice Co-Location or Integration Status



Source: Primary Care Physician Survey 2015, NJ Medicaid claims and enrollment data from 2015-2016.
Notes: ***=p<0.01; **=p<0.05; *=P<.01; BH=Behavioral Health; CC: Chronic Medical Comorbidity; SMI: Severe Mental Illness. Presented rates are unadjusted.

Table 4-5: Sample Characteristics by Outcome Status of Having at Least Five Emergency Room Visits in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥ 5 ED Visits		All	≥ 5 ED Visits		All	≥ 5 ED Visits	
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	7599	17.21	-	4162	23.33	-	3850	22.23	-
Individual Characteristics									
Recipient Gender			<0.01			<0.01			0.01
Male	2,697	14.39		1,494	20.35		1,371	19.91	
Female	4,902	18.77		2,668	25.00		2,479	23.52	
Recipient Race			<0.01			<0.01			<0.01
White	3,674	17.26		2,208	23.14		2,113	22.34	
Black	1,563	25.85		886	33.75		745	30.20	
Hispanic	1,237	14.55		553	18.81		541	18.11	
Asian/Other	1,104	7.88		502	10.76		441	13.38	
Medicaid Eligibility Category			<0.01			0.18			0.32
Blind/Disabled	1,908	19.44		1,349	22.98		1,296	21.99	
NJ Family Care, Children's Services, Other	2,889	17.58		1,271	25.10		1,134	23.72	
General Assistance	2,802	15.31		1,542	22.18		1,420	21.27	
Severe Mental Illness			<0.01			<0.01			-
No	3,749	12.06		1,223	18.81		-	-	-
Yes	3,850	22.23		2,939	25.21		-	-	-
Elixhauser Mortality Score	7599	6.42	<0.01	4162	6.78	<0.01	3850	6.82	<0.01
Patient Age	7599	39.67	<0.01	4162	40.37	<0.01	3850	40.37	<0.01
Provider and Practice Characteristics									
BH Provider Co-location			<0.01			<0.01			0.13
No	5,981	16.57		3,174	22.46		2,918	21.86	
Yes	1,238	20.36		784	27.17		727	24.48	
BH Provider Integration			0.09			0.22			0.24
No	6,445	16.57		3,469	22.51		3,213	21.60	
Yes	590	19.32		371	25.34		323	24.46	
Single Specialty			<0.01			<0.01			<0.01
No	1,541	22.84		887	30.10		833	25.69	

Yes	5,631	15.77		3,054	21.41		2,832	21.12	
Specialty			<0.01			<0.01			0.01
Family Medicine/General Practice	3,481	19.16		1,970	25.43		1,859	23.35	
Internal Medicine	3,134	14.33		1,785	19.94		1,610	20.06	
Obstetrics and Gynecology/Pediatrics	984	19.51		407	28.01		381	25.98	
Number of Practice Locations			<0.01			<0.01			<0.01
1	4,582	14.58		2,428	19.81		2,146	19.52	
2-3	1,600	19.50		916	26.31		948	25.32	
4 or more	1,382	23.44		797	30.87		741	26.18	
Practice Location			<0.01			<0.01			<0.01
Private office	5,879	14.95		3,142	20.40		2,985	20.03	
CHC or hospital/ outpatient clinic	1,720	24.94		1,020	32.35		865	29.83	
Percent of Patients with Chronic/Severe BH Diagnosis			<0.01			<0.01			<0.01
<25%	5,607	15.48		2,912	21.02		2,710	20.74	
≥25%	1,931	22.27		1,214	28.91		1,113	25.88	
At least 20% have Medicaid or Uninsured			0.02			0.02			0.11
No	2,082	15.56		1,235	20.89		1,146	20.59	
Yes	5,517	17.84		2,927	24.36		2,704	22.93	
Provider Gender			<0.01			<0.01			<0.01
Male	5,053	15.97		2,839	21.35		2,671	21.04	
Female	2,526	19.71		1,309	27.73		1,168	25.00	
Provider Age	7599	52.51	0.29	4162	52.01	0.03	3850	53.26	0.51
Number of Non-BH Providers	7599	2.65	0.04	4162	2.67	0.07	3850	2.61	0.08

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity; ED: Emergency department. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E.

Table 4-6: Sample Characteristics by Outcome Status of Having at Least Two Hospitalizations in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥ 2 Inpatient		All	≥ 2 Inpatient		All	≥ 2 Inpatient	
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	7599	28.95	-	4162	34.98	-	3850	36.62	-
Individual Characteristics									
Recipient Gender			0.79			0.2			0.37
Male	2,697	28.77		1,494	36.28		1,371	37.56	
Female	4,902	29.07		2,668	34.26		2,479	36.1	
Recipient Race			<0.01			<0.01			<0.01
White	3,674	31.22		2,208	36.64		2,113	38.29	
Black	1,563	34.48		886	39.62		745	40.54	
Hispanic	1,237	22.39		553	28.03		541	29.57	
Asian/Other	1,104	21.01		502	27.49		441	31.07	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	1,908	35.12		1,349	38.03		1,296	39.04	
NJ Family Care, Children's Services, Other	2,889	25.93		1,271	30.13		1,134	32.89	
General Assistance	2,802	27.91		1,542	36.32		1,420	37.39	
Severe Mental Illness			<0.01			<0.01			-
No	3,749	21.1		1,223	24.78		-	-	-
Yes	3,850	36.62		2,939	39.23		-	-	-
Elixhauser Mortality Score	7599	7.52	<0.01	4162	8.12	<0.01	1,410	7.74	<0.01
Patient Age	7599	43.17	0.08	4162	44.61	<0.01	1,410	43.80	0.10
Provider and Practice Characteristics									
BH Provider Co-location			<0.01			<0.01			<0.01
No	5,981	27.77		3,174	33.62		2,918	35.47	
Yes	1,238	34.57		784	39.29		727	41.82	
BH Provider Integration			0.01			0.31			0.06
No	6,445	28.39		3,469	34.56		3,213	36.23	
Yes	590	33.22		371	37.20		323	41.49	

Single Specialty			<0.01			<0.01			0.1
No	1,541	34.20		887	39.35		833	39.26	
Yes	5,631	27.97		3,054	34.02		2,832	36.16	
Specialty			<0.01			0.05			0.01
Family Medicine/General Practice	3,481	28.15		1,970	35.18		1,859	35.5	
Internal Medicine	3,134	26.83		1,785	33.61		1,610	36.21	
Obstetrics and Gynecology/Pediatrics	984	38.62		407	40.05		381	43.83	
Number of Practice Locations			<0.01			<0.01			0.09
1	4,582	26.95		2,428	32.74		2,146	35.14	
2-3	1,600	32.00		916	39.3		948	38.92	
4 or more	1,382	32.13		797	36.89		741	38.06	
Practice Location			<0.01			0.36			0.62
Private office	5,879	27.98		3,142	34.60		2,985	36.42	
CHC or hospital/ outpatient clinic	1,720	32.33		1,020	36.18		865	37.34	
Percent of Patients with Chronic/Severe BH Diagnosis			0.35			0.76			0.52
<25%	5,607	28.71		2,912	34.92		2,710	36.27	
≥25%	1,931	29.83		1,214	35.42		1,113	37.38	
At least 20% have Medicaid or Uninsured			0.78			0.88			0.73
No	2,082	28.72		1,235	34.82		1,146	36.21	
Yes	5,517	29.06		2,927	35.05		2,704	36.80	
Provider Gender			<0.01			0.07			0.2
Male	5,053	30.24		2,839	35.93		2,671	37.29	
Female	2,526	26.37		1,309	33.00		1,168	35.10	
Provider Age	7599	53.33	0.01	4162	53.21	0.04	3850	53.50	0.99
Number of Non-BH Providers	7599	2.64	<0.01	4162	2.59	0.11	3850	2.41	0.73

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E.

Table 4-7: Results of Multi-Level Logistic Regression of Association Between Behavioral Health Provider Co-Location or Integration and Having High ED/Inpatient Utilization for Medicaid Enrollees Ages 18-64 during 2015-2016

	Model 1	Model 2	Model 3
	Odds Ratio (CI)	Odds Ratio (CI)	Odds Ratio (CI)
High ED Utilization (At Least 5 ED Visits During Study Period)			
Patients with BH diagnosis in 2015 or 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.44** (1.07, 1.95)	1.35** (1.01, 1.79)	1.29 (0.98, 1.70)
Behavioral Health Provider Integration (Ref: No Integration)	1.25 (0.83, 1.87)	1.21 (0.82, 1.77)	1.29 (0.87, 1.92)
Patients with BH diagnosis in 2015 and 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.35 (0.97, 1.86)	1.35 (0.99, 1.83)	1.36 (0.98, 1.84)
Behavioral Health Provider Integration (Ref: No Integration)	1.13 (0.73, 1.767)	1.14 (0.75, 1.74)	1.21 (0.77, 1.90)
Patients with Severe Mental Illness and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.19 (0.87, 1.63)	1.21 (0.89, 1.64)	1.22 (0.89, 1.66)
Behavioral Health Provider Integration (Ref: No Integration)	1.05 (0.68, 1.62)	1.07 (0.69, 1.65)	1.24 (0.77, 2.00)
High Inpatient Utilization (At Least 2 Hospitalizations During Study Period)			
Patients with one BH diagnosis over 2015 or 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.43*(1.07, 1.92)	1.19 (0.89, 1.59)	1.27 (0.99, 1.62)
Behavioral Health Provider Integration (Ref: No Integration)	1.34 (0.92, 1.94)	1.27 (0.88, 1.85)	1.37 (0.98, 1.90)
Patients with BH diagnosis in 2015 and 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.29 (0.97, 1.73)	1.06 (0.80, 1.40)	1.19 (0.90, 1.56)
Behavioral Health Provider Integration (Ref: No Integration)	1.12 (0.76, 1.66)	1.10 (0.76, 1.59)	1.30 (0.88, 1.91)
Patients with Severe Mental Illness and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.29 (0.98, 1.70)	1.12 (0.86, 1.46)	1.25 (0.96, 1.63)
Behavioral Health Provider Integration (Ref: No Integration)	1.18 (0.81, 1.72)	1.19 (0.83, 1.72)	1.37 (0.92, 2.02)

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity; ED: Emergency department. The number of stars indicates level (***p<0.001; **p<0.01; *p<0.05). A multilevel/hierarchical models were used to analyze whether co-location or integration of BH providers in primary care practices can reduce odds of having high ED or inpatient utilization. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Model 1 independent variables include co-location or integration. Model 2 independent variables include co-location or integration along with patient-level covariates including age, gender, race/ethnicity, Medicaid eligibility category, enrollment duration, presence of severe mental illness, Elixhauser Comorbidity Index, and patient's zip-code-level population density and household income. Model 3 independent variables include all variables in Models 1 and 2 along with practice characteristics including number of non-BH medical providers, single-specialty status, number or practice location, practice location, percent of patients with chronic/severe BH Diagnosis, having at least 20% of patients who are uninsured or enrolled in Medicaid, and provider specialty, age and gender. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E.

Table 4-8: Sample Characteristics by Outcome Status of Having at Least One 30-Day Readmission in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	Readmission		All	Readmission		All	Readmission	
		Row % or			Row % or			Row % or	
	No.	Mean	P-Value	No.	Mean	P-Value	No.	Mean	P-Value
Total	1589	12.34	-	1061	15.65	-	997	16.15	-
Individual Characteristics									
Recipient Gender			0.06			0.68			0.78
Male	559	15.56		394	16.24		362	16.57	
Female	1,030	12.14		667	15.29		635	15.91	
Recipient Race			0.93			0.55			0.3
White	831	13.24		587	15.33		579	14.51	
Black	399	13.03		261	14.18		217	17.05	
Hispanic	187	14.97		111	19.82		106	20.75	
Asian/Other	166	13.25		99	17.17		93	19.35	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	532	18.23		398	19.6		386	19.69	
NJ Family Care, Children's Services, Other	531	8.10		279	10.75		262	10.31	
General Assistance	526	13.69		384	15.1		349	16.62	
Severe Mental Illness			<0.01			<0.01			-
No	592	8.61		234	9.83		-	-	-
Yes	997	16.15		827	17.29		-	-	-
Elixhauser Mortality Score	1589	14.67	<0.01	1061	14.79	<0.01	997	14.47	<0.01
Patient Age	1589	48.06	<0.01	1061	47.81	<0.01	997	47.76	<0.01
Provider and Practice Characteristics									
BH Provider Co-location			<0.01			<0.01			<0.01
No	1,197	11.95		775	14.06		732	14.34	
Yes	322	20.19		232	23.28		221	23.98	
BH Provider Integration			0.85			0.79			0.71
No	1,332	13.44		884	15.95		833	16.09	
Yes	140	12.86		94	14.89		91	17.58	
Single Specialty			0.96			0.56			0.68
No	390	13.33		269	16.73		245	15.10	

Yes	1,127	13.22		742	15.23		709	16.22	
Specialty			<0.01			<0.01			<0.01
Family Medicine/General Practice	722	14.54		515	16.31		478	17.15	
Internal Medicine	609	15.93		435	17.70		412	18.20	
Obstetrics and Gynecology/Pediatrics	258	6.88		111	4.50		107	3.74	
Number of Practice Locations			0.08			0.33			0.18
1	884	13.01		557	14.90		517	16.63	
2-3	373	16.35		279	18.28		271	18.08	
4 or more	328	10.67		223	13.90		208	12.02	
Practice Location			0.05			0.36			0.16
Private office	1,181	14.31		788	16.24		762	17.06	
CHC or hospital/ outpatient clinic	408	10.54		273	13.92		235	13.19	
Percent of Patients with Chronic/Severe BH Diagnosis			0.95			0.62			0.97
<25%	1,138	13.36		732	15.30		678	16.22	
≥25%	438	13.47		321	16.51		310	16.13	
At least 20% have Medicaid or Uninsured			0.92			0.73			0.73
No	430	13.49		306	15.03		290	15.52	
Yes	1,159	13.29		755	15.89		707	16.41	
Provider Gender			0.09			0.18			0.06
Male	1,099	14.29		743	16.55		702	17.52	
Female	486	11.11		316	13.29		293	12.63	
Provider Age	1589	53.17	0.86	1061	53.00	0.74	997	53.32	0.80
Number of Non-BH Providers	1589	2.35	0.42	1061	2.36	0.50	997	1.98	0.18

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E.

Table 4-9: Results of Logistic Regression Between Behavioral Health Provider Co-Location or Integration and Having 30-Day All-Cause Readmission for Medicaid Enrollees Ages 18-64 during 2015-2016

	Model 1	Model 2	Model 3
	Odds Ratio (CI)	Odds Ratio (CI)	Odds Ratio (CI)
Patients with one BH diagnosis over 2015 or 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.54 (0.96, 2.47)	1.23 (0.85, 1.77)	1.30 (0.92, 1.85)
Behavioral Health Provider Integration (Ref: No Integration)	1.33 (0.69, 2.52)	1.21 (0.71, 2.04)	1.38 (0.80, 2.37)
Patients with BH diagnosis in 2015 and 16 and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.49** (1.01, 2.21)	1.36 (0.91, 2.05)	1.45 (0.83, 2.52)
Behavioral Health Provider Integration (Ref: No Integration)	0.83 (0.36, 1.88)	0.93 (0.48, 1.83)	1.08 (0.53, 2.21)
Patients with Severe Mental Illness and CC			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.71** (1.01, 2.86)	1.64** (1.15, 2.36)	1.39* (0.94, 2.06)
Behavioral Health Provider Integration (Ref: No Integration)	1.36 (0.65, 2.84)	1.22 (0.66, 2.25)	1.57 (0.80, 3.08)

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. The number of stars indicates level (***p<0.001; **p<0.01; *p<0.05). A multilevel/hierarchical models were used to analyze whether co-location or integration of BH providers in primary care practices can reduce odds of having an all-cause 30-day readmission. Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Model 1 independent variables include co-location or integration. Model 2 independent variables include co-location or integration along with patient-level covariates including age, gender, race/ethnicity, Medicaid eligibility category, enrollment duration, presence of severe mental illness, Elixhauser Comorbidity Index, and patient's zip-code-level population density and household income. Model 3 independent variables include all variables in Models 1 and 2 along with practice characteristics including number of non-BH medical providers, single-specialty status, number or practice location, practice location, percent of patients with chronic/severe BH Diagnosis, having at least 20% of patients who are uninsured or enrolled in Medicaid, and provider specialty, age and gender. Details of clinical inclusion criteria of samples can be found in the Table 4-2 in Chapter 4.

Table 4-10: Sample Characteristics by Outcome Status of Having at Least One Avoidable Readmission (PQI Chronic Composite/ PQI Overall Composite) in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	PQI Chronic Composite #92			PQI Overall Composite #90		
	ACSCs+ BH diagnosis in 2015 or 2016			ACSCs+ BH diagnosis in 2015 or 2016		
	All	Avoidable Hospitalization		All	Avoidable Hospitalization	
		Row % or			Row % or	
	No.	Mean	P-Value	No.	Mean	P-Value
Total	1697	12.32		1697	17.56	
Individual Characteristics						
Recipient Gender			0.67			0.15
Male	667	12.74		667	15.89	
Female	1,030	12.04		1,030	18.64	
Recipient Race			0.04			0.17
White	884	10.18		884	15.72	
Black	431	14.85		431	19.95	
Hispanic	194	14.95		194	20.62	
Asian/Other	184	14.13		184	17.93	
Medicaid Eligibility Category			<0.01			<0.01
Blind/Disabled	613	16.8		613	23.00	
NJ Family Care, Children's Services, Other	477	7.97		477	14.05	
General Assistance	607	11.2		607	14.83	
Severe Mental Illness			0.96			0.71
No	571	12.26		571	18.04	
Yes	1,126	12.34		1,126	17.32	
Elixhauser Mortality Score	1697	12.61	<0.01	300	11.75	<0.01
Patient Age	1697	50.91	<0.01	300	49.46	<0.01
Provider and Practice Characteristics						
BH Provider Co-location			0.61			0.51
No	1,249	12.01		1,249	17.05	
Yes	361	13.02		361	18.56	
BH Provider Integration			0.16			0.53
No	1,401	12.56		1,401	17.49	
Yes	161	8.70		161	15.53	
Single Specialty			0.23			0.66
No	403	10.42		403	16.38	

Yes	1,205	12.70		1,205	17.34	
Specialty			<0.01			0.02
Family Medicine/General Practice	787	13.85		787	18.17	
Internal Medicine	729	12.76		729	18.79	
Number of Practice Locations			0.17			0.47
1	925	13.30		925	17.84	
2-3	423	12.29		423	18.44	
4 or more	341	9.38		341	15.25	
Practice Location			0.54			0.21
Private office	1,290	13.18		1,290	18.22	
CHC or hospital/ outpatient clinic	407	9.58		407	15.48	
Percent of Patients with Chronic/Severe BH Diagnosis			0.52			0.69
<25%	1,207	12.68		1,207	17.81	
≥25%	477	11.53		477	16.98	
At least 20% have Medicaid or Uninsured			0.47			0.48
No	484	13.22		484	18.60	
Yes	1,213	11.95		1,213	17.15	
Provider Gender			0.7			0.34
Male	1,182	12.10		1,182	16.92	
Female	509	12.77		509	18.86	
Provider Age	1697	52.44	0.23	1697	52.59	0.23
Number of Non-BH Providers	1697	2.20	0.26	1697	2.26	0.25

Note: BH: Behavioral health; ACSC: ambulatory care sensitive conditions; PQI: Prevention Quality Indicator. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E.

Table 4-11: Results of Multi-Level Logistic Regression of Association Between Behavioral Health Provider Co-Location or Integration and Having at Least One Ambulatory Care Sensitive Condition Related Admission (PQI Chronic Composite/(PQI Overall Composite) for Medicaid Enrollees Ages 18-64 during 2015-2016

	Model 1	Model 2	Model 3
	Odds Ratio (CI)	Odds Ratio (CI)	Odds Ratio (CI)
PQI Chronic Composite			
ACSC + Behavioral Health Disorder in 2015 or 16			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.43 (0.87, 2.35)	0.86 (0.56, 1.33)	0.95 (0.63, 1.42)
Behavioral Health Provider Integration (Ref: No Integration)	0.71 (0.31, 1.60)	0.83 (0.42, 1.64)	1.05 (0.53, 2.07)
PQI Overall Composite			
ACSC + Behavioral Health Disorder in 2015or 16			
Behavioral Health Provider Co-Location (Ref: No co-location)	1.44* (1.02, 2.03)	1.01 (0.69, 1.47)	0.95 (0.68, 1.33)
Behavioral Health Provider Integration (Ref: No Integration)	1.02 (0.59, 1.75)	1.10 (0.70, 1.74)	1.08 (0.61, 1.92)

Note: BH: Behavioral health; ACSC: ambulatory care sensitive conditions; PQI: Prevention Quality Indicator. The number of stars indicates level (***p<0.001; **p<0.01; *p<0.05). A multilevel/hierarchical models were used to analyze whether co-location or integration of BH providers in primary care practices can reduce the odds of hospitalizations for ACSCs. Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. Model 1 independent variables include co-location or integration. Model 2 independent variables include co-location or integration along with patient-level covariates including age, gender, race/ethnicity, Medicaid eligibility category, enrollment duration, presence of severe mental illness, Elixhauser Comorbidity Index, and patient's zip-code-level population density and household income. Model 3 independent variables include all variables in Models 1 and 2 along with practice characteristics including number of non-BH medical providers, single-specialty status, number or practice location, practice location, percent of patients with chronic/severe BH Diagnosis, having at least 20% of patients who are uninsured or enrolled in Medicaid, and provider specialty, age and gender. Details of clinical inclusion criteria of samples can be found in the Table 4-2 in Chapter 4.

Chapter 5: Association of Patient Behavioral Health Status and Relational Continuity in Primary Care and Among Adult Medicaid Enrollees

This chapter addresses the following research question: Is there an association between patients' behavioral health conditions and experiencing continuity of care with primary care providers for adult Medicaid enrollees in New Jersey from 2015-2016?

ABSTRACT

Considered an essential component of delivering high quality primary care, continuity of care is considered crucial when caring for patients with complex health care needs. Despite a significant number of patients with behavioral health conditions seeking care in primary care settings, there is not much previous work studying how behavioral health disorders might influence patients' continuity of care. In this study, I use New Jersey Medicaid claims and enrollment data from 2015-2016 to examine the relationship between patients having behavioral health disorders and continuity of care in primary care settings. Findings reveal that patients with behavioral health disorders (broadly defined), SMI, or depression have reduced continuity of care relative to patients without disorders. Patients with anxiety disorders have increased continuity of care with primary care providers, compared to those without anxiety.

BACKGROUND

Behavioral health (BH) disorders, comprising mental health (MH) disorders and substance use disorders (SUD), are common among adults, especially those with lower socioeconomic status, and contribute to poor health outcomes and high service utilization and cost (129, 149, 150). Lifetime prevalence of MH disorders is as high as 57%, ranging from nearly 30% for anxiety and 20% for mood disorders (20). Prevalence of mental illness is twice as high in

Medicaid beneficiaries as in the general population, and Medicaid accounts for more than a quarter of national spending on BH (151). As more low-income individuals acquire coverage through Medicaid expansion, there is need to identify factors associated with high-quality care for this population (151, 248).

With an increasing number of people with mental illness being treated in the general medical sector, these settings present an opportunity to take care of patient needs (12). One essential aspect of high-quality care in primary care settings is continuity of care, which relies on establishment of patient-provider relationship extending beyond an episode of illness and is accompanied by a sense of loyalty between patients and providers (249, 250). Continuity of care with primary care providers (PCPs) has been found to be associated with improved patient satisfaction, medical management, and health outcomes and with reduction in utilization of redundant and costly health care services and associated spending (69, 81, 82).

Continuity of care has been shown to be especially important in managing patients with complex health conditions including multiple chronic conditions; these patients benefit from ongoing interactions with providers who know the historical course of patients' diseases (251). Studies have shown mixed results in terms of how chronic diseases might affect continuity of care with PCPs. Patients with heart failure have been shown to experience high continuity in primary care in a study conducted in Netherlands, but a study of adults conducted in England showed an inverse association between patient multimorbidity and continuity in primary care (252, 253). The focus of such studies, however, has largely been chronic medical comorbidities and not BH conditions. With nearly one-third of adults who have a MH-related visit, especially for mood disorders including depression and anxiety, seeking care solely in primary care settings, it is important to know how patients with BH conditions experience care in these

settings (13, 14). I am able to identify one other study which included BH conditions when looking at correlates of continuity; the researchers using survey data from adults in Ontario showed that patients with poorer MH had less continuity (254).

Shuffling between different health care and social sectors, Medicaid enrollees with BH disorders are especially vulnerable to the fragmented health care system. Continuity of care has been shown to be important for patients with BH disorders, but most studies have looked at continuity in the MH care sector (255-257). There is a lack of studies on how BH conditions might influence the processes of primary care services, especially in low-income populations. This is the first in a series of two chapters addressing some of these limitations. In this chapter I examine the relationship between BH conditions and continuity of care with PCPs among adult Medicaid enrollees in New Jersey (NJ). In the next chapter, I examine the association between PCP continuity of care and health care services utilization and spending among adult NJ Medicaid enrollees with BH disorders and chronic medical conditions.

DEFINING AND MEASURING CONTINUITY OF CARE

Considered an essential cornerstone of primary care, continuity of care is something that occurs when patients experience care over time with the same providers or when elements of care are linked in a way that best meets patient needs (258). When I mention continuity of care throughout chapters 5 and 6, I am specifically referring to relational continuity. Continuity of care can be conceptualized in different ways, and one of the earliest frameworks was provided by Hennen who considered continuity of care to have different dimensions including informational, chronological, interpersonal, interdisciplinary, and geographical (249). While this framework for continuity is one of the most comprehensive, other researchers have developed ways of considering continuity which are easier to operationalize and better suited for empirical work. I use the framework by Haggerty et al. who break down the idea of continuity of care into

three types including information, management, and relational continuity (80). This conceptualization was further supported by an international workgroup (259).

Information continuity refers to when there is availability of information and data regarding patients' health and prior clinical care to facilitate future encounters (80). Information continuity can help connect different health care providers and events in a way that allows for creating more effective care delivery as providers are able to make better and more informed care decisions (260). Management continuity implies that there are coherent transitions of care between providers, often a critical element of caring for patients with multiple chronic morbidities (80). An essential part of management continuity is effective communication across care teams, between providers, and between providers and patients. The third type of continuity, and the type I focus on, is relational continuity, encompassing continuity of provider-patient relationships such as that with a PCP (80). Relational continuity is what other researchers might call chronological or longitudinal continuity, referring to continuous health care interaction occurring within the same place or with the same provider who accumulates knowledge regarding patient (261). Also referred to in literature as personal or interpersonal continuity, relational continuity refers to the trust that develops over time between the patient and provider, allowing for more therapeutic relation more effective care delivery (79, 261).

It is also important to mention that continuity is an aspect of care that relates to care of an individual patient (80). This aspect of this dimension of quality might differ from other characteristics of primary care such as comprehensiveness or coordination. Though it might be related to an organizational factor, continuity of care is experienced at a patient level, and thus the unit of measurement of continuity is the individual patient (259). Continuity of care can be

measured in a variety of ways from patient or provider perception of continuity to other methods using the number of visits to PCPs. I use the later method, which has associated measures that are well-established in literature (262, 263). Measures of continuity of care can be conceptualized as looking at duration, density, dispersion, or sequence of care. I use measures of density, Usual Provider of Care (UPC) and dispersion, Bice-Boxerman Continuity of Care Index (COCI), both of which are further discussed in the methods section.

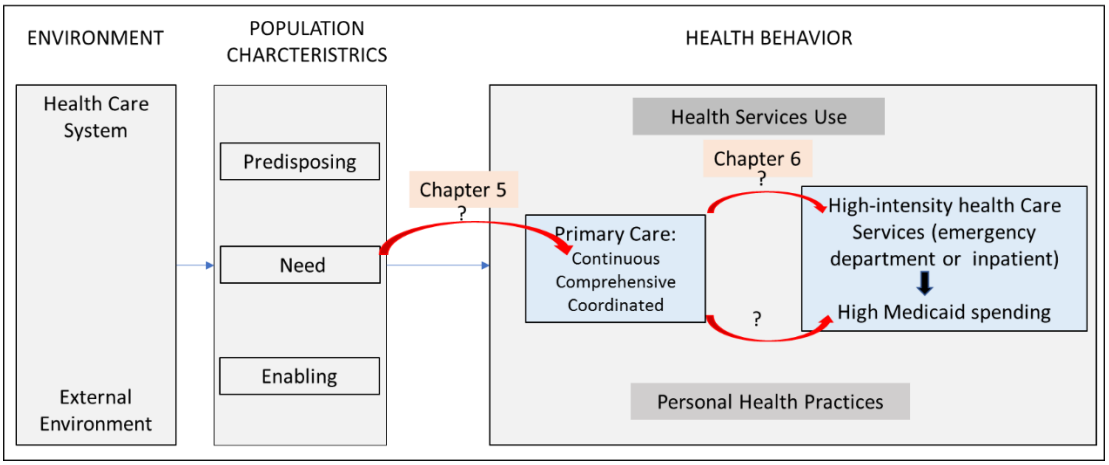
THEORHETICAL FRAMEWORK

Figure 5-1 shows the conceptual framework guiding dissertation chapters 5 and 6. The underlying framework is based on Andersen's Behavioral Model of Health Services Use (Andersen's Model) (167). I adapted the model to separate the health services use into use of primary care services and use of health care services associated with emergency department and inpatient use. Based on the original model, health behaviors including use of health services is influenced by various population characteristics including predisposing, need, and enabling factors (167). The model was later adopted by Andersen to include health care system and external environmental factors (167). In this chapter I look at the association between BH conditions and continuity of care with PCPs for adult NJ Medicaid enrollees. In the subsequent chapter, I look at the association between continuity of care with PCPs and patient health care services utilization and associated spending for adult NJ Medicaid enrollees.

As per the model patient need (perceived and actual health status, chronic disease burden, BH disorder burden, etc.), enabling (health insurance, income, etc.), and predisposing (age, gender, race, etc.) factors play a significant role in determining health care services utilization. Many studies support the use of this framework in studying continuity of care; researchers have shown that continuity of care is associated with patient age, health status,

education, living in rural/urban areas, and employment status among other factors (254, 264). Additionally, continuity might also be influenced by various environmental factors, such as zip-code level population density and income, along with health care system factors including availability and organization of medical resources.

Figure 5-1: Conceptual Framework for Chapters 5 and 6



METHODS

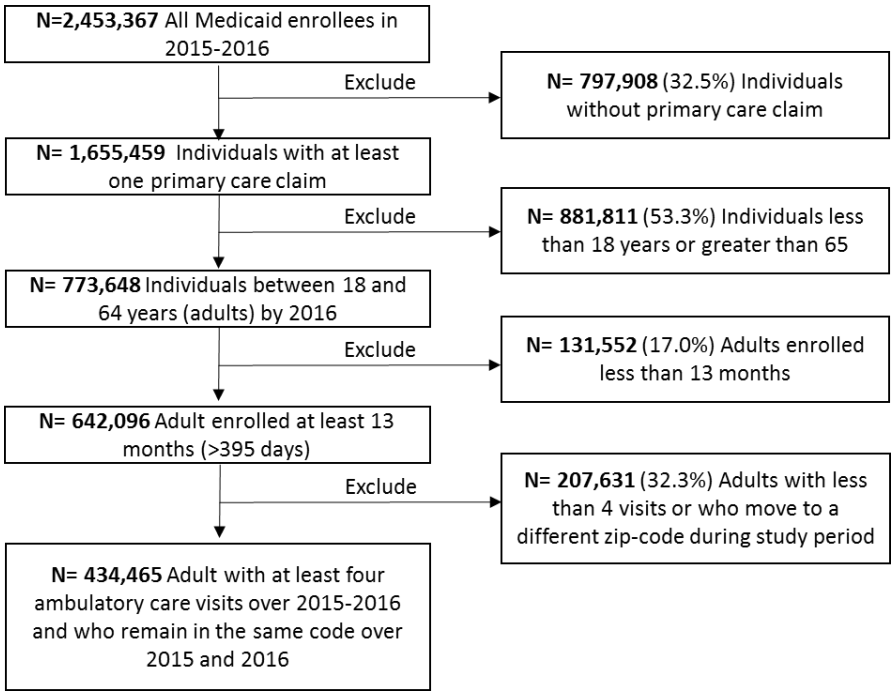
Data

This analysis uses NJ Medicaid enrollment and fee-for-service (FFS) claims and managed care organization (MCO) encounter data for 2015-2016. The dataset provides enrollee-level demographic, diagnosis, and service utilization information. Outpatient and inpatient claims files include information on claims for services provided in ambulatory and inpatient settings with International Classification of Diseases, 9th and 10th editions, Clinical Modification (ICD-9-CM and ICD-10-CM) codes. Zip-code level income and population density variables are obtained from the 2010-2014 census. Since I am using Medicaid data from 2015 and 2016, it is suitable to use data from years prior to that for those were the conditions which existed as prior to patient level outcomes I am interested in looking at.

Study Sample

This study analyses paid claims to NJ Medicaid over the two-year time period from January 1, 2015 and December 31, 2016. Since I am only interested in continuity in primary care, I use evaluation and management claims in outpatient settings (the criteria for defining primary care claims is discussed in detail in methods section of Chapter 4) to obtain visits which are eligible for sample determination. Claims from 2015 and 2016 are pooled allowing me to look at concentration of visits among providers over a time period of two year. Since it would be difficult to measure continuity with a very small number of ambulatory care visits, I include patients who had at least 4 ambulatory primary care visits during 2015-2016. Additionally I only keep patients who had the same zip-code of residence in 2015-2016 to avoid patients who moved which might change their source of care. The sample selection chart is presented in Figure 5-2.

Figure 5-2: Sample Selection Protocol for Chapter 5



Measures

Dependent Variables: Measures of Continuity of Care

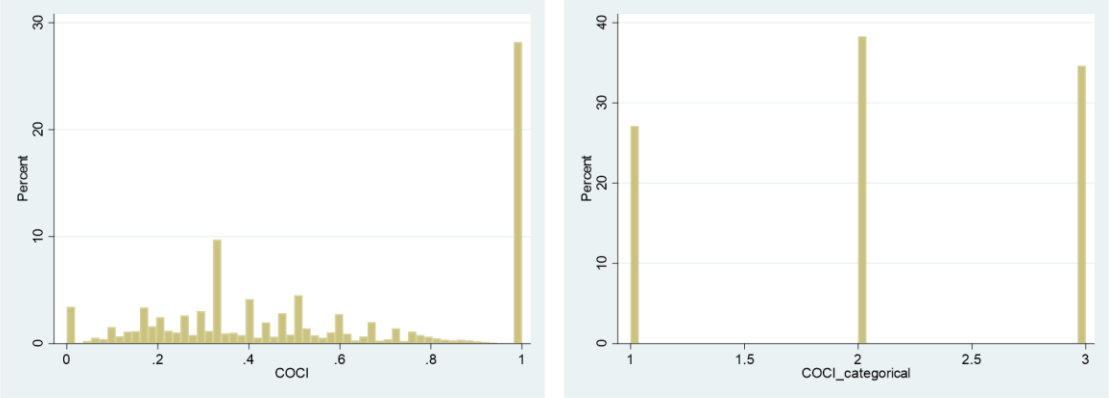
The UPC and COCI are two of the most widely used continuity of care Indices (82, 265). The COCI reflects the extent to which a patient's total number of visits were concentrated or dispersed during a certain time period or for a certain episode of care with a single provider (266). This measure continuity has several advantages in that it allows me to look at continuity over various providers and has been shown to be a good metric when looking at patients with different utilization of health care services and visits to many different provider (79, 265). It is important to highlight here that I am looking at provider and not practice-level continuity (I use National Provider Identification numbers on claims to associate a provider with the visit). Given available data, I am unable to associate providers with practices to also look at practice-level continuity for this study. The COCI is calculated using the following equation.

$$\text{COCI}=\frac{(\sum_{i=1}^{p} n_i^2)-\text{N}}{N(N-1)} \qquad \textbf{[5-1]}$$

In the above equation, N represents the total number of provider visits during the study period, n_i represents the number of patient visits to provider i, and p represents the total number of providers seen during the study period. The COCI ranger from 0 to 1 with higher index values indicating lesser dispersion; 0 represents perfect dispersion with different providers seen for all visits, and index value of 1 represents that patient only saw a single provider for all visits. COCI is modeled both as a linear outcome as well as a categorical outcome with three categories with the following cutoffs: category "low" with COCI value less than 0.333, category "medium" between COCI index value between 0.333 and 0.712, and category "high" with COCI index value greater than 0.712. These cutoffs were chosen to divide the distribution of index values for the sample into terciles, each containing close to one third of the analytic sample.

Breaking up the sample as such facilitates interpretation and comparisons, and other studies have used a similar approach (267). It might also be of interest that nearly 30% of the sample had a COCI value of 1, and most of the patients in the third category thus have complete continuity with one PCP. Figure 5-3 shows the overall distribution of the COCI as continuous as well as after recoding as categorical variable.

Figure 5-3: Bice Boxerman Continuity of Care Index Distribution as a Continuous and Categorical Variable



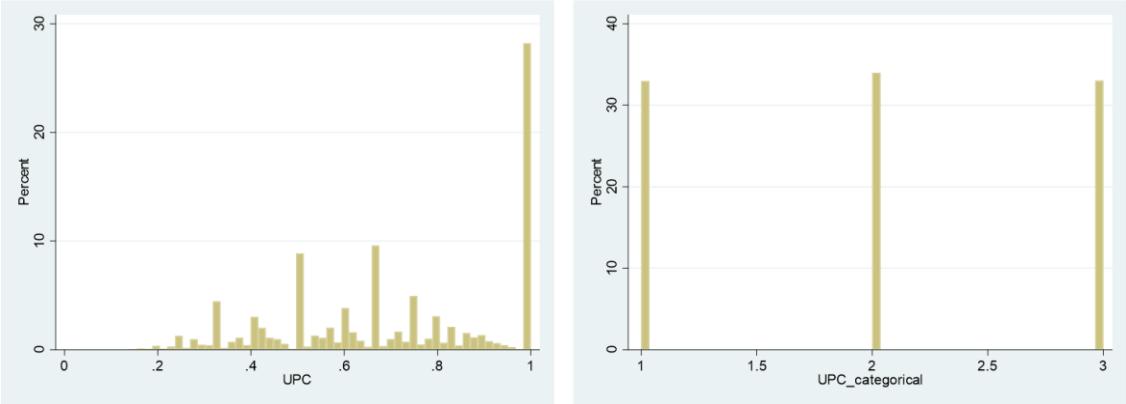
The UPC reflects the "density" of visits with a PCP and takes into account the frequency with which patients seek care from the particular provider with whom the patient has the largest proportion of visits (79). This measure, thus, is more physician centered and looks at patient visits with respect to a certain provider (265). UPC is calculated using the following equation.

$$\mathrm{UPC} = \frac{ni}{N} \qquad \textbf{[5-2]}$$

In the above equation, N represents the total number of provider visits during the study period and, and n_i represents the number of patient visits to provider i. Similar to COCI, UPC is modeled both as a linear outcome as well as a categorical outcome with three categories with the following cutoffs: category "low" between UPC index value less than 0.588, category "medium" between UPC index value between 0.588 and 0.861, and category "high" between

UPC index value greater than 0.861. These cutoffs were chosen to divide the distribution of index values for the sample into terciles with nearly 30% of the sample having a UPC index value of 1. Breaking up the sample as such facilitates interpretation and comparisons, and other studies have used a similar approach (267). Figure 5-4 shows the overall distribution of the UPC as continuous as well as after recoding as categorical variable.

Figure 5-4: Usual Provider of Care Index Distribution as a Continuous and Categorical Variable



Defining BH Disorders

I investigate the association between BH metrics in Table 5-1 and continuity of care. In order to define the BH metrics, I use the AHRQ Clinical Classification Software (CCS) (228, 229). For a detailed account for how I define the conditions captured in BH or SMI, refer to the methods section of chapter 4 where I discuss in detail how the BH disorder and SMI indicators are created. The only new additions are the conditions of depression and anxiety, for which the diagnostic and procedual codes used to create the indicator are listed in Appendix K.

Table 5-1: Defining BH Conditions in Medicaid Claims

Clinical sub-group	Definition
BH Disorder 2015 or 2016	At least one claims with a BH diagnosis code over 2015 and 2016
BH Disorder 2015 and 2016	At least one claims with a BH diagnosis code in 2015 as well as in 2016
Severe Mental Illness 2015 or 2016	At least one claims with a relevant SMI diagnosis code in 2015 or 2016
Depression	At least one claims with a depression diagnosis in 2015 and 2016
Anxiety	At least one claims with a depression diagnosis in 2015 and 2016

Notes: BH: Behavioral Health; SMI: Severe Mental Illness

Covariates

I include various sociodemographic and health needs factors along with contextual and environmental factors that relate to health care for patients with BH and chronic medical conditions listed in Table 5-2. The criteria for inclusion were potential theoretical relevance and utilization in previous research of continuity of care. I use the Andersen Behavioral Model of Health Service Use as the underlying framework for choosing covariates including need factors (Elixhauser comorbidity index, total number of ambulatory care visits during study time period, and SMI in models which are do not only include patients with SMI), predisposing factors (age, gender, and race), and enabling factors (Medicaid eligibility category and income in patients' residential ZIP code). Rather than including individual clinical comorbidities, I use Elixhauser Comorbidity Index to create a measure of overall comorbidity with higher score representing grater comorbidity. These covariates have significant evidence base in being important in explaining continuity of care with primary care providers (254, 267). In addition to patient specific factors, there might be other relevant contextual factors which warrant consideration for inclusion. Contextual factors in the model include population density, and the number of primary care doctors in the zip code[9].

Table 5-2: Overview of Covariates
Individual-Level Covariates
Predisposing Factors
Age
Gender
Race/Ethnicity
Enabling Factors
Area Socioeconomic Status
Medicaid Eligibility Category
Enrollment Duration
Need Factors
Severe Mental Illness
Elixhauser Comorbidity index
Total ambulatory care visits
Provider-Level Covariates
Percent of Patients with Chronic BH Conditions
Contextual Factors
Area Population Density
Number of primary care providers in zip-code

[9] For the metric representing total number of primary care provider in patient Zip-Code, we used Medicaid claims data for 2015-2016 to obtain providers who had associated claims. Since not all primary care providers in the area necessarily accept Medicaid, calculating the metric as such will give us an idea of how many providers in the area are actively seeing Medicaid patients during the study time period. This is a more appropriate measures of provider availability than the total number of primary care doctors in an area.

Practice level factor included in the model are percent of patients with BH problems.

Statistical Analysis

Only observations with valid, non-missing values for all variables of interest were included in the analysis. First, I used chi-square and t-tests test to examine whether there were differences in the distributions of covariates by outcomes status (Table 5-3). Subsequently, I used multivariate ordinal logistic regression with robust standard errors to analyze the categorical outcomes and assess whether there is any association between BH status of adult Medicaid enrollees and patients having low, medium, or high values of continuity of care with PCPs (Table 5-4). One critical assumption underlying the ordered logistic models is the relationship between an independent variable and each of the levels of the outcome is the same. For all of the ordinal logistic models, I tested the proportional odds assumptions using the brant test to ensure that the parallel slopes assumptions were not violated.

To confirm these findings, I also used tobit regression to analyze the indices as continuous (Table 5-4). The distribution of the continuity of care indices is shown in Figures 5-3 and 5-4 for COCI and UPC, respectively, with a spike at the value of 1. In such cases, using ordinary least squares regression can results in coefficients biased towards null. Tobit models can better estimate linear relationships when there is left or right side data censoring, which is the case for these data since they fall between 0 and 1. I used tobit regression to model and correct for the bounded-ness (upper limit 1 and lower limit 0) of the outcome index values. Using tobit regression can correct for that bias and is the preferred methods for modeling outcomes which are bounded (268). The results are interpreted the same as would be for OLS.

All covariates were included in the models as categorical except for the following which were included as continuous: Elixhauser comorbidity index, patient age, Zip-code level income and population density, number of PCPs in Zip-Code, proportion of Medicaid patients seen by

provider in 2015-2016 with BH disorders. All hypotheses regarding bivariate associations as well as multivariate coefficients and odds ratios are tested at the α=0.05 significance level. Analysis was done using Stata 15 (StataCorp, College Station, TX)

RESULTS

A total of 434,465 Medicaid enrollees between 2015 and 2016 met the inclusion criteria; there is no missing information for any of the variables. Table 5-3 gives the distribution of sample characteristics along with frequency distribution of covariates by continuity of care index categories and bivariate association between patient characteristics and continuity of care. All of the variables are statistically significantly associated with outpatient continuity of care with PCPs. A statistically significant higher percentage of males, compared to females, are in the high category for both COCI and UPC. Additionally, a higher percentage of people in the Asian/Other race/ethnicity category are in the high category of both the COCI and UPC compared to other groups who are distributed more evenly between the three COCI and UPC categories. Whereas 37.43% of patients with SMI have high COCI, only 31.04% of people with SMI are in the high category. The overall pattern is the same with a lower percentage of patients with one or two BH diagnoses over 2015-2016, with depression, or with anxiety having high COCI or UPC compared to those without the respective disorders. Patients in the high UPC category have the lowest Elixhauser comorbidity score (2.25) relative to those in the medium (3.01) and low (3.82) UPC categories, with overall pattern being very similar for COCI.

The results of the multivariate ordered logistic regression on the continuity of care indices are shown in Table 5-4. Having BH diagnosis (either one over study period or one in each year), SMI, or depression is associated with reduced odds of being in the high COCI or UPC groups versus the combined low or intermediate groups. The odds of being in the high COCI or UPC categories versus the low or middle groups is nearly 10-12% lower for those with SMI

relative to those without SMI (COCI OR: 0.883; CI: 0.870, 0.897 and UPC OR: 0.896; CI:0.882, 0.910). For those with BH disorder diagnoses in 2015 and 2016, the odds of being the high COCI or UPC categories versus the low or middle groups is nearly 5% lower relative to those without BH disorder diagnoses (COCI OR:0.951; CI: 0.935, 0.967 and UPC OR: 0.960; CI: 0.943, 0.977). For patients with anxiety, however, odds are higher of being in the higher continuity of care index values, compared to the combined low or medium groups, relative to those without anxiety. Relative to patients without anxiety, those with anxiety have 2% increased odds of being in the high COCI category (CI: 1.003, 1.039) and nearly 3% increased odds or being in the high UPC group (CI: 1.01, 1.05) compared to both medium and low categories.

The results from tobit regressions in Table 5-4 corroborate the ordinal logistic regression findings. In fully adjusted tobit models all of the variables were statistically significantly associated with continuity of care indices. Patients with BH disorder (either one or two diagnoses over study period), SMI, or depression have lower values of COCI or UPC compared to patients without the respective disorders. Compared to patients without anxiety, patient with anxiety have higher COCI and UPC values, but thought the relationships are significant, the coefficients are very small (COCI coefficient: 0.007; CI: 0.003, 0.015 and UPC coefficient 1.029; CI: 1.01, 1.05).

Though results for other variables are not reported in the tables, a one-unit increase in Elixhauser comorbidity index is associated with 4-5% reduction[10] in odds of being in the high COCI or UPC categories versus the medium or low categories across all clinical groups. Additionally, compared to males, females have nearly 25% reduced odds of being in the high

[10] Interval estimates are not provided here due to there being slight variations across different models but the association is statistically significant at 0.05 level across all models.

COCI or UPC categories, versus the medium or low categories; the association is robust across models for all subgroups. Though results for other variables are not shown here, similar to the findings for the ordinal logistic models, tobit models show that females have COCI and UPC values which are 0.07-0.1[11] units lower as compared to males. Additionally, higher comorbidity scores are associated with lower COCI and UPC values across tobit models for the different clinical groups.

DISCUSSION

Study findings show that having BH conditions, except for anxiety, are associated with reduced continuity with PCPs for adult Medicaid enrollees in 2015-2016. These findings are particularly concerning as this population is socially vulnerable and bears a high burden of BH disorders along with chronic medical conditions (269, 270). Findings are robust across different disorders and measures of continuity of care. The only other study which looked at association between MH and primary care continuity and showed an inverse association used survey data and looked at perceived continuity (254). This study corroborates those results using claims data allowing us to look at experienced continuity through visits.

Though the findings are novel in that there is no previous work looking at how experiences of continuity in Medicaid enrollees might be affected by BH disorders, the results are not altogether surprising. The findings related to anxiety are in line with research showing that patients with symptoms of general anxiety disorder tend to have higher rates of medical visits (271). That the association is significant after adjusting for total number of visits shows that patients with anxiety might be more likely to visit the same providers rather than different ones. The pattern is quite opposite for BH disorders generally, SMI, or depression. Previous

[11] Interval estimates are not provided here due to there being slight variations across different models but the association is statistically significant at 0.05 level across all models.

qualitative work has identified that patients with depression convey that their PCPs do not always listen to them (272). Other researchers studying patients 18-70 years of age at risk of depression in Netherlands found that 53% of patients contacted two or more providers across care settings (273). It's possible, thus, that patients with depression might seek out different PCPs more frequently, having lower continuity of care with providers.

Challenges in maintaining continuity for patients with BH disorders have also been expressed by providers. Though patients with BH disorders often seek care in primary care, providers do not always feel comfortable treating these patients, which might making patients less likely to build long term relationships with these providers. Defining complex patients as those with multidimensional needs including socio-economic, medical, and MH needs, PCPs have expressed that individual providers are unlikely to meet needs of complex patients and other systematic supports are needed (274).

Additionally, these findings might also be reflective of a larger system-level issues that adults Medicaid enrollees with BH disorders experience in maintaining continuity with PCPs. Along with challenges posed by the fragmentation of the health care system, these patients also face challenges relating to Medicaid "churning" with being enrolled and disenrolled based as income and life circumstances change.

These results showing that higher comorbidity burden is associated with lower continuity of care with PCPs is concerning, for these patients are the ones who would likely benefit from higher continuity. Findings in previous research have been mixed. Whereas a study Netherlands showed that patients with heart failure have high continuity of care, other researchers in England have reported that chronic disease burden is associated with reduced primary care continuity (252, 253). Both the association between BH and chronic medical conditions and continuity must continue to be studied further. Future studies can include

practice-level continuity and also visits to specialists to get further insight into the care pattern for these patients.

LIMITATIONS

This study is subject to various limitations. Given that this is a cross-sectional study, I can only speak of the observed relationships as association and not as causal relations between patients have BH disorders and continuity with PCPs. Additionally, using only data from New Jersey, I cannot generalize these findings to other area. However, since much of Medicaid policy is made at the state level, my findings can shed light on how to improve care for NJ Medicaid enrollees. Further, using claims data to identify conditions allows me to looks at only diagnosed conditions.

Though the omnibus test for overall model significance is statistically significant across all models, the overall variation in outcomes explained by the tobit models ranges from 5-6% and the overall improvement in the log-likelihood of ordinal logistic models, compared to null, is only 8-10%. This indicates that there might be other factors, likely provider characteristics, which might be important determinants of continuity and should be included. Future studies should take provider level factors into account and consider linking Medicaid data to other patient level sociodemographic variables including education and employment.

Observation regarding association between patients having BH conditions and experiencing reduced continuity imply that might be challenges faced by these patients. This study, however does nor delve into the nature of those barriers which might be personal, provider-level, or health care system-related. A possible future study looking at these aspects can be very enlightening.

Table 5-3: Sample Characteristics by Outcome Status of Continuity of Care in Primary Care for Adult Medicaid Enrollees during 2015-2016

	Bice-Boxerman Continuity of Care Index					Usual Provider of Care Index				
		Low	Med	High			Low	Med	High	
	total	Row % or Mean			P-Value	total	Row % or Mean			P-Value
Total	434,465	27.11	38.27	34.62		434,465	32.96	34.00	33.03	
Recipient Gender					<0.01					<0.01
male	151,236	23.56	37.29	39.15		151,236	29.14	33.27	37.59	
female	283,229	29.01	38.79	32.20		283,229	35.01	34.39	30.60	
Recipient Race					<0.01					<0.01
White	168,317	30.43	37.89	31.68		168,317	35.86	34.01	30.13	
Black	99,478	28.29	38.27	33.44		99,478	34.03	34.04	31.93	
Hispanic	85,717	24.80	39.66	35.54		85,717	31.25	34.91	33.84	
Asian/Other	79,077	21.17	37.55	41.27		79,077	27.41	32.97	39.63	
Medicaid Eligibility Category					<0.01					<0.01
Blind/Disabled	77,558	28.93	38.83	32.25		77,558	35.92	33.50	30.58	
NJ Family Care, Children's Services, Other	201,131	27.56	37.73	34.72		201,131	32.75	34.01	33.24	
General Assistance	155,776	25.63	38.70	35.67		155,776	31.77	34.25	33.98	
Behavioral Health in 2015 or 2016					<0.01					<0.01
No	195,547	24.18	37.42	38.40		195,547	29.43	33.61	36.96	
Yes	238,918	29.52	38.97	31.52		238,918	35.85	34.33	29.82	
Behavioral Health in 2015 and 2016					<0.01					<0.01
No	317,961	25.56	38.08	36.36		317,961	31.19	33.98	34.83	
Yes	116,504	31.33	38.80	29.86		116,504	37.82	34.06	28.12	
Severe Mental Illness in 2015 or 2016					<0.01					<0.01
No	243,181	25.11	37.46	37.43		243,181	30.07	33.93	36.00	
Yes	191,284	29.66	39.31	31.04		191,284	36.65	34.10	29.26	
Depression in 2015 or 2016					<0.01					<0.01
No	331,059	25.56	38.03	36.41		331,059	31.18	33.94	34.88	
Yes	103,406	32.09	39.05	28.86		103,406	38.67	34.22	27.11	
Anxiety in 2015 or 2016					<0.01					<0.01
No	356,656	26.15	38.17	35.68		356,656	31.81	34.04	34.15	
Yes	77,809	31.53	38.72	29.74		77,809	38.27	33.83	27.90	
Elixhauser Comorbidity Score	434,465	3.77	3.15	2.29	<0.01	434,465	3.82	3.01	2..24	<0.01
Patient Age (Years)	434,465	40.24	41.35	41.29	<0.01	434,465	40.91	40.97	41.20	<0.01

Source: New Jersey Medicaid claims and enrollment data from 2015-2016. For Elixhauser Comorbidity, higher number indicated greater comorbidity.

Table 5-4: Results from Tobit and Ordinal Logistic Regression Showing Association Between Having Behavioral Health Disorders and Continuity of Care in Primary Care for Adult Medicaid Enrollees during 2015-2016

	Bice-Boxerman COC Index- Linear	Bice-Boxerman COC Index- 3 categories	Usual Provider of Care Index- Linear	Usual Provider of Care Index- 3 Categories
		Type of Model (See Table Notes)		
	Tobit coefficient (CI)	Ordinal Logit OR (CI)	Tobit coefficient (CI)	Ordinal Logit OR (CI)
BH diagnosis in 2015 or 2016	-.014*** (-0.016, -0.012)	0.907*** (0.895, 0.920)	-0.012*** (-0.014, -0.010)	0.905*** (0.892, 0.918)
BH diagnosis in 2015 and 2016	-.007*** (-0.010, -0.004)	0.951*** (0.935, 0.967)	-0.007*** (-0.009, -0.004)	0.960*** (0.943, 0.977)
SMI diagnosis in 2015 or 2016	-.053*** (-0.059, -0.046)	0.883*** (0.870, 0.897)	0.009*** (-0.012, -0.008)	0.896*** (0.882, 0.910)
Depression	-0.056*** (-0.064, -0.047)	0.876*** (0.858, .895)	-0.016** (-0.019, -0.013)	0.887*** (0.870, 0.906)
Anxiety	0.007** (0.003, 0.015)	1.020** (1.003, 1.039)	.006** (.003, .005)	1.029** (1.01, 1.05)

Note: BH: Behavioral health; COC: Continuity of Care; OR: Odds ratio; CI: Confidence Interval. The number of stars indicates significance level (***p<0.001; **p<0.01; *p<0.05). Source: New Jersey Medicaid claims and enrollment data from 2015-2016 and U.S. Census data. Given the structure of the outcomes, different models were used to look at the association between having varying degree and type of BH disorders and CC and having continuity of care as measures in various different ways. All models are adjusted for age, gender, race, elixhauser comorbidity score, SMI (except for the subgroup with SMI only), Medicaid eligibility category, numbers of days enrolled in 2015-2016, total number of ambulatory care visits in 2015 and 2016, Zip-code level income and population density, percent of patients with BH disorder seen by physician, and number of primary care providers in zip-code.

Chapter 6: Association of Relational Continuity in Primary Care and Emergency Room Use, Inpatient Utilization, and Spending for Adult Medicaid Enrollees.

This chapter addresses the following research question: Is continuity of care associated with reduction in emergency department (ED) use, inpatient utilization, and Medicaid spending among adult New Jersey Medicaid enrollees with behavioral health disorders and chronic medical comorbidity in 2015-2016?

ABSTRACT

Given the importance of continuity of care for effective delivery of primary care services, the lack of studies on continuity of primary care for patients with behavioral health disorders is concerning. The primary objective of this chapter is to assess the association of primary care provider-level continuity of care with health care utilization and Medicaid spending among adult Medicaid enrollees in New Jersey with behavioral health disorders and chronic medical conditions. Using Medicaid claims and enrollment data from 2015 and 2016, I employed a retrospective design using logistic regression to examine whether higher continuity of care is associated with reduction in use of inpatient and ED services along with Medicaid inpatient and total spending. Overall, higher continuity of care was associated with reduction in odds of patient having high rates of hospitalizations, ED use, and Medicaid total and inpatient spending.

BACKGROUND

Behavioral health (BH) disorders, comprising mental health (MH) and substance use disorders (SUD) impact nearly 20% of the US population and often co-occur with medical conditions (27). Lifetime prevalence of MH disorders is as high as 57%, ranging from nearly 30% for anxiety and 20% for mood disorders (20). Nationally, nearly 30% of people with a chronic

medical conditions (CC) also had at least one MH condition, and 70% of adults with a MI had a comorbid medical condition 2001-03 (130). Patients with comorbid conditions have worse medical prognosis and higher symptom burden and functional impairment as well as lower quality of life (3). Among Medicaid enrollees, compared to those without BH conditions, enrollees with BH conditions are more likely to also have CC and self-rate their health as poor (269).

With nearly one-third of adults with a MH visit seeking care solely in primary care, these settings provide a key opportunity to address critical patient needs, but often struggle to manage patients with BH disorders and especially those with comorbidities (12, 13). One aspect of primary care that is especially important in managing patients with complex health care needs is continuity of care (79, 275). Continuity of care is considered one of the essential elements of primary care and refers to longitudinal therapeutic relationship between a patient and provider which extends beyond a specific episode of care or disease, with physician having ongoing responsibility for patient (80, 276). The continuous relationship between a patients and primary care providers (PCPs) has been shown to have a positive effect on quality of health care services, health outcomes, and patient satisfaction (82).

Though there is consensus around the importance of continuity for patients in primary care, there is lack of research on how continuity with primary care providers might improve quality of care for patients for BH disorders in low-resource groups such as Medicaid enrollees. BH disorders are highly prevalent among Medicaid enrollees in New Jersey who have high rates of ED and inpatient use (205). These services are expensive and may occur as a result of inadequate care in the community and are thus often not considered the best use of resources. With nearly half million additional Medicaid beneficiaries in NJ receiving Medicaid coverage

between 2013 and 2017, increasing total enrollment by 37%, it is imperative to look at strategies for improving quality of care for patients while avoiding costly service utilization (86). In thinking about how to reduce costly but potentially avoidable service utilization, I look at whether there are opportunities in primary care. More specifically, I investigate whether continuity of care with PCPs is associated with reduction in ED and inpatient service utilization and Medicaid spending.

Inpatient and ED are considered high cost care settings, and reducing utilization is considered a priority among policymakers. With Medicaid enrollees using ED services at nearly two times the rate than those who are privately insured, reducing on ED is especially important for Medicaid policymakers (270, 277, 278). Additionally, patients without a usual source of care and those with mental illness are more likely to use ED services at higher rates (270, 278). Similarly, inpatient utilization among Medicaid enrollees is also disproportionately high (269). In New Jersey, a large proportion of the Medicaid spending if for enrollees with high rates of inpatient and ED use along with those with complex MH and chronic medical needs (6). I hypothesize that improvement in continuity of care with PCPs is associated with reduced odds of having high ED and inpatient use among adult NJ Medicaid enrollees with BH disorders and CC. Additionally, I hypothesize that there is such an inverse association between continuity of care and Medicaid inpatient and total spending.

CURRENT STATE OF EVIDENCE AND CONCEPTUAL FRAMEWORK

Most empirical work on continuity of care in primary care settings suggests that continuity can improve outcomes related to high-cost service utilization and patient quality of care. Increased continuity with PCPs is associated with reduction in rates of hospitalization, ED use, and costs (82). Analyzing the impact of The Health Care Coverage Initiative in California

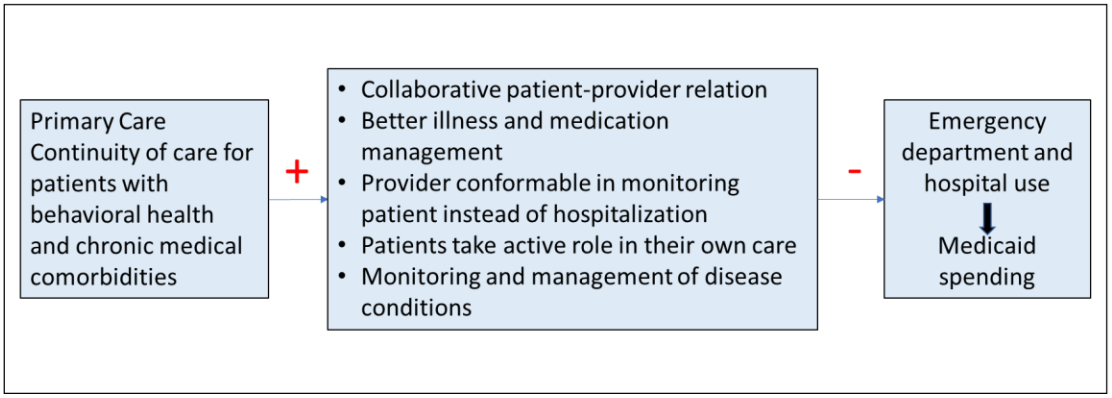
with the goal of increasing patient adherence to individual PCPs inn California, researchers find that along with improved adherence to PCPs, there was reduction in rates of ED and inpatient utilization (81). One study using national-level Medicare claims data for patients getting care from a national representative set of PCPs showed that adjusted expenditures and odds of hospitalization was were nearly 15% lower for the higher continuity quintile relative to lowest (279). Studies using Medicaid claims data have also found that higher continuity with PCPs is associated with reduction in use of hospital-based services. Using a single year of Delaware Medicaid claims data for continuously enrolled adult patients, Gill et al. find that patients with higher continuity of primary care have reduction in likelihood of making single or multiple ED visits, hospitalization for any conditions, and hospitalization for chronic ambulatory care sensitive conditions (280, 281). Two high-quality systematic reviews have shown that continuity of care in primary care settings is overwhelmingly associated with improved quality of care with reduction in hospitalization and ED use along with improvement in delivery of preventive services and patient satisfaction (82, 275). Along with utilization and cost-related outcomes, continuity of care has also been shown to prevent redundant tests and conflicting medical guidance (79, 282).

Whereas many studies have shown improvements in patient outcomes for those with CC including asthma or diabetes, there is a lack of studies of how continuity of primary care influences utilization outcomes for patients with BH disorders and CC, especially in low-resource populations (283, 284). I am able to identify only a few studies specifically in patients with BH disorders. One study used data from Korean National Health Insurance cohort and showed that higher continuity was associated with reduction in hospitalizations as well as in suicide deaths for those diagnosed with unipolar or bipolar depressive disorder (285). One qualitative study of

patients with schizophrenia, schizoaffective disorder, affective psychosis, or bipolar disorder showed that relational continuity indirectly improved quality of life through patients having higher satisfaction with their care (286).

Figure 5-1 illustrates the framework for analysis in Chapter 5 and 6. In this chapter, I continue to use the Andersen Behavioral Model of Health Services use (Andersen's Model) to look at ED and inpatient utilization along with associated Medicaid spending (167). Figure 6-1 provides the framework for understanding how continuity might reduce utilization of costly health care services as well as associated Medicaid spending. Continuity of care allows for building trust between patients and providers, which is often manifested in an implicit contract between them resulting in building collaborative relations and high levels of patient satisfaction with care (261, 287). Continuity of care can also lead to establishing trust between patients and provider, which can in-turn increase patient compliance and cooperation with care plan leading to less complications associated with lack of compliance (252, 288, 289). Continuity of care has also been shown to be associated with reduction in missed appointments which in turn might allow providers to stay abreast of any complications which can lead to ED or inpatient use (290). Additionally, conceptually, providers who are familiar with patients and their disease courses through a longitudinal relationship might be more comfortable monitoring patients instead of

Figure 6-1: Conceptual Framework for Primary Care Continuity Association with Reduction in Health Care Services Use and Medicaid Spending



sending patients to the emergency room for slight complications that do not require urgent care.

Additionally, whereas the framework in Figure 6-1 only shows how continuity with PCPs might directly influence outcomes, there might also be an indirect path. Through a longitudinal relationship as providers becomes more familiar with patient medical and social history along with disease course, there can be better management of conditions and more timely recognition of new conditions, which if left unrecognized might lead to worsening health (275, 291). If through higher continuity, patients' perceived or actual health states can improve, then there might be reduction in the need factor of the Andersen model (see Figure 5-1), resulting in reduction in ED or inpatient use.

METHODS

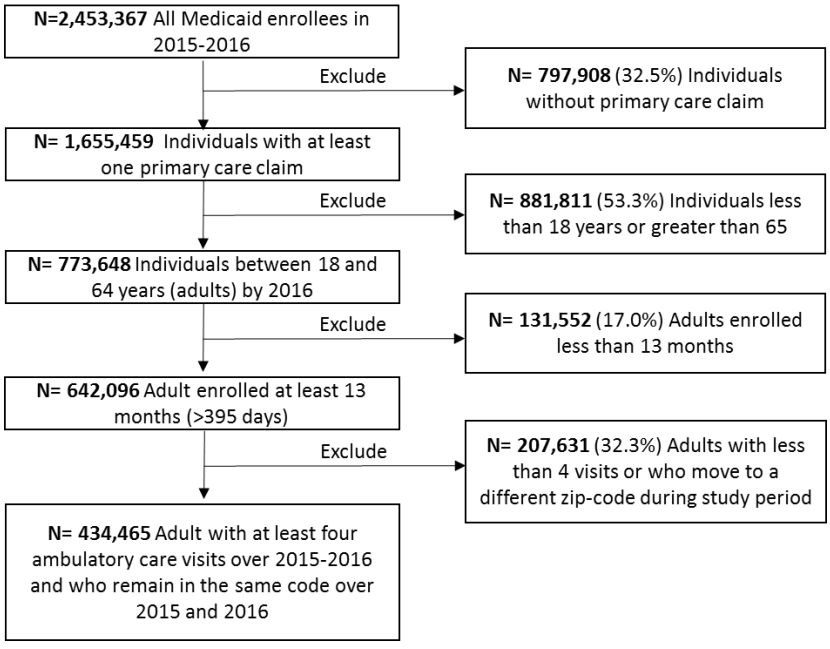
Data

This analysis uses NJ Medicaid enrollment and fee-for-service (FFS) claims and managed care organization (MCO) encounter data for 2015-2016. The dataset provides enrollee-level demographic, diagnosis, and service utilization information. Outpatient and inpatient claims files (including fee-for-service claims and managed care encounter records) included information on services provided in ambulatory and inpatient settings and contained International Classification of Diseases, 9th and 10th editions, Clinical Modification (ICD-9-CM and ICD-10-CM) codes. Zip-code level income and population density variables are obtained from the 2010-2014 census. Since I am using Medicaid data from 2015 and 2016, it is suitable to use data from years prior to that for those are the conditions which existed as prior to patient level outcomes I am interested in looking at.

Study Sample

This study analyses paid claims to NJ Medicaid over the two-year time period from January 1, 2015 and December 31, 2016. Since I am only interested in continuity in primary care, I use evaluation and management claims in outpatient settings (the criteria for defining primary care claims is discussed in detail in methods section of Chapter 4) to obtain visits which are eligible for sample determination. Claims from 2015 and 2016 are pooled allowing us to look at concentration of visits among providers over a time period of two year. Since it would be difficult to measure continuity with a very small number of ambulatory care visits, I include patients who had at least 4 ambulatory primary care visits during 2015-2016. Additionally I only keep patients who had the same zip-code of residence in 2015-2016 to avoid patients who moved which might change their source of care. The sample selection chart is presented in Figure 6-2.

Figure 6-2: Sample Selection Protocol for Chapter 6



In order to define the BH metrics, I use the AHRQ Clinical Classification Software (CCS) (228, 229). For a detailed account for how I define BH conditions, refer to the methods section

of chapter 4 where I discuss in detail how the BH disorder and SMI indicators are created. I look at subgroups of varying clinical severity or complexity as outlined in Table 6-1. When looking at outcomes of interest, patients are included in analysis if along with a CC they have accompanying 1) one BH diagnosis over two years, 2) two BH diagnoses over two years (in 2015 and 2016), or 3) one SMI diagnosis over 2015 or 2016. I use the number of claims of BH disorders as an indicator of severity. A patient with a behavioral disturbance might have one claim over the two years but someone with two claims with BH diagnoses might likely have more serious behavioral concerns. Patients with a diagnosis for and SMI condition likely have highest disease burden and functional impairment. I choose to build my study cohorts in this way to allow me to look at different scopes of BH disorders and comorbidity to assess whether continuity of care influences outcomes different across different severity groups. Prior research has found that patients with different severities of CC and has found that continuity can have different effects on outcomes depending on CC severity (292).

Table 6-1: Samples based on Behavioral Health and Chronic Medical Conditions

Analytic Group	Clinical Definition
BH 2015 or 2016 and CC	At least one claims with a relevant BH diagnosis code over 2015 and 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016
BH 2015 and 2016 and CC	At least one claims with a relevant BH diagnosis code in 2015 as well as in 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016
SMI 2015 or 2016 and CC	At least one claims with a relevant SMI diagnosis code in 2015 or 2016 with at least one claim with a diagnosis code for the chronic medical condition over 2015 and 2016

Notes: BH: Behavioral Health; SMI: Severe Mental Illness; CC: Chronic Medical Condition

Measures

Outcome Metrics

Outcome metrics are listed in Table 6-2. I look at two health care services utilization metrics including inpatient admission and ED visits. Inpatient and ED use are very costly and not considered the best use of resources. Whereas some situations that necessitate use of ED or inpatient services are not related to the quality of health care and social welfare systems, a very high rate of utilization might imply that there is a gap in meeting patients' health care needs outside of the hospital. Rather than focusing on whether there is any utilization, I want to capture how to improve care for patients with highest levels of needs but looking at whether continuity of care is associated with reduction in high rates of utilization. ED visits, identified using ED specific Medicaid claims, show whether patients get ambulatory care services in the ED, either in or outside of NJ. ED visits which result in inpatient admission are not included in the ED utilization measure. For analysis, a dichotomous variable was created for 5 or more visits over 2015-2016, representing 90th percentile of sample distribution (1: at least 5 ED visits; 0: less than 5 ED visits). Similarly, the inpatient hospital utilization metric was constructed based on all inpatient Medicaid claims. In creating this measure I consider inpatient utilization to be at any general acute care hospital, either in or outside of New Jersey. For analysis, a dichotomous variable was created for 2 or more visits over 2015-2016, representing 90th percentile of sample distribution (1: at least 2 hospitalizations; 0: less than 2 hospitalizations).

Table 6-2: Outcomes (Dependent Variables)
Utilization Measures
Inpatient Admission (90th Percentile)
Emergency Department Visit (90th Percentile)
Spending Measures
Inpatient Spending (90th Percentile)
Total Spending (90th Percentile)

In creating the inpatient spending metric, I consider all claims which were associated with inpatient utilization at any general acute care hospital, either in or outside of New Jersey

during 2015-2016. Similarly, for creating the total spending metric, I consider all patient claims over 2015-2016. Many studies have shown that a disproportionately small percentage of patients account for a large share of health care cost generally but also for Medicaid (85, 293, 294). Patients in the highest percentiles of spending are more likely to have multiple CC and BH disorders, direct and indirect complications of which lead to utilization of expensive health care services (85, 295). While care for all patients should be improved, there must be special attention towards looking at strategies to improve care for these patients. Such a strategy allows for more targeted approaches in having large gains in quality while simultaneously reducing costs. I, thus, look at whether higher continuity is associated with reduction in having very high spending. What qualifies as very high can also be subjective, and in this study I dichotomize spending outcomes into more or less than 90th percentile spending. Across the different analytic subgroups, patients in the top 10% of spending distribution accounted for nearly 50% of the total Medicaid spending in 2015-2016. Spending metrics were constructed by first looking at the distribution of inpatient and total spending in the different analytic subgroups. A dichotomous variable was then created to represent more or less than 90th percentile total or inpatient spending (1: 90th percentile total or inpatient spending; 0: less than 90th percentile total or inpatient spending). In discussing spending, I refer to those with 90th percentile of Medicaid inpatient or total spending as being high rates of spending.

Independent variables

Measures of Continuity of Care

The usual provider of care index (UPC) and the Bice-Boxerman Continuity of Care Index (COCI) are two of the most widely used continuity of care Indices (82, 265). The COCI reflects the extent to which a patient's total number of visits were concentrated or dispersed during a

certain time period or for a certain episode of care with a single provider (266). This measure continuity has several advantages in that it allows me to look at continuity over various providers and has been shown to be a good metric when looking at patients with different utilization of health care services and visits to many different provider (79, 265). It is important to highlight here that I am looking at provider and not practice-level continuity (I use National Provider Identification numbers on claims to associate a provider with the visit). Given this data, I am unable to associate providers with practices to also look at practice-level continuity for this study. The COCI is calculated using equation 6-1.

$$\text{COC}= \frac{(\sum_{i=1}^{p} n_i^2)-\text{N}}{N(N-1)} \qquad \textbf{[6-1]}$$

In the above equation, N represents the total number of provider visits during the study period, n_i represents the number of patient visits to provider i, and p represents the total number of providers seen during the study period. The COCI ranger from 0 to 1 with higher index values indicating lesser dispersion; 0 represents perfect dispersion with different providers seen for all visits, and index value of 1 represents that patient only saw a single provider for all visits. COCI is included in the model a categorical variable with three categories to divide the sample into terciles.

The UPC reflects the "density" of visits with a PCP and takes into account the frequency with which patients seek care from the particular provider with whom the patient has the largest proportion of visits (79). This measure, thus, is more physician centered and looks at patient visits with respect to a certain provider (265). UPC is calculated using equation 6-2.

$$\text{UPC} = \frac{ni}{N} \qquad \textbf{[6-2]}$$

In the above equation, N represents the total number of provider visits during the study period and, n_i represents the number of patient visits to provider i. Similar to COCI, UPC is included in the model as a categorical outcome with three categories breaking up the sample into terciles in terms of continuity of care. Breaking up the sample as such facilitates interpretation and making comparisons.

Covariates

I include various sociodemographic and health needs factors along with contextual and environmental factors listed in Table 6-3 that relate to health care for patients with BH and CC. The criteria for inclusion were potential theoretical relevance and utilization in previous research of continuity of care. I use the Andersen Behavioral Model of Health Service Use to adjust for need factors (SMI, Elixhauser comorbidity index, and total number of ambulatory care visits during study time period), predisposing factors (age, gender, and race), and enabling factors (Medicaid eligibility category, income in patients' residential ZIP code, Medicaid enrollment duration). These covariates have significant evidence base in being important in explaining the outcomes of interest in patients with BH disorders (204, 211, 220, 240). Comorbidities can be a significant contributor to utilization of costly health care services (240). Rather than including individual clinical comorbidities, I use Elixhauser Comorbidity Index to create a measure of overall comorbidity with higher score representing grater comorbidity. In addition to patient specific factors, there might be other relevant contextual factors which warrant consideration for inclusion. Contextual factors in the model include population density

Table 6-3: Overview of Covariates
Individual-Level Covariates
Predisposing Factors
Age
Gender
Race/Ethnicity
Enabling Factors
Area Socioeconomic Status
Medicaid Eligibility Category
Enrollment Duration
Need Factors
Severe Mental Illness
Elixhauser Comorbidity index
Total ambulatory care visits
Provider-Level Covariates
Percent of Patients with Chronic BH Conditions
Contextual Factors
Area Population Density
Number of primary care providers in zip-code

and the number of primary care doctors in the zip code. Provider-level factors included in the model are percent of patients with BH disorders. All covariates were included in the model as categorical except for the following which were included as continuous: Elixhauser comorbidity index, patient age, Zip-code level income and population density, number of PCPs in Zip-Code, proportion of Medicaid patients seen by provider in 2015-2016 with BH disorders.

Analysis

Only observations with valid, non-missing values for all variables of interest were included in the analysis. I use the chi-square or t-test to examine whether there were differences in the distributions of continuity of care indices or covariates by outcomes status (Table 6-4-6-7). Subsequently, multivariate logistic regression models with odds ratios and 95% confidence intervals were estimated for high rates of inpatient or ED utilization and Medicaid inpatient or total spending using Stata 15 (StataCorp, College Station, TX). All hypotheses regarding bivariate or multivariate associations were tested at the α=0.05 significance level.

RESULTS

Tables 6-4 through 6-7 show the distribution of sample characteristics along with frequency distribution of covariates by outcomes across the analytic groups. A lower percentage of patients in the high COCI and UPC groups, compared to low and medium categories, are in 90th percentile of inpatient and the ED utilization as well as for inpatient and total spending across all of the groups. Across the different analytic groups, and consistently for both measures of continuity of care, compared to the highest COCI or UPC tercile, the lowest tercile has nearly double the percentage of patients in the 90th percentile of inpatient or ED use as well as total or inpatient spending. Most variables in the model are significantly associated with outcomes in bivariate analysis. A higher percentage of males have high inpatient use, but a higher percentage of females have higher ED utilization across all groups. Nearly twice the

percentage of males have high inpatient and total spending relative to females across all analytic groups, which is not surprising given that inpatient services are the most expensive. When looking among the two groups of patients with BH disorders (not SMI only) nearly twice the percentage of patients with SMI have high ED or inpatient utilization and high inpatient or total spending compared to patients without SMI.

Table 6-8 shows the results of fully adjusted models. For ease of discussion and clarity, since associations between continuity measures and outcomes are similar across analytic groups, the precise point and interval estimates are mentioned here but are available in Table 6-8. Additionally, all associations which are discussed have p-value less than 0.01 and are thus significant. Across all analytic groups, being in the high COCI or UPC categories is associated with nearly 40% reduction, and being in the medium categories is associated with nearly 20% reduction in odds of having high ED utilization compared to the low COCI or UPC groups. In terms of inpatient utilization, across the different analytic groups, being in the highest tercile of COCI or UPC is associated with nearly 30% reduction, and being in the 2nd tercile with almost 15% reduction, in odds of having high inpatient use relative to the lowest COCI or UPC terciles.

As per Table 6-8, for inpatient spending, being in the high COCI or UPC groups is associated with approximately 35% reduction, and being in the medium groups is associated with 15-20% reduction, in odds relative to the low COCI or UPC groups across all analytic groups. For total spending, the overall pattern is similar. For all analytic groups, being in the high COCI or UPC categories is associated with 20-25% reduction, and being the medium groups is associated with 10-15% reduction in odds of having high total spending relative to being in the low COCI or UPC groups.

Though these results are not listed in tables, in fully adjusted models across the different analytic groups, higher Elixhauser mortality scores are associated with higher odds of having high rates of ED visits and inpatient utilization; these results are also consistent with what I observed in Chapter 4. Additionally, higher Elixhauser comorbidity scores are also associated with higher odds of having high total and inpatient and Medicaid spending across all subgroups and models.

DISCUSSION

In this investigation of adult Medicaid enrollees with BH disorders and CC, I found that higher continuity of primary care is associated with reduction in inpatient and ED utilization along with total and inpatient Medicaid spending irrespective of continuity measure or analytic group. These results especially underscore the potential importance of the role of primary care in managing patients with BH disorders and CC. The reduction in odds of having high inpatient utilization and spending was proportional to the level of continuity; compared to the third tercile, the second tercile has less reduction in odds of having high utilization or spending relative to the lowest tercile. As was mentioned in the methods section, nearly 30% of the UPC or COCI distribution have value of one, indicating that patients who obtain all of their care from one PCP, implying less fragmented care, have reduced odds of getting costly hospital use and having high Medicaid spending. These results indicate that if the challenges in maintaining continuity with PCPs for the study population can be overcome, quality of care can very much be improved.

These findings generally support the many previous studies using administrative data-based or patient perception-based measures of continuity to show that increased continuity with PCPs is associated with the improved quality, utilization, and spending outcomes in

patients (81, 82, 275). Additionally, I extend the previous findings by underscoring the importance of continuity of primary care for Medicaid enrollees with BH disorders and CC, a group that is at high risk for receiving fragmented care. The findings that continuity of primary care is important for these patients also lends support to the recent focus of delivery system reform encouraging primary care to better meet needs of patients with BH conditions. Even though these patients' other needs might be better addressed in other systems, this study highlights the importance of the primary care sector in caring for patients with BH disorders.

Based on these results, higher continuity is associated with reduced of having high utilization and spending across all groups of patients, even those with SMI. Whereas patients with mild to moderate BH disturbances interface with the health care system through primary care, patients with SMI often first week care in specialty MH settings (88). Thus, most of the literature focusing on patients with SMI discusses how bringing primary care into specialty MH settings can better meet the needs of these patients (184). While there is more than enough evidential support that "reverse co-location" might be the best way to meet physical health needs of patients with SMI, it is also important to consider that delivery system changes are slow and can take a long time to be universally implemented. While these changes are taking place, meeting the needs of these patients through continuous relationships with providers in the primary care sector should still continue to be emphasized, especially given the high rates of medical comorbidity in this population (296).

From the perspective of policy makes, continuity of care can present a challenge for the causal pathway to high continuity is likely convoluted with patient, provider, community, and larger society-based factors. However there are elements of policy that can at least create an environment which would facilitate continuity. In the care of Medicaid enrollees such policies

might be related to ensuring that contracted managed care plans do not readily change provider networks or to reducing churning or turnover through full-calendar year enrollment, for example.

In terms of the different cohorts of patients, there were no remarkable differences in how continuity of care affected utilization or spending. Additionally, the two measures of continuity have high concordance, which is consistent with what others have observed (262, 263).

LIMITATIONS

Given that this is a cross-sectional study, I can only speak of the observed relationships as association and not as causal relations between patients having higher continuity of care and reduction in utilization. Further, there might be omitted variables which are associated with continuity that I have not accounted for. I am, however, able to adjust for many variables including gender, age, and medical comorbidity, which have been shown in literature to be significantly associated with the outcomes of interest.

Additionally, using only data from adult Medicaid enrollees in NJ, I cannot generalize these findings to other areas or age groups. However, since much of Medicaid policy is made at the state level, out findings can shed light on how to improve care for adult NJ Medicaid enrollees. Further, using claims data to identify conditions allows me to look at only diagnosed conditions.

Finally, continuity of care can happen at different levels. While the literature on relational continuity focuses on continuity with primary care providers, there can also be practice-level continuity. Given available data, I am unable to associate providers with practices for this study, but it should be a focus of a future study. In order to have more insight into

which policies which have the biggest improvement in continuity of care, one future study might look separately at fee-for-service and managed care encounters assess the role that payment systems play in continuity of care.

Table 6-4: Sample Characteristics by High Inpatient Use in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥ 2 Inpatient		All	≥ 2 Inpatient		All	≥ 2 Inpatient	
		Row % or			Row % or			Row % or	
	No.	Mean	P-Value	No.	Mean	P-Value	No.	Mean	P-Value
Total	191,284	12.04		107,904	16.49		95,722	16.97	
Continuity of Care Index			<0.01			<0.01			<0.01
Low	56,727	16.13		33,895	20.98		30,305	21.18	
Medium	75,186	11.99		42,248	16.35		37,431	16.84	
High	59,371	8.18		31,761	11.89		27,986	12.59	
Usual Provider Index			<0.01			<0.01			<0.01
Low	70,100	15.49		41,697	20.21		37,084	20.48	
Medium	65,221	11.78		36,447	16.13		32,373	16.65	
High	55,963	8.01		29,760	11.72		26,265	12.42	
Recipient Gender			<0.01			<0.01			<0.01
male	70,376	14.55		40,700	19.74		34,876	20.18	
female	120,908	10.57		67,204	14.53		60,846	15.13	
Recipient Race			<0.01			<0.01			<0.01
White	80,678	13.52		50,506	17.57		44,884	18.55	
Black	50,681	14.45		29,774	18.64		25,850	18.83	
Hispanic	30,899	8.37		14,433	12.73		13,496	12.51	
Asian/Other	28,385	7.58		12,872	11.61		11,209	11.83	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	54,166	18.48		39,078	21.01		36,306	20.94	
NJ Family Care, Children's Services, Other	62,299	7.08		27,961	10.18		23,984	10.93	
General Assistance	74,819	11.5		40,865	16.49		35,432	17	
Severe Mental Illness			<0.01			<0.01			-
No	95,562	7.09		32,954	10.49		-	-	
Yes	95,722	16.97		74,950	19.13		-	-	
Patient Age	191,284	46.75	<0.01	107,904	47.04	<0.01	95,722	46.40	<0.01
Elixhauser Mortality Score	191,284	12.00	<0.01	107,904	12.02	<0.01	95,722	11.52	<001

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Source: NJ Medicaid claims and enrollment data 2015-2016

Table 6-5: Sample Characteristics by High Emergency Department Use in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥ 5 ED Visits		All	≥ 5 ED Visits		All	≥ 5 ED Visits	
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	191,284	13.79		107,904	19.19		95,722	18.67	
Continuity of Care Index			<0.01			<0.01			<0.01
Low	56,727	18.41		33,895	24.52		30,305	23.96	
Medium	75,186	13.45		42,248	18.68		37,431	18.21	
High	59,371	9.79		31,761	14.18		27,986	13.56	
Usual Provider Index			<0.01			<0.01			<0.01
Low	70,100	17.29		41,697	23.1		37,084	22.63	
Medium	65,221	13.62		36,447	19.02		32,373	18.5	
High	55,963	9.59		29,760	13.91		26,265	13.29	
Recipient Gender			<0.01			<0.01			<0.01
male	70,376	12.18		40,700	17.54		34,876	17.5	
female	120,908	14.72		67,204	20.19		60,846	19.34	
Recipient Race			<0.01			<0.01			<0.01
White	80,678	14.39		50,506	19.31		44,884	19.37	
Black	50,681	18.59		29,774	23.87		25,850	22.54	
Hispanic	30,899	11.15		14,433	16.75		13,496	15.61	
Asian/Other	28,385	6.44		12,872	10.67		11,209	10.69	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	54,166	16.27		39,078	19.55		36,306	19.39	
NJ Family Care, Children's Services, Other	62,299	13.65		27,961	20.4		23,984	18.85	
General Assistance	74,819	12.09		40,865	18.02		35,432	17.81	
Severe Mental Illness			<0.01			<0.01			<0.01
No	95,562	8.89		32,954	14.3		-	-	
Yes	95,722	18.67		74,950	21.34		-	-	
Patient Age	191,284	41.23	<0.01	107,904	42.12	<0.01	95,722	42.09	<0.01
Elixhauser Mortality Score	191,284	7.13	<0.01	107,904	7.54	<0.01	95,722	7.64	<0.01

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Source: NJ Medicaid claims and enrollment data 2015-2016

Table 6-6: Sample Characteristics by High Total Spending in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥90st Percentile		All	≥90st Percentile		All	≥90st Percentile	
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	191,284	10		107,904	10		95,722	10	
Continuity of Care Index			<0.01			<0.01			<0.01
Low	56,727	12.65		33,895	12.14		30,305	11.91	
Medium	75,186	10.23		42,248	9.96		37,431	9.98	
High	59,371	7.19		31,761	7.78		27,986	7.96	
Usual Provider Index			<0.01			<0.01			<0.01
Low	70,100	12.74		41,697	12.34		37,084	12.14	
Medium	65,221	9.56		36,447	9.16		32,373	9.25	
High	55,963	7.07		29,760	7.76		26,265	7.9	
Recipient Gender			<0.01			<0.01			<0.01
male	70,376	13.84		40,700	13.84		34,876	13.96	
female	120,908	7.76		67,204	7.68		60,846	7.73	
Recipient Race			<0.01			<0.01			<0.01
White	80,678	11.45		50,506	10.74		44,884	10.88	
Black	50,681	12.03		29,774	11.83		25,850	11.96	
Hispanic	30,899	5.78		14,433	6.02		13,496	5.51	
Asian/Other	28,385	6.86		12,872	7.29		11,209	7.32	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	54,166	23.08		39,078	19.79		36,306	19.53	
NJ Family Care, Children's Services, Other	62,299	2.94		27,961	2.72		23,984	2.63	
General Assistance	74,819	6.41		40,865	5.62		35,432	5.22	
Severe Mental Illness			<0.01			<0.01			-
No	95,562	5.78		32,954	6.02		-	-	
Yes	95,722	14.22		74,950	11.75		-	-	
Patient Age	191,284	49.58	<0.01	107,904	49.66	<0.01	95,722	49.39	<0.01
Elixhauser Mortality Score	191,284	11.61	<0.01	107,904	12.04	<0.01	95,722	11.66	<0.01

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Source: NJ Medicaid claims and enrollment data 2015-2016

Table 6-7: Sample Characteristics by High Inpatient Spending in 2015-2016 Across Cohorts of Behavioral Health and Chronic Condition Severity

	Patients with BH diagnosis in 2015 or 2016 and CC			Patients with BH diagnosis in 2015 and 2016 and CC			Patients with SMI diagnosis in 2015 or 2016 and CC		
	All	≥90st Percentile		All	≥90st Percentile		All	≥90st Percentile	
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	191,284	10		107,904	10		95,722	10	
Continuity of Care Index			<0.01			<0.01			<0.01
Low	56,727	13.61		33,895	13.34		30,305	13.11	
Medium	75,186	9.99		42,248	9.98		37,431	9.95	
High	59,371	6.55		31,761	6.46		27,986	6.69	
Usual Provider Index			<0.01			<0.01			<0.01
Low	70,100	13.29		41,697	13.03		37,084	12.87	
Medium	65,221	9.59		36,447	9.57		32,373	9.55	
High	55,963	6.35		29,760	6.27		26,265	6.5	
Recipient Gender			<0.01			<0.01			<0.01
male	70,376	13.01		40,700	13.1		34,876	13.01	
female	120,908	8.24		67,204	8.12		60,846	8.27	
Recipient Race			<0.01			<0.01			<0.01
White	80,678	11.03		50,506	10.43		44,884	10.75	
Black	50,681	11.83		29,774	11.5		25,850	11.34	
Hispanic	30,899	6.67		14,433	7.3		13,496	6.76	
Asian/Other	28,385	7.46		12,872	7.89		11,209	7.78	
Medicaid Eligibility Category			<0.01			<0.01			<0.01
Blind/Disabled	54,166	14.51		39,078	13.03		36,306	12.85	
NJ Family Care, Children's Services, Other	62,299	5.31		27,961	4.9		23,984	5.14	
General Assistance	74,819	10.64		40,865	10.59		35,432	10.37	
Severe Mental Illness			<0.01			<0.01			-
No	95,562	6.49		32,954	6.82		-	-	
Yes	95,722	13.5		74,950	11.4		-	-	
Patient Age	191,284	48.03	<0.01	107,904	48.63	<0.01	95,722	47.47	<0.01
Elixhauser Mortality Score	191,284	12.52	<0.01	107,904	13.73	<0.01	95,722	12.27	<0.01

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity. Source: NJ Medicaid claims and enrollment data 2015-2016

Table 6-8: Association Between Continuity of Care in Primary Care and High Rates of Health Care Services Utilization and Spending for Adult Medicaid Enrollees during 2015-2016

	Utilization		Spending	
	≥6 ER Visits	≥2 Inpatient Admissions	≥ 90th Percentile Inpatient Spending	≥ 90th Percentile Total spending
	Odds Ratio (CI)	Odds Ratio (CI)	Odds Ratio (CI)	Odds Ratio (CI)
BH diagnosis in 2015 or 16 and CC				
Continuity of Care Index-Low	Reference	Reference	Reference	Reference
Continuity of Care Index-Medium	0.768*** (0 .744, 0.793)	0.837*** (0.815, 0.860)	0.807*** (0.775, 0.840)	0.892*** (0.855, 0.930)
Continuity of Care Index-High	0.601*** (0.579, 0.623)	0.662*** (0.643, 0.681)	0.634*** (0.605, 0.664)	0.730*** (0.696, 0.766)
Usual Provider Index-Low	Reference	Reference	Reference	Reference
Usual Provider Index-Medium	0.838*** (0.812, 0.865)	0.844*** (0.809, 0.879)	0.832*** (0.799, 0.866)	0.888*** (0.852, 0.926)
Usual Provider Index-High	0.629*** (0.607, 0.653)	0.735*** (0.704, 0.768)	0.646*** (0.617, 0.677)	0.747*** (0.713, 0.783)
BH diagnosis in 2015 and 16 and CC				
Continuity of Care Index-Low	Reference	Reference	Reference	Reference
Continuity of Care Index-Medium	0.777*** (0.749, 0.806)	0.841*** (0.806, 0.878)	0.813*** (0.771, 0.857)	0.868*** (0.821, 0.917)
Continuity of Care Index-High	0.610*** (0.584, 0.637)	0.693*** (0.659, 0.728)	0.621*** (0.583, 0.662)	0.782*** (0.735, 0.833)
Usual Provider Index-Low	Reference	Reference	Reference	Reference
Usual Provider Index-Medium	0.849*** (0.819, 0.881)	0.851*** (0.812, 0.892)	0.835*** (0.792, 0.880)	0.833*** (0.788, 0.880)
Usual Provider Index-High	0.638*** (0.611, 0.666)	0.777*** (0.739, 0.817)	0.638*** (0.598, 0.680)	0.804*** (0.756, 0.854)
SMI diagnosis in 2015 or 16 and CC				
Continuity of Care Index-Low	Reference	Reference	Reference	Reference
Continuity of Care Index-Medium	0.771*** (0.741, 0.802)	0.847*** (0.809, 0.886)	0.818*** (0.774, 0.865)	0.880*** (0.831, 0.933)
Continuity of Care Index-High	0.601*** (0.574, 0.630)	0.719*** (0.682, 0.757)	0.652***(0.609, 0.697)	0.800*** (0.749, 0.855)
Usual Provider Index-Low	Reference	Reference	Reference	Reference
Usual Provider Index-Medium	0.846*** (0.813, 0.880)	0.856*** (0.814, 0.899)	0.842*** (0.796, 0.891)	0.855*** (0.807, .907)
Usual Provider Index-High	0.631*** (0.603, 0.661)	0.756*** (0.761, 0.845)	0.669*** (0.625, 0.715)	0.818*** (0.767, 0.872)

Note: BH: Behavioral health; CC: Chronic Medical Condition; OR: Odds ratio; CI: Confidence Interval. The number of stars indicates significance level (***p<0.001; **p<0.01; *p<0.05). Source: New Jersey Medicaid claims and enrollment data from 2015-2016 and U.S. Census data. All models are adjusted for age, gender, race, elixhauser comorbidity score, SMI (except for the subgroup with SMI only), Medicaid eligibility category, numbers of days enrolled in 2015-2016, total number of ambulatory care visits in 2015 and 2016, Zip-code level income and population density, percent of patients with BH disorder seen by physician, and number of primary care provider in zip code.

Chapter 7: Summary, Policy Implications and Future Research

Structure of Dissertation and Key Findings

Behavioral health (BH) disorders, comprising mental health (MH) disorders and substance use disorders (SUD), are a leading cause of disability globally (1). In the United States (US), nearly one in every five adults (46.6 million) aged 18 and older suffered from a mental illness in 2017, with 4.1% having a serious mental illness (SMI) (2). Medical and psychiatric comorbidities are very common, and patients with both have worse medical prognosis and higher symptom burden and functional impairment (3). Further, BH conditions are disproportionately represented in patients who rely extensively on hospital-based services, accounting for a high share of spending on health care in the US (4-6). Public payers bear majority of the spending burden with Medicaid accounting for more than a quarter of spending on BH services nationally, a key driver of Medicaid costs (7). Among Medicaid enrollees, compared to those without BH conditions, enrollees with BH conditions are more likely to also have Chronic Medical Comorbidity (CC) and self-rate their health as poor (269).

Despite the need for better management of BH conditions and improvement in treatments, the mental healthcare system does not reach many people who need services and often provides uncoordinated care to those who do have access (8, 9). With nearly one-third of adults who have a MH-related visit seeking care solely in primary care settings, these settings present an opportunity to assess and threat behavioral disorders and address patient's psychosocial needs (12-15). This dissertation examines the challenges and opportunities in caring for patients with BH and CC by investigating how aspects of primary care including BH provider co-location or integration in primary care settings or continuity with primary care providers might relate to quality of care for patients.

In chapters 2 through 4, I investigate correlates of BH provider co-location or integration in primary care settings and subsequently look at association of BH provider co-location and integration with provider perceptions and patient health care services utilization. In chapter 2, I use data from a 2015 survey of primary care practices in New Jersey (PCP Survey) and utilize logistic regression to show that larger practices and those located within the context of community health centers have higher odds of having co-located BH providers. Similarly, larger practices, and those with higher number of health information technology capabilities, have higher odds of record-sharing between BH and medical providers. These observations are in line with previous research and jointly show that capacity is an important consideration in bringing about practice transformation (13).

Subsequently in chapter 3, using the PCP Survey data and logistic regression, I find that having BH-provider co-location is associated with higher odds of providers agreeing that it is easy to find MH services for patients. This finding is important, for it adds to previous work (mostly qualitative) discussed in chapter 3, showing that primary care providers find value in having behavioral health providers in proximity (274). Whereas BH provider co-location is not significantly associated with primary care providers agreeing that they receive timely information from MH providers, having care managers in practice is associated with higher odds of this outcome. Information from different sources is integrated in order to provide comprehensive primary care for patients, and this is especially important for patients with BH disorders given their complex needs. These findings jointly imply that while BH provider colocation is important, there are other aspects of practices, such as care coordination, which play critical role in facilitating timely information exchange.

In chapter 4, I use PCP Survey and Medicaid claims and enrollment data from 2015-2016 in order compare use of costly hospital-based services for patients seeking care at primary care

practices with and without BH provider co-location or integration. I used multi-level modeling to look at the association between co-location and integration and having high (>90th percentile) utilization of emergency department (ED) and inpatient services along with having any 30-day all-cause readmission or any preventable hospitalizations. Though my results do not show significant association between co-location or integration and reduction in odds of having high levels of any of the aforementioned costly hospital services, the conclusion is not that co-location is ineffective in reducing utilization of inpatient use. It is possible that a higher-intensity co-location might be muted by how I operationally defined co-location. Contrarily, it is also possible that there are aspects of inpatient service use which are impervious to significant change through changes in primary care. Further research is needed to explore these relationships.

In Chapter 5, I shift focus to another aspect of primary care provision to examine the association between BH disorders and continuity of care with primary care providers using ordinal regression and tobit models. Continuity of care was measured using previously-validated Bice-Boxerman continuity of care index (COCI) along with the Usual Provider of Care (UPC) index. Results showed that having SMI, depression, or BH disorders generally is associated with reduced odds of having high continuity with primary care providers; anxiety was found to be associated with having increased odds of high continuity. The association was similar across measures of continuity, and conclusions were similar whether I measured continuity outcomes as continuous of categorical. Additionally, the inverse association between having BH condition and reduced odds of high continuity was not only statistically significant, but the magnitude was such that the results are also substantively important. Our observations emphasize the challenges faced by patients with BH disorders and other CC as well as by providers and policy makers in ensuring the delivery of quality primary care.

Continuing to investigate the importance of continuity in primary care for patients with BH disorders and CC, in chapter 6, I use logistic regression to examine the association between continuity of care (COCI and UPC index) and having high (>90th percentile) health care service use and Medicaid spending. There is a strong and consistent association between higher continuity of care with primary care providers and reduction in odds of having high utilization of emergency department (ED) and inpatient use along with total and inpatient spending for Medicaid enrollees with BH disorders and CC. Our findings relating to continuity of care reinforce its importance as a facet of high-quality primary care.

Limitations and Future Research

There are several important limitations which must be considered when interpreting the findings from this dissertation. The cross-sectional nature of the PCP Survey data does not allow for isolating causality or directionality of relationships, but I can look at associations. By adjusting for the many factors which have been shown to be important in studying the outcomes of choice, I was able to alleviate some of the concern. However, there can be other ways of addressing this issue which future projects should employ. Whereas there are no national surveys of primary care practices that include questions about BH staffing, it might be possible to link practice level data available from Center of Medicare and Medicaid (CMS) to Medicaid claims data which would allow us to look at outcomes at practice level before and after co-location, for such practice level data is available for multiple years. Additionally, my analysis focused on Medicaid enrollees in only one state and did not include health care utilization data for NJ residents who are not enrolled in Medicaid. However, of the 8.9 million population in New Jersey, nearly a quarter are low-income and 17% are covered by Medicaid/Child Health Insurance Program(CHIP), and thus we are able to have complete health

care utilization information for almost 20% of the population (297). Because I use only New Jersey data, the results cannot be generalized to other places. With many of the policies that affect medical practice being made at the state level, however, it is important to look within the states to see how to improve care. Even though my results cannot be generalized to other states, with the sampling framework used, the results should be generalizable to New Jersey and can thus shed light on how primary care practices are organized and can be improved in NJ. For future studies, I will look to expand the geographical scope of the work to use national level data including Medicaid Analytic eXtract (MAX) data.

For the parts of the dissertation on continuity of care, it is important to acknowledge that continuity of care can happen at different levels. While the literature on relational continuity focuses on continuity with primary care providers, there can also be practice-level continuity. Given available data, I am unable to associate providers with practices for this study, but it should be a focus of a future study. In order to have more insight into which policies might have the biggest improvement in continuity of care, future studies should look separately at fee-for-service and managed care encounters assess the role that payment systems play in continuity of care.

Policy and Practice Implications

As mentioned, nearly 20% of New Jersey's population is covered by Medicaid, which makes it imperative to have strategies to improve care for this low-income group, especially those with BH conditions and CC (297). The findings in chapter 2 underscore the importance of looking into policies that provide more resources for small practices to facilitate practice changes such and BH provider co-location, for these practices comprise a large share of primary care in New Jersey. The finding regarding potential importance of care managers in facilitating

information exchange is important from a policy perspective, especially as payer support for such practice transformation can have tremendous gains in quality of care (298). Most of the literature showing association of co-location and integration with reduction in health care service utilization has been in health care systems with more structured integration programs. That our study does nor corroborate previous results highlights the need for future studies to look into how precisely primary care practices are locally incorporating BH services into primary care. We need to better understand how co-location and integration is being understood and implemented in local contexts, especially in smaller practices.

The results from chapters 5 and 6 jointly present an opportunity to help patients with low resources in primary care settings. Medicaid enrollees with various BH disorders have less continuity but if continuity can be improved, there might be scope for significant reduction in expensive health care services use along with Medicaid spending. We have extended previous findings regarding association between continuity of care in primary care settings and health care service utilization by showing that continuity is associated with reduced odds of having high ED visits or hospitalizations for Medicaid enrollees with BH conditions and CC. These findings imply that policies to improve continuity of care for Medicaid enrollees with BH disorders should be encouraged. Even though we only used NJ data, coverage programs for low-income adults including Medical enrollees will likely benefit nationally from specific efforts in order to encourage continuity or primary care, which is a hallmark of health care reform (299). Such policies might be related to maintaining more consistent networks of primary care providers so that patients can continue to see the same providers over time. In 2018, 57% per total Medicaid spending was on managed care, which comprises a significant part of Medicaid (297). Making policies that ensure the managed care plan maintain some stability in their provider networks will make it easier for patients to have continuity.

Whereas stability in provider networks is likely very important, so is general continuity in coverage of Medicaid. Many low-income adults have fluctuations in household composition or income that can influence Medicaid eligibility and cause periods of lack of coverage or churning between Medicaid and other payers such as marketplace plans. Strategies to reduce such churning might include expanding the choice of Medicaid plans to those being offered in the exchanges with the government paying premiums for those eligible for Medicaid. Another possible way to reduce churning might be to extend policy coverage from when a person becomes eligible to a certain time period without consideration of subsequent eligibility during that period. Using U.S. Census Bureau's Survey of Income and Program Participation data, a group of researchers used simulation to look at potential policy options for addressing the problem of Medicaid churn. These researchers found that two policy options including extending coverage through calendar year or for one year from time of enrollment can both be effective options improve continuity of care for Medicaid enrollees (300).

Appendices

Appendix A: Primary Care Physician Survey

(Survey Page 1)

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NJ Primary Care Practice Survey

RUTGERS Center for State Health Policy

Please complete survey questions in reference to the New Jersey practice location where you provide the most primary care services. If uncertain about an answer, give your best estimate. **All responses will be kept strictly confidential.**

1. **During your last complete week of work, approximately how many hours did you spend delivering primary care services at this location?**

☐☐☐ # hours ☐ IF zero PRIMARY CARE hours, CHECK HERE and return the survey in the envelope provided

2. Please indicate your level of agreement or disagreement with the following statements:	Agree Strongly	Agree Somewhat	Neither Agree nor Disagree	Disagree Somewhat	Disagree Strongly
a. Changes in the health care system are likely to help me improve care for patients with chronic conditions in the next few years	O	O	O	O	O
b. It is easy to secure mental health services for my patients if needed	O	O	O	O	O
c. It is easy to secure smoking cessation services for my patients if needed	O	O	O	O	O
d. E-cigarettes/vaping is a health problem among my patients	O	O	O	O	O
e. I receive timely notifications when my patients are *hospitalized* or visit an *emergency room*	O	O	O	O	O
f. I receive timely information I need from *medical specialists* my patients visit	O	O	O	O	O
g. I receive timely information I need from *mental health providers* my patients visit	O	O	O	O	O

Health Information Systems at the Location Where You Provide the Most Primary Care

3. **What percent of <u>your</u> ...**

a. prescription orders are sent electronically (e-prescribing) to a pharmacy? ☐☐☐ %

b. lab orders are you able to <u>send</u> electronically?..... ☐☐☐ %

c. patient records are maintained on an Electronic Health Record?..... ☐☐☐ % **IF NONE, skip to Question 8**

4. **Do you have electronic access to...**

a. clinical information on your patients' emergency room visits? O Yes O No

b. hospital discharge summaries for your patients? O Yes O No

c. reports from specialist physicians? O Yes O No

d. records of prescriptions filled by your patients? O Yes O No

1 0 0 0 0 1

(Survey Page 2)

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Staffing and Practice Characteristics at the Location Where You Provide the Most Primary Care

15. **How many total primary care locations does your practice organization have?** ☐☐ # locations

16. **Is this a single specialty or multi-specialty practice?** O Single Specialty Practice O Multi-Specialty Practice

17. **In a typical work week, do any of the following work in your practice at this location:**

a.	Nurse practitioners/advance practice nurses	O Yes O No
b.	Physician assistants	O Yes O No
c.	Nurse care managers/care coordinators	O Yes O No
d.	Social workers/case managers	O Yes O No
e.	Health educators or health coaches	O Yes O No

18. **How many of the following full-time or part-time patient care staff, if any, work in your practice at this location on a typical work day?** *(your best estimate is fine; enter zero if none)*

a. Physicians (MD or DO).....	☐☐☐ # full time	☐☐☐ # part-time
b. Behavioral health providers (e.g., psychologist)	☐☐☐ # full time	☐☐☐ # part-time

(If no behavioral health providers, skip to Q20)

19. **Do medical and behavioral health providers at this practice location have routine access to each other's clinical records** (e.g., progress notes and treatment plans) **for shared patients?**

O Yes O No

20. **What best describes this practice location?** *(Mark one only)*

O Private office
O Federally Qualified Health Center (FQHC)
O Hospital based clinic or outpatient department
O Other health center/clinic (not hospital based or FQHC)
O Medical school/faculty practice plan
O Other, specify ☐

21. **Which of the following hold ownership stake(s) in your practice?** *(Mark all that apply)*

☐ Physician(s) in your practice
☐ Non-physician managers in your practice
☐ Hospital, health system, hospital holding company
☐ HMO or other insurance entity
☐ Non-profit/government/state university entity
☐ Other, specify ☐

22. **Does your practice participate in any of the following Accountable Care Organizations?** *(Mark all that apply)*

☐ Medicare ACO Shared Savings Program ☐ NJ Medicaid ACO Demonstration ☐ Commercial ACO

23. **During the past year, did you or your practice receive any performance payments from a health plan or government program based on the following?**

a.	Performance on patient satisfaction	O Yes O No
b.	Performance on clinical quality measures	O Yes O No
c.	Reporting of clinical quality measures	O Yes O No
d.	Performance on patient utilization or cost	O Yes O No
e.	Meaningful use of information technology	O Yes O No

1 0 0 0 0 1

(Survey Page 3)

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5. **How many of your patients, if any, communicate with you electronically through a secure web portal?**
   O All O Most O Some O None
6. **Can your practice easily generate an electronic list of patients needing care for a specific chronic condition(s)** (e.g., diabetes patients with HbA1c>8)**?** O Yes O No
7. **Do you use electronic reminders at the time of patient visits about recommended tests or treatment for your patients with chronic medical conditions?** O Yes O No
8. **Indicate whether you receive any patient satisfaction, preventive screening, utilization/cost or clinical quality data from the following sources and rate their usefulness:** *(mark one per row)*

Source of data	Very Useful	Somewhat Useful	Not Very Useful	Not At All Useful	DO NOT receive data from this source
Your EHR	O	O	O	O	O
Health Insurance Plans	O	O	O	O	O
Hospitals or Hospital Systems	O	O	O	O	O
Accountable Care Organizations	O	O	O	O	O

Care Management, Access, and Health Promotion at the Location Where You Provide the Most Primary Care

9. **Does your practice use primary care teams, by which we mean groups of physicians or other staff who meet with each other regularly to discuss the care of patients for whom they share responsibility for care?**
   O Yes O No O Plan to in future
10. **Does your practice use "advanced access" or "open access" scheduling that encourages your office staff to offer same-day appointments to virtually all patients who want to be seen?**
    O Yes O No O Plan to in future
11. **Does your practice have group visits in which multiple patients with chronic illnesses meet together with a trained clinician to address clinical, behavioral, or psychosocial concerns?**
    O Yes O No O Plan to in future
12. **Does your practice routinely send reminders to your patients for recommended…**
    a. preventive services (e.g., immunizations or cancer screening)?
       O Yes O No O Plan to in future
    b. follow-up care (e.g., HbA1c testing) to your patients with chronic conditions?
       O Yes O No O Plan to in future
13. **Do you routinely refer patients for tobacco cessation services (NJ Quitline or NJ Mom's Quit Connection) offered by the NJ Department of Health to your patients who smoke?**
    O Yes O No O Plan to in future
14. **How often, if ever, do you recommend to patients that smoke that they switch to e-cigarettes/vaping?**
    O Never O Sometimes O Often

1 0 0 0 0 1

(Survey Page 4)

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24. Approximately what percent of your practice's annual revenue did these additional payments from Question 23 above constitute, if any? *(your best estimate is fine)* ☐☐☐ %

25. For about how many of your patients, if any, does your practice receive monthly care management fees?

O All O Most O Some O None

26. Is your practice recognized by the National Committee of Quality Assurance (NCQA) as a Patient-Centered Medical Home (PCMH) and, if so, at what level?

O Not a PCMH O Level 1 PCMH O Level 2 PCMH O Level 3 PCMH

27. Does your practice have plans to adopt any of the following strategies? *(mark one per row)*	**Have Specific Plans to Implement**	**Considering, but No Specific Plans**	**No Plans to Implement**
a. Obtain or increase level of PCMH certification	O	O	O
b. Join (additional) Accountable Care Organizations (ACOs)	O	O	O
c. Invest in improving EHR capacity	O	O	O
d. Hire (additional) non-physician care management staff	O	O	O
e. Hire (additional) health educators/coaches	O	O	O
f. Hire (additional) behavioral health providers	O	O	O
g. Enter into (additional) formal financial arrangements with a hospital or health system	O	O	O

28. About what percent of your patients have these primary payment sources? *(your best estimate is fine)*

29. Are you accepting NEW patients with these payment sources?

a. Medicare.....	☐☐☐ % →	O Yes	O No
b. Medicaid/NJFamilyCare.....	☐☐☐ % →	O Yes	O No
c. Uninsured/Self-pay.....	☐☐☐ % →	O Yes	O No
d. All others (e.g., private plans, workers' comp)	☐☐☐ % →	O Yes	O No

100%

30. About what percent of your patients...	**None**	**1-10%**	**11-25%**	**More than 25%**
a. have a chronic or severe behavioral health diagnosis?	O	O	O	O
b. need language translation services during their visits?	O	O	O	O
c. face social challenges such as hunger or housing instability?	O	O	O	O

31. Your age? ☐☐ years old

32. Your gender? O Male O Female

33. Do you plan to retire or leave clinical practice within the...

O Next 2 years O Next 5 years O Next 10 years O Longer/Unsure

THANK YOU!!

Please return in the enclosed stamped, addressed envelope or mail to:
NJ Primary Care Practice Survey, c/o Abt SRBI Inc.
55 Wheeler Street Suite 1A, Cambridge, MA 02138

1 0 0 0 0 1

Appendix B: Service and Procedural Codes Included in Sample Selection to Specify Primary Care Claims

HCPCS)/ Current Procedural Technology (CPT)	Description
99201–99205	New patient, office, or other outpatient visit
99211–99215	Established patient, office, or other outpatient visit
99241-99245	Office Consult
99304–99306	New patient, nursing facility care
99307–99310	Established patient, nursing facility care
99315–99316	Established patient, discharge day management service
99318	Established patient, other nursing facility service
99324–99328	New patient, domiciliary or rest home visit
99334–99337	Established patient, domiciliary or rest home visit
99339–99340	Established patient, physician supervision of patient (patient not present) in home, domiciliary, or rest home
99341–99345	New patient, home visit
99347–99350	Established patient, home visit
G0402	Initial Medicare visit
G0438	Annual wellness visit, initial
G0439	Annual wellness visit, subsequent
G0463*	Hospital outpatient clinic visit (ETA hospitals only)
99381-99397	Preventive Medicine Claims
99401-99409	Preventive Medicine Claims

Appendix C: CCS Categories Used in Identifying Behavioral Health Conditions

	CCS Number		CCS Description
Behavioral Health	**Mental Health**		
	5.1	650	Adjustment disorders
	5.2	651	Anxiety disorders
	5.3	652	Attention deficit conduct and disruptive behavior disorders
	5.7	656	Impulse control disorders not elsewhere classified
	5.8	657	Mood disorders
	5.9	658	Personality disorders
	5.10	659	Schizophrenia and other psychotic disorders
	5.13	662	Suicide and intentional self-inflicted injury
	5.14	663	Codes related to mental health disorders
	5.15	670	Miscellaneous mental disorders
	Substance Abuse		
	5.11	660	Alcohol-related disorders
	5.12	661	Substance-related disorders
	5.14.2[12]	6632	Codes related to substance-related disorders

Source: AHRQ Clinical Classification Software (CCS). Numbers in the first column denote multi-level CCS diagnostic categories. Numbers in the second column denote single-level categories.

[12] Only use if claim had ICD-9 coding

Appendix D: ICD-9-CM Diagnosis Codes Used in Identifying Severe Mental Illness

ICD-9-CM Diagnosis Codes by Category and Severity Level	Categories of M/SU disorders
295(all); 297(all); 298(all)	Psychoses
296.00-06, 10-16, 40-46, 50-56, 60-66; 296.7; 296.80-82, 89, 90, 99	Bipolar I and II conditions
304 (all); 648.3(all); 655.5(all); 760.72, 73, 75; 779.5; 965.0(all)	Drug dependence
300.3	Obsessive-compulsive disorder
300.4; 309.1; 301.11-12	Dysthymia (chronic depression)
301.83	Borderline Personality Disorder
78.01	Hallucinations (Delirium and Dementia)
313.81	Oppositional defiant disorder
296.20, 23, 24, 30, 33, 34; 301.20; 312.03, 13, 21; V11.0	Related ICD-9-CM codes "severe"

Appendix E: Definition of Chronic Conditions

CCW Chronic Conditions	
Acquired Hypothyroidism	Cataract
Acute Myocardial Infarction	Chronic Kidney Disease
Alzheimer's Disease	Chronic Obstructive Pulmonary Disease
Alzheimer's Disease, Related Disorders, or Senile Dementia	Diabetes
Anemia	Glaucoma
Asthma	Heart Failure
Atrial Fibrillation	Hip / Pelvic Fracture
Benign Prostatic Hyperplasia	Hyperlipidemia
Cancer, Colorectal	Hypertension
Cancer, Endometrial	Ischemic Heart Disease
Cancer, Breast	Osteoporosis
Cancer, Lung	Rheumatoid Arthritis / Osteoarthritis
Cancer, Prostate	Stroke / Transient Ischemic Attack
Other Chronic or Potentially Disabling Conditions Included in Indicator	
Autism Spectrum Disorders	Multiple Sclerosis and Transverse Myelitis
Cerebral Palsy	Muscular Dystrophy
Cystic Fibrosis and Other Metabolic Developmental Disorders	Obesity
Epilepsy	Other Developmental Delays
Fibromyalgia, Chronic Pain and Fatigue	Peripheral Vascular Disease (PVD)
Human Immunodeficiency Virus and/or Acquired Immunodeficiency Syndrome (HIV/AIDS) *	Pressure and Chronic Ulcers
Intellectual Disabilities and Related Conditions	Sensory - Blindness and Visual Impairment
Learning Disabilities	Sensory - Deafness and Hearing Impairment
Leukemias and Lymphomas	Spina Bifida and Other Congenital Anomalies of the Nervous System
Liver Disease, Cirrhosis and Other Liver Conditions	Spinal Cord Injury
Migraine and Chronic Headache	Traumatic Brain Injury and Nonpsychotic Mental Disorders due to Brain Damage
Mobility Impairments	Viral Hepatitis (General)

Appendix F: AHRQ Prevention Quality Indicators– Composites and Constituents

Overall Composite (PQI #90)	
PQI #01 Diabetes Short-Term Complications Admission Rate	PQI #11 Bacterial Pneumonia Admission Rate
PQI #03 Diabetes Long-Term Complications Admission Rate	PQI #12 Urinary Tract Infection Admission Rate
PQI #05 Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate	PQI #13 Angina without Procedure Admission Rate[13]
PQI #07 Hypertension Admission Rate	PQI #14 Uncontrolled Diabetes Admission Rate
PQI #08 Congestive Heart Failure (CHF) Admission Rate	PQI #15 Asthma in Younger Adults Admission Rate
PQI #10 Dehydration Admission Rate	PQI #16 Rate of Lower-Extremity Amputation Among Patients With Diabetes
Chronic Composite (PQI #92)	
PQI #01 Diabetes Short-Term Complications Admission Rate	PQI #13 Angina without Procedure Admission Rate[13]
PQI #03 Diabetes Long-Term Complications Admission Rate	PQI #14 Uncontrolled Diabetes Admission Rate
PQI #05 Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate	PQI #15 Asthma in Younger Adults Admission Rate
PQI #07 Hypertension Admission Rate	PQI #16 Rate of Lower-Extremity Amputation Among Patients With Diabetes
PQI #08 Congestive Heart Failure (CHF) Admission Rate	

Source: Prevention Quality Indicators Technical Specifications - Version 5.0, March 2015; http://www.qualityindicators.ahrq.gov/Modules/PQI_TechSpec.aspx.

[13] This component was retired in Version 6.0 of the PQI software which accommodated ICD-10 coding. This software version was used for generating the overall composite indicator in October-December 2015.

Appendix G: Demographic and Other Characteristics of Adult Medicaid Enrollees by Attribution Status to PCP Survey Providers 2015-2016

	Total	Attributed to Survey Providers	
	No.	Row % or Mean	P-Value
Total	637,523	2.80	-
Recipient Gender			<0.01
male	227,766	2.68	
female	409,757	2.85	
Recipient Race			<0.01
White	240,648	3.17	
Black	158,048	2.18	
Hispanic	123,324	2.89	
Asian/Other	112,909	2.74	
Broad Medicaid Eligibility Categories			<0.01
Blind/Disabled	104,119	2.62	
NJ Family Care, Children's Services, Other	311,405	2.98	
General Assistance	221,999	2.61	
Behavioral Health Disorder			<0.01
No	320,638	2.68	
Yes	316,885	2.90	
Mental Illness			<0.01
No	392,666	2.66	
Yes	244,857	3.00	
Substance Use Disorder			0.591
No	452,444	2.78	
Yes	185,079	2.81	
Mental Illness and Substance Use Disorder			<0.01
No	524,472	2.75	
Yes	113,051	2.96	
Severe Mental Illness			<0.01
No	487,346	2.73	
Yes	150,177	3.00	
Age (Average)	637,523	38.55	<0.01
Elixhauser Comorbidity Score (Average)	637,523	2.44	0.27
Enrollment Duration (days) (Average)	637,523	681.63	<0.01
Zip-Code Population Density (per sq. mile) (Average)	637,523	8815.80	0.42
Zip-code Income Per capita (Average)	637,523	60518.32	0.02

Note: Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. *Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits.

Appendix H: Survey Practice Characteristics of Primary Care Practices in New Jersey With and Without Attributed Medicaid Patients, 2015

	Among providers for from NPI is available		
	Total	Has Attributed Patients	
	No.	Row % or Mean	P-Value
Total	390	70.00	-
BH Provider Co-location			0.04
No	296	71.96	
Yes	72	59.72	
BH Provider Integration			0.2
No	319	72.10	
Yes	28	60.71	
Single Specialty			0.16
No	85	76.47	
Yes	300	68.67	
Specialty			0.06
Family Medicine/General Practice	111	72.07	
Internal Medicine	119	76.47	
Obstetrics and Gynecology/Pediatrics	160	63.75	
Number of Practice Locations			<0.01
1	257	68.09	
2-3	67	61.19	
4 or more	60	88.33	
Practice Location			0.21
Private office	308	68.51	
CHC or hospital/ outpatient clinic	82	75.61	
% patients with chronic or severe behavioral health diagnosis			0.57
<25%	331	69.79	
≥25%	53	73.58	
At least 20% have Medicaid or Uninsured			<0.01
No	273	62.27	
Yes	117	88.03	
Provider Gender			0.82
Male	223	70.85	
Female	162	69.75	
Number of Non-BH Providers	386	3.53	0.02
Provider Age	384	52.24	0.05

Note: NPI: National Provider Identification Number. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data.

Appendix I: Sample Characteristics by Whether Patient Seeks Care in Practice with Co-location or Integration in 2015-2016 for Adult Medicaid Enrollees in Sample Who are Attributed to Practices Completing PCP Survey

	Patient Attributed to practice with BH Provider Co-location			Patient Attributed to practice with BH Provider Integration		
	No.	Row % or Mean	P-Value	No.	Row % or Mean	P-Value
Total	16,884+	14.15	-	16,545+	6.53	-
Recipient Gender			0.33			0.02
Male	5,751	13.79		5,664	5.70	
Female	11,133	14.34		10,881	6.97	
Recipient Race			<0.01			0.14
White	7,252	15.58		7,128	6.97	
Black	3,232	16.4		3093	6.63	
Hispanic	3,381	9.46		3335	6.18	
Asian/Other	2,958	13.69		2929	5.8	
Medicaid Eligibility Category			<0.01			<0.01
Blind/Disabled	2,573	19.47		2,506	8.42	
NJ Family Care, Children's Services, Other	8,791	11.93		8,626	5.96	
General Assistance	5,520	15.20		5,413	6.58	
Sever Mental Illness			<0.01			<0.01
No	12,609	12.49		12,387	5.89	
Yes	4,275	19.04		4,158	8.47	
BH diagnosis in 2015 or 2016 and CC			<0.01			<0.01
No	8,145	11.52		8,010	5.08	
Yes	8,739	16.6		8,535	7.90	
BH diagnosis in 2015 and 2016 and CC			<0.01			<0.01
No	12,194	12.21		11,987	5.55	
Yes	4,690	19.19		4,558	9.13	
Chronic Medical Comorbidity			<0.01			<0.01
No	4,348	12.21		4,282	5.44	
Yes	12,536	14.82		12,263	6.92	
Ambulatory Care Sensitive Conditions			<0.01			0.3
No	7,687	13.01		7,553	6.32	
Yes	9,197	15.10		8,992	6.72	
Elixhauser Mortality Score	16,884	3.23	<0.01	16,545	2.79	<0.01
Patient Age	16,884	41.34	<0.01	16,545	39.37	0.04

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity; ACSC: Ambulatory Sensitive Care Condition. Data Source: The linked data sets of Center for State Health Policy Primary Care Physician Survey from 2015, New Jersey Medicaid claims and enrollment data from 2015-2016, and U.S. Census data. *Sample includes adults aged 18–64 years who are enrolled in Medicaid over the study period (2015-2016) for at least 13 months and have at least two primary care visits. Details of clinical inclusion criteria for BH of CC can be found in the Table 4-2 in Chapter 4 as well as in Appendices C, D, E. +These numbers differ slightly from the sample size in Chapter 4 Figure 4-3 because of missing values on some of the variables.

Appendix J: Random intercept variance components models

	Intercept	Intercept Variance and Standard Error	P-value	Interclass Correlation Coefficient
High ED Utilization (At Least 5 ED Visits During Study Period)				
Patients with BH diagnosis in 2015 or 16 and CC	-1.73	0.25 (0.06)	<0.01	7.03%
Patients with BH diagnosis in 2015 and 16 and CC	-1.34	0.24 (0.06)	<0.01	6.70%
Patients with Severe Mental Illness and CC	-1.36	0.16 (0.05)	<0.01	4.58%
High Inpatient Utilization (At Least 2 Hospitalizations During Study Period)				
Patients with BH diagnosis in 2015 or 16 and CC	-0.88	0.30 (0.06)	<0.01	8.50%
Patients with BH diagnosis in 2015 and 16 and CC	-0.65	0.19 (0.05)	<0.01	5.56%
Patients with Severe Mental Illness and CC	-0.56	0.15 (0.05)	<0.01	4.23%
All-Cause 30-Day Readmissions				
Patients with BH diagnosis in 2015 or 16 and CC	-2.11	0.37 (0.16)	<0.01	10.10%
Patients with BH diagnosis in 2015 and 16 and CC	-1.9	0.28 (0.15)	<0.01	7.83%
Patients with Severe Mental Illness and CC	-1.8	0.22 (0.13)	<0.01	6.24%
PQI Chronic Composite				
ACSC + Behavioral Health Disorder in 2015 or 16	-3.42	0.21 (0.11)	<0.01	5.89%
PQI Overall Composite				
ACSC + Behavioral Health Disorder in 2015or 16	-2.98	0.11 (0.07)	0.01	3.27%

Note: BH: Behavioral health; SMI: Severe Mental Illness; CC: Chronic medical comorbidity; ACSC: Ambulatory Sensitive Care Condition. The intercept, variance, and standard error are for the null two-level model (intercept-only). P-value from Likelihood Ratio Test tests the null hypothesis that level two variance is zero. Interclass correlation coefficient is the percent of total variance in level one outcome that can be explained at level 2.

Appendix K: Diagnostic and procedural codes to identify depression and anxiety

Conditions	Valid ICD-9 / MS DRG / HCPCS Codes	Valid ICD-10 Codes	Number/Type of Claims to Qualify[14]
Depression	DX 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 296.51, 296.52, 296.53, 296.54, 296.55, 296.56, 296.60, 296.61, 296.62, 296.63, 296.64, 296.65, 296.66, 296.89, 298.0, 300.4, 309.1, 311 (any DX on the claim)	DX F31.30, F31.31, F31.32, F31.4, F31.5, F31.60, F31.61, F31.62, F31.63, F31.64, F31.75, F31.76, F31.77, F31.78, F31.81, F32.0, F32.1, F32.2, F32.3, F32.4, F32.5, F32.9, F33.0, F33.1, F33.2, F33.3, F33.40, F33.41, F33.42, F33.8, F33.9, F34.1, F43.21, F43.23 (any DX on the claim)	At least 1 inpatient, SNF, HHA, HOP or Carrier claim with DX Codes[15] over one year
Anxiety	DX 293.84, 300.00, 300.01, 300.02, 300.09, 300.10, 300.20, 300.21, 300.22, 300.23, 300.29, 300.3, 300.5, 300.89, 300.9, 308.0, 308.1, 308.2, 308.3, 308.4, 308.9, 309.81, 313.0, 313.1, 313.21, 313.22, 313.3, 313.82, 313.83 (any DX on the claim)	DX F06.4, F40.00, F40.01, F40.02, F40.10, F40.11, F40.210, F40.218, F40.220, F40.228, F40.230, F40.231, F40.232, F40.233, F40.240, F40.241, F40.242, F40.243, F40.248, F40.290, F40.291, F40.298, F40.8, F40.9, F41.0, F41.1, F41.3, F41.8, F41.9, F42, F42.2, F42.3, F42.4, F42.8, F42.9, F43.0, F43.10, F43.11, F43.12, F44.9, F45.8, F48.8, F48.9, F93.8, F99, R45.2, R45.5, R45.6, R45.7 (any DX on the claim)	At least 1 inpatient OR 2 other non-drug claims of any service type with DX codes over 2 years

[14] When 2 claims are required, they must occur at least one day apart. Note that the claims inclusion rules for these algorithms differ somewhat from the rules for the set of "CCW Chronic Condition Algorithms."

[15] SNF refers to skilled nursing facility; HHA refers to home health agency; HOP refers to hospital outpatient. Carrier claims refer to claim types 71 and 72 (not DME claim types 81 or 82), and excludes any claims for which line item Berenson-Eggers Type of Service [BETOS] code variable equals D1A, D1B, D1C, D1D, D1E, D1F, D1G (which is DME), or O1A (which is ambulance services). The intent of the algorithm is to exclude claims where the services do not require a licensed health care professional. When 2 claims are required, they must occur at least one day apart.

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