Title
The Role of Licensed Mental Health Staffing in Improving Patient Outcomes at Health Centers

Author
Bonilla, Amy Gabriela

Publication Date
2020

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

The Role of Licensed Mental Health Staffing in Improving Patient Outcomes at Health Centers

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Health Policy and Management

by

Amy Gabriela Bonilla

2020

ABSTRACT OF THE DISSERTATION

The Role of Licensed Mental Health Staffing in Improving Patient Outcomes at Health Centers

by

Amy Gabriela Bonilla

Doctor of Philosophy in Health Policy and Management

University of California, Los Angeles, 2020

Professor Nadereh Pourat, Chair

Background: In 2016, close to 45 million adults in the United States had some form of mental illness, but only 43% received treatment for their condition. This unmet need for mental health (MH) services has been attributed to the cost of care or insufficient insurance coverage. Research has also shown that patients with comorbid MH and medical conditions are at a higher risk for health complications and are frequently high utilizers of health services.

Research Objective: I aimed to assess the potential benefits of MH staffing within health centers (HCs) funded by HRSA, a crucial part of the safety net which provides primary care services regardless of patients' ability to pay. My research questions are whether licensed MH staffing within a patient's HC is associated with higher likelihood of MH service utilization (paper 1) and lower likelihood of high utilization of outpatient and acute care services (paper 2).

Data and Sample: In the first study I use data from HRSA's 2014 Health Center Patient Survey and administrative data on patients' HCs from the UDS 2013 report. The study sample included 4,575 patients aged 18-64 who identified their HC as their usual source of care. In the second study, I use patient level encounter data from California's Low-Income Health Program (LIHP) from 2011-2013, and administrative data on patients' HCs from California's OSHPD 2012 Primary Care Utilization report. This study sample included 26,833 patients between the ages of 19-64, enrolled in LIHP and assigned to an HC as their medical home.

Results: My first research paper showed that more overall licensed MH staffing at HCs (versus none) increased the likelihood of patients receiving MH treatment anywhere and on-site (at the patient's HC), and any level of psychiatrist staffing also increased the likelihood of receiving MH treatment on-site. My second study showed that licensed MH staffing of at least 0.5 FTE (versus none) was associated with high patient utilization of outpatient visits. I also found that any level of psychiatrist staffing (versus none) increased the likelihood of having three or more ED visits, and any level of LCSW staffing decreased the likelihood of 3 or more ED visits and any hospitalization.

Discussion: Access to MH services for low-income populations continues to be a challenge in the United States. Due to the strategic location of HCs in medically under-served areas, co-locating an adequate number of licensed MH providers at HCs is likely to help reduce disparities in access to MH services. Staffing levels for specific types of providers in these studies may have been too low to help reduce high utilization of services. More research is needed on the role of specific types of MH providers and the necessary level of FTE to adequately meet patient needs.

The dissertation of Amy Gabriela Bonilla is approved.

Emmeline Chuang

Susan Louise Ettner

Bonnie T Zima

Nadereh Pourat, Committee Chair

University of California, Los Angeles

2020

DEDICATION

I would like to thank my parents, Otilia Cortez and Luis Bonilla, and my sister, Berenice Bonilla, for all their love, sacrifice, and support. Los quiero mucho; seguimos adelante.

I would also like to thank Mr. and Mrs. Cornell for their friendship and affection, and for the shared memories around the dining table.

Table of Contents	

List of Acronyms	
Coronary Artery Disease/ Congestive Heart Failure	CAD/CHF
The Chronic Illness & Disability Payment System	CDPS
Chronic Obstructive Pulmonary Disease	COPD
Emergency Department	ED
Federal Poverty Line	FPL
Full Time Employee	FTE
Health Center	HC
Health Care Coverage Initiative	HCCI
Health Resources and Services Administration	HRSA
California's Low Income Health Program	LIHP
Mental Health	MH
Primary Care Provider	PCP
Substance Abuse and Mental Health Services Administration	SAMHSA
Substance Use Disorder	SUD
UCLA Center for Health Policy Research	UCLA CHPR

ACKNOWLEDGEMENTS

I would like to thank and acknowledge my committee chair, Dr. Nadereh Pourat, and my other committee members, Dr. Emmeline Chuang, Dr. Susan Louise Ettner, and Dr. Bonnie T Zima for all their guidance and support throughout this process. I will always appreciate your encouraging words. I would like to thank Dr. Xiao Chen and Connie Lu for their support as well.

I would also like to thank Dr. Maria Elena Young and Dr. Emmeline Chuang for their mentorship during my time working with them as a graduate student researcher. The experience was invaluable in helping me decide my research plans and career path.

I am also grateful for the funding support I received throughout my doctoral studies, including the fellowships mentioned below, as well as the UCLA Graduate Research Mentorship Award.

This research was funded by the Agency for Healthcare Research and Quality (AHRQ, grant number 2T32HS000046) and the National Institutes of Health (NIH)/National Center for Advancing Translation Science (grant numbers TL1TR000121 & TL1TR001883). The views expressed in this publication are solely the responsibility of the authors and do not necessarily reflect the official views or policies of HHS, AHRQ, NIH, or HRSA, nor does mention of the department or agency names imply endorsement by the U.S. Government.

Chapter Three is a version of a manuscript accepted at *Psychiatrist Services* and currently in preparation for publication. The citation is as follows:

Bonilla A, Pourat N, Chuang E, Ettner S, Zima B, Chen X, Lu C, Hoang H, Hair B, Bolton J, Sripipatana A. (accepted). Mental health staffing at HRSA-funded health centers may improve access to care. *Psychiatric Services.*

As committee members, Nadereh Pourat, PhD, MSPH, Emmeline Chuang, PhD, Susan Ettner, PhD, Bonnie Zima, MD, MPH, provided continuous input on theoretical and analytical approaches to the research study, reviewed results, shared their interpretations of findings, provided edits to the manuscript. Xiao Chen, PhD provided statistical consulting support throughout the research process. Connie Lu, MPH assisted with data management as well as manuscript writing and preparation. Hank Hoang, PharmD, MBA, Brionna Hair, PhD, MPH, Joshua Bolton, MSIE, Alek Sripipatana, PhD, MPH were part of the research team at HRSA that reviewed analysis plans and findings, as well as provided edits to the manuscript.

VITA

EDUCATION

Syracuse University, Maxwell School of Citizenship and Public Affairs July 2011

Master of Public Administration

Stanford University June 2008

Bachelor of Arts

Double Major in International Relations and Communication, with Honors

SELECTED HONORS AND AWARDS

UCLA Los Angeles Area Health Services Research Training Program Fellowship

AHRQ National Research Service Award 2018- 2019

UCLA Clinical and Translational Science Institute NIH

Translational Science Fellowship 2014- 2018

UCLA Graduate Research Mentorship Award 2016 - 2017

Emil and Maud Beck Family Scholarship

The Graduate School of Syracuse University 2010 - 2011

Maxwell Dean's Office Professional Scholar Award

Syracuse University Maxwell School of Citizenship and Public Affairs 2010 - 2011

PRESENTATIONS

Chuang E, Collins-Camargo C, McBeath B, **Bonilla A**, Verbist A. Strategies for improving use of research evidence: The role of organizational supports. Oral presentation at the Forum for Youth Investment /William T. Grant Foundation Using Research Evidence Meeting - Advancing the Use of Research Evidence in Ways that Benefit Youth. Washington D.C. (April 2018)

Bonilla A, Wallace S, Young ME, Pourat N, Rodriguez M, Hadler M. It's not only about Medicaid expansion: Forces impacting community health center capacity to serve the remaining uninsured. Oral presentation at the American Public Health Association Annual Meeting; Denver, CO (November 2016)

PUBLICATIONS

Peer Reviewed

Bonilla A, Pourat N, Chuang E, Ettner S, Zima B, Chen X, Lu C, Hoang H, Hair B, Bolton J, Sripipatana A. (accepted). Mental health staffing at HRSA-funded health centers may improve access to care. *Psychiatric Services.*

Pourat N**, Bonilla A. G**., Young ME, Rodriguez M, & Wallace SP. (2018). There and Back Again: How the Repeal of ACA Can Impact Community Health Centers and the Populations They Serve. *Family & community health*, *41*(2), 83-94.

Manuscripts Under Review or In Progress

Bonilla A, Pourat N, Chuang E, Ettner S, Zima B, Chen X, Lu C, Hoang H, Hair B, Bolton J, Sripipatana A. (accepted). Mental health staffing at HRSA-funded health centers may improve access to care. *Psychiatric Services.*

Collins-Camargo C, Chuang E, Lauzus N, **Bonilla A**, McBeath B. Frontline worker perceptions of organizational supports to promote evidence use in private child welfare agencies. *Accepted at "Child Welfare*."

Policy Briefs

Chuang E, Collins-Camargo C, **Bonilla A**, Luzzus N, McBeath B. (2020). Facilitating evidence use by frontline staff. Berkeley, CA: Mack Center on Public and Nonprofit Human Services Management.

Wallace SP, Young ME, Rodriguez MA, **Bonilla A,** Pourat N. (2016) Community Health Centers Play a Critical Role in Caring for the Remaining Uninsured in the Affordable Care Act Era. Los Angeles, CA: UCLA Center for Health Policy Research.

Young ME, Wallace SP, **Bonilla A**, Pourat N, Rodriguez M. (2017) Partnership strategies of community health centers: Building capacity in good times and bad. Los Angeles, CA: UCLA Center for Health Policy Research.

CHAPTER 1: INTRODUCTION

Introduction

In this dissertation, I assess the role of mental health (MH staffing) within federally funded health centers (HCs) in improving access to MH services for HC patients. In the first chapter, I summarize the relevant literature on primary care and mental health integration, the role of HCs in the healthcare safety net, and outline the dissertation aims. In Chapter 2, I describe the conceptual framework guiding this study. I present the major findings of this dissertation in Chapters 3-4. In Chapter 3, I draw on nationally representative 2014 survey data on patients receiving care from HCs, and administrative data on those HCs, to examine whether having licensed MH staff at HCs is significantly associated with patient utilization of MH services. In Chapter 4, I use encounter data from patients enrolled in California's Low-Income Health Program in 2011-2013 and whose medical homes were HCs, along with administrative data from those HCs, to examine whether co-locating licensed MH providers is significantly associated with patient utilization of outpatient and acute care services. In Chapter 5, I summarize the overall findings of my dissertation, which suggest that MH staffing at HCs can improve access to MH services, but that adequate staffing levels, although important for improving patient outcomes, were still lacking in many HCs across the country as late as 2013. I further conclude that more research is needed to explore how different MH providers and their specific expertise can be best utilized in primary care settings to improve patient outcomes.

Literature Review

Prevalence of Mental Health and Disparities in Access to Services

In 2018, close to 48 million adults in the United States had some form of mental illness. Among this group, only 43% received treatment for their condition. (1) This unmet need for mental health (MH) services has been well documented and has been often attributed to the cost of care or insufficient insurance coverage. (2-7) This cost barrier is particularly alarming because there is a higher prevalence of mental illness among low-income groups who are unlikely able to afford any out-of-pocket costs for MH services. (8-11) Other obstacles to accessing MH services include shortage of MH providers in medically underserved areas and stigma surrounding MH disorders. (10, 12-15) Research has shown that most adults with MH disorders seek or receive treatment for their conditions within the primary care setting. (16) However, primary care providers (PCPs) often lack the necessary training, expertise, and time required to detect, diagnose, and treat MH conditions. (12, 17, 18) Even less severe conditions such as mild depression and anxiety can be difficult to detect due to the overlap with symptoms of many physical chronic conditions. (10, 12-15). For example, PCPs may attribute MH symptoms such as lethargy or muscle pain to a physical illness and overlook it as an indication that the patient may be experiencing depression. (19, 20) As a result, patients with physical chronic conditions can be left with undiagnosed and untreated MH conditions.

Addressing MH conditions within primary care settings is particularly important since studies have shown that MH conditions are often comorbid with chronic conditions. (21-23) Watson et al. reported depression rates between 13% and 20% for arthritis, 10% - 47% for heart disease, 11% - 31% for diabetes, and 27% for asthma and chronic obstructive pulmonary disease (COPD). (24) Research has also shown that complex patients (those who suffer from both MH

and physical chronic conditions) have more trouble managing their health issues and adhering to treatment plans. (25, 26) Consequently, these patients are at a higher risk of health complications, disability, and mortality. (27)

Not surprisingly, complex patients are frequently high utilizers of health services. (28) While 12.5 percent of ED visits in 2007 were related to MH and substance use disorders, these conditions are also common among patients who utilize the emergency department (ED) for other health reasons. (29, 30) Increasingly, high utilizers have been the focus of research in the U.S. over the last several decades because they are responsible for a large share of healthcare costs even though they are a relatively small percentage of the population. Studies have shown that 5% -10% of Medicaid beneficiaries are responsible for over 50% of expenditures. (31-33) Overutilization of acute care services has been linked to chronic conditions and underutilization of primary care services, and this trend is especially evident among patients with serious mental illness. (34, 35)

Patient compliance and behavior outside of the clinic plays a crucial role in patients' health and utilization of health services (36-38). Interventions designed to reduce unnecessary utilization and associated costs include more guidance for patients and their families during hospital discharge, the role of patient navigators, partnerships between hospitals and community clinics, and home visits by healthcare staff or social workers. (39, 40) Improving MH status among chronically ill patients through primary care and mental health integration is another proposed approach for helping complex patients manage their health and utilization of health services. (41-43).

Mental Health Integration in Primary Care

Over the last two decades, federal legislation and action has helped improve access to MH services for underserved populations in primary care settings. Earlier in 2002, President George W. Bush had established the New Freedom Commission on Mental Health to report on the state of the nation's mental healthcare system, identify areas needing improvement, and provide recommendations on how to integrate MH care with general medicine. (44) Among other findings, the subcommittee on *Mental Health Interface with General Medicine* reported the need to improve access to MH care for vulnerable populations, particularly the uninsured. The subcommittee's report also emphasized the value of MH providers in the primary care settings, where uninsured or publicly insured patients are most likely to seek care. Since then, healthcare organizations have been facing increased pressure to integrate MH services with their primary care services. (45)

MH integration with primary care refers to collaborative practice between PCPs and MH providers. Although integration can take many different forms, the degree to which both providers work together to treat the patient is often described along a continuum. (46-48) At the least integrated end of the spectrum lies the *coordinated model.* This approach is the most common since medical and MH care delivery has traditionally been siloed. Frequently, the PCP and the MH provider are based at different locations, and PCPs simply refer patients to a MH provider with or without further effort to ensure the patient visits the MH provider. Challenges associated with this approach include limited availability of MH providers who accept low-income patients and other barriers such as ability and willingness of patients to schedule MH appointments, limited transportation options, distrust of new providers, and cost. (9, 10) Because services are provided in different locations and through different entities, care coordination is limited. As a result, patients' physical and MH are addressed separately, despite the

overwhelming evidence demonstrating their interdependence. However, some PCPs may take additional steps to help patients make appointments and promote the likelihood that patients have MH visits to address some of these challenges. (47)

An improvement on the coordinated model approach is *co-location of* MH providers within primary care settings. Co-location provides easier access to MH providers for patients and can also facilitate consultation and collaboration opportunities between primary care and MH providers. Co-location can also facilitate and improve PCP trainings on best practices for MH screening, diagnosis, and treatment. Despite these advantages, PCPs and MH providers can still encounter obstacles in coordinating treatment for their patients. Problems can stem from lack of proper communication protocols, restricted access to patient records, different scheduling and billing systems, and differences in practice styles and priorities. Although co-location improves access to services, it does not require a team-based approach to care, thereby hindering care coordination for complex patients. (46-48)

At the highest end of the continuum is *the fully integrated* approach. In this approach, specific organizational protocols are established to enable coordinated and complementary treatment of each patient's physical and mental health. Fully integrated models enable ongoing communication between primary care and MH providers who work as a team to understand, diagnose, and treat a patient's symptoms. (49) Unlike the co-located approach, full integration involves all aspects of care delivery. As Strohasl (50) explains, this includes mission integration, clinical integration, physical integration, operations integration, information integration, and financial and resource integration. In other words, PCPs and MH providers work together, taking a holistic, whole-person approach to health care, sharing information, and utilizing records systems that allow for joint tracking and monitoring. Implementing this type of approach

requires resources, including software systems, staff expertise, and physical space. Not surprisingly, healthcare systems with limited resources face many operational challenges when trying to implement this level of integration. (45-48)

In practice, existing models of primary care and MH integration include different approaches to team structure and responsibilities. (51, 52) Some models have been developed to guide integration. These include the Primary Care and Behavioral Health Integration Model (PCBHI) (53), the Collaborative Care Model (54), the Chronic Care Management Model (CCM) (55, 56), and the Patient Centered Care Medical Home (PCMH). (45, 57) All of these models or approaches aim to replace the traditional, fragmented, biomedical approach to treating patients with a more holistic team-based strategy that addresses their overall well-being, including psychosocial elements which can also influence the likelihood of adherence to treatment plans and recovery. (58, 59)

Existing Evidence of Impact of Primary Care and Mental Health Integration

Numerous case studies and a few randomized controlled trials have demonstrated that integration of MH providers into primary care settings can lead to significant improvements in access, depression management and remission rates, satisfaction with care, and improvements in comorbid chronic conditions. (24, 60-65) For example, the Veterans Affairs Medical Center in White River Junction Vermont showed that integrating a Primary Mental Healthcare clinic into their primary care clinic led to a significant increase in the number of patients diagnosed with depression receiving treatment. (66) In addition, the PRISM-E study which looked at strategies to improve depression, anxiety disorders, and problem drinking among elderly primary care

patients, showed that patients were more likely to engage in MH services integrated into their primary care setting rather than enhanced referral services. (67)

The Intermountain Mental Health Integration Program (MHIP) is an example of a fully integrated health care delivery system. Intermountain Healthcare is a medical group in Utah consisting of 22 hospitals and 180 clinics. (68) In 2000, Intermountain began a Mental Health Integration (MHI) quality improvement program which redesigned the role of PCPs, mental health providers, consumers, and families to work in a collaborative team environment to address mental health in the primary care setting. In 2010, Intermountain began a longitudinal cohort design study comparing patient outcomes between their mental health primary care practices that operated as traditional management practices (TPMs) to those that had adopted team-based care (TBCs). The authors of the study reported that TBC practices had higher rates of active depression screening, higher adherence to a diabetes care bundle, and higher documentation of self-care plans. Patients at TBC practices also had fewer emergency department visits, hospital admissions, ambulatory care sensitive visits and admissions, and primary care physician encounters. However, the study did not find significant differences between TBC and TPM patients for visits to urgent care facilities or specialty care physicians.

Several reviews on integrated or collaborative care for chronically ill patients have focused less specifically on the role of MH providers, but instead explored other team-based approaches with care management, in which both physical and mental aspects of a patient's health are considered and addressed in their treatment plan. In many of these interventions, care managers are responsible for working with patients to address patient compliance and other factors outside of the clinic setting that may affect their health. These care managers include nurses, social workers, peer navigators, or other staff members/volunteers who provide patients

with services such as health education, prescription management, and follow-up care to help patients self-manage their physical chronic conditions alongside their MH conditions. These studies specifically address the importance of psychosocial factors and behavioral change in patient outcomes, even if treatment is not directly provided by licensed MH providers. (24, 40, 62) Some examples of these types of interventions are highlighted below.

Bogner and DeVries conducted a randomized control study at a large primary care practice comparing outcomes for older patients (ages 50-84) who were prescribed medication for depression and hypertension. (69) The intervention group worked with an integrated care manager, trained in pharmacotherapy and supervised by the principal investigator, who was responsible for monitoring and tracking patient progress, and ensuring that patients understood their health conditions and treatment plans. Patients in the comparison group did not work with the integrated care manager. This study showed that at six weeks, patients in the intervention group had fewer depressive symptoms, lower systolic and diastolic blood pressure, and greater adherence to medications for both conditions.

In a 2012 study, Bogner, Morales, Vries, & Cappola conducted a randomized controlled trial at a large primary care system to compare outcomes between patients who received integrated care or usual care. (70) Patients in the study had both depression and type 2 diabetes. Patients in the integrated care intervention worked on self-management strategies with two research coordinators who had received training in pharmacotherapy from the principal investigator before the start of the intervention. The study found the intervention group to be more likely to achieve HbA_{1c}levels of less than 7%, as well as remission of depression.

A 2010 study by Katon et al. compared outcomes for patients with depression and coronary heart disease and/or diabetes at 14 primary care clinics based on whether they received

collaborative care or usual care. (71) In this study, three registered nurses took on the role of care managers. The nurses were supervised by a psychiatrist, a psychologist, and a primary care physician. Researchers found that in addition to better quality of life and greater satisfaction with care, at 12 months, patients in the collaborative care group had improved glycated hemoglobin levels, systolic blood pressure, LDL cholesterol levels, and SCL-20 depression scores. Patients in the intervention group were also more likely to have adjustments made to their medications.

The variations in intervention design and the inconsistencies in patient samples and settings has made it difficult to identify which components of integration are most effective for improving patient outcomes. It is also difficult to determine how much training and supervision for care managers is required for interventions to be successful. Nevertheless, these studies provide evidence that when integrated care includes services specifically designed to help improve patient self-management of their conditions, taking into account psychosocial elements of their health, improvements are consistently achieved.

Mental Health Integration Within the Safety Net

The Case of Health Centers

Integration of MH services is not feasible in all primary care settings. However, health Centers (HCs) are one group of primary care providers with capacity for delivery of MH services. The majority of these organizations are funded by the Health Resources and Services Administration (HRSA), with the mission of providing affordable, comprehensive, primary care services to low-income and uninsured or underinsured populations in medically underserved areas. (67) These HCs receive Section 330 grants and guarantee access to care regardless of ability to pay to uninsured patients. Frequently, the majority of their patients are covered by

Medicaid. In 2018, HCs delivered care to over 28 million Americans and reported providing MH services to over 2 million patients, including individual or group counseling/psychotherapy, cognitive-behavioral therapy, 24-hour crisis services, and case management services. The same year, HCs also reported providing some form of MH services to over two million patients. (72) These services could include individual or group counseling/psychotherapy, cognitive-behavioral therapy or problem-solving therapy, 24-hour crisis support, and case management. (73)

HCs are well-positioned to address disparities in access to MH care because of their strategic location in underserved areas, as well as their capability and experience providing culturally appropriate health care. (73-75) However, despite their expertise in providing care to vulnerable groups, HCs are often stretched thin in terms of their ability to meet demand, especially since the expansion of Medicaid resulted in a wave of new patients seeking care. (76) Recruitment of MH providers can be especially challenging for HCs because of cost and limited supply. (77) Furthermore, these organizations are often too under-resourced to experiment with different care delivery models, in part because of their smaller budgets and staff size.

Although there are few peer-reviewed research articles on primary care and MH integration and patient outcomes at HCs, the HRSA Bureau of Primary Health Care began promoting this delivery model as early as 1999 through technical assistance programs. By 2005, HRSA had worked with academic researchers to provide over 50 health centers with consulting services on integration practices. (78) Despite the program ending in 2005, soon after, HRSA and SAMHSA picked up these efforts with their Center for Integrated Health Solutions and the Primary Care and Behavioral Health Intervention (PCBHI) program in 2009.

The objective of the PCBHI grant program was to encourage community mental/behavioral health centers (CBHC/CMHCs) to implement care delivery strategies to

provide their patients with easily accessible primary care services. Most CBHC/CMHCs developed partnerships with HCs to provide these primary care services. By July 2013, 100 CBHCs/CMHCs had been granted a PCBHI grant. Based on data collected from three matched PCBHI and control clinics, compared to patients receiving non-integrated care, those in the PCBHCI program had better outcomes for a number of physical health indicators including diastolic blood pressure, total cholesterol, LDL cholesterol, and fasting plasma glucose. However, no significant differences between the groups were found for systolic blood pressure, body mass index, HDL cholesterol, glycated hemoglobin, triglycerides, and self-reported smoking. No significant differences were found for behavioral health indicators either. (77)

Because patients with severe MH problems have trouble managing their health and seeking primary care services on their own, integrating primary care services into CBHCs/CMHCs was considered a sensible strategy for this population. However, this approach does not address the needs of patients with undiagnosed MH conditions and those with less severe MH conditions who may be less likely to seek treatment at specialized MH facilities. For this group, integrating MH care into HCs may be more appropriate. In line with this thinking, HRSA continues to provide HCs with technical assistance grants to help them recruit MH providers and receive training on best practices. These include the *Access Increases for Mental Health and Substance Abuse Services (AIMS) Awards*, the *Behavioral Health Workforce education and Training (BHWET) Program*, and the *Expanding Access to Quality Substance Use Disorder and Mental Health Services Funding.* (79)

Dissertation Objective

My dissertation addresses the gap in the literature on the relationship between staffing of licensed MH providers at federally funded HCs (co-location) and utilization of MH services, general outpatient services, and acute care services by patients who depend on these organizations for their care. Understanding the potential impact of having licensed MH providers on-site at HCs is important because it may provide evidence that co-location is an effective solution to reducing access disparities in MH for the uninsured and underinsured. While direct treatment from MH professionals may not always be available, co-location also allows for collaboration and teaching opportunities for PCPs to improve their treatment practices of patients at risk for MH conditions. Furthermore, HC patients also have a high rate of chronic disease and often lack important psychosocial supports that may hinder their ability to properly self-manage their health conditions. As a result, these patients may have a high rate of utilization for outpatient and acute care services. It is therefore important to assess whether access to co-located MH providers can reduce the likelihood of at-risk patients becoming high utilizers of health services. Such a finding would provide support for co-locating MH services in these settings, as well as signal potential cost-savings that could elevate the role of HCs in providing value-based care.

Significance and Contribution to the Literature

It is difficult to measure the impact of primary care and MH integration on patient outcomes because of the great variation across different integrated care models. Consequently, research has not yet reached a consensus on best practices and expected benefits from this approach. (46) Thielke, Vannoy & Unutzer (80) provided an overview of studies assessing different approaches to integrating primary care and mental health. The authors summarized

these approaches as "efforts focused on screening, provider training, dissemination of guidelines, referral to mental health specialists, or co-locating mental health practitioners in primary care settings." The authors also noted that research has not shown any of these strategies to be effective on their own, and that providers must adopt a collaborative care approach, i.e. full integration, to improve patient outcomes. Nevertheless, co-location is an important and necessary first step toward successful full integration. Studying the role of co-located MH providers in HCs is especially critical since this patient population has limited access to MH services due to limited supply of MH providers in the public sector and the usual cost of care in the private sector. HCs have a strong track record of providing comprehensive services to a population at risk for both chronic diseases and MH conditions, therefore, co-location could be especially effective and efficient in this setting. Enabling patients to access MH services in a familiar environment may help them improve self-management of health conditions and reduce their need for medical services.

The available literature on integration has focused largely on how to improve outcomes for patients already diagnosed with MH conditions, as opposed to improving access for people at risk of having an unmet need for MH services. In addition, most of these studies have taken place at large healthcare systems, and usually as part of a larger partnership with hospitals, academic centers, and/or health departments. (81) This narrow scope makes it difficult to generalize findings to other settings such as HCs where the majority of low income and uninsured patients receive their care. Recent studies on integration at HCs have looked at increased MH staffing, but not subsequent utilization of services by patients. Although many studies have studied integrated or collaborative care practices at HCs, these have been focused on one organization and specific intervention model. Again, these case studies are difficult to

generalize to most community care settings where MH services are often under-staffed and under-resourced.

My dissertation contributes to the literature by focusing on the broader national population who depend on HCs for primary care services, and who are also at risk for MH conditions and unmet need for MH services due to their low-income status. The research studies I present also build on the literature by combining patient level survey and encounter data with administrative data which provide organizational level characteristics of the patient's usual source of care. This allows me to address potential confounders and important control variables that affect utilization of services, while isolating the role of staffing licensed MH providers within HCs (co-location) - an important first step in successfully implementing integrated care practices.

CHAPTER 2: THE CONCEPTUAL FRAMEWORK

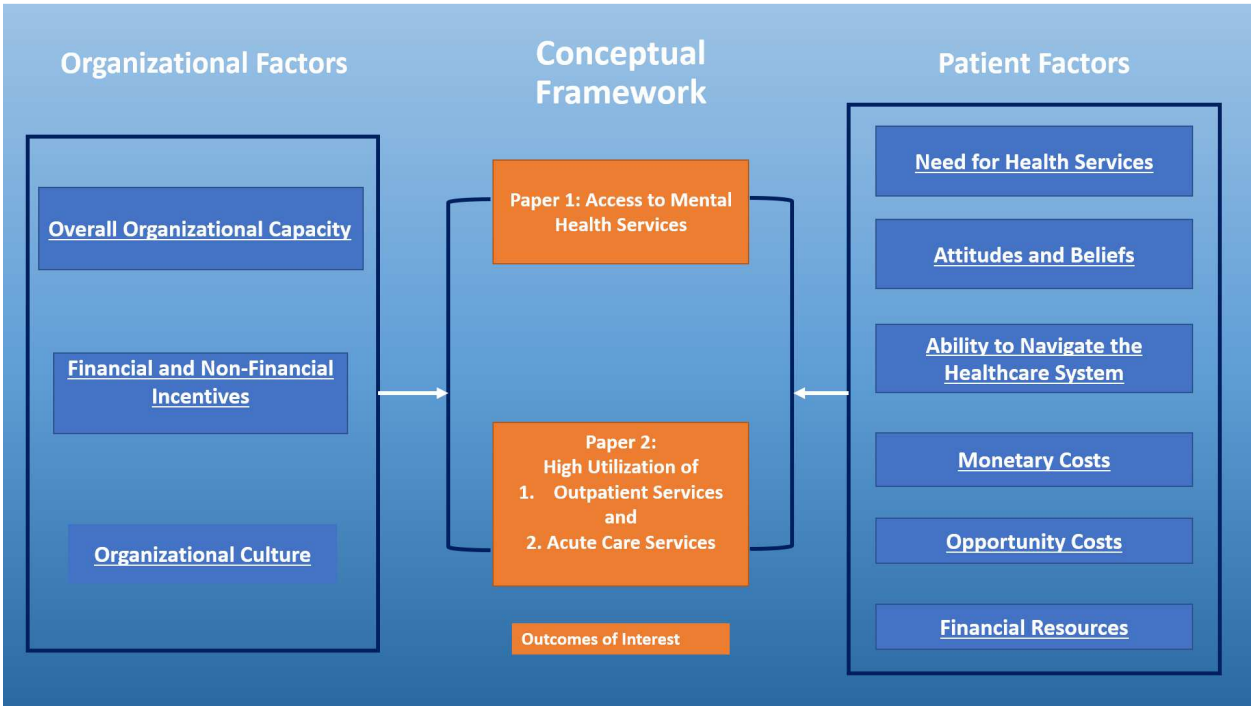
In this Chapter, I provide and describe a conceptual framework for assessing the potential impact of co-location of MH providers in HCs on utilization of MH and other medical services. I use this framework to develop the hypotheses and analytical frameworks for both papers in this dissertation.

The Conceptual Framework

The conceptual framework below (Figure 1) depicts how broad organizational and patient level factors affect patient utilization of MH services, non-MH outpatient services (primary care or specialty services), and acute care services (emergency department visits and hospitalizations).

On the left-hand side of the model, from top to bottom, there are three distinct organizational aspects that are conceptualized to affect patient utilization of these services. These include overall organizational capacity, financial and non-financial incentives, and organizational culture. On the right-hand side, patient characteristics that determine utilization include need for health services, attitudes and beliefs, ability to navigate the healthcare system, monetary costs, opportunity costs, and financial resources. Collectively, these factors determine whether patients utilize MH services at a given HC organization, depicted as the first outcome of interest in the middle (top) of the model. These organizational and patient characteristics also determine whether patients use high levels of outpatient services or acute services, depicted as the second outcome of interest in the middle (bottom) the model. Each of these factors determining utilization are described in detail in the following sections. Due to differences in data sources used, this conceptual framework is operationalized in separate analytical models for each of the research papers presented in Chapters 3 and 4.

Figure 1. Conceptual Framework for Utilization of Mental Health and Other Health Services by Patients at Health Centers



Organizational Level Factors Affecting Utilization of Mental Health and Other Health Services by Health Center (HC) Patients

Overall Organizational Capacity

The overall organizational capacity of an HC will affect access to services for their patients. In this dissertation, I conceptualize organizational capacity as the availability of providers and staff to provide care and other related services. Providers include physicians and MH professionals, and staff include nurses, medical assistants, and other clinical support staff. Availability of providers and staff subsequently determine access through an HC's ability to offer specific services, the amount of time a PCP can spend with patients during those

appointments, staff support available to help with care coordination efforts, including referrals, and wait times for appointments.

The number and type of co-located MH providers determine the amount and type of MH care an HC will be able to offer to their patients and whether they can address the needs of their patients. HCs without adequate numbers of licensed MH providers may coordinate referrals to external MH providers, and successful coordination efforts will depend largely on the availability of external MH providers in the area. This is often a complicated and time-consuming process because these external providers are separate entities with their own policies, administrative procedures, and priorities. HC patients are often low-income and uninsured, so HCs must identify external MH providers who are willing to offer their services at no cost or at a discounted rate. A 2014 study by Bishop, Press, Keyhani & Pincus found that psychiatry was the least likely specialty to accept any form of insurance, with only 43% of providers participating. (82) Furthermore, among psychiatrists in private practice, only 32% accepted Medicaid. In addition to being difficult to find, referrals can disrupt a patient's continuity of care if there is limited communication between primary care and MH providers and no access to the medical records. Frequently, patients also fail to follow through with their appointment due to difficulties with scheduling, transportation, miscommunication, distrust of new providers, or stigma. (5)

In some cases, HCs will have partnerships in place to expedite the referral process. Although these arrangements promote access for patients, there will be limitations such as the number of patients that external providers are willing to accept free of charge or at discounted rates. Providing co-located MH services improves access for patients on-site and reduces the need to coordinate scheduling, billing, and follow-up care with other providers.

The ability of HCs to hire and co-locate MH providers with different expertise is important for addressing the wide range of patient conditions and needs. For example, licensed clinical social workers (LCSWs) are easier to recruit because they are in greater supply and less expensive. However, LCSWs are also limited in their scope of practice to specific services. Psychologists receive more advanced training in therapy, but their salaries are higher, and they are not licensed to prescribe medication for MH treatment. Psychiatrists are the only MH providers who can prescribe and treat patients with medication, but they are more difficult to recruit and the most expensive to hire. Consequently, the type of MH provider in an HC will determine which services are available to patients and if they meet their MH needs. (83-85)

In addition to offering on-site MH services to patients, co-location of MH providers at HCs is also beneficial for patients because the proximity allows PCPs the opportunity to consult with MH providers on cases as they arise. This collaboration opportunity is critical since most MH needs are first addressed within the primary care setting and PCPs often lack adequate training in diagnosing and treating MH conditions. (17)

Providing patients with MH services may also reduce their high use of outpatient services, including primary and specialty care, by helping them improve self-management of their chronic physical health conditions. (36, 58, 86) Furthermore, better management of chronic conditions is likely to reduce multiple emergency room visits, or hospitalizations. Even if patients do not directly access MH services at the HC, co-location of MH providers in the primary care setting can improve PCPs' skills in diagnosing and treating mild or moderate MH conditions because of their collaboration with MH providers.

PCPs also play an important role in determining utilization of MH services by screening patients for MH conditions and determining the need for MH services. However, the more

patients that PCPs need to see in a given day, the less time they will have available to establish trust and a strong patient-provider relationship that is needed to adequately address MH concerns. (87-89)

If HCs have a higher proportion of patients with MH conditions and fewer MH providers, patients may have a harder time getting timely MH appointments. Inability to address MH needs of patients may result in additional visits to PCPs or increased demand for care coordination services. Lack of adequate MH providers can also lead to inadequate screening and detection of MH conditions and subsequent lack of referrals to external specialty care providers.

Having adequate clinical support staff allows PCPs to spend more time with patients to discuss their symptoms, potentially detect MH issues, and present the option to seek MH care. This additional time is valuable in helping patients feel comfortable with their PCP to discuss personal concerns, during which providers may notice important cues to prompt a MH screening or referral. When patient-provider communication is strong, patients may be more open to receiving MH treatment and follow through on appointments. This patient-provider relationship may be a more critical factor when MH referrals are off-site since patients may need more encouragement to follow-through on those visits.

Clinical support staff can also help PCPs to deliver comprehensive care, adhere to guidelines, and collaborate with other providers in the organization by assisting with care coordination. When there is co-location, clinical support staff can assist PCPs with mental health screenings during PC visits, as well as coordination with co-located licensed MH providers. Conversely, when there is no co-location, clinical support staff can help coordinate with external MH providers and assist patients with the referral process.

The diversity of the providers and staff also determines the amount and type of services an HC can provide to patients. These apply to both MH services, as well as other primary care services that are essential to helping patients with chronic conditions manage their health and avoid overutilization of outpatient and acute care services. Although HCs are only obligated to provide comprehensive primary care services, they may also arrange partnerships with external specialty care providers to provide these services to their patients. However, the ability to provide these other services will be influenced by availability of willing external providers. As previously mentioned, finding both MH and specialty care providers who are willing to accept patients free of charge or at a discounted rate can be difficult, and this becomes more challenging in shortage areas for MH and specialty care. HCs in rural areas and low-income neighborhoods are likely to face challenges recruiting and coordinating with these providers to provide adequate access for their patients. The more services available at or near a patient's HC, the easier it will be to address their health issues in a timely manner and avoid complications that lead to more utilization of health services and use of the ED and hospitalizations. This is especially important for HC patients who are often unable to access specialty care on their own due to cost and inadequate insurance coverage.

Financial and Non-Financial Incentives

A second determinant of service utilization is the financial and non-financial incentives that may determine patient access and utilization of services. These incentives may drive the HC organization to conduct activities that improve quality of care and reconfigure the delivery of care to promote better outcomes. For example, HCs that have contracts with Medicaid managed care plans are likely to have incentives to improve their performance metrics including access to

and quality of care because these plans require them. (90) Managed care contracts may encourage or require care coordination and patient-centered medical home (PCMH) status which emphasize an integrated care approach to health care delivery. (91)These managed care practices can incentivize providers to conduct MH screenings, coordinate care with external MH providers, collaborate with co-located MH providers in development of treatment plans and medication management, and avoid overuse of outpatient visits or acute care.

HCs may have also received financial incentives from HRSA and SAMHSA in the form or funding and training opportunities designed to promote integrated care at HCs. These grants include technical assistance workshops on how to improve collaboration between PCPs and MH providers, which should improve the effectiveness of MH screenings, detection, and referrals for MH services when needed. (79) Complex patients that attend an HC with strong integrated care practices may benefit from improved care coordination and be less likely to overutilize other health services as well.

Organizational Culture

The organizational culture at a patient's HC can also affect access by increasing the likelihood that they will be screened for MH, and whether the screening will be effective at connecting them with MH services when there is a need. HCs whose leadership and providers consider MH as an important component of overall health and believe in collaborative and integrated patient-centered care will be more likely to promote access to MH and other services. The impact of such an organizational approach will be reflected in establishing workflows and referral protocols to promote patient utilization of MH services internally or externally, and collaboration of MH and medical care staff in conducting case conferences and development of

treatment plans. Fully integrated care delivery requires a cultural shift across the organization that results in increased transparency and communication between providers. Patients with mental health conditions that receive services at HCs with this type of organizational culture may benefit from the focus on MH and care coordination which in turn can promote better self-care practices and adherence to treatment plans, thereby reducing their use of other outpatient and acute care services. (92)

Patient Level Factors Affecting Utilization of Mental Health and Other Health Services by Health Center Patients

Need for Health Services

Individuals' use of MH or other health services is determined by their level of need. Need may be self-perceived, professionally assessed, or both. Patients may perceive problems such as depression or anxiety and inability to perform their daily activities and subsequently seek MH or other care. When a condition is debilitating and/or long-lasting, patients are more likely to seek out services on their own. Symptom severity will also affect a patient's decision to seek help in a primary care setting such as an HC versus a MH specialty provider.

Provider diagnosis of MH conditions will also determine use of MH and other services. Diagnosis is more likely if providers regularly screen for MH conditions or providers observe indications of these conditions during a visit, particularly when a patient presents with more severe symptoms. The severity will also affect a provider's decision on whether to refer a patient to external providers. For example, if a patient's MH condition requires psychotropic medications typically prescribed by psychiatrists, and the HC does not have a psychiatrist, the PCP will have to refer the patient elsewhere. Providers may also perceive that a patient is

struggling with managing their chronic conditions due to presence of undiagnosed and untreated MH conditions and is therefore more frequently visiting the HC or the emergency department (ED) and hospitals. In such circumstances, providers may be more likely to recommend MH services to patients.

Attitudes and Beliefs

An individual's attitudes and beliefs can be an important factor in determining utilization of MH and other health services. For example, MH stigma can keep some patients from seeking MH services, or even from discussing their feelings and concerns with their PCP. (13) MH stigma may be a bigger concern for certain population subgroups. For example, social norms around ideas of self-reliance and masculinity may make it more acceptable for women to discuss their emotions and seek out therapy than men. In some cultures, religion or spirituality is viewed as the appropriate approach to treating MH symptoms, over therapy or medication. Age can also affect a person's perspective on use of MH services, including therapy. Younger adults may perceive less MH stigma and be more comfortable seeking help than older adults. Similarly, higher levels of education can reduce MH stigma by creating less reliance on misinformation and misperceptions around MH diseases.

Beliefs about the healthcare system can also affect how likely a person is to seek out other types of health services. (93, 94) These beliefs or attitudes can vary by population subgroup. For example, women may be more open to seeking care than men due to social norms around gender and resiliency. Younger people may be more confident in their ability to manage their symptoms at home, whereas older people may feel more inclined to see their doctor on a regular basis because of their higher risk for complications. Patients from certain racial/ethnic

groups may be less trusting of the healthcare system because of past and ongoing racial discrimination. (95) Patients concerned about immigration status may avoid seeking care because of fear, confusion, and distrust of the healthcare system. (96) Some patients may be high utilizers of health services because they feel ill-equipped to take care of themselves and would prefer to receive advice and guidance from medical experts. Personal knowledge and experience can also affect how likely patients are to understand the benefits of seeking care earlier on, as opposed to waiting for symptoms to get worse.

A patient's experience will also influence their attitudes and beliefs toward the healthcare system, and therefore their decision to seek care in the future. Those with negative experiences or dissatisfaction with services are less likely to seek care and be open about their symptoms or concerns during appointments. This can occur if patients have felt ignored or judged by healthcare staff during past visits, or if they spent valuable time and resources seeking care only to get minimal attention, or even experience worse symptoms. Some patients may choose to seek care at the ED because they view the technical expertise and capability to be higher there than at their primary care office. (97)

On the other hand, patients with positive past experiences may be more inclined to seek care early on. Positive experiences include easy and flexible appointment scheduling and wait times, feeling heard and understood by providers and staff, and receiving useful advice and assistance with referrals, prescriptions, or even social services. Patients with positive experiences will also be more likely to trust their providers and follow their advice, thereby encouraging appropriate utilization of health services and perhaps less need for follow-up visits and acute care services. (98)

Ability to Navigate the Healthcare System

The ability to navigate the healthcare system can also determine access to care. Knowing how to search for healthcare providers that accept your insurance or see uninsured patients, understanding what insurance covers and what are the out-of-pocket costs, and knowing which services are available and where can be difficult for patients for several reasons. These reasons include unfamiliarity with the healthcare system or trouble communicating with healthcare providers and staff. For example, patients who grew up in other countries or who have limited English skills may have difficulty setting appointments and communicating with providers and insurance agents due to unfamiliarity with the U.S. healthcare system and language limitations. These obstacles may prevent patients from seeking preventive primary care and utilizing other outpatient services, which lead to ED visits and hospitalizations when their health problems have worsened. Patients who cannot successfully navigate the healthcare system may also visit the ED as the first point of service because navigating outpatient care requires skills, planning and time, but the ED is always open, does not require an appointment, and patients may receive multiple services such as lab and imaging.

Monetary Costs

Monetary costs can also determine use of MH and other services. (99) Financial difficulties reduce affordability, and the patient's ability to pay for the full cost or out-of-pocket costs of health services and medications can lead to delays or unmet need. Some psychologists and psychiatrists do not accept any or some types of insurance such as Medicaid. Even when patients are insured, high levels of cost-sharing can make service use prohibitive. Limitations in provider networks or other requirements may also limit access to care. The fewer choices

provided to patients, the more difficult it will be for them to find a suitable MH or specialty care provider. Potential delays or unmet health needs may place patients at a higher risk for health complications, both mentally and physically. Patients of HCs may have an easier time accessing primary care because HCs accept all patients regardless of their ability to pay and use a sliding scale fee payment approach. However, accessing specialty services from other providers is a bigger challenge, especially when HCs do not have partnerships with external providers willing to see patients at discounted rates.

Opportunity Costs

A number of non-monetary opportunity costs also determine utilization. (99) Receiving care requires taking time off work, making childcare arrangements, and finding transportation. Some patients will not get paid when not working, or do not have anyone to provide free child-care, or need to take multiple buses to reach a provider. Therefore, the time it takes to make an appointment or make needed arrangements in order to attend the appointment, and the time needed for the actual appointment, including waiting room time and filling prescriptions, may discourage many patients from seeking care until they feel it is absolutely necessary.

Financial Resources

A patient's financial resources determines access and is part of their decision to seek MH and other health services. (99) For example, those with higher incomes and other financial assets will have an easier time affording the out-of-pocket costs associated with receiving care and buying medications. Having more financial resources also makes it easier for patients to arrange transportation to the clinic, as well as finding childcare options.

Conclusion

Overall, these organizational and patient level factors will affect a patient's access to health services. In the following chapters, I present two research studies that examine how MH staffing within a patient's HC affects their likelihood of 1) using MH services, and 2) using outpatient services and acute care services. This conceptual framework is operationalized in the analytical models presented separately in each study.

CHAPTER 3: PAPER 1

In this chapter, I present the first paper of my dissertation titled: **Mental Health Staffing at HRSA-Funded Health Centers May Improve Access to Care**. The chapter is intended to be comprehensive and self-standing. The sections consist of background, study objectives and hypotheses, methods, results, discussion, study limitations, and policy implications.

Background

Disparities in access to mental health (MH) services are common in the United States. Medicaid's low reimbursement rates combined with the high demand from higher income patients has contributed to the limited supply of MH providers in the public sector, leaving many of the most vulnerable patients with restricted access to MH services. (82) Recent legislation has addressed several major obstacles to mental health care access in the United States. For example, the Affordable Care Act (ACA) also emphasized the value of MH care by including coverage for MH and substance use disorders as one of the essential health benefits for healthcare plans on the Health Insurance Marketplace. (100) By promoting value-based care and patient centered medical homes, the ACA also incentivized efforts to adopt team-based, whole person care. (101, 102)

Health Resources and Services Administration (HRSA)-funded health centers (HCs) are a major provider of primary care for uninsured and low-income patients. HCs provide comprehensive and affordable primary care to all patients, regardless of ability to pay. (75)In 2018, HCs delivered care to over 28 million Americans and reported providing MH services to over 2 million patients, including individual or group counseling/psychotherapy, cognitive-behavioral therapy, 24-hour crisis services, and case management services. (72, 73) The strategic location of HCs in medically underserved areas and their experience providing culturally appropriate care make these organizations essential players in improving access to MH services among low-income patients. (73) To date, research on MH services at HCs has consisted mostly of case studies of implementation challenges for integration at a limited and unrepresentative number of HCs. (103-105) Over the last decade, several studies have examined growth of MH staffing and services at HCs. (15, 104, 106-108) However, many of these studies have been

largely descriptive in nature and have not controlled for additional organizational and patient level factors in assessing this relationship. This study builds on the literature by combining organizational level data with patient data to assess the relationship between MH staffing at HCs and utilization of MH services by HC patients.

Study Objectives and Hypotheses

The objectives of this study were to examine whether staffing of licensed MH providers at HCs was significantly associated with 1) patients receiving MH treatment anywhere and 2) patients receiving MH treatment on-site (at the patient's HC) versus off-site. I proposed the following hypotheses for these objectives.

Hypothesis 1: Patients at HCs with more licensed MH providers on staff were more likely to utilize any MH services within the past 12 months than patients at HCs with no licensed MH providers.

Rationale: HCs with licensed MH providers on staff can provide direct services including diagnosis, treatment, and referral of patients with MH conditions. Staffing of licensed MH providers may also help PCPs with improved awareness and guidance on screening and detection of MH issues for their patients, thereby increasing the likelihood of providing referrals for MH services when appropriate.

Hypothesis 2: Among patients who received MH services, those at HCs with more licensed MH providers were more likely to utilize MH services on-site as opposed to off-site.

Rationale: HCs with licensed MH providers on staff reduces patients' concerns about cost of MH services. Staffing of licensed MH providers also reduces barriers to access such as having

to find available MH providers elsewhere and the perceived stigma associated with seeking care at MH specialty providers.

Additional study objectives were to examine whether staffing of specific types of MH providers (psychiatrists, psychologists, and other licensed MH providers) were associated with 1) patients receiving MH treatment anywhere and 2) patients receiving MH treatment on-site (at the patient's HC) versus off-site. I proposed the following hypotheses for these objectives.

Hypothesis 1a: Patients at HCs with any psychiatrist, clinical psychologist, or other licensed MH provider on staff were more likely to utilize any MH services within the past 12 months than patients at HCs without these licensed MH providers on staff.

Hypothesis 2a: Among patients who utilized MH services, those at HCs with any psychiatrist, clinical psychologist, or other licensed MH provider on staff were more likely to utilize MH services on-site (as opposed to off-site) than patients at HCs without these licensed MH providers on staff.

Rationale: MH providers offer different services depending on their specialty and may treat different MH conditions or levels of severity. Psychiatrists are the only MH providers who are licensed to prescribe psychotropic medications and are more likely to treat patients with more severe conditions, while psychologists and LCSWs provide counseling through different therapeutic modalities.

Methods

Data and Sample

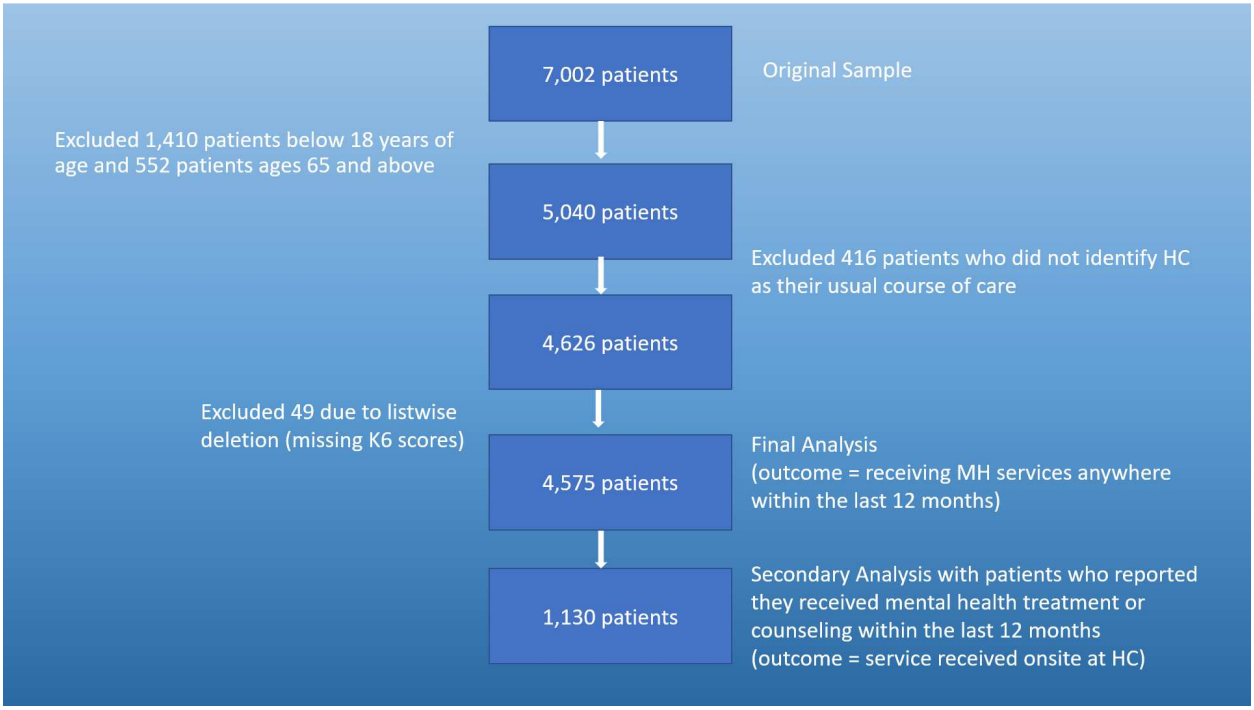
For this analysis, I used data from the 2014 Health Center Patient Survey (HCPS), which is an in-person survey of HC patients conducted between October 2014 and April 2015. (109)

The HCPS includes information on patient demographics, healthcare utilization, health conditions, and patient experiences at 169 HCs. The survey was designed using a three-stage sampling method to provide a nationally representative sample of HC parent organizations, clinic sites within the parent organization, and patients at clinic sites. Patients were pre-screened to ensure they had at least one prior visit to the HC and were interviewed in the waiting room when they registered for an appointment. I merged the HCPS data with the 2013 Uniform Data System (UDS) data to include HC characteristics. UDS includes aggregated administrative data on staffing, revenues, patient demographics, and services delivered for each HC organization for the past calendar year. (110) I used the 2013 UDS data as the best estimate of co-located MH providers at the beginning of 2014 and before the time period when patients reported receiving MH treatment. This study was determined exempt by the University of California Los Angeles Institutional Review Board.

Of the 7,002 patients included in HCPS, I excluded 1,410 patients below 18 years of age and 552 patients ages 65 and above from the study sample (n=5,040). I made this decision in consideration of the differential service needs among these patient groups. For example, older adults are mostly covered by Medicare and few are uninsured. Older adults also have a higher prevalence of MH conditions correlated with aging and social isolation. (111) Among children, the common types of MH conditions also vary from those of adults in outpatient care settings, with a higher prevalence of disruptive behavior problems, learning disorders, adolescent-onset depression and suicide risk. (111, 112)Studies on service utilization among children also require additional emphasis on the role of parents in detecting problems and seeking treatment. I excluded another 416 patients who did not identify the HC they were interviewed at as their usual source of care since they would have received their primary care or MH services at other

facilities. Finally, I deleted 49 respondents because they had missing K6 scores. The final sample size for analyses of utilization of MH services anywhere was 4,575. The final sample size for analyses of utilization of MH services on-site versus off-site was 1,130. (See Figure 2)

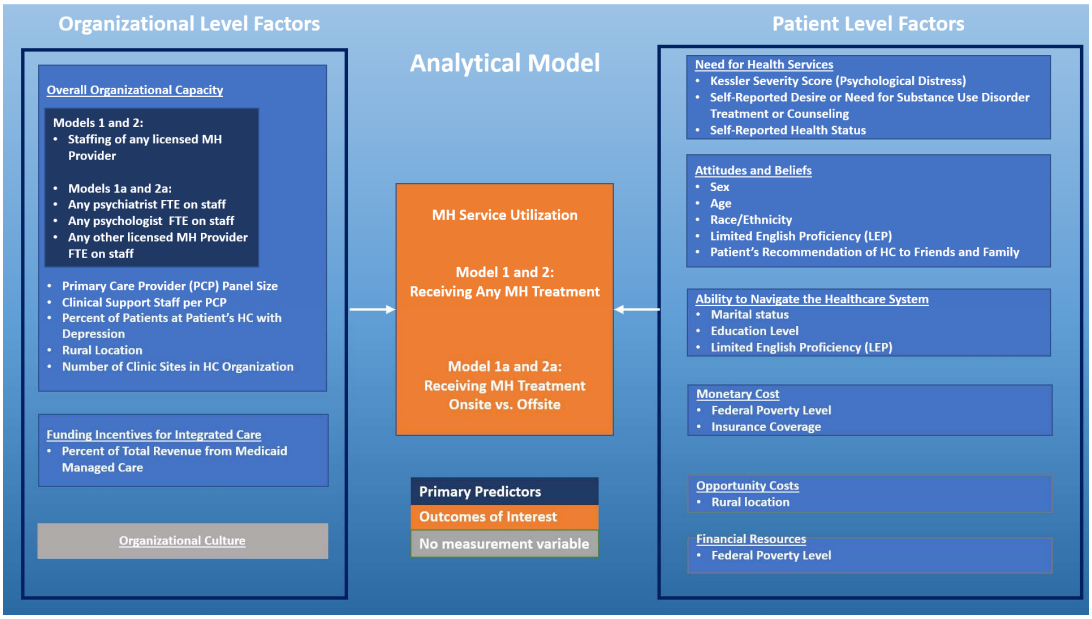
Figure 2. Paper 1 Study Sample and Eligibility Criteria



Analytical Framework

Figure 3 depicts the analytical framework for this paper, based on the conceptual framework presented in Chapter 2 (Figure 1). This framework depicts how the broad constructs of organizational and patient level factors are operationalized into specific representative variables. Details on variable construction are also provided in Appendix A.

Figure 3. Analytical Framework for Utilization of Mental Health (MH) Services by Health Center Patients



Dependent Variables

The first dependent variable was based on the following survey question: "Have you received any mental health treatment or counseling in the past 12 months? Please include treatment with prescription medication, group, family, couples, or individual counseling with a mental health provider such as a social worker, psychologist, psychiatrist, psychiatric nurse or other mental health professional, and inpatient treatment. Do not include or advice given by a friend, or spiritual counseling through a church or religious group." A follow-up question to this

asked the patient whether they had received any MH services or counseling within the last 12 months. I used these responses to construct a dichotomous outcome variable indicating whether a patient had utilized MH services anywhere within the last 12 months (no (reference) versus yes). Although my predictor of interest was staffing of licensed MH providers at HCs, the outcome included the possibility of patients receiving MH treatment or counseling from their PCP, licensed MH providers who were volunteers but not on staff at the HC, or unlicensed MH providers supervised by licensed MH providers who were not on staff at the HC.

The second dependent variable was based on a follow-up question that asked whether the patient received all, some, or none of the MH visits at the HC. Due to small sample sizes, I combined the first two categories to indicate at least some MH visits were received on-site versus no MH visits were received on-site (reference).

Independent Variables

Organizational Level Factors for Utilization of Mental Health Services

All organizational variables were constructed using UDS data. The histograms and distribution details for all organizational level variables which I categorized are provided in Appendix A.

Primary Predictor – Staffing of Licensed MH Providers at Patient's HC

The primary predictor of interest for this analysis was staffing of licensed MH providers at a patient's HC, defined as the ratio of total full time MH employees (MH FTE) per 2,000 patients. MH providers included psychiatrists, licensed clinical psychologists, LCSWs, and other licensed MH providers including psychiatric social workers, psychiatric nurse practitioners, family therapists, and other licensed master's degree prepared clinicians (as listed in the UDS

report). (110) Unlicensed MH providers were not included in the analysis because they require supervision from licensed MH providers to practice and cannot bill for services under guidelines by the Centers for Medicare & Medicaid Services (CMS). (113)

Due to discontinuous and highly skewed distributions of MH FTE, I constructed a categorical variable to indicate whether an HC had 1) no MH FTEs, 2) less than one MH FTE, or 3) at least one MH FTE per 2,000 patients to test hypotheses 1 and 2. The cutoff of one FTE was chosen to distinguish between part-time and full-time staffing. The literature on MH integration does not provide a consensus on the optimal or average panel sizes for MH providers in primary care settings. This question is further complicated by the different MH professions and their varying treatment modalities and ability to treat various MH conditions. Consequently, I standardized the co-located MH provider measure to one MH FTE per 2,000 patients based on the calculation that in one year (50 weeks, excluding vacation/sick time) one FTE would be able to provide approximately 2,000 consultations lasting about 1hour.

To tests hypotheses 1a and 2a, I used staffing variables from UDS data that reported number of FTE for psychiatrist, clinical psychologist, LCSWs and any other licensed MH provider to construct three separate dummy variables to indicate whether the HCs had 1) more than 0 FTE for psychiatrist (versus none), 2) more than 0 FTE for psychologist (versus none), and 3) more than 0 FTE for any other licensed MH provider (including LCSW) (versus none). I did not use the count of these MH providers because the numbers of these FTEs were frequently too small, and the distributions were also highly skewed and multimodal.

Control Variables

Overall Organizational Capacity

PCPs may screen patients for MH conditions or treat mild conditions but their ability to do so depends on their workload. Therefore, I included a variable to control for the size of the PCP panel and their workload. The amount of time a PCP has for appointments is important not only for screening purposes, but also to establish trust with their patients for honest communication. I created this variable by dividing the total number of medical patients (excluding dental only or patients seen for other purposes) by the total number of family physician, general practitioner, internist, nurse practitioner, and physician assistant FTEs. Due to the skewed and multimodal distribution of this variable, I then categorized this variable based on the 25th and 75th percentiles of the distribution of patients in the sample: 1) panel size of less than 1,200 patients (reference), 2) panel size of at least 1,200 patients but less than 2,000 patients, and 3) panel size of at least 2,000 patients.

Furthermore, I controlled for clinic support staff to PCP ratio as a measure of the capacity of PCPs to spend more time with patients and collaborate with MH providers in care of patients with MH conditions. Clinic support staff included registered nurses, licensed practical and vocational nurses, home health and visiting nurses, clinical nurse specialists, public health nurses, medical assistants, and nurses' aides. I created categories for this variable with cutoffs based on the 25th and 75th percentiles of the distribution of patients in the sample: 1) ratio of 2 or less (reference), 2) ratio greater than 2 but no more than 4, and 2) ratio greater than 4.

I included an indicator for rural (versus urban) location of the HC to control for local supply of external MH providers because rural areas often face shortages.

To reflect the overall capacity in size and service offerings of an HC, I controlled for number of clinic sites within the HC organization. Due to the skewed distribution of this variable, I used a categorical variable with cutoffs to reflect whether patients went to an HC with

a low, medium, or high number of clinic sites. The cutoffs were based on the 50th and 75th percentiles of the distribution of patients in the sample: 1) 10 sites or fewer (reference), 2) more than 10, but less than 20 sites, and 3) 20 or more sites.

As a measure proxying appointment availability for MH services, I included a variable indicating the percent of patients diagnosed with depression (regardless of primary diagnosis) at the patient's HC from the UDS data. Due to the skewed distribution of this variable, I created categories to account for low, medium, and high demand for MH services. The cutoffs were based on the 25th and 90th percentiles of the distribution of patients in the sample: 1) 5% or less of total patients (reference), 2) More than 5%, but less than 15% of total patients, and 3) 15% or more of total patients.

Financial and Non-Financial Incentives

As a proxy for financial incentives from managed care contracts to provide integrated care, I included a variable to measure the percent of total revenue charges that came from Medicaid Managed Care (capitated) contracts at a patient's HC. Due to the highly skewed distribution, I categorized this variable based on the 90th percentile of the distribution of patients in the sample: 1) no revenue from Medicaid Manage Care (reference), 2) less than 25% of total revenue, and 3) 25% or more of total charges.

Organizational Culture

There were no variables available in the UDS to create measures of organizational culture that would promote integration.

Patient Level Factors for Utilization of Mental Health Services

Most patient level variables were constructed using HCPS data.

Need for Health Services

I used several variables to account for a patient's need for MH services. I constructed a variable to account for the patient's level of psychological distress using the Kessler 6 (K6) diagnostic questions in the survey. K6 is a validated 6-item screening scale for psychological distress which asks patients about the frequency of symptoms of distress, with the possible responses ranging from "none of the time" as the minimum and coded as 0, to "all of the time" as the maximum and coded as 4, for each question. The overall score ranges between 0 to 24 and the patient's level of psychological distress is measured as mild, moderate, and severe. I used diagnostic criteria validated by Prochaska et al. (114) Patients with a score below 5 are considered as having mild psychological distress (or none), and those with a score of at least 5 but less than 13 are considered as having moderate psychological distress. Patients with a score of 13 or higher are considered as having severe psychological distress (see Appendix A).

Because substance use disorders are highly correlated with MH conditions, I also included an indicator variable for whether a patient reported wanting or needing counseling or treatment for drugs and/or alcohol in the last 12 months (versus reference category of not wanting treatment or counseling).

I also used the patient's self-reported health status as an overall measure of health to control for the negative psychological effects of pain, lack of energy, and interruptions to work and social life for those in poor health. I dichotomized this variable as indicating excellent or very good health (versus reference category of good, fair, or poor health).

Attitudes and Beliefs

I used demographic characteristics to proxy for different perceptions or cultural attitudes and beliefs toward MH and seeking care through the healthcare system. These included the patient's sex (male (reference) versus female), age (26-49 (reference) versus 18-25 or 50-64), and race/ethnicity (non-Hispanic White (reference) versus Hispanic/Latino, non-Hispanic Black, and other or unknown) as proxies for perceived mental health stigma. (115) The categories for patient's age were consistent with SAMHSA's report on Key Substance Use and MH Indicators from the National Survey on Drug Use and Health. (1) The *other* category for patient's race/ethnicity included patients who identified themselves as Asian, Native Hawaiian/Pacific Islander, Native American/Alaskan Native, other, and unknown. These groups were combined due to sample size limitations. I also included a variable indicating whether a patient had limited English language proficiency (LEP) as a proxy for immigration status and a patient's familiarity with the healthcare system and level of trust with healthcare providers. Patients were included in the LEP category if they said they spoke English well, not well, or not at all. Patients were included in the reference category of "not LEP" if they said they did not speak a language other than English at home or if they said they spoke English very well. To control for patients' past experiences with the HC, I included a variable indicating whether a patient reported that they would not definitely recommend the HC to their friends or family. To capture any dissatisfaction with service, this variable combined both patients who said they would not recommend and those who said they would only somewhat recommend the HC, compared to patients who reported that they would definitely recommend the HC (reference).

Ability to Navigate the Healthcare System

I used marital status as a proxy for social support that could help a patient navigate the healthcare system. I dichotomized this variable as married or living with a domestic partner (reference) versus never married, separated, widowed, or divorced. I also included the patient's education level as a proxy for patient's potential familiarity and ability to navigate the healthcare system. This variable was categorized into the following categories: 1) less than high school (reference), 2) through high school, or 3) more than high school. LEP status was also considered a proxy for a patient's limited ability to communicate and trust healthcare professionals.

Monetary Costs

I used Federal Poverty Level (FPL) as a proxy for a patient's potential concern over out of pockets associated with receiving care. Because HC patients were primarily low-income, I dichotomized this variable to indicate whether the patient was at or below 100% FPL (reference category was above 100% FPL). I included another categorical variable indicating whether patients were uninsured (reference), had Medicaid, or had some other type of insurance (private, other public insurance, etc.) with the expectation that having insurance and the type of insurance influenced their ability to afford out-of-pocket costs of MH services.

Opportunity Costs

I considered rural location of the HC as a proxy for opportunity costs since clinics in rural are likely to be farther away from a patient's residence, which means more time spent traveling to and from the appointment.

Financial Resources

I also used federal poverty level as a proxy for a patient's financial resources since those with low FPL are less likely to have other financial assets beyond income.

Statistical Analysis

I used STATA 16 to conduct the statistical analysis for this paper. I reported the descriptive results at the population level by adjusting the data for the complex survey design using the *svyset* option and the single aggregate sampling weight available in HCPS. I also conducted chi-squared tests to determine whether there were significant differences across HCs with different levels of licensed MH staffing. To check for collinearity between independent variables, I obtained VIF estimates after running a simple regression model to ensure no variables had a VIF value higher than 5 (see Appendix Table 1).

I did not use the same approach to weighting the data in the regressions because clustering of patients within HCs influenced the relationship between independent and dependent variables and HCPS did not provide the needed weights. Therefore, I used multilevel logistic generalized structural equation models (GSEM) to examine association of licensed MH providers on staff at patients' HCs with patient utilization of MH services, controlling for clustering of patients within HCs. All GSEM models included a latent variable (M1) to account for the random effect of HCs. I also used the sampling weight which was scaled to adjust for HC size (number of patients sampled was proportional to the size of the HC). For ease of interpreting results of these models, I used the margins, dydx command to obtain absolute predicted probabilities and predictive margins. To explore whether MH staffing at HCs is a more effective approach to delivering MH care for patients with differing levels of MH need, I also ran separate

regression models stratified by the K6 categories, diagnosis of depression or anxiety, and diagnosis of panic disorder, schizophrenia, and bipolar disorder as reported by patients in HCPS.

Results

Descriptive Results

Table 1 provides patient characteristics of the sample and shows that the majority of patients (71%) were patients of HCs with less than one licensed MH FTE staff per 2,000 patients, followed by 19% with no licensed MH provider, and 10% with one or more licensed MH provider. Out of the entire study sample, most patients (73%) reported no MH visits in the last 12 months, while 11% had all MH visits off-site, and 16% had at least some MH visits on-site.

A little over half the sample (58%) went to an HC where the PCP panel size was at least 1,200 patients, but less than 2,000 patients; a quarter of the sample (25%) went to an HC where the panel size was at least 2,000 patients; only 17% of the sample went to an HC where the panel size was less than 1,200 patients. About half the sample (54%) went to an HC with a clinic support staff to PCP FTE ratio greater than 2, but less than 4; about a third of patients (34%) went to an HC where the ratio was less than 2; and 12% of patients went to an HC with a ratio of greater than 4. About half of the sample went to an HC located in a rural area (47%). Over half of the patients (60%) went to an HC that had 10 or fewer clinic sites; 23% went to an HC that had more than 10, but less than 20 sites; and 17% of patients went to an HC with 20 or more sites. More than half the sample (59%) went to an HC where more than 5%, but less than 15% of the patients had a depression diagnosis. About a third of patients (30%) went to an HC where 5% of patients or less had a depression diagnosis, and 11% went to an HC where 15% or more of the

patients had a depression diagnosis. More than half of patients (56%) went to an HC that did not collect any revenue from Medicaid Managed Care, while 38% went to an HC where less than 25% of total revenue came from this source, and 6% of patients went to an HC where at least 25% of the total revenue came from this source.

Across all patients, 45% had mild or no psychological distress, 40% had moderate psychological distress, and 15% had severe psychological distress. There was a higher proportion of patients who reported moderate or severe psychological distress among those who went to HCs with at least one MH FTE (68%) than at HCs with fewer or no MH FTE (56% and 46% respectively). Only 5% of patients reported a wanting or needing counseling or treatment for drugs and/or alcohol, and 20% reported excellent or very good health (versus good, fair or poor health). The majority of patients were female (66%), about half were in the 26-49 age group (52%), and almost half identified as non-Hispanic white (48%). Only 17% of the sample had limited English proficiency, and 14% said they would not recommend or only somewhat recommend the HC to their friends or family. More than half of the sample was not married or living with a domestic partner (59%), about a third (37%) had more than a high school education. More than half of the patients (57%) were at or below 100% FPL and most were either uninsured (30%) or had Medicaid coverage (54%).

Table 1 Characteristics of Study Subjects/Population Estimates

	Health Center Co-Located Mental Health (MH) Staffing												
	Total			None			Less than 1 Licensed MH FTE per 2,000 patients			At least 1 Licensed MH FTE per 2,000 patients			
	(n=4,575)			(n=547, 19%)			(n=3,543, 71%)			(n=485, 10%)			
	n	Wtd. %	Std. Error	n	Wtd. %	Std. Error	n	Wtd. %	Std. Error	n	Wtd. %	Std. Error	x2 p-value
Dependent Variables													
Patient Mental Health Utilization (within past 12 months)													
No MH visits	3,419	73%	2%	459	81%	3%	2,695	74%	2%	291	50%	11%	
All MH visits off-site	506	11%	1%	66	13%	2%	395	11%	1%	45	12%	4%	
At least some MH visits on-site	650	16%	2%	22	6%	2%	453	15%	2%	149	37%	8%	0.00
Health Center Characteristics													
PCP Panel Size													
Less than 1,200 patients (reference)	866	17%	4%	144	21%	11%	602	15%	5%	120	23%	12%	
At least 1,200 patients, but less than 2,000 patients	2,565	58%	6%	221	60%	15%	1,990	58%	7%	354	50%	19%	
At least 2,000 patients	1,144	25%	5%	182	19%	11%	951	27%	6%	11	27%	21%	0.94
Clinic support staff to PCP FTE ratio													
ratio of 2 or less (reference)	1,306	34%	6%	170	43%	15%	971	33%	7%	165	26%	13%	
ratio greater than 2, but no more than 4	2,710	54%	6%	262	47%	16%	2,128	53%	7%	320	74%	13%	
ratio greater than 4	559	12%	4%	115	10%	8%	444	14%	5%	0	-	-	0.67
Rural location for HC	1,506	47%	6%	304	72%	16%	1,001	43%	7%	201	28%	14%	0.13
Number of clinic sites within patient's Health Center													
10 sites or fewer (reference)	2,298	60%	6%	407	80%	12%	1,756	57%	7%	135	49%	19%	
More than 10, but less than 20 sites	1,173	23%	5%	140	20%	12%	975	25%	6%	58	10%	8%	
20 or more sites	1,104	17%	4%	0	-	-	812	18%	5%	292	41%	18%	0.15
Percent of patients diagnosed with depression at patient's Health Center													
5% or less (reference)	1,244	30%	5%	304	52%	15%	930	28%	6%	10	1%	1%	
More than 5%, less than 15%	2,915	59%	6%	226	34%	14%	2,362	64%	6%	327	70%	15%	
15% or more	416	11%	4%	17	14%	13%	251	8%	3%	148	30%	15%	0.05

Percent of Revenue from Medicaid Managed Care													
No revenue (reference)	2,259	56%	6%	293	48%	16%	1,751	58%	7%	215	55%	18%	
Less than 25% of total revenue	1,974	38%	6%	234	51%	16%	1,470	34%	6%	270	45%	18%	
25% or more of total revenue	342	6%	2%	20	2%	2%	322	8%	3%	0	-	-	0.58
Patient Characteristics													
Mental health status (based on K6 score)													
Mild or no psychological distress	2,029	45%	3%	270	55%	7%	1,585	44%	3%	174	32%	7%	
Moderate psychological distress	1,797	40%	3%	202	33%	6%	1,377	40%	2%	218	57%	8%	
Severe psychological distress	749	15%	1%	75	13%	3%	581	16%	2%	93	11%	5%	0.08
Reported wanting or needing treatment or counseling for use of alcohol or drugs	356	5%	1%	40	4%	2%	263	6%	1%	53	5%	3%	0.89
Excellent or very good health (reference: good, fair, or poor health)	775	20%	2%	107	16%	3%	580	19%	2%	88	28%	4%	0.12
Female	2,946	66%	2%	369	74%	4%	2,311	66%	3%	266	48%	10%	0.04
Age													
18-25	427	16%	2%	265	62%	4%	1,691	50%	2%	247	51%	4%	
26-49 (reference)	2,203	52%	2%	47	9%	2%	350	18%	2%	30	17%	4%	
50-64	1,945	31%	2%	235	29%	4%	1,502	32%	3%	208	32%	5%	0.06
Race/Ethnicity													
Non-Hispanic White (reference)	1,081	48%	4%	144	60%	5%	770	44%	5%	167	53%	15%	
Hispanic/Latino	1,616	25%	3%	183	19%	6%	1,313	28%	4%	120	15%	3%	
Non-Hispanic Black	1,074	20%	2%	159	18%	6%	813	21%	3%	102	18%	9%	
Other	804	6%	1%	61	3%	2%	647	6%	1%	96	14%	6%	0.24
Widowed, divorced, separated, or never married (reference: married or living with a domestic partner)	2,717	59%	2%	308	49%	5%	2,075	61%	2%	334	61%	3%	0.06
Limited English Proficiency (reference: not LEP)	1,418	17%	2%	138	11%	4%	1,203	19%	3%	77	13%	3%	0.13
Would not recommend or only somewhat recommend HC to family or friends (reference: would definitely recommend)	840	14%	1%	102	9%	2%	649	16%	2%	89	14%	5%	0.19
Education													
Less than high school (reference)	1,980	34%	2%	270	39%	4%	1,533	33%	3%	177	35%	7%	
Up through high school	1,268	29%	2%	125	24%	2%	1,001	32%	2%	142	21%	7%	
More than high school	1,327	37%	2%	152	37%	4%	1,009	35%	2%	166	44%	6%	0.28

At or below 100% Federal Poverty Level (reference: above 100% FPL)	3,004	57%	3%	340	49%	6%	2,341	60%	3%	323	51%	7%	0.13
Insurance coverage status													
Uninsured	1,241	30%	3%	197	25%	5%	942	31%	4%	102	27%	7%	
Medicaid	2,531	54%	4%	227	51%	5%	2,002	54%	5%	302	56%	7%	
Other or missing response	803	16%	2%	123	24%	6%	599	15%	2%	81	17%	4%	0.43
Source: Uniform Data System 2013 and Health Center Patient Survey 2014 MH = Mental Health, FTE= Full Time Employee, HC = Health Center Wtd. % = Weighted Percent													

Regression Results

Staffing of Licensed MH Providers at HCs and HC Patients Receiving MH treatment Anywhere (Model 1)

Multivariate regression results using GSEM with a logistic specification identified staffing of licensed MH providers at HCs as significantly associated ($p<0.05$) with the likelihood of patients receiving any MH services within the past 12 months (Table 2). All factors equal, the predicted probability of receiving any MH services was 22% for patients at HCs with no licensed MH provider, compared to 32% for patients at HCs with at least 1 licensed MH FTE per 2,000 patients. However, the analysis also showed that compared to receiving care at an HC with no licensed MH provider, receiving care at an HC with less than 1 licensed MH FTE per 2,000 patients was not significantly associated with patients' likelihood of receiving MH treatment. More detailed regression results for this model are presented in Appendix Table 2. A number of control variables were significant predictors of high utilization of outpatient visits. Among organizational-level variables, going to an HC where there was a higher level of need MH services (compared to an HC where only up to 5% of total patients with a depression diagnosis) was a significant positive predictor of the patient receiving MH treatment within the last 12 months.

Among patient characteristics (see Appendix Table 2), having more than a high school education (versus less than high school), having Medicaid coverage (versus no insurance), having moderate or severe psychological distress (versus mild or none), and reporting wanting or needing treatment or counseling for their use of alcohol or drugs were significant predictors of receiving MH treatment. Being in the older age group (50-64 versus 26-49), identifying as

Hispanic/Latino or non-Hispanic Black (versus non-Hispanic White), and having limited English proficiency were significantly associated with a lower likelihood of receiving MH treatment.

Table 2: Staffing of Licensed MH Providers at HCs and Predicted Probabilities of HC Patients Receiving Mental Health Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services)

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group*	p-value for Difference
Sample Size	**4,575**			
Model 1 **Primary Predictor:** **Overall Licensed Mental Health Provider FTE**				
No MH FTE (reference)	22%	2%	ref	ref
Less than 1 MH FTE per 2,000 patients	24%	1%	2	0.379
At least 1 MH FTE per 2,000 patients	32%	4%	10	0.047

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for PCP panel size, clinic support staff to PCP ratio, rural location, number of clinics in overall HC organization, percent of HC patients diagnosed with depression, percent of total revenue from Medicaid Managed Care), sex, age, race/ethnicity, marital status, education level, limited English proficiency, personal recommendation of HC, federal poverty level, insurance coverage, MH status, reported desire for SUD counseling or treatment, self-reported overall health status).
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider,
SUD = Substance Use Disorder
*Point differences are rounded to closest whole number

Regression results were similar when stratifying observations by K6 scores (see Appendix Table 3) for patients with mild or moderate and only moderate psychological distress. However, this was not the case for the group of patients with only severe psychological distress. Similarly, stratified analyses yielded similar significant findings when examining patients with depression or generalized anxiety but not for patients with panic disorder, schizophrenia, bipolar disorder (see Appendix Table 4).

Specific Types of Licensed MH Providers at HCs and HC Patients Receiving MH treatment Anywhere (Model 1a)

I did not find a significant relationship between having different types of licensed MH providers on staff at HCs and patients receiving MH treatment within the past 12 months (Table 3). In other words, controlling for other variables in the model (including having other licensed MH providers on staff), going to an HC that had any level of psychiatrist FTE (versus going to an HC with no FTE psychiatrist) did not change the likelihood of receiving MH treatment. There was also no significant change in the likelihood of receiving MH treatment whether a patient went to an HC with any level of psychologist FTE (versus no FTE), or an HC with any level of other types of licensed MH providers FTE (versus none). The only HC characteristic that made a significant difference in whether patients received MH services was the percentage of patients at the HC with a depression diagnosis, and this was a positive relationship (see Appendix Table 5).

The associations between patient characteristics and receiving MH treatment were consistent with the previous model (see Appendix Table 5).

Table 3: Staffing of Specific Types of Licensed MH Providers at HCs and Predicted Probabilities of HC Patients Receiving Mental Health Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services)

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group*	p-value for Difference
Sample Size	**4,575**			
Model 1a **Primary Predictors: Type of Licensed Mental Health Provider**				
Attending an HC with no psychiatrist FTE on staff	24%	2%	ref	n/a
Attending an HC with any psychiatrist FTE on staff	26%	2%	2	0.377
Attending an HC with no clinical psychologist FTE on staff	25%	1%	ref	ref
Attending an HC with any clinical psychologist FTE on staff	25%	2%	0	0.814
Attending an HC with no other licensed MH provider FTE on staff	25%	3%	ref	ref
Attending an HC with any other licensed MH provider FTE on staff	25%	1%	0	0.977

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for PCP panel size, clinic support staff to PCP ratio, rural location, number of clinics in overall HC organization, percent of HC patients diagnosed with depression, percent of total revenue from Medicaid Managed Care), sex, age, race/ethnicity, marital status, education level, limited English proficiency, personal recommendation of HC, federal poverty level, insurance coverage, MH status, reported desire for SUD counseling or treatment, self-reported overall health status).
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider,
SUD = Substance Use Disorder
*Point differences are rounded to closest whole number

Staffing of Licensed MH Providers at HCs and HC Patients Receiving MH treatment On-site (Model 2)

For patients who reported receiving any MH services within the last 12 months, the predicted probabilities of having on-site MH visits are displayed in Table 4. Patients at HCs with no licensed MH FTE had a significantly lower predicted probability of reporting an on-site visit (28%) than those at HCs with limited licensed MH providers (49%) and patients at HCs with at

least one licensed MH FTE per 2,000 patients (65%). More detailed regression results are provided in Appendix Table 6. In this case, the percent of patients at the HC with a depression diagnosis was not a significant predictor in this case. No other organizational level factors were significant predictors of having on-site MH visits. Among patient characteristics, identifying as Hispanic/Latino or one of the "other" race/ethnicity categories (versus non-Hispanic White), limited English proficiency (versus not LEP), and severe psychological distress (versus mild or none) were significant predictors of having at least some on-site MH visits. Younger age (18-25 versus 26-49), not recommending or only somewhat recommending their HC (versus definitely recommending), and reporting excellent or very good health (versus good, fair, poor health) were significant predictors of not having any on-site MH visits at the HC.

Table 4: Staffing of Licensed MH Providers at HCs and Predicted Probabilities of At Least Some On-Site Patient Utilization of Mental Health Services (versus All Off-Site) Among HC Patients Receiving Any Mental Health Services

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group*	p-value for Difference
Sample Size	**1,130**			
Model 2 **Primary Predictor: Any Licensed Mental Health Provider**				
No MH FTE (reference)	28%	6%	ref	ref
Less than 1 MH FTE per 2,000 patients	49%	3%	22	0.001
At least 1 MH FTE per 2,000 patients	65%	7%	38	0.000

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for PCP panel size, clinic support staff to PCP ratio, rural location, , number of clinics in overall HC organization, percent of HC patients diagnosed with depression, percent of total revenue from Medicaid Managed Care), sex, age, race/ethnicity, marital status, education level, limited English proficiency, personal recommendation of HC, federal poverty level, insurance coverage, MH status, reported desire for SUD counseling or treatment, self-reported overall health status).

Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider, SUD = Substance Use Disorder
*Point differences are rounded to closest whole number

Specific Types of Licensed MH Providers at HCs and HC Patients Receiving MH treatment On-site (Model 2a)

In the model assessing the relationship between having different types of licensed MH providers on staff and location of MH visits, all other factors equal, the predicted probability of having any on-site MH visit was significantly higher (58% versus 40%) if the HC had any psychiatrist FTE level on staff versus 0 psychiatrist FTE (see Table 5). No other MH provider categories, however, were significantly associated with this outcome. No other organizational level factors were significant predictors of having MH visits on-site. Associations between patient characteristics and having any MH visits on-site were consistent with the previous model (see Appendix Table 7).

Table 5: Staffing of Specific Types of Licensed MH Providers at HCs and Predicted Probabilities of At Least Some On-Site Patient Utilization of Mental Health Services (versus All Off-Site) Among HC Patients Receiving Any Mental Health Services

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group*	p-value for Difference
Sample Size	**1,130**			
Model 2a **Primary Predictors: Type of Mental Health Staff**				
Attending an HC with no psychiatrist FTE on staff	40%	4%	ref	ref
Attending an HC with any psychiatrist FTE on staff	58%	4%	17	0.002
Attending an HC with no clinical psychologist FTE on staff	50%	3%	ref	ref

Attending an HC with any clinical psychologist FTE on staff	50%	3%	0	0.935
Attending an HC with no other licensed MH provider FTE on staff	42%	5%	ref	ref
Attending an HC with any other licensed MH provider FTE on staff	51%	3%	9	0.133

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for PCP panel size, clinic support staff to PCP ratio, rural location, number of clinics in overall HC organization, percent of HC patients diagnosed with depression, percent of total revenue from Medicaid Managed Care), sex, age, race/ethnicity, marital status, education level, limited English proficiency, personal recommendation of HC, federal poverty level, insurance coverage, MH status, reported desire for SUD counseling or treatment, self-reported overall health status).
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider,
SUD = Substance Use Disorder
*Point differences are rounded to closest whole number

Discussion

Study findings showed that patient's HCs in 2013 had some licensed MH providers but only a small proportion (10%) had at least one licensed MH FTE per 2,000 patients. The findings (partially) supported the hypothesis 1) that staffing of licensed MH providers at HCs (at least one licensed MH FTE per 2,000 patients) increased the likelihood of patients receiving MH treatment within the past12 months. The findings did not support the hypothesis 1a) that the type of MH provider (psychiatrist, clinical psychologist, other licensed MH provider) increased the likelihood of patients receiving MH treatment. Results did support my hypothesis 2) that among those who received MH services, receiving care at an HC with more licensed MH providers on staff (versus none) increased the likelihood of patients having at least some on-site MH visits. The results also partially supported my hypothesis 2a) that compared to going to an HC with no psychiatrist FTE, going to an HC with any level of psychiatrist FTE increased this predicted probability. However, there was no significant difference for psychologist or the other licensed MH providers.

Results of this study are consistent with previous research that suggests co-location of licensed MH providers increases access to MH services. (116, 117) This increase is likely due to the higher capacity for screening and detecting patients with MH conditions and treating them rather than referring out to external providers. (117) These findings highlight the importance of having at least one MH FTE per 2,000 patients to increase the likelihood of patients at federally funded HCs receiving MH treatment. This is likely because lower licensed MH provider capacity does not adequately support systematic screening of patients due to limited availability of licensed MH providers to consult with PCPs, engage in warm handoffs of patients, and diagnose and treat all patients that need MH care. (118)

The stratified analyses showed that patients with mild or moderate MH conditions were more likely to benefit from more licensed MH staffing, while no significant difference was observed for patients with more severe forms of MH conditions. One possible explanation is that patients with severe MH symptoms are prioritized for referrals to more specialized care, so within HC staffing does not have the same benefits for these patients.

The findings also suggest that co-location of psychiatrists significantly increased the predicted probability of receiving on-site MH services among patients who received any MH services within the past 12 months. This may be related to the fact that psychiatrists are the only MH providers who can prescribe medications.

Study Limitations

Findings from this study should be considered in light of some important limitations. Due to the cross-sectional study design of the HCPS, I was unable to determine a causal relationship between staffing of licensed MH providers at HCs and patients receiving MH treatment. UDS

data provides aggregate information for the calendar year, e.g. total staff FTE by the end of the year. Because patients were asked about HC visits that they had starting in 2014, 2013 health center data were intentionally used to address temporality issues in the study. Although staffing levels may have changed from 2013 to 2014, 2013 data served as a more appropriate baseline to reflect the resources already in place at the beginning of 2014. Also, because the HCPS does not include information on precisely when patients started receiving MH treatment, patients could have received MH services elsewhere before visiting the HC for primary care reasons.

My analyses of the type of MH providers on staff was limited to assessing whether an HC had each type of provider separately. I was not able to construct a variable that showed what combination of types of MH providers were on staff in an HC due to sparseness of the data. In other words, I could not examine if having a psychiatrist and psychologist versus a psychologist and licensed clinical social worker led to different outcomes.

Another limitation of this study is that UDS includes administrative data for the entire HC organization rather than at the specific HC clinic site where patients received care. Therefore, individual clinics could have had a different level of staffing than the HC organization as a whole. This could have biased results of my study away from finding a significant association with co-location since the level of exposure to MH staff was likely exaggerated in some cases. A related issue is that patients at HCs with more than one site may have reported receiving MH treatment off-site even if they received care at a different clinic within the same HC organization. The phrasing of the survey question does not provide clarity on this issue. Regardless, when HC providers are able to refer patients to services within their same organization, there are still fewer cost barriers for patients because of their mission to provide care to all patients regardless of their ability to pay. Within-HC MH staffing also helps address

other barriers such as care coordination, familiarity or comfort with provider or setting, and possibly those related to opportunity costs since HCs often offer enabling services to help patients with transportation and other obstacles to access.

HCPS respondents may have underreported MH utilization due to the sensitive nature of questions about their MH. (119) This means the sample may have had more patients with MH conditions who would have benefitted from co-location of MH providers. This undercount of MH service need could have biased my study results toward finding a significant and positive effect of MH staffing on utilization of MH services. Although I tried to control for MH need in my analysis, the K6 score may not have been a reliable indicator for past MH need. K6 questions provide information about the patient's psychological distress during the last 30 days, whereas the outcome of interest was whether the patient received MH services within the last 12 months. Patients who had MH problems in the past could have been in remission or their symptoms may have been under control at the time of the survey. Patients may have also received treatment and had their symptoms improve as a result. In both cases, patients may not have felt psychological distress within the last 30 days, so their MH status was not adequately accounted for. The K6 questions also do not capture all forms of MH needs. It is possible that my measures of MH need were inadequate, and I underestimated this need. It is possible that MH staffing at HCs may only improve access for patients with a higher level of need for MH services. However, the K6 diagnostic tool provided a useful measure to capture patients at risk for having MH conditions or likely to have had MH problems in the past, as opposed to only patients who have already been diagnosed with a specific MH condition.

The limitations of the K6 score as an indicator of MH need also means there was the possibility of self-selection bias of patients with MH conditions purposefully seeking out HCs

that provided MH services. However, study results show that even HCs with MH staff are often very limited in terms of their staffing capacity, i.e. total FTE, particularly for psychiatrists and psychologists. I used the chi2 test to assess whether there were differences across HC staffing and patient's level of psychological stress (K6 score), but the results did not indicate significant differences at the $p<0.05$ level.

Despite these limitations, this is the first study to use representative national data to examine the relationship between staffing of licensed MH providers at HCs and utilization of MH services, while controlling for extensive patient level factors, as well as organizational characteristics of their HC. This is an important step in understanding the potential role that co-located MH providers can play in improving access for those most at risk for unmet MH needs.

Policy Implications

My findings show that level of MH staffing at HCs is very limited. Research has identified common operational and financial challenges that HCs face in trying to hire and integrate MH providers into their practice. (76, 120-122) These circumstances continue to present obstacles for low-income, uninsured, and underinsured patients to access MH services at their HC.

Even at HCs where there is MH staffing, FTE levels may not be enough to meet the need for these services. HCs will need adequate staffing levels to help decrease the unmet need due to limited screening, diagnosis, and treatment capacity. It is also important to note that co-location alone does not equate to full integration between PCPs and MH providers at HCs. Full integration requires intensive efforts to promote close collaboration between PCPs and MH providers and requires commitment from HC leadership, workflow adjustments, and provider

buy-in. (123) As previous researchers in this field have argued, co-location alone is not enough for organizations to see improvements in patient outcomes. These changes can be promoted through federal funding providing incentives for HCs to engage in integrated care practices. To help HCs successfully integrate care, HRSA and SAMHSA should continue to provide funding for technical assistance, as well as expand access to workshops and trainings through their Center for Integrated Health Solutions (CIHS). (79) For example, HRSA has implemented the Behavioral Health Workforce Education and Training (BHWET) Program to recruit MH providers, as well as periodically disbursing MH workforce grants. (15) State and federal government can further help address recruitment challenges by expanding programs like the National Health Corps (124) with an increased focus on MH services, disbursing additional earmarked grants for HCs to hire MH providers, and allowing for flexible billing options and increased Medicaid reimbursement rates for MH professionals who work at HCs. (14, 125)

Study findings also highlight the potential value of hiring of psychiatrists at HCs for improving continuity of care for HC patients. Since psychiatric services are in short supply, particularly in community-based settings, patients are likely to have trouble finding providers willing to accept Medicaid coverage or offering sliding scale prices. This makes availability of psychiatrists at HCs especially important for addressing disparities in access to MH services.

The findings from this study raise several questions for future research. Studying patterns of utilization more closely would provide insight into the effectiveness of integrated care in improving access and other outcomes such as quality of care, patient satisfaction, and improvements in mental and physical health. Considering the differences in training, expertise, and salary levels among MH providers, it is also worth exploring how the type of provider (e.g. licensed clinical social worker versus psychologist) and team structure at HCs may affect these

outcomes. (126) For example, hiring psychiatrists may HCs improve continuity of care and medication management for patients with more severe forms of MH conditions. Without their on-site services, patients would otherwise need a referral elsewhere and would likely have trouble finding providers willing to take them on at discounted rates. (82) More research is also needed on the necessary level of FTE to adequately meet patient needs. For more robust analyses, UDS data should include data on staffing structure at the clinic level as opposed to organizational level. Partnered research with HCs in these areas could provide invaluable learning opportunities on how to minimize disparities in MH care access among some of the nation's most vulnerable population groups.

CHAPTER 4: PAPER 2

In this chapter, I present the second paper of my dissertation titled: **Can Co-Location of Licensed Mental Health Providers at Health Centers Reduce High Utilization of Health Services?** The chapter is intended to be comprehensive and self-standing. The sections consist of background, study objectives and hypotheses, methods, results, discussion, study limitations, and policy implications.

Background

The high expenditures associated with use of emergency department (ED) and acute health services has led to an upsurge of research focused on identifying high utilizers of acute care and identifying less costly services that can reduce acute care utilization. (127) Existing evidence indicates that high utilizers frequently have mental health (MH) comorbidities, which are often undiagnosed and untreated because MH care has been traditionally siloed from settings where most patients receive health care. (23, 29, 128-131) Such unmet need can in turn hinder self-management of chronic conditions and possibly lead to higher use of acute care and worse health outcomes. (22) Evidence indicates that co-location of MH providers in primary care settings can help address unmet MH need, and improve patients' self-management skills, compliance with provider recommendations, and ultimately avoid complications leading to increased healthcare utilization. (36-38, 86, 132-137) Some studies have identified a relationship between integrated care and improvements in MH status, medication adherence, and patient outcomes for chronic condition such as diabetes and hypertension. (60, 69, 70, 132)

Co-located MH providers can promote screening, diagnosis, and treatment of MH conditions, teach patients self-management skills, promote adherence to treatment plans, and support primary care providers (PCPs) in managing patients with MH conditions. There are differences in the type of services provided by each type of MH provider. Psychiatrists can diagnose patients and provide psychotherapy and pharmacological treatments depending on the care setting. They can also train PCPs on and consult with them on pharmacological treatment of patients with moderate and severe conditions. Clinical psychologists and licensed clinical social workers (LCSWs) can provide different forms of psychotherapy for MH conditions as well as behavioral change therapies and other services to increase self-management skills. LCSWs may

also oversee case management efforts in which patients are screened for and referred to social services for problems with housing, transportation, legal and financial problems.

There are few studies that have assessed the relationship between integrated care and utilization of non-MH outpatient and acute care services. Most research on high utilizers have focused on the role of care coordination or case management for high utilizers, and many of these interventions begin in the hospital setting when a patient is discharged and connected to primary care and other social services. (39, 40, 92) However, it has been well-established that MH conditions are common among high utilizers of health services, and that MH conditions and other psychosocial barriers can have negative effects on physical health and patients' ability to manage their symptoms and adhere to treatment plans. This paper aims to contribute to the literature by studying how access to MH services may help reduce high utilization of health services among a vulnerable population of patients.

Study Objectives and Hypotheses

In this study, I explored the potential role of co-location of licensed MH providers at Health Centers (HCs) in reducing patients' high utilization of health services. My objectives were to assess whether co-location of licensed MH providers was associated with high utilization of 1) outpatient visits, 2) ED visits, and 3) any hospitalization. I proposed the following hypotheses for these objectives.

Hypothesis 1: Patients at HCs with more co-located licensed MH providers are less likely to be high utilizers of outpatient visits than patients of HCs with fewer or no co-located providers.

Hypothesis 2: Patients at HCs with more co-located licensed MH providers are less likely to be high utilizers of ED visits than patients of HCs with fewer or no co-located providers.

Hypothesis 3: Patients of HCs with more co-located licensed MH providers are less likely to have a hospitalization than patients of HCs with fewer or no co-located providers.

Rationale: Co-locating more MH providers in HCs promotes screening, diagnosis, treatment, monitoring, and referrals for MH services. MH providers can also help teach patients self-management skills for their physical health conditions. Co-location would then decrease the overuse of outpatient visits, ED visits, or hospitalizations due to untreated MH conditions.

Hypothesis 1a: Patients at HCs with any psychiatrist FTE, clinical psychologist FTE, any LCSW FTE are less likely to be high utilizers of outpatient visits than patients of HCs without these types of MH providers. (Each type of MH provider is considered separately).

Hypothesis 2a: Patients at HCs with any psychiatrist FTE, clinical psychologist FTE, any LCSW FTE are less likely to be high utilizers of ED visits than patients of HCs without these types of MH providers. (Each type of MH provider is considered separately).

Hypothesis 3a: Patients at HCs with any psychiatrist FTE, clinical psychologist FTE, any LCSW FTE are less likely to have a hospitalization than patients of HCs without these types of MH providers. (Each type of MH provider is considered separately).

Rationale: Psychiatrists are trained and licensed to provide medication treatment for patients with long-standing anxiety, depression, and more severe MH conditions such as Attention Deficit Hyperactivity Disorder (ADHD), bipolar disorder, and schizophrenia. These conditions can have debilitating effects on patient's everyday functioning, which can impede their ability to practice good health habits and adhere to treatment plans. Providing patients with access to psychiatrists can help them address both their mental and physical health in a holistic

manner, with proper supervision to avoid problems with prescription management, both of which may help them avoid MH crises that exacerbate their health problems and result in increased utilization of outpatient visits, and ED or hospital admissions.

Psychologists and LCSWs are trained to provide patients with various forms of psychotherapy. Although they are not trained or licensed to provide medication treatment, they are more likely to engage closely with patients in individual or group therapy sessions to address specific psychosocial barriers that can negatively affect patient's physical, mental, and emotional health. They may also work closely with PCPs to help patients with behavioral health changes that are necessary for improving their physical health, such as increasing their physical activity, eating healthier, and dealing with anxiety or sleeping problems. (138) In some cases, LCSWs may also oversee case management strategies to connect patients to social services if patients are dealing with MH stressors such as financial problems, domestic violence, or food insecurity. (83)Providing patients with access to these MH providers may help them manage their mental and emotional health and alleviate the strain this puts on their physical health. By improving their daily living practices, patients may see benefits in their physical health, such as fewer complications that would require outpatient visits, and ED and hospital admissions.

Methods

Data and Sample

For this study, I used encounter data from the evaluation of California's Low-Income Health Plan (LIHP). LIHP was a Section 1115 Medicaid Waiver demonstration program which took place between July 1, 2011 and December 31, 2013. LIHP was an extension of a previous and similar program called the Health Care Coverage Initiative (HCCI) implemented in the10

largest counties in California. LIHP was adopted by 53 California counties that offered health care coverage to low-income adults who were ineligible for Medicaid and Medicare. The 53 counties that took part in LIHP were Alameda, Contra Costa, Kern, Los Angeles, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Tulare, Ventura, and 35 rural counties organized under the County Medical Services Program.

LIHP counties were required to create a provider network and offer enrolled participants a benefits package that included preventive and primary care, specialty care, and case management and/or disease management services for certain chronic conditions. Counties were also responsible for monitoring the quality of care and use health information systems such as registries and/or electronic health records.

LIHP enrollees were primarily under 133% of Federal Poverty Level (FPL) and uninsured but became eligible for Medicaid after passage of the Affordable Care Act in 2014. A small number of counties also enrolled patients between 134-200% FPL who transitioned into California's exchange marketplace after 2014.

LIHP enrollment sometimes occurred at point of services, which could have been during an outpatient visit, ED visit, or hospitalization. Enrollees were assigned to a medical home after enrollment, many of which were health centers (HCs). To be eligible for the LIHP program, patients had to be between the ages of 19-64, citizens or legal residents with over 5 years residency in the United States, and a family income of 200% FPL or lower.

I had access to a deidentified dataset from the evaluation of LIHP from the UCLA Center for Health Policy Research, which combined patient level LIHP enrollment and claims data with data from the 2012 Primary Care Clinic Annual Utilization Data provided by California's Office

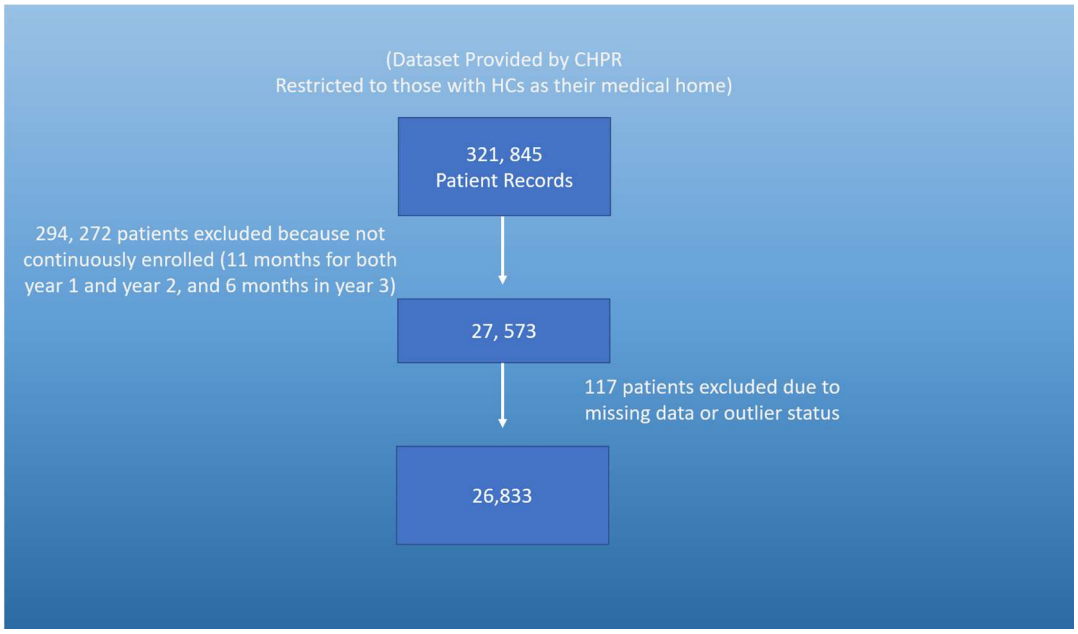
of Statewide Health Planning and Development (OSHPD). (139) All health centers and clinics licensed to operate by the California Department of Public Health report this data to OSHPD on an annual basis and include information on staffing, patient demographics, services provided, and revenue. Data exclude clinics owned and operated by a hospital system but include all others. The content of OSHPD data is similar to UDS data that I used for the analysis in Study 1, with the notable difference that the former is only aggregated at the clinic level, as opposed to the latter, which is reported for the entire HC organization.

This study was determined exempt by the University of California Los Angeles Institutional Review Board.

The LIHP sample I received was restricted to patients whose designated medical home was an HC that reported to OSHPD so that I could include clinic characteristics in the analysis. This resulted in the exclusion of patients whose medical homes were county clinics, free clinics, private physicians, and hospital clinics. The HCs that remained were primarily designated as a Federally Qualified or Look-Alike HC, which operate under federal regulation, have unique funding and reimbursement mechanisms, and have practice standards and delivery models that impact access and quality of care. (75) I further restricted the study sample to a cohort of patients who were enrolled in the LIHP program for at least 11 months in each of the first two program years (July 1, 2011 – June 30, 2012 and July 1, 2012 – June 30, 2013) and all six remaining months of the program (July 1, 2013 – December 31, 2013). I used this inclusion requirement to ensure patients had continuous LIHP coverage during the study period. I chose to exclude patients who were enrolled in LIHP for less time because they could have received care elsewhere or may have only enrolled for too short a period to address a specific need. Patients in the original sample also included those from LIHP counties that started enrollment at later

period, thereby lacked data for a long enough time period. Excluding patients without continuous coverage reduced this unexplained variation. I also wanted to follow patients for a total of 2.5 years to capture 1 year of baseline data and at least 1 year of outcome data. To address possibility of regression to the mean, I chose to follow patients for as long as possible (through the end of LIHP), especially considering the small percentage of patients with more than 3 ED visits and more than 1 hospitalization in year 2. These restrictions excluded 294,272 patients (observations) from the original 321,845 enrollees in the original LIHP dataset I received, resulting in an initial sample size of 27,573 patients. I excluded 632 additional patients from 1 HC that had missing data for their clinic support staff to PCP ratio. I also found this variable to have significant outliers from two HCs with a ratio of 19 and 89, and chose to drop their combined 117 observations, resulting in a final sample size of 26,833.

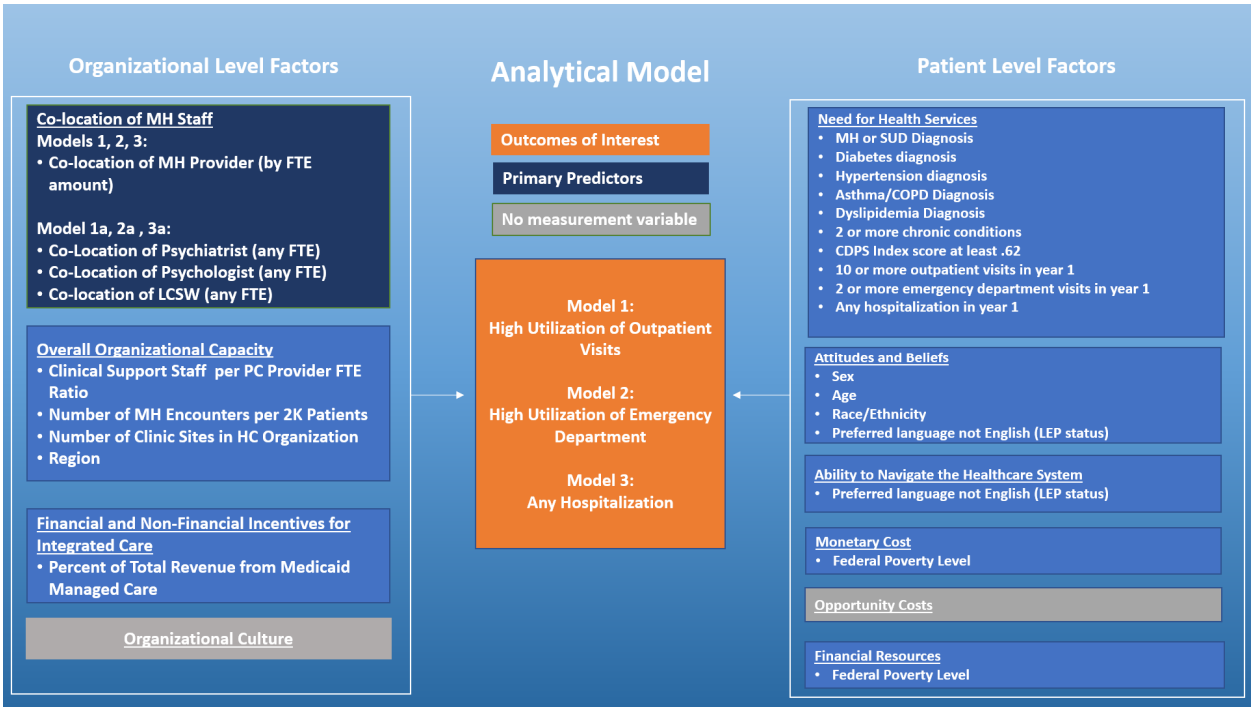
Figure 4. Paper 2 Study Sample and Eligibility Criteria



Analytical Framework

Figure 5 depicts the analytical framework for this paper, based on the conceptual framework presented in Chapter 2 (Figure 1). This framework depicts how the broad constructs of organizational and patient level factors are operationalized into specific representative variables.

Figure 5. Analytical Framework for Health Services Utilization by Health Center Patients



Dependent Variables

I constructed three dependent variables. The first measured high utilization of outpatient visits defined as 15 or more outpatient visits throughout the last 18 months of the period (July 1, 2012 – December 31, 2013). I chose the cutoff of 15 or more visits since this was the 90th percentile of the distribution and the high utilizers are commonly identified as the top 5-10% in research studies. (136) This cutoff is roughly equal to 10 visits for a single year.

The second dependent variable was high utilization of ED, which I defined as three or more ED visits throughout the last 18 months of the study period, which were followed by discharge rather than hospitalization. In this case, the 90th percentile for the distribution was 1 ED visit, and the 95th percentile was 2 ED visits. However, I chose to use 3 ED visits as the cutoff for high utilizers because 2 ED visits over an 18-month period was lower than the cutoffs usually found in studies about high utilizers. (22, 40, 140) This cutoff was roughly equal to 2 ED visits for a single year.

The third dependent variable was any hospitalization throughout the last 18 months of the study period. This was consistent with the cutoff of 95th percentile.

I constructed the dependent variables based on patient utilization in the last 18 months of the LIHP program, or years 2 and 3 of the program to allow for a one-year baseline period of enrollment (July 1, 2011 – June 30, 2012) during which time patients had sustained access to care. This allowed patients who were previously uninsured and had newly gained access to receive needed services, which they may have delayed due to affordability concerns. Counting utilization during the first year could have biased results toward a higher likelihood of high utilization among patients.

Independent Variables

Organizational Level Factors for Utilization of Health Services

All organizational variables were constructed using OSHPD data. The histograms and distribution details for all organizational level variables which were categorized are provided in Appendix B.

Primary Predictor – Co-location of MH Providers at Patient's HC

As in Paper 1, the primary predictor of interest for this analysis was co-location of MH providers at a patient's HC, defined as the ratio of total full-time MH employees (FTE) per 2,000 patients at the HC. MH providers included psychiatrists, licensed clinical psychologists, and LCSWs. I did not include unlicensed MH providers in the analysis because they require supervision from licensed MH providers to practice and cannot bill for services under guidelines by the Centers for Medicare & Medicaid Services (CMS). (113)

Due to discontinuous and highly skewed distribution of the MH provider FTE variables, I constructed a categorical variable to indicate whether an HC had 1) no MH FTEs, 2) limited or less than 0.5 MH FTE, or 3) at least 0.5 MH FTE per 2,000 patients. Initially, I standardized the co-located licensed MH provider measure to one MH FTE per 2,000 patients based on the calculation that in one year (50 weeks, excluding vacation/sick time) one FTE would be able to provide approximately 2,000 consultations lasting about 1 hour. However, I ended up using a half-time (0.05) equivalent cutoff because few HCs in the sample had one or more MH FTE providers per 2,000 patients. The literature on MH integration does not provide a consensus on the optimal or average panel sizes for MH providers in primary care settings. This question is further complicated by the different MH professions and their varying treatment modalities and ability to treat various MH conditions. (118, 141)

To test hypotheses 1a, 2a, and 3a, I constructed three separate dummy variables to indicate whether HCs had 1) any psychiatrist FTE, 2) any psychologist FTE, or 3) any LCSW FTE. I did not have data on FTE level specific to these types of staff. I included separate indicators for psychologists and LCSWs because HCs may differ in their preferences regarding which provider to employ, even though they could provide very similar services. (83-85)

Control Variables

Overall Organizational Capacity

I controlled for clinic support staff to PCP ratio as a proxy for PCPs' capacity to collaborate with MH providers in caring for patients with diagnosed and potential MH conditions. When PCPs have more support available from clinical staff, they can spend more time communicating with patients about their concerns. Clinical support staff can also help with administrative work related to referrals for MH and social services. Clinic support staff included the following categories from OSHPD PCC data - registered nurses, medical assistant, licensed and vocational nurses. PCPs included physicians, physician assistants, and nurse family practitioners. I constructed this variable dividing the total number of clinic support staff FTE by the total number of PCP FTE. I then categorized this variable based on the 50th and 75th percentiles of the distribution of patients in the sample to reflect low, medium, and high levels of clinic support for PCPs. The cutoffs were the following: 1) ratio of 2 or fewer clinic support staff per PCP FTE (reference), 2) ratio of greater than 2, but less than 3.5, and 2) ratio of 3.5 or greater.

I created a two-category variable indicating region (Southern California versus Northern or Central California(reference)) as a broad indicator of market differences, population density, regional differences in patterns of utilization, and potential differences in LIHP implementation.

For each HC, I included a variable that measured the total number of clinics in the parent HC organization as a proxy for resources and service offerings available to the individual HC. I categorized this variable based on the 25th and 75th percentiles of the distribution of the sample to reflect the number of patients from small (1 site, reference), medium (2 to 4 sites), and large (5 or more sites) organizations.

As a proxy for appointment availability with MH providers, using OSHPD data, I included an indicator variable reflecting whether the HC had a higher than average number of MH encounters by HC patients. I standardized this variable to every 2,000 patients and constructed a binary variable to reflect high demand based on the distribution of the sample, using the 75th percentile as the cutoff. The variable was thus dichotomized to reflect 300 encounters per 2,000 patients or more (versus fewer).

Financial and Non-Financial Incentives

As a proxy for funding incentives for the HC to provide co-located MH services, I included a binary variable to reflect whether the HC had a higher than average percentage of their revenue from Medicaid managed care plans. Based on the median for the sample (19%), I dichotomized this variable to reflect 20% of total revenue or more (versus less).

Organizational Culture

There were no variables available in the dataset to create measures of organizational culture that would promote integration.

Patient Level Factors for Utilization of Health Services by Health Center Patients

The majority of patient level variables were constructed using LIHP encounter data.

Need for Health Services

I included several measures of health status to control for the level of need for health care use. I included an indicator variable for whether the patient had a diagnosis of MH or substance use disorders, as well as 5 additional binary variables indicating whether the patient had a

diagnosis for any of the following chronic conditions: diabetes, hypertension, asthma/COPD, CAD/CHF, and dyslipidemia. I also included an indicator variable reflecting whether the patient had two or more diagnoses for chronic conditions (versus one or none). To further control for severity of health problems, I included an indicator variable based on the patient's index score for the Chronic Illness and Disability Payment System (CDPS). CDPS index scores are a diagnostic classification system calculated to reflect risk level of patients based on the patient's diagnoses and subsequent health expenditures. (142) I categorized this variable into patients that had a CDPS score of at least 0.62 (75^{th} percentile) to identify those at the highest level of severity.

I also controlled for patients' utilization of health care services in the first year of LIHP as a measure of propensity for high utilization of health services. I constructed three binary variables to indicate whether during the first year of the study (July 1, 2011 – June 30, 2012), a patient had 10 or more outpatient visits (based on the 90^{th} percentile), 2 or more ED visits (based on the 95^{th} percentile), and any hospitalizations. The baseline cutoffs for past outpatient visits and ED visits were less than the cutoffs used to construct the dependent variables because the baseline period was only 1 year, whereas the dependent variables reflected utilization over 18 months.

Attitudes and Beliefs

I used demographic characteristics as proxies for different attitudes and beliefs toward the healthcare system that can affect a patient's likelihood of seeking care. These included sex (female versus male (reference)), a three-category variable for age - 1) ages 19-39, 2) ages 40-49 (reference), and 3) ages 50-64, and a 5 category variable for race/ethnicity - 1) non-Hispanic

White (reference), 2) Hispanic, 3) Asian American and Pacific Islander, 4) Black or African American, and 5) other race/ethnicity or missing response. I included the other or missing race/ethnicity as a separate category because of the large number of observations (14.2%), which would have eliminated too much of the sample from the analyses. I included a binary variable to indicate whether a patient indicated their preferred language of communication as English (reference) versus another language, which I used as a proxy for limited English proficiency (LEP) and immigration status. Patients who had missing information for this variable were included as LEP.

Ability to Navigate the Healthcare System

LEP status was also used as a proxy for a patient's ability to navigate the healthcare system due to the difficulties this could create in communicating with healthcare providers, staff, insurance representatives, as well as understanding general information about available resources for accessing health services.

Monetary Costs

To proxy for a patient's concern over out-of-pocket costs associated with receiving care, I used a categorical variable to indicate whether the patient's income was at or below 133% FPL as opposed to 134-200% FPL (reference). I constructed this variable based on whether the patient was enrolled in the LIHP Medicaid expansion program, which had an eligibility criteria of 133% FPL or below, or the LIHP-HCCI program, which had an eligibility criteria of 134 - 200% FPL.

Opportunity Costs

I did not have measurement variables available to proxy for opportunity costs such as taking time off work, finding transportation, and arranging childcare options.

Financial Resources

I also used a patient's FPL category to proxy for their financial resources, because patients with lower FPL are less likely to have other financial assets to help cover the costs of seeking care beyond out-of-pocket costs.

Statistical Analysis

I used STATA 16 to conduct the statistical analysis for this paper. I obtained VIF estimates after running a multivariate OLS regression model to test for multicollinearity and used a cutoff of 5 or less for inclusion of variables in the final regression models. I also ran descriptive statistics for the study sample and compared variables across patients grouped by their HC's MH provider capacity.

I used propensity weighting to address the potential internal validity threat of patients with MH conditions self-selecting into HCs with co-located licensed MH providers. I calculated an inverse probability weight using a "treatment model" with logistic specification, where the dependent variable was whether a patient's HC had *any* licensed MH providers. The predictors in the treatment model were all the patient level variables. I conducted additional analyses using STATA's *teffects* command to ensure the propensity weighting improved the balance of covariates between patients at HCs with licensed MH providers and patients at HCs without licensed MH providers. The *treatment effects* command allows for a hypothesis test comparing

the two groups overall and by specific variables. I also used robust standard errors to reduce standard error inflation that could have resulted from clustering of patients within HCs.

For the final regression models, I used a multilevel generalized structural equation model (GSEM) with logistic specification to account for clustering of patients within HCs. The models included a latent variable to control for unobserved HC effects.

Results

Descriptive Results

The multicollinearity check using VIF estimates did not find any issues (Appendix Table 8). Table 6 provides sample characteristics and shows that the majority of patients (59%) went to HCs with limited licensed MH provider capacity (less than 0.5 MH FTE), while 33% went to HCs with no licensed MH provider, and 8% went to HCs with at least 0.5 MH FTE. In terms of specific MH professions, 29% of patients went to HCs with a co-located psychiatrist, 34% went to HCs with a co-located clinical psychologist, and 54% went to HCs with a co-located LCSW. Out of the entire study sample, during years 2 and 3 of the study period, 10% of patients had 15 or more outpatient visits, 5% had 3 or more ED visits, and 7% had at least 1 hospitalization.

Half of the sample (50%) were patients at an HC where the clinic support staff to PCP FTE ratio was greater than 2, but less than 3.5. Almost a third of patients (28%) went to an HC with a ratio of 2 or less, and about a fifth of the sample (21%) were patients at an HC with a ratio greater than 3.5. Most patients (78%) went to an HC in the Southern California region. Almost half the sample (46%) went to an HC that was part of a HC organization with more than one site but less than five sites. About a quarter of the sample (24%) went to an HC that was part of an HC organization with just one site, and almost a third (30%) went to an HC that was part of an

HC organization with five or more sites. Almost a third of the sample (29%) went to an HC that had more than 300 MH encounters per 2,000 patients (versus fewer). Almost half the sample (48%) went to an HC where Medicaid Managed Care made up at least 20% of the total revenue.

Almost two thirds (62%) of patients were female and most were in the age range 50-64 (67%). Among racial/ethnic groups, the largest group was Hispanic at 42%, while 18% were non-Hispanic White, 18% Asian/Pacific Islander, 7% Black or African American, and 14% were listed as "other or missing response" More than half of patients (57%) had limited English proficiency. Two thirds of patients (75%) were LIHP enrollees (versus HCCI). With regard to health conditions, 24% had a diagnosis for a mental health or substance use disorder. Hypertension was the most common physical chronic condition (48%), followed by dyslipidemia (36%), diabetes (32%), asthma/COPD (12%), CAD/CHF (6%). Comorbidities were also common among this sample, with 39% of patients having at least 2 physical chronic conditions. Also, 61% had a CDPS index score at or above the median of 0.62. For baseline characteristics, during the first year of the study period, 12% of patients had 10 or more outpatient visits, 6% had 2 or more ED visits, and 5% had at least one hospitalization.

Although the proportion of patients with chronic conditions and with two or more comorbidities was similar across the different categories for HC licensed MH providers, the proportion of patients with a MH or substance use disorder diagnosis was almost twice as much in the group who went to HCs with at least 0.5 MH FTE than the groups with limited or no licensed MH providers.

Table 6: Characteristics of Study Subjects/Population Estimates (Paper 2)

	Total n=26,833		No Licensed MH Providers n=8,956 (33%)		Less than 0.5 MH FTE n=15,740 (59%)		At least 0.5 MH FTE n=2,137 (8%)		X^2 p-value
	n	%	n	%	n	%	n	%	
Health Center Characteristics									
15 or more outpatient visits *	2,797	10%	861	10%	1,596	10%	340	16%	0.000
3 or more emergency department visits*	1,288	5%	405	5%	715	5%	168	8%	0.000
Any hospitalization*	1,772	7%	635	7%	977	6%	160	7%	0.006
Psychiatrist on staff (any FTE)	7,851	29%	0	0%	6,290	40%	1,561	73%	0.000
Clinical psychologist on staff (any FTE)	9,079	34%	0	0%	8,178	52%	901	42%	0.000
Licensed social worker on staff (any FTE)	14,479	54%	0	0%	12,382	79%	2,097	98%	0.000
Clinic support staff to PCP FTE ratio									
ratio of 2 or less	7,579	28%	3,107	35%	3,927	25%	545	26%	
ratio greater than 2 but less than 3.5	13,503	50%	3,167	35%	9,872	63%	464	22%	
ratio of 3.5 or greater	5,751	21%	2,682	30%	1,941	12%	1,128	53%	0.000
Southern California region (versus Northern or Central)	20,835	78%	7,138	80%	12,345	78%	1,352	63%	0.000
Number of clinic sites in overall health center organization									
1 site	6,381	24%	2,964	33%	3,176	20%	241	11%	0.000
more than 1 site, but less than 5 sites	12,434	46%	2,469	28%	8,822	56%	1,143	53%	
5 or more sites	8,018	30%	3,523	39%	3,742	24%	753	35%	
More than 300 mental health encounters per 2,000 patients	7,782	29%	806	9%	5,285	34%	1,691	79%	0.000
Percent of total revenue from Medicaid Managed Care at least 20%	12,927	48%	4,210	47%	7,342	47%	1,375	64%	0.000
Patient Characteristics									
Mental health or substance use disorder diagnosis	6,373	24%	1,858	21%	3,701	24%	814	38%	0.000
Diabetes diagnosis	8,492	32%	3,011	34%	4,854	31%	627	29%	0.000

Hypertension diagnosis	12,808	48%	4,130	46%	7,617	48%	1,061	50%	0.000
Asthma/COPD diagnosis	3,332	12%	1,141	13%	1,822	12%	369	17%	0.000
CAD/CHF diagnosis	1,618	6%	553	6%	912	6%	153	7%	0.035
Dyslipidemia diagnosis	9,535	36%	3,058	34%	5,689	36%	788	37%	0.003
2 or more chronic conditions	10,362	39%	3,422	38%	6,070	39%	870	41%	0.100
CDPS Index at least .62	16,423	61%	5,316	59%	9,778	62%	1,329	62%	0.000
10 or more outpatient visits in year 1*	3,186	12%	1,062	12%	1,779	11%	345	16%	0.000
2 or more emergency department visits in year 1*	1,576	6%	575	6%	818	5%	183	9%	0.000
Any hospitalization in year 1*	1,354	5%	461	5%	755	5%	138	6%	0.004
Female	16,675	62%	5,503	61%	9,893	63%	1,279	60%	0.007
Age									
19-39	4,961	18%	1,674	19%	2,868	18%	419	20%	
40-49	3,948	15%	1,397	16%	2,187	14%	364	17%	
50-64	17,924	67%	5,885	66%	10,685	68%	1,354	63%	0.000
Race/Ethnicity									
non-Hispanic White	4,926	18%	1,771	20%	2,583	16%	572	27%	
Hispanic/Latino	11,180	0%	4,778	53%	5,784	37%	618	29%	
Asian American /Pacific Islander	4,962	18%	603	7%	4,072	26%	287	13%	
non-Hispanic Black/African American	1,955	7%	558	6%	1,020	6%	377	18%	
Other or Missing Response	3,810	14%	1,246	14%	2,281	14%	283	13%	0.000
Limited English proficiency	15,361	57%	4,229	47%	10,208	65%	924	43%	0.000
LIHP Enrollment income level above 133% FPL (reference: HCCI Enrollment - income level between 134%-200% FPL)	20,230	75%	6,397	71%	12,269	78%	1,564	73%	0.000

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE= Full Time Employee, HC = Health Center
* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
** Year 1 was from July 1, 2011-June 30, 2012

Regression Results

Inverse Probability Weights

After running the treatment model, the accompanying *tebalance overid* test indicated that covariates were not balanced, but the *tebalance summarize* command indicated that standardized differences were all close to 0 and the variance ratios were all close to 1, indicating there was an overall improvement after propensity weighting (see Appendix Tables 9 and 10).

Co-location of Licensed MH Providers and 15 or More Outpatient Visits (Model 1)

Multivariate regression results showed that all other factors equal, going to an HC with at least 0.5 MH FTE per 2,000 patients significantly ($p<0.05$) increased the likelihood of having 15 or more outpatient visits compared to going to an HC with no co-located MH providers. In other words, the predicted probability of being a high utilizer of outpatient visits was 15% with 0.5 co-located MH providers at a patient's HC versus 10% with no co-located MH providers (Table 7). Co-location of less than 0.5 licensed MH FTE did not make a significant difference compared to not having any licensed MH providers. More detailed regression results are presented in Appendix Table 11. A number of control variables were significant predictors of high utilization of outpatient visits. Going to an HC that had a clinic support staff to PCP FTE ratio greater than 2 but less than 3.5 (versus 2 or less) was significant and negatively associated with being a high utilizer of outpatient visits. Going to an HC located in Southern California (versus Northern or Central California) was significant and positively associated with high utilization of outpatient visits. Younger age (19-29 versus 30-49) was negatively associated but, MH or substance use disorder diagnosis, having one of the listed physical chronic conditions, having a high CDPS index score, being a high utilizer of outpatients visits in year 1, and being a high utilizer of the

ED in year 1 were significantly and positively associated with having 15 or more outpatient visits.

Table 7. Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of 15 or More Outpatient Visits by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: High utilization of outpatient visits (15 or more)*				
Predictor: Overall Co-Located Licensed MH Providers (Model 1)				
No Licensed MH Providers (reference)	10%	1%	n/a	
Less than 0.5 MH FTE per 2,000 patients	11%	1%	0	0.797
At least 0.5 MH FTE per 2,000 patients	15%	2%	5	0.029

Notes:
Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Type of Co-Located Licensed MH Providers and 15 or More Outpatient Visits (Model 1a)

In the model assessing the relationship between type of licensed MH provider and having 15 or more outpatient visits, co-location of the different types of licensed MH providers was not significantly associated with the outcome (Table 8). Results for covariates were similar to those in model with overall licensed MH FTE as the predictor. More detailed regression results are available in Appendix Table 12.

Table 8. Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of 15 or More Outpatient Visits by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: High utilization of outpatient visits*				
Predictor: Type of Co-Located Licensed MH Providers (Model 1a)				
No psychiatrist on staff (reference)	10%	1%		
Psychiatrist on staff (any FTE)	12%	1%	2	0.224
No clinical psychologist on staff (reference)	11%	1%		
Clinical psychologist on staff (any FTE)	10%	1%	-1	0.463
No LCSW on staff (reference)	11%	1%		
LCSW on staff (any FTE)	11%	1%	0	0.766

Notes:
Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Co-Location of Licensed MH Providers and Three or More ED Visits (Model 2)

Multivariate regression results assessing the relationship between overall licensed MH provider FTE and 3 or more ED visits showed that after controlling for other factors in the model, the number of MH FTE at a patient's HC was not significantly associated with their high utilization of the ED (Table 9). More detailed regression results for this model are presented in Appendix Table 13. None of the other organizational level variables included in the model were significant predictors of high ED utilization either. Among patient level variables, older age (50-64 versus to 30-49) was significant and negatively associated with being a high utilizer of the ED. Having a MH substance use disorder diagnosis, an asthma/COPD diagnosis, a CAD/CHF diagnosis, having a high CDPS index score, being a high utilizer of the ED in year 1, and having any hospitalization in year 1 were all significant and positively associated with being a high utilizer of the ED in the last 18 months of the study period.

Table 9. Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of Three or More ED Visits by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: High Utilization of ED Visits*				
Predictor: Overall Co-Located Licensed MH Providers (Model 2)				
No Licensed MH providers (reference)	5%	1%	n/a	
Less than 0.5 MH FTE per 2,000 patients	5%	0%	0	0.923
At least 0.5 MH FTE per 2,000 patients	6%	0%	1	0.427
Notes: Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance				

use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Type of Co-Located Licensed MH Providers and Three or More ED Visits (Model 2a)

Multivariate regression results assessing the role of different types of MH providers showed a significant and positive association between co-location of a psychiatrist and patients being a high utilizer of the ED. The predicted probability of being a high utilizer of the ED was 7% for patients at HCs with a co-located psychiatrist (versus 4% for patients at HCs with no psychiatrist) (Table 10). The model also indicated a significant and negative association between co-location of an LCSW and patients being high utilizers of the ED. The predicted probability was 4% if a patient's HC had a co-located LCSW (versus 6% for patients at an HC with no LCSW). These findings were significant at the $p<.05$ level. Results on the relationship between high ED utilization and the other co-variates were similar to results with overall licensed MH FTE as the predictor and presented in Appendix Table 14.

Table 10. Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of Three or More ED Visits by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: High Utilization of ED Visits*				
Predictor: Type of Co-Located Licensed MH Providers (Model 2a)				
No psychiatrist on staff (reference)	4%	1%		
Psychiatrist on staff (any FTE)	7%	1%	2	0.014
No clinical psychologist on staff (reference)	5%	0%		
Clinical psychologist on staff (any FTE)	4%	1%	0	0.522
No LCSW on staff (reference)	6%	1%		
LCSW on staff (any FTE)	4%	0%	-2	0.033

Notes:
Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic

conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Co-Location of Licensed MH Providers and Any Hospitalization (Model 3)

Multivariate regression results showed no significant association between overall MH FTE and patients having a hospitalization (Table 11). More detailed regression results are presented in Appendix Table 15. None of the other organizational variables included in the model were significant predictors of having a hospitalization. Among patient characteristics, patients who were female, and patients who were Hispanic/Latino, Asian/Pacific Islander, non-Hispanic Black/African American, or in the "other or missing response" category (compared to non-Hispanic White patients) were less likely to have a hospitalization. Patients were significantly more likely to have a hospitalization if they had a MH or substance use disorder diagnosis, diabetes diagnosis, hypertension diagnosis, asthma/COPD diagnosis, CAD/CHF diagnosis, a high CDPS index score, were a high utilizer of the ED in year 1, or had least one hospitalization in year 1.

Table 11. Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of Any Hospitalization by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: Any Hospitalization*				
Predictor: Overall Co-Located Licensed MH Providers (Model 3)				
No Licensed MH provider (reference)	7%	1%	n/a	
Less than 0.5 MH FTE per 2,000 patients	7%	1%	0	0.821
At least 0.5 MH FTE per 2,000 patients	5%	1%	-1	0.169

Notes:
Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Type of Co-Located Licensed MH Providers and Any Hospitalizations (Model 3a)

Multivariate regression results assessing the relationship between type of MH providers and patient hospitalizations are available in Table 12. Co-location of a psychiatrist was not significantly associated with having a hospitalization in the last 18 months of the study period. However, co-location of an LCSW was negatively associated with having any hospitalization. The predicted probability of having at least one hospitalization was 6% if a patient's HC had a co-located LSCW (versus 7% for patients at HCs with no LCSW). This difference was significant at the $p<0.05$ level (Table 7). The findings on associations with the other covariates were similar to the model with overall licensed MH FTE as the predictor and presented in Appendix Table 16.

Table 12. Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of Any Hospitalization by Health Center Patients

	Predicted Probability	Robust Standard Error	Percentage Point Difference from Reference Group**	p-value for Difference
Sample Size	**26,833**			
Outcome: Any Hospitalization*				
Predictor: Type of Co-Located Licensed MH Providers (Model 3a)				
No psychiatrist on staff (reference)	6%	0%		
Psychiatrist on staff (any FTE)	8%	1%	1	0.122
No clinical psychologist on staff	7%	0%		
Clinical psychologist on staff (any FTE)	7%	1%	0	0.835
No LCSW on staff	7%	1%		
LCSW on staff (any FTE)	6%	0%	-2	0.012

Notes:
Results are based on multivariate generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences. The full model controlled for clinic support staff to PCP ratio, region, number of clinics in overall HC organization, number of MH encounters per 2,000 patients, percent of total revenue from Medicaid Managed Care),sex, age, race/ethnicity, limited English proficiency, FPL category, diagnosis indicators for MH/substance use disorder, diabetes, hypertension, asthma/COPD, CAD/CHF diagnosis, and dyslipidemia, having 2 or more chronic conditions, a CDPS index of at least .62, having 10 or more outpatient visits in year 1**, having 2 or more emergency department visits in year 1, and having any hospitalization.

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
*Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
**Point differences are rounded to closest whole number

Discussion

Results from this study did not support my hypotheses that co-location of more MH FTE reduces high utilization of outpatient visits. I found that attending an HC clinic with 0.5 MH FTE per 2,000 patients versus a clinic with no co-located MH FTE significantly increased the likelihood of 15 or more outpatient visits instead of decreasing this likelihood. I did not have data on distribution of primary versus specialty outpatient visits or reasons for these visits, thus it is difficult to ascertain whether high utilization in this case was necessary or avoidable. I also did not have data to assess if these visits were driven by unmet MH needs. However, the reason for this finding may be that HCs with a high percentage of medically complex patients may be more likely to hire MH providers to address patient need. Still, these HCs may not have adequate capacity to treat all patients' needs, including coordinating their care. The cap in MH visits under LIHP may also have prevented patients from getting needed specialty MH and other health care. Therefore, high utilization of outpatient visits may reflect inability of patients to access appropriate and necessary care.

I did not find that more licensed MH FTE at HCs would lower the likelihood of high utilization of ED visits or any hospitalizations. These findings are consistent with past findings from several implementation studies examining co-location of MH providers and patient outcomes. These studies suggest that co-location of MH providers may help improve access to MH services, but improvements in other patient outcomes are difficult to obtain without clinic practices that support full integration or collaborative care practices. The latter includes

collaborative protocols between primary care and MH providers within the clinic setting, as well as enhanced patient education and support by care managers. These findings may also be reflecting lack of access to specialty services for HC patients on-site. HCs provide comprehensive primary care services but refer patients for specialty care elsewhere. LIHP patients who needed specialty care may have faced long wait times for an appointment and used the ED instead. Patients may also go to the ED when they are unable to go to their HC or service providers during operating hours, or if they are seeking more technical expertise than they feel is available at their home clinic. (97)

My hypotheses on the impact of the type of co-located licensed MH providers on high utilization were partially confirmed. Contrary to my hypothesis, there was a positive relationship between co-location of a psychiatrist and high ED utilization, and no significant relationship with outpatient visits or hospitalizations. The positive relationship with ED visits may reflect the overall patient complexity or severity of MH conditions at co-located HCs. Psychiatrists are the least common MH profession at HCs, but HCs are more likely to hire them if they have patients who need specific MH services, such as medication management. My analyses accounted for number of MH encounters for every 2,000 patients at the patient's HC as a proxy for demand for MH services. However, I could not measure the adequacy of co-located psychiatrist FTE. Even if an HC had a co-located, limited appointment availability may have resulted in only patients with severe symptoms getting care and not others. Although I also controlled for previous utilization and diagnoses for MH conditions, I was not able to distinguish between patients with mild versus severe MH conditions.

My hypothesis that patients at HCs with psychologists and LCSWs would be less likely to be high utilizers of outpatient visits, ED visits, and have any hospitalization were partially

confirmed. I did not find a significant relationship between psychologists and high healthcare utilization. However, I found that co-location of an LCSW slighted reduced the likelihood of high utilization of ED visits and any hospitalizations, although not outpatient visits. These findings suggest that LCSW services could be effective in improving management of chronic conditions and promoting self-care, which in turn prevent multiple ED visits or any hospitalizations.

Study Limitations

The analyses had limitations. First, there was variation in the data provided by California counties for the LIHP evaluation. Some counties provided 26 diagnosis and others provided fewer or only 1. Therefore, it is possible that patients in this study may have had health conditions not reflected in the data. Some counties did not report MH claims from specialty MH providers, which means the sample may have had more patients with MH conditions who could have benefitted from co-location of MH providers. This undercount of MH need among patients could have biased my study results toward finding a significant effect of MH co-location on reducing high utilization of health services. On the other hand, if the sample included more patients with high MH needs, and level of co-located MH FTE was not enough to meet demand, this could have made it harder for patients to benefit from co-location of MH providers. As previously mentioned, only 2% of HCs had one or more MH FTE per 2,000 patients. Thus, the non-significant findings may be due to the fact that the licensed MH provider capacity at the majority of these HCs was too small to address the MH needs of patients that could contribute to their high utilization of health care services.

Since this retrospective study relied on observational data where randomization of the treatment (co-located MH providers at HCs) was not possible, self-selection was an internal validity concern. Therefore, I used inverse probability weighting (IPW) to address the possibility that patients with MH service needs may have self-selected into HCs offering MH services. Nevertheless, despite the use of IPW, there were still some differences between "control" and "treatment" subjects in the study that I was not able to resolve. It is therefore possible that some self-selection may have occurred. Although I was able to control for MH diagnosis, I was not able to control for severity of MH conditions or frequency of MH utilization.

Another limitation of this study is the concern over temporality. I used LIHP encounter data from July 2012 through the end of 2013 to construct the dependent variables. The evaluation data included the 2012 OSHPD data, which coincided with part of the observation period for the dependent variables. The 2011 OSHPD data may have provided a more accurate measure of HC staffing. However, since staffing levels at HCs can change both throughout the year and from year to year, it is difficult to fully address this problem using data from only one year of OSHPD data.

Some patients were enrolled in the LIHP program during a visit to the emergency department or hospital. In these cases, exposure to co-located MH providers at their HC would have occurred after utilization of acute services. For this reason, I used only the last 18 months of data to construct the dependent variables. This means a patient would have had at least a year to visit their medical home/HC and benefit from having co-located MH providers. I did not distinguish psychiatric ED visits because the frequency of these visits was very small and many LIHPs did not report this data.

Although I controlled for several organizational HC variables, I was not able to control for the organizational culture of HCs, which would have affected the collaboration and care coordination that took place between MH and primary care teams within the HC. I also did not have data on specific protocols or organizational practices between MH providers and PCPs at HCs. To include these factors in the analysis would require additional primary data collection, ideally verified by first-hand observation.

Findings from this study may not be generalizable to patients of other providers, such as those at hospital clinics, county clinics, and private practices. Although LIHP enrollees were similar to patients of HCs in other states in most respects, state policies on funding sources, Medicaid enrollment and reimbursement policies, and supply of MH providers and their scope of practice allowed by licensing boards could affect patient outcomes. (113) However, the advantage is that these findings were not confounded by differences in policies or market conditions specific to the state of California.

Policy Implications

The findings of this study have implications for research and practice. There is much variation among HCs in terms of their organizational capacity. It is important to examine how co-location of MH services may affect an HC's ability to improve patient outcomes, including patient adherence to treatment plans that may result in less utilization of acute care services. This study suggests that more co-location of MH providers in general could actually lead to more outpatient visits. However, if many of these visits were recommended for monitoring chronic conditions and/or medications, this could suggest that co-location of MH providers may be an effective intervention for helping patients access timely care services to better manage their

health. Further research should look into the type of care that is delivered when MH providers are co-located at HCs. Although most of the HC characteristics included in this study were not significant predictors of high utilization, additional research on co-located care at HCs should include measures reflecting collaborative care practices with PCPs such as trainings by MH providers, internal referral protocols, and shared use of medical records.

Finding adequate staffing ratios for MH providers to patients is critical in ensuring co-location can address patients' unmet MH need for care. One of the major findings of my study is that supply of MH providers at HCs is likely too low to address patient needs. However, because my sample was not restricted to patients with MH conditions, it is also possible that the results could have been diluted by patients who do not need MH services. Further research should look at settings where licensed MH provider capacity is higher, particularly for psychologists and psychiatrists, since the latter are generally much harder to hire and recruit to health centers. Although it would be valuable to compare the effect of co-location on patients with MH conditions to patients without MH conditions, it is also important to consider that many patients who are low-income and in poor health may benefit from MH consults in their primary care setting despite not having specific MH needs or diagnoses.

This study also showed that LCSWs may be effective for reducing the need for acute care services. Further studies should look at the role that LCSWs play in co-located settings, and in particular, how they complement the role of PCPs and how their role differs from other MH providers. Since both psychologists and LCSWs provide behavioral therapy, it would be useful to know if LCSWs are engaged in other type of work, such as care coordination with social services. This type of work may be especially helpful for HC patients who experience MH

stressors from problems with poor health, food insecurity, unemployment, and other issues related to financial instability.

CHAPTER 5: CONCLUSION

My studies shed light on the capacity of HCs in delivery of MH services and whether co-location of MH providers was associated with high utilization of outpatient and acute services. My first research paper showed that staffing of one or more licensed MH FTE providers at HCs increased the likelihood of receiving MH treatment anywhere and on-site, and presence of a psychiatrist also increased the likelihood of receiving MH treatment on-site. My second study showed that having at least 0.5 MH FTE providers was associated with higher likelihood of 15 or more outpatient visits and presence of any psychiatrist increased the likelihood of 3 or more ED visits. On the other hand, I found that presence of any LCSWs decreased the likelihood of 3 or more ED visits or any hospitalizations. When considered together, the main conclusions from my two research studies are the following:

1) Co-locating a sufficient number of MH providers at HCs is likely to promote access to MH services.

2) Co-location of a minimum of a half-time MH provider or a psychiatrist does not reduce high utilization of outpatient and acute care services. But co-location of any LCSWs may play an important role in avoiding high utilization of acute care services.

My research studies were retrospective observational studies and had limitations. Nevertheless, both studies contribute to the existing literature by jointly examining organizational and patient level factors. I also focused on the general population of HC patients rather than those with MH conditions. My research provides a more general overview of the status of MH provider co-location into primary care settings that are the cornerstone of the U.S.'s safety net. Further studies should continue to include both organizational level and patient level factors in their analysis, but also a more detailed analysis on the organizational culture, as well as procedures and protocols that are followed within these settings. These studies would highlight

which segments of the most vulnerable populations have reliable access to MH services and how we may be able to disentangle the relationship between poverty and MH conditions.

Over the last 20 years, HRSA has invested significant resources to encourage HCs to hire MH providers, and has provided training resources on best practices for delivering integrated care. Nevertheless, data indicate that in 2014 only 10% of HC patients went to HCs with one or more MH FTEs per 2,000 patients.

Access to MH services for vulnerable, low-income populations continues to be a challenge in the United States. Although stigma often plays a role in whether people choose to seek help when experiencing MH problems, cost is also a common barrier to receiving these services. HRSA-funded HCs have the potential of playing a crucial role in reducing disparities in access to MH services for several reasons. Due to their strategic location in medically under-served areas, HCs provide care to vulnerable groups who are at risk of going without needed care and experience MH stressors due to financial and environmental concerns. HCs are also required to provide services to patients regardless of their ability to pay, which means patients have access to care at sliding scale rates for services provided on-site. In addition, HCs focus on delivery of culturally appropriate care and are experienced in providing care to vulnerable populations living in poor health and difficult living situations. This aspect of HC service delivery is especially important in screening and detecting MH conditions in the primary care settings where most patients seek care.

APPENDICES

APPENDIX A

Variable Definitions/Construction for Chapter 3 (Paper 1)

Appendix A – Variable Definitions/Construction for Chapter 3 (Paper 1)

Dependent Variables

Data Source: 2014 HRSA Health Center Patient Survey (HCPS)

Variable	HCPS Survey Questions	Description /Construction
Receiving mental health treatment within the past 12 months	1) Have you ever received any mental health treatment or counseling? 2) In the past 12 months, did you receive any mental health treatment or counseling?	Reference Category: reported never receiving MH treatment in the past *versus* Category 1: reported receiving MH treatment in the past 12 months
Location of where MH visits took place	How many of your treatment or counseling sessions you received did you get at the [reference health center]? Would you say? 1= all of the visits 2= some of the visits 3= none of the visits	Reference Category: none of the visits took place at the reference health center *versus* Category 1: all of the visits or some of the visits took place at the reference health center

Appendix A (Continued) – Variable Definitions/Construction for Chapter 3 (Paper 1)

Independent Variables

Health Center Characteristics (Organizational Level)

Data Source: 2013 UDS DATA

Variable	UDS Variables Used	Construction and Categories
co-location of licensed MH provider	psychiatrists (FTE) + licensed clinical psychologists (FTE) + licensed clinical social workers or other licensed MH provider (FTE)	Reference Category: 0 licensed MH provider FTE *versus* Category 1: total licensed MH provider FTE per 2,000 patients > 0 but <1 Category 2: total licensed MH provider FTE per 2,000 patients >=1
co-location of psychiatrist	psychiatrists (FTE)	Reference Category: 0 FTE *versus* Category 1: any FTE for psychiatrist
co-location of psychologist	licensed clinical psychologists (FTE)	Reference Category: 0 FTE *versus* Category 1: any FTE for clinical psychologist
co-location of LCSW or other licensed MH provider	licensed clinical social workers (LCSW) (FTE) and other licensed MH provider FTE	Reference Category: 0 FTE *versus* Category 1) any FTE for LCSW or other licensed MH provider
primary care provider (PCP) panel size	primary care providers: family physicians (FTE) + general practitioners (FTE) + internists (FTE) + nurse practitioners (FTE) + physician assistants (FTE) number of medical patients	total medical patients / total PCP FTE --- Reference Category: panel size < 1,200 patients *versus* Category 1: panel size>=1,200 patients but <2,000 patients Category 2: panel size >=2,000 patients

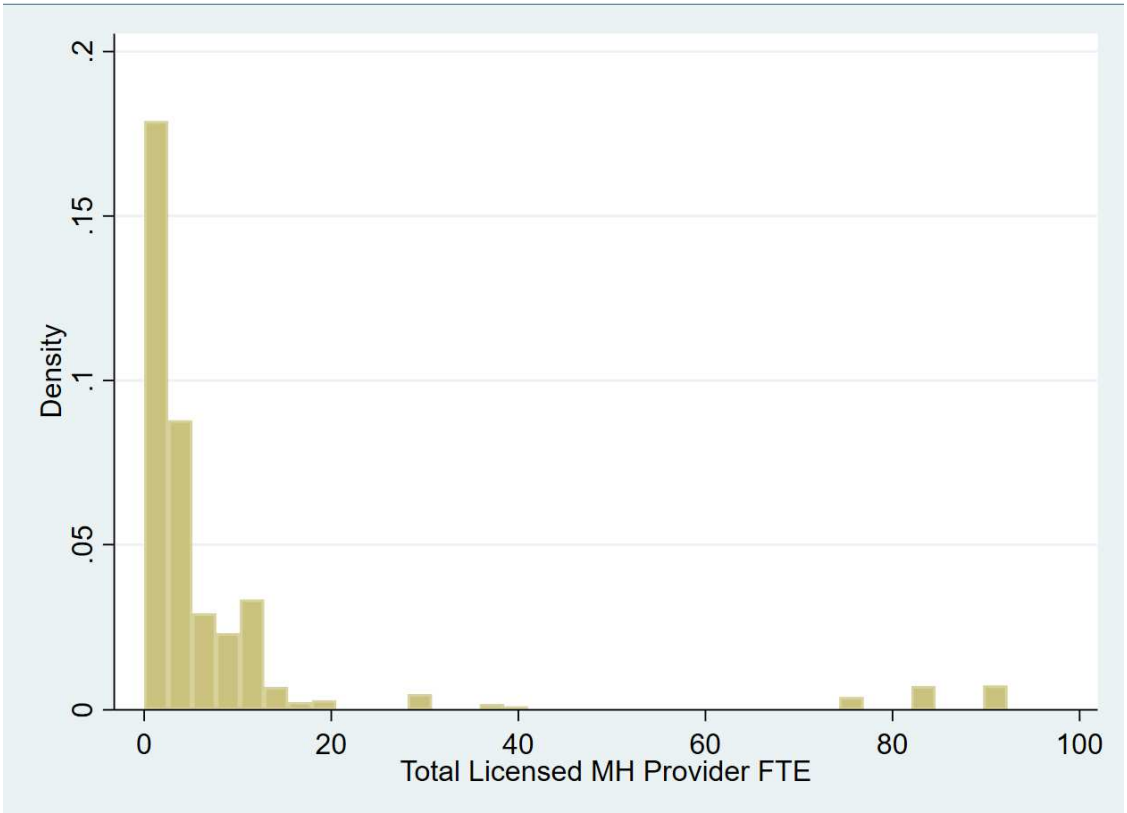
clinical support staff per primary care provider (PCP)	clinical support staff: nurses (FTE) + other medical personnel (FTE) primary care providers: family physicians (FTE) + general practitioners (FTE) + internists (FTE) + nurse practitioners (FTE) + physician assistants (FTE)	clinical support staff FTE / PCP FTE --- Reference Category: clinic support staff per PC provider <=2 *versus* Category 1: clinic support staff per PCP >2 but <=4 Category 2: clinic support staff per PCP > 4
rural location of HC clinic	urban/rural flag	Reference Category: urban *versus* Category 1: rural
number of clinic sites within HC organization	number of clinic sites (from CHPR)	Reference Category: number of clinic sites within HC organization <=10 *versus* Category 1: number of clinic sites within HC organization >10 but <20 Category 2: number of clinic sites >=20
percent of patients at HC with depression diagnosis	number of patients with depression diagnosis regardless of primacy	(number of patients with depression diagnosis / total number of medical patients) x 100 Reference Category: percent of patients at HC with depression diagnosis <=5% *versus* Category 1: percent of patients at HC with depression diagnosis >5% but <15% Category 2: percent of patients at HC with depression diagnosis >=15%

percent of total revenue from Medicaid Managed Care	total revenue and revenue from Medicaid Managed Care	revenue from Medicaid managed care / total charges for the year) x 100 --- Reference Category: no revenue *versus* Category 1: percent of total revenue <25% Category 2: percent of total revenue >=25%

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



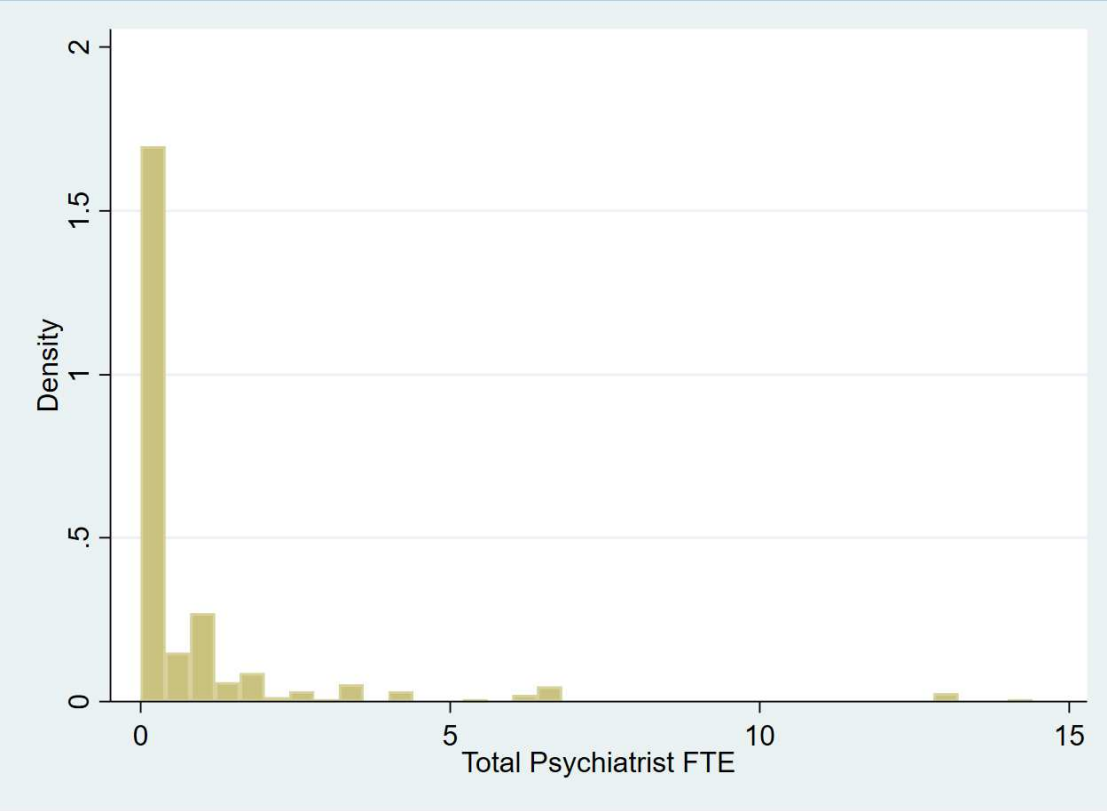
Total Licensed MH Provider FTE

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	4,575
25%	1	0	Sum of Wgt.	4,575
50%	3.25		Mean	8.437969
		Largest	Std. Dev.	17.94179
75%	7.16	92.27		
90%	12.77	92.27	Variance	321.9077
95%	38.44	92.27	Skewness	3.722244
99%	92.27	92.27	Kurtosis	16.16059

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



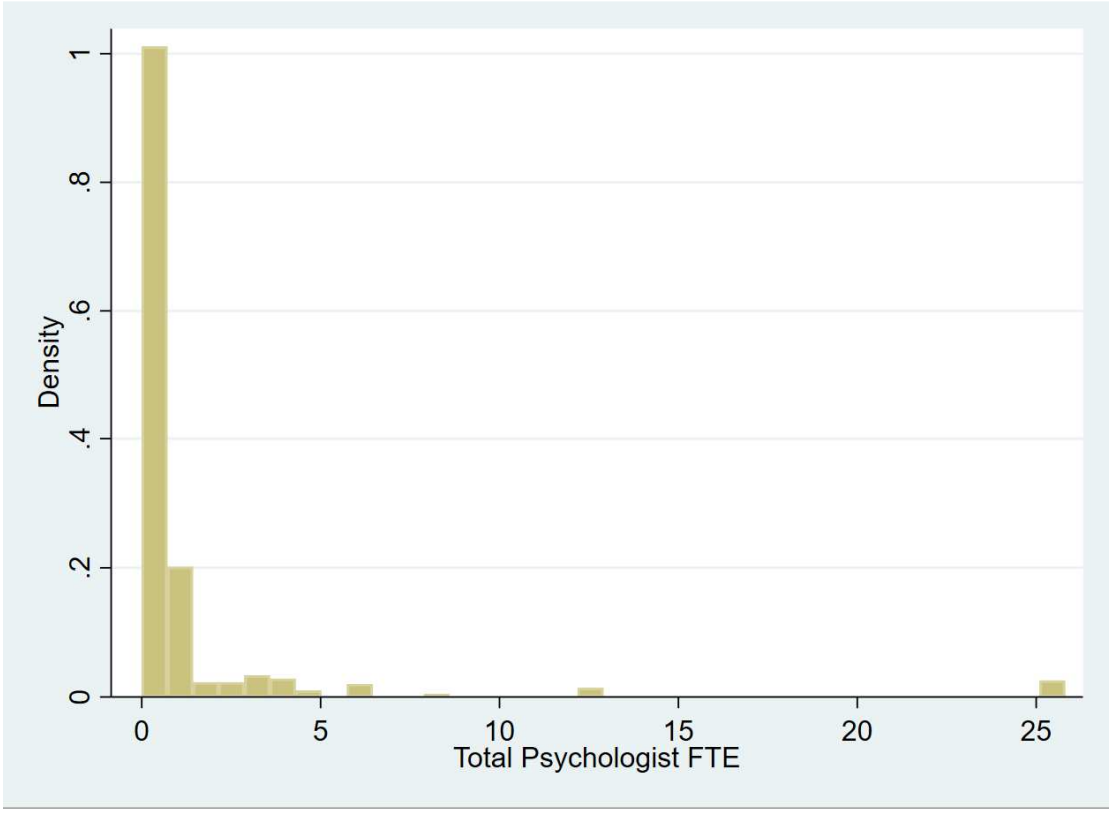
Total Psychiatrist FTE

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	4,575
25%	0	0	Sum of Wgt.	4,575
50%	.07		Mean	.8040415
		Largest	Std. Dev.	1.91382
75%	.86	14.41		
90%	2	14.41	Variance	3.662708
95%	4.24	14.41	Skewness	4.306763
99%	12.83	14.41	Kurtosis	24.93064

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



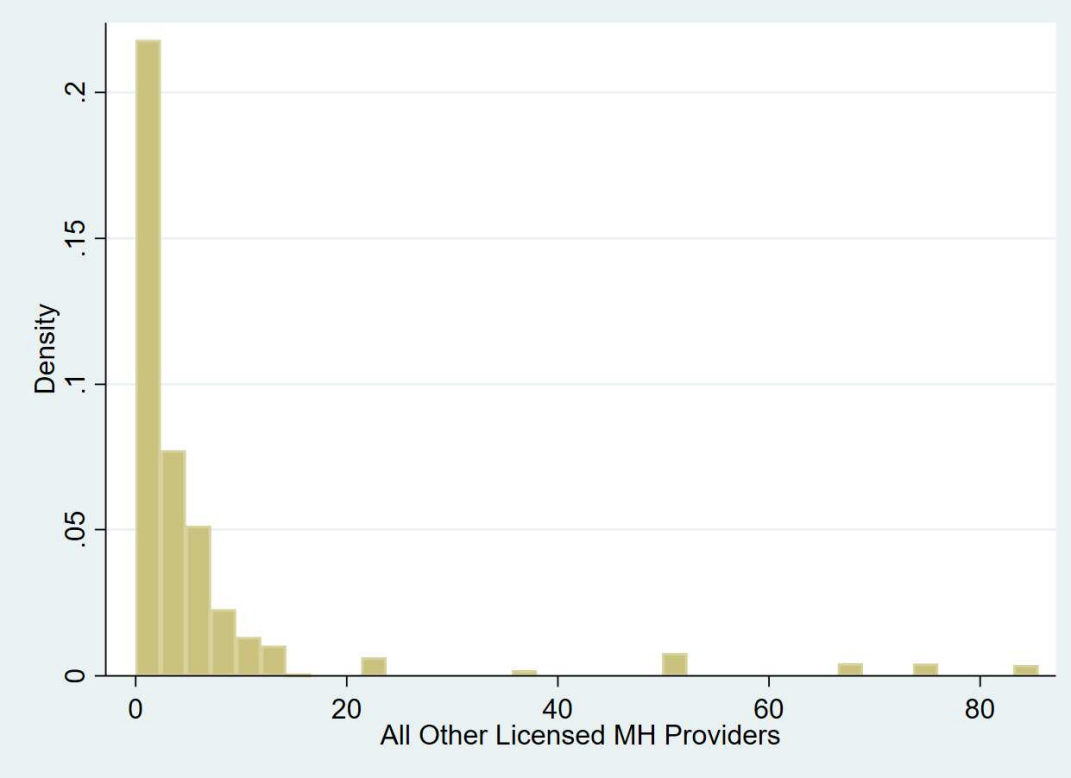
Total Psychologist FTE

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	4,575
25%	0	0	Sum of Wgt.	4,575
50%	0		Mean	1.137016
		Largest	Std. Dev.	3.776257
75%	.8	25.81		
90%	2.64	25.81	Variance	14.26012
95%	4.63	25.81	Skewness	5.454615
99%	25.81	25.81	Kurtosis	34.42338

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



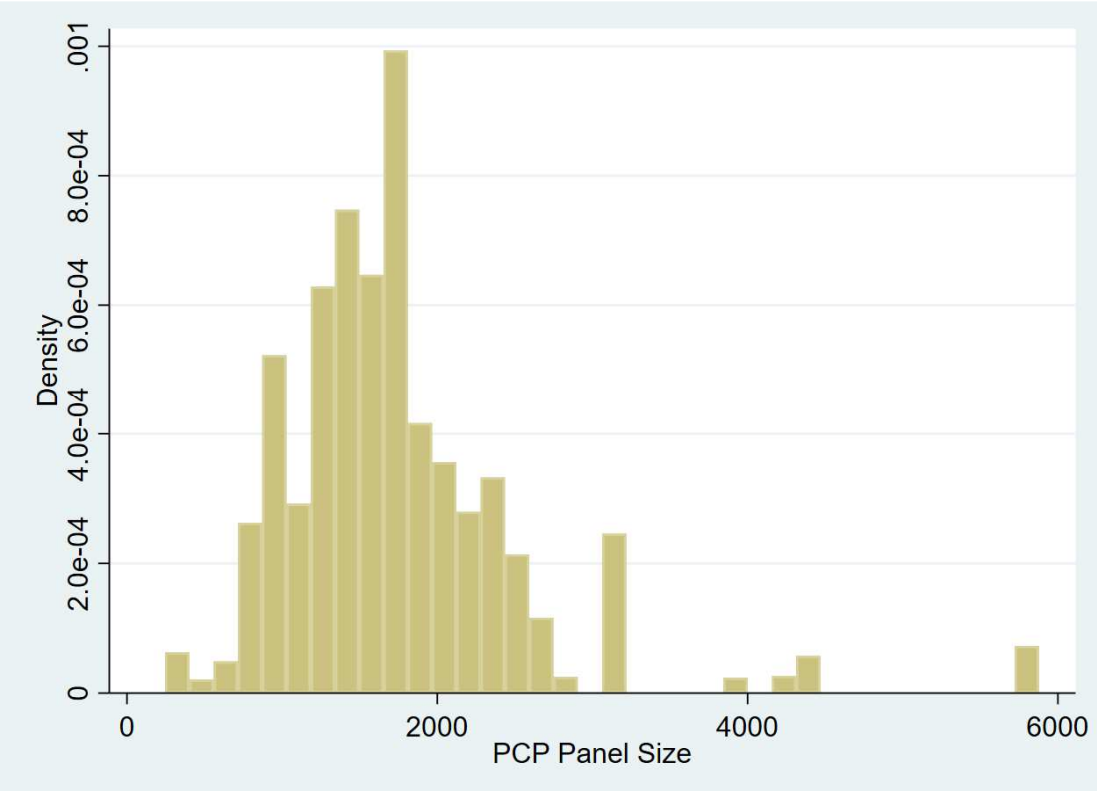
All Other Licensed MH Providers

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	4,575
25%	.52	0	Sum of Wgt.	4,575
50%	2.08		Mean	6.496912
		Largest	Std. Dev.	14.26016
75%	5.76	85.53		
90%	11.02	85.53	Variance	203.3521
95%	37.43	85.53	Skewness	3.956048
99%	75.81	85.53	Kurtosis	18.78837

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



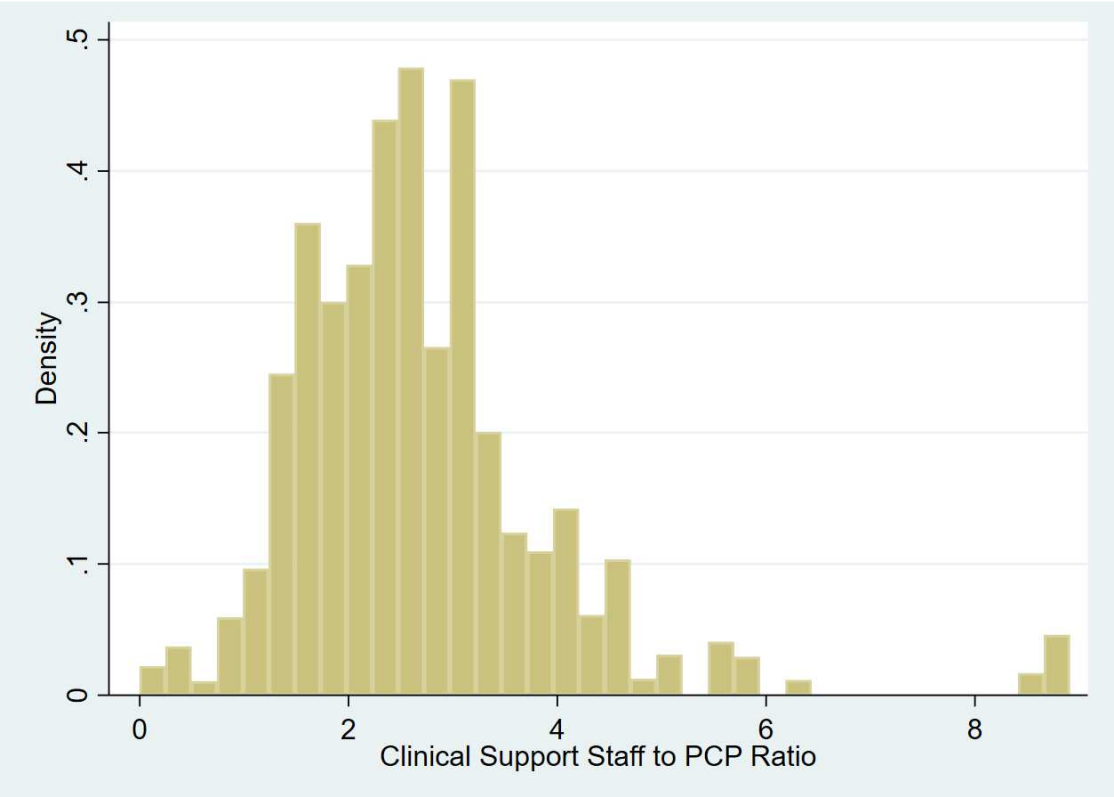
PCP Panel Size

Percentiles		Smallest		
1%	521.7125	245.815		
5%	856.5	245.815		
10%	939.9543	245.815	Obs	4,575
25%	1282.261	245.815	Sum of Wgt.	4,575
50%	1640.597		Mean	1746.176
		Largest	Std. Dev.	794.381
75%	2061.601	5877.917		
90%	2568.679	5877.917	Variance	631041.1
95%	3081.592	5877.917	Skewness	2.151968
99%	5877.917	5877.917	Kurtosis	10.87193

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



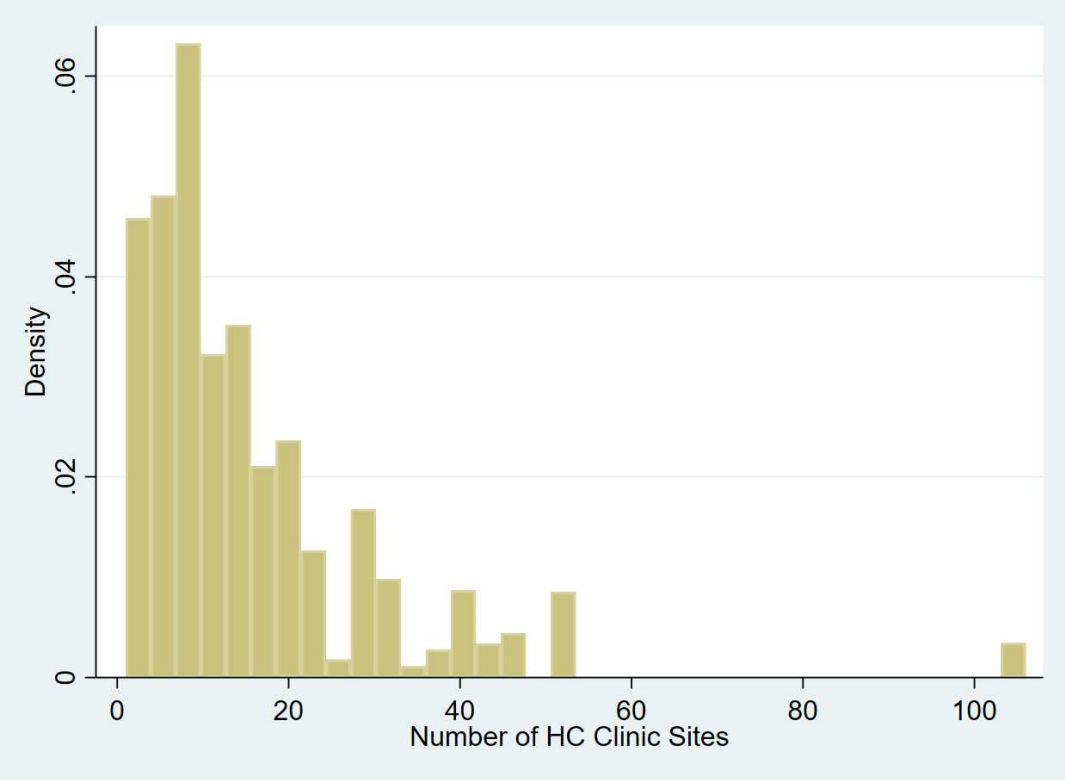
Clinical Support Staff to PCP Ratio

	Percentiles	Smallest		
1%	.3571429	0		
5%	1.157303	0		
10%	1.416974	0	Obs	4,575
25%	1.898473	0	Sum of Wgt.	4,575
50%	2.533099		Mean	2.709602
		Largest	Std. Dev.	1.286314
75%	3.173109	8.909172		
90%	4.107647	8.909172	Variance	1.654604
95%	4.63972	8.909172	Skewness	1.866797
99%	8.909172	8.909172	Kurtosis	9.512761

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



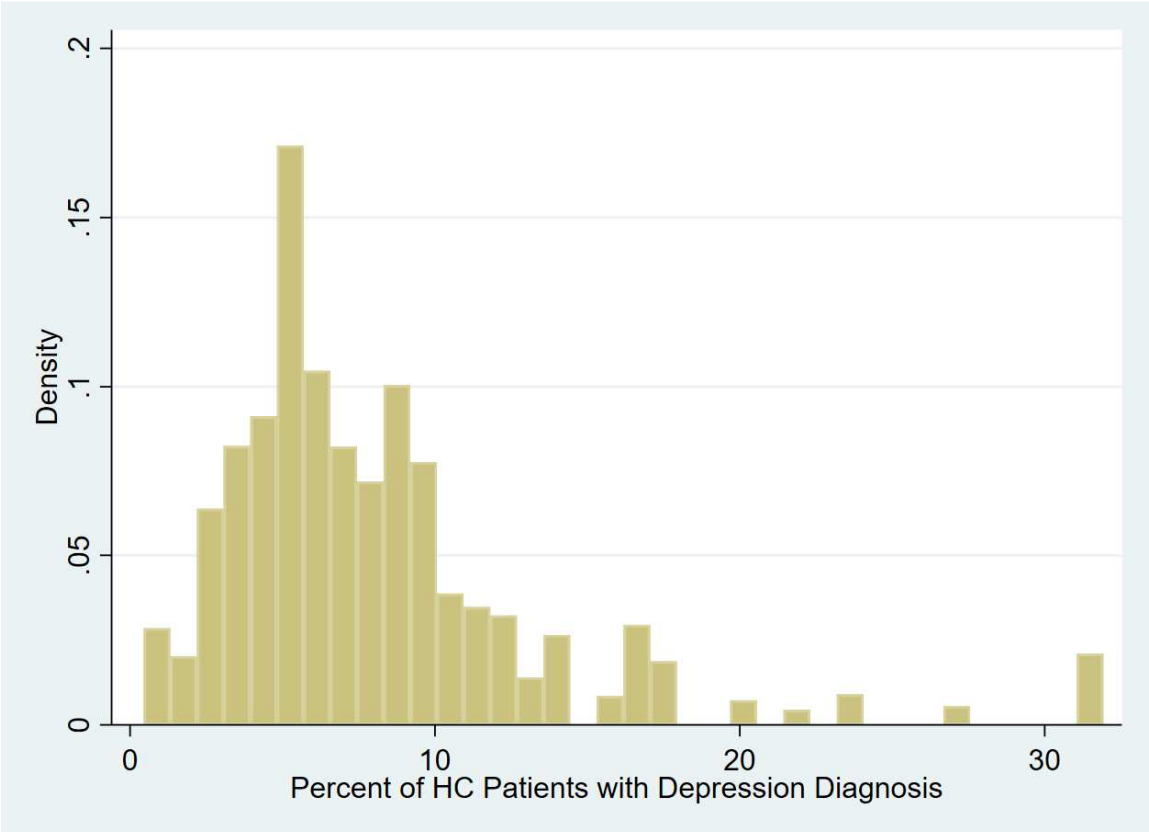
Number of HC Clinic Sites

Percentiles		Smallest		
1%	1	1		
5%	2	1		
10%	3	1	Obs	4,575
25%	6	1	Sum of Wgt.	4,575
50%	10		Mean	15.53486
		Largest	Std. Dev.	15.17519
75%	19	106		
90%	33	106	Variance	230.2864
95%	44	106	Skewness	2.713942
99%	106	106	Kurtosis	14.31453

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



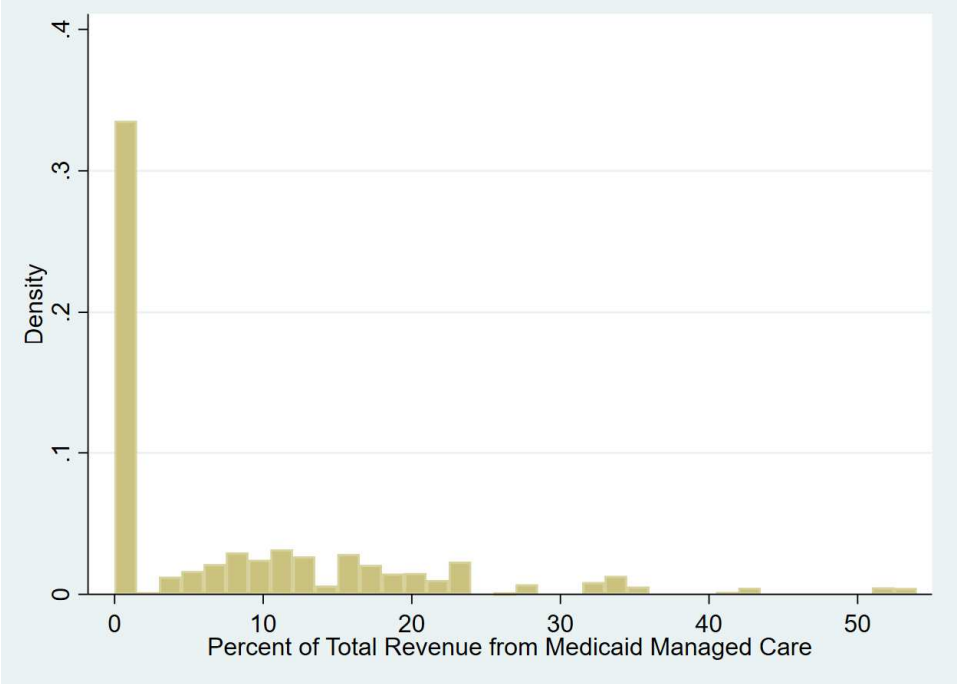
Percent of HC Patients with Depression Diagnosis

	Percentiles	Smallest		
1%	.9783631	.4454343		
5%	2.354748	.4454343		
10%	3.181077	.4454343	Obs	4,575
25%	4.850467	.4454343	Sum of Wgt.	4,575
50%	6.670883		Mean	8.060007
		Largest	Std. Dev.	5.463979
75%	9.82861	31.92665		
90%	14.34556	31.92665	Variance	29.85506
95%	17.50161	31.92665	Skewness	2.096823
99%	31.92665	31.92665	Kurtosis	8.854118

Appendix A (Continued) - Variable Definitions/Construction for Chapter 3 (Paper 1)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Source: 2013 UDS Data from HRSA



Percent of Total Revenue from Medicaid Managed Care

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	4,575
25%	0	0	Sum of Wgt.	4,575
50%	.3717892		Mean	8.287861
		Largest	Std. Dev.	11.2138
75%	13.91527	53.97076		
90%	23.10589	53.97076	Variance	125.7494
95%	33.4808	53.97076	Skewness	1.627982
99%	51.68465	53.97076	Kurtosis	5.736803

Appendix A (Continued) – Variable Definitions/Construction for Chapter 3 (Paper 1)

Independent Variables

Patient Characteristics

Data Source: HRSA 2014 Health Center Patient Survey (HCPS)

Variable	Survey Questions	Description /Construction
Kessler Severity Score(114)	During the past 30 days, how often did you feel […..]? 1. So sad that nothing could cheer you up? 2. Nervous? 3. Restless or fidgety? 4. Hopeless? 5. That everything was an effort? 6. Worthless? Response Options: a. All of the time b. Most of the time c. Some of the time d. A little of the time e. None of the time Diagnostic criteria based on analysis by Prochaska, Sung, Max, Shi & Ong (114)	Score less than 5: No psychological distress Score of 5-12: Moderate psychological distress Score of 13+: Severe psychological distress --- Reference Category: no psychological distress *versus* Category 1: moderate psychological distress Category 2: Severe psychological distress
Reported desire or need for substance abuse counseling	1) In the past 12 months, did you want or need treatment or counseling for your use of alcohol? 2) In the past 12 months, did you want or need treatment or counseling for your use of drugs?	Reference Category: responded "no" to both wanting/needing and treatment or counseling for alcohol or drugs *versus* Category 1: responded "yes" to wanting/needing treatment or counseling for alcohol or drugs
Self-reported health status	Would you say your health in general is	Reference Category: good, fair, or poor health

	excellent, very good, good, fair, or poor?	*versus* Category 1: Excellent or very good health (don't know responses included in excellent or very good health)
Sex	What is your gender? 1= male 2=female	Reference Category: male *versus* Category 1: female
Age	Can you tell me your current age?	Reference Category: ages 26-49 *versus* Category 1: ages 18-25 Category 2: ages 50-64
Race/Ethnicity	1) Are you of Hispanic, Latino, or Spanish origin? 1= yes 2= no 2) Which race or races do you consider yourself to be? You may select one or more. 1= White 2 = Black/African American 3 = American Indian or Alaska Native 4 = Native Hawaiian 5 = Guamanian or Chamorro 6 = Samoan 7 = Tongan 8 = Marshallese 9 = Asian Indian 10 = Chinese 11= Filipino 12 = Japanese 13 = Korean 14 = Vietnamese 15 = Other	Reference Category: non-Hispanic White *versus* Category 1: Hispanic/Latino Category 2: non-Hispanic Black/African American Category 3: all other categories
Limited English Language Proficiency (LEP)	Do you speak a language other than English at home? 1= yes 2= no	Reference Category: Not LEP (doesn't speak a language other than English at home and/or speaks English very well) *versus*

	If yes: How well you speak English? 1= very well 2= well 3= not well 4= not at all	Category 1: LEP (speaks English well, not well, not at all)
Patient's Recommendation of HC Center	Would you recommend Health Center to your family and friends? Would you say yes definitely, yes somewhat, or no?	Reference Category: Would definitely recommend *versus* Category 1: Would not definitely recommend (responded with "yes somewhat" or "no")
Marital Status	Are you…? 1=married 2=have a domestic partner 3= widowed 4=divorced 5=separated 6=never married	Reference Category: married or domestic partner *versus* widowed, divorced, separated, never married, refusal, don't know
Education	Please describe the highest grade or year of school you have completed?	(variable constructed by CHPR) --- Reference Category: less than high school degree *versus* Category 1: through high school Category 2: more than high school
Federal Poverty Line (FPL)	Household income in the past 12 months against 2012 poverty thresholds by size of family and number of related children under 18 years of age	(variable constructed by CHPR) --- Reference Category: FPL >100% *versus* Category 1: FPL <=100%
Insurance Coverage Status	According to the information you have provided, you do not have any health insurance now. Is that correct? *If no:* What kind of insurance coverage do you have?	(variable constructed by CHPR) --- Reference Category: uninsured *versus* Category 1: Medicaid coverage Category 2: other or missing response

APPENDIX B

Variable Definitions/Construction for Chapter 4 (Paper 2)

Appendix B – Variable Definitions/Construction for Chapter 4 (Paper 2)

Dependent Variables

Data Source: California Low-Income Health Program (LIHP) Data 2011-2013

Variable	**Description /Construction** (CMS Place of Services (POS) codes and Current Procedural Technology (CPT) codes were used to identify the services utilizes by LIHP enrollees)
High utilization of outpatient visits	Reference Category: less than 15 or more outpatient visits through the last 18 months of the study period (July 1, 2012 -December 31, 2013 *versus* Category 1: 15 or more outpatients visits throughout the last 18 months of the study period
High utilization of emergency department (ED) visits	Reference Category: less than 3 ED visits throughout the last 18 months of the study period *versus* Category 1: 3 or more ED visits throughout the last 18 months of the study period
Any hospitalization	Reference Category: no hospitalizations throughout during the last 18 months of the study period. *versus* Category 1: any hospitalizations throughout during the last 18 months of the study period.

Appendix B (Continued) – Variable Definitions/Construction for Chapter 4 (Paper 2)

Independent Variables

Health Center Characteristics (Organizational Level)

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)

Variable	OSHPD Variables Used	Description/Construction
Co-location of licensed Mental Health (MH) provider	Psychiatrists (FTE) + Licensed Clinical Psychologists (FTE) + Licensed Clinical Social Workers (FTE)	Reference Category: 0 licensed MH provider FTE *versus* Category 1: total licensed MH provider FTE per 2,000 patients >0 but <0.5 Category 2: total licensed MH provider FTE per 2,000 patients >=0.5
Co-location of psychiatrist	Psychiatrists (FTE)	Reference Category: 0 FTE for psychiatrist *versus* Category 1: any FTE for psychiatrist
Co-location of psychologist	Licensed Clinical Psychologists (FTE)	Reference Category: 0 FTE for clinical psychologist *versus* Category 1: any FTE for clinical psychologist
Co-location of Licensed Clinical Social Worker (LCSW)	LCSW (FTE)	Reference Category: 0 FTE for LCSW *versus* Category 1: any FTE for LCSW
Clinical support staff to Primary Care Provider (PCP) FTE ratio	PCP FTE: Family physicians (FTE) + General practitioners (FTE) + Internists (FTE)	Clinical Support Staff FTE / PCP FTE ---

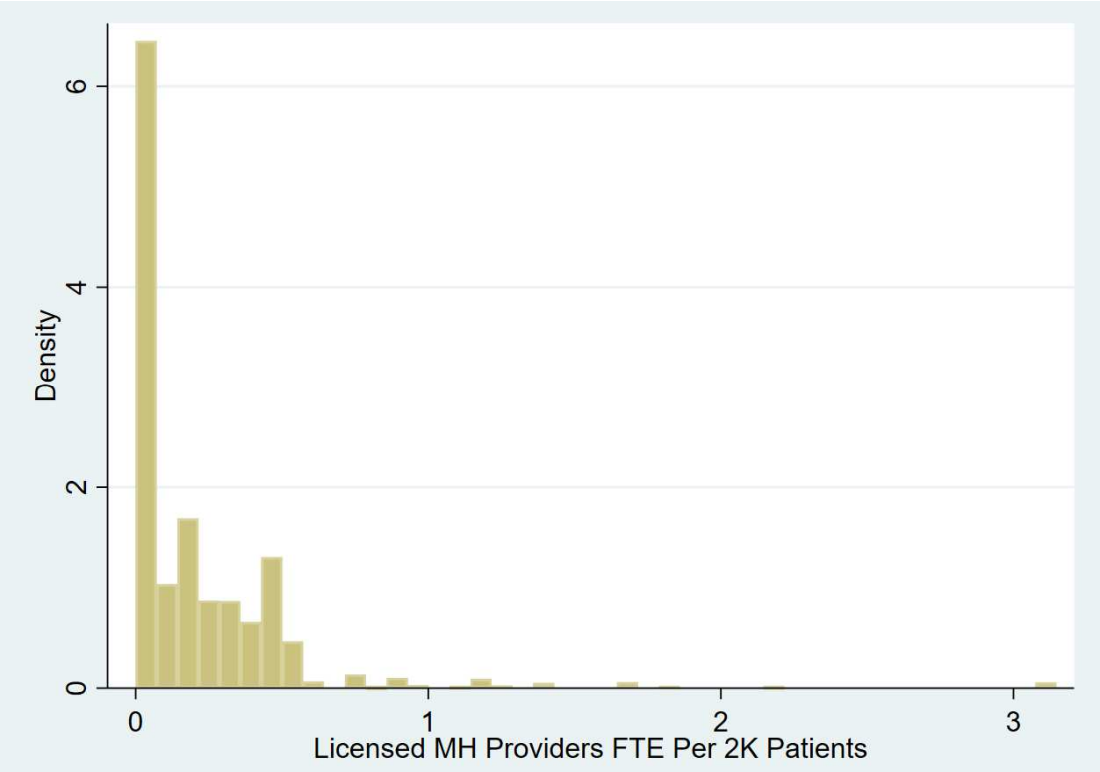
	+ Nurse Practitioners (FTE) + Physician Assistants (FTE) Clinical Support Staff FTE: Nurses (FTE) + Other Medical Personnel (FTE)	Reference Category: clinic support staff per PC provider <=2 *versus* Category 1: clinic support staff per PCP >2 but <3.5 Category 2: clinic support staff per PCP >=3.5
Region	* Variable created by UCLA CHPR	Reference Category: Northern or Central California *versus* Category 1: Southern California
Number of clinic sites within HC parent organization	Number of clinic sites (from CHPR)	Reference Category: number of clinic sites within HC organization =1 *versus* Category 1: number of clinic sites within HC organization >1 but <5 Category 2: number of clinic sites within HC organization >=5
Number of MH encounters per 2,000 patients	Number of MH encounters	Reference Category: 300 MH encounters or less per 2,000 patients *versus* Category 1: more than 300 MH encounters per 2,000 patients
Percent of total revenue from Medicaid Managed Care	Revenue from Medicaid managed care	Reference Category: percent of total revenue from Medicaid Managed Care less than 20%

		versus Category 1: percent of total revenue from Medicaid Managed Care at least 20%

Appendix B (Continued) - Variable Definitions/Construction for Chapter 4 (Paper 2)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)



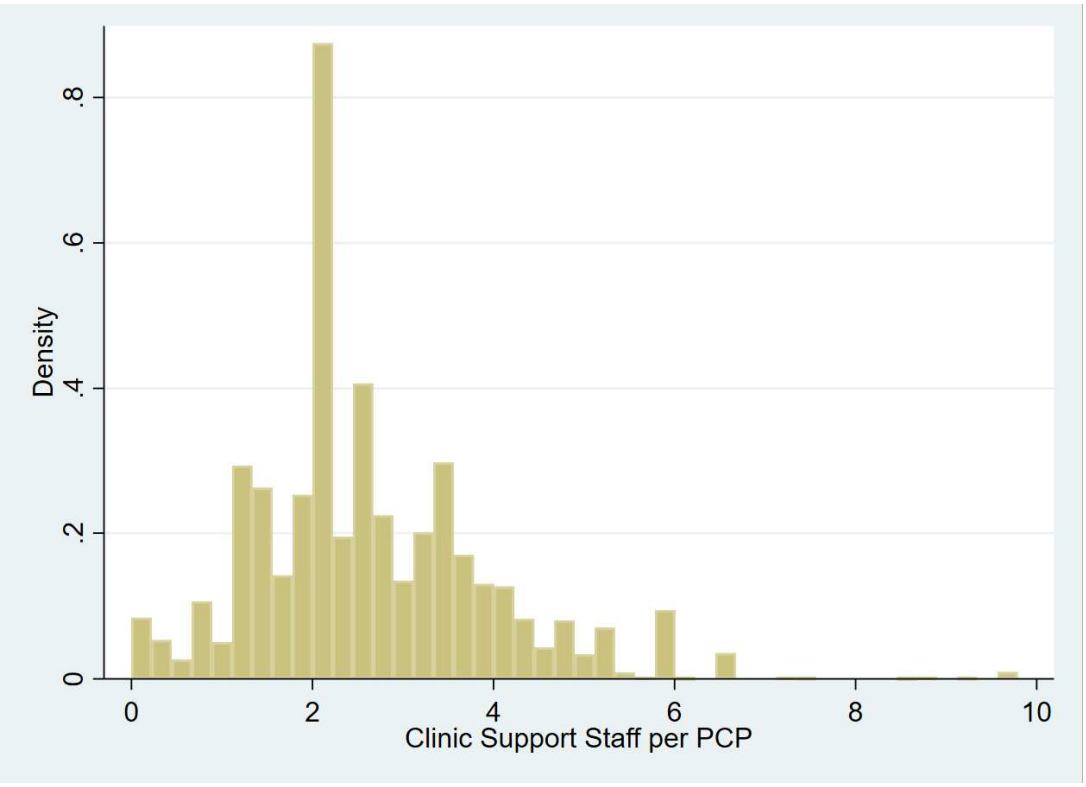
Licensed MH Providers FTE Per 2K Patients

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	26,833
25%	0	0	Sum of Wgt.	26,833
50%	.1227898		Mean	.2038932
		Largest	Std. Dev.	.3193125
75%	.3240034	3.146729		
90%	.4815068	3.146729	Variance	.1019605
95%	.5496022	3.146729	Skewness	4.509523
99%	1.387925	3.146729	Kurtosis	35.33006

Appendix B (Continued) - Variable Definitions/Construction for Chapter 4 (Paper 2)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)



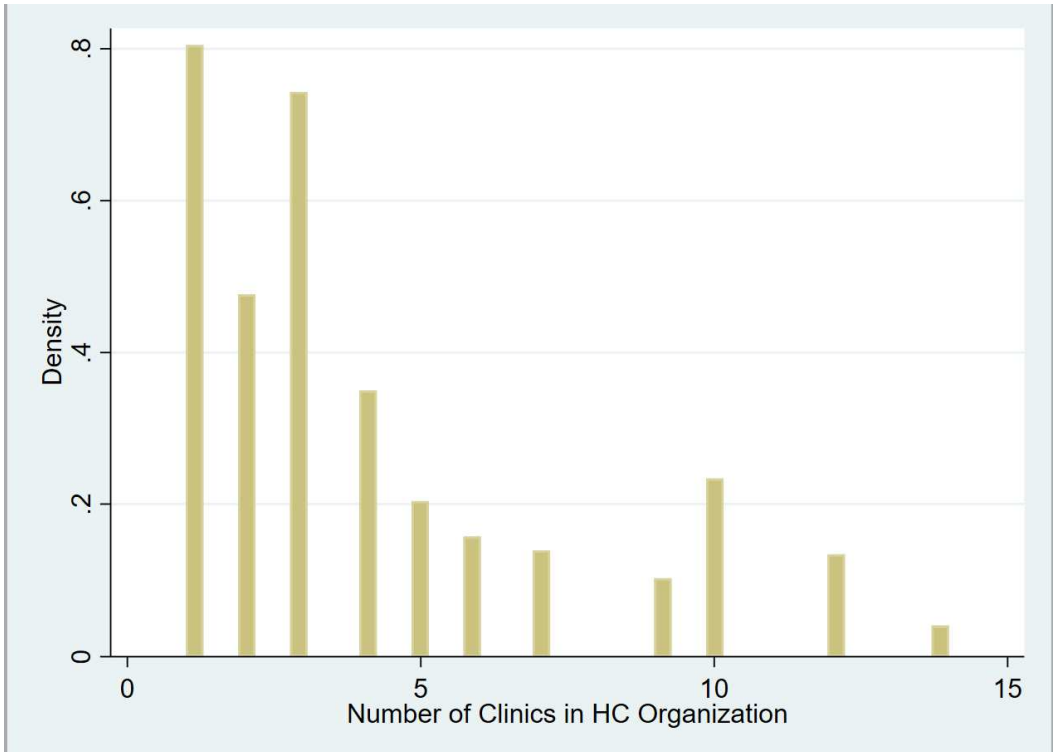
Clinic Support Staff per PCP

Percentiles		Smallest		
1%	0	0		
5%	.87	0		
10%	1.29	0	Obs	26,833
25%	1.84	0	Sum of Wgt.	26,833
50%	2.29		Mean	2.621892
		Largest	Std. Dev.	1.298824
75%	3.39	9.79		
90%	4.3	9.79	Variance	1.686943
95%	5.28	9.79	Skewness	.9899173
99%	6.47	9.79	Kurtosis	5.311614

Appendix B (Continued) - Variable Definitions/Construction for Chapter 4 (Paper 2)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)



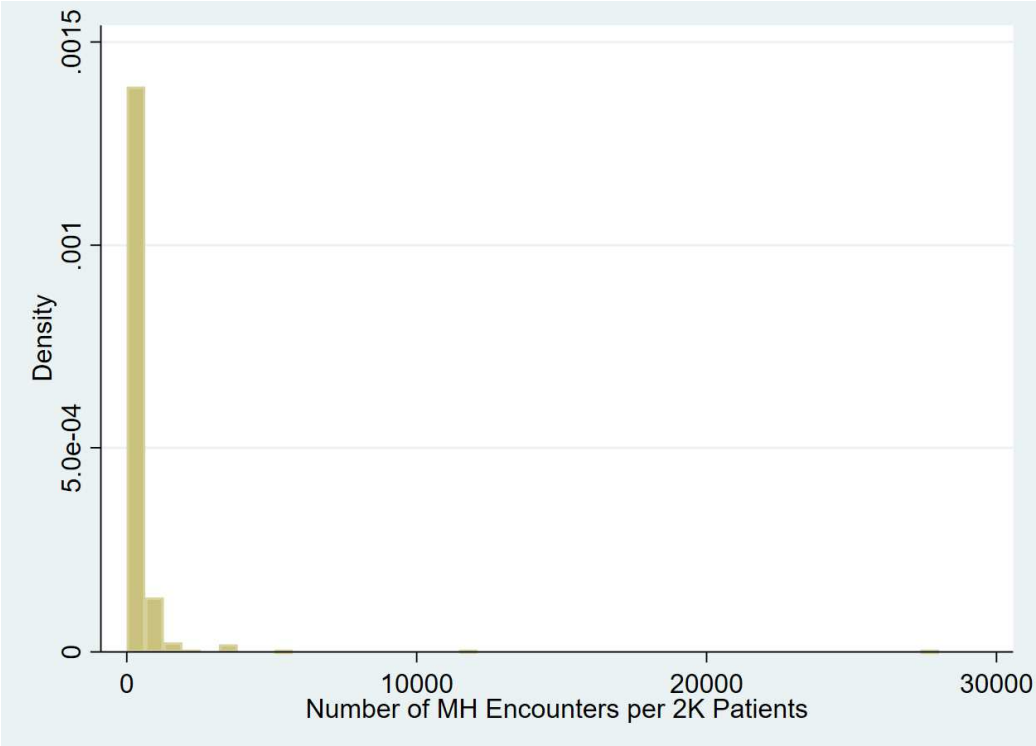
Number of Clinics in HC Organization

Percentiles		Smallest		
1%	1	1		
5%	1	1		
10%	1	1	Obs	26,833
25%	2	1	Sum of Wgt.	26,833
50%	3		Mean	4.064808
		Largest	Std. Dev.	3.242786
75%	5	14		
90%	10	14	Variance	10.51566
95%	12	14	Skewness	1.253435
99%	14	14	Kurtosis	3.667358

Appendix B (Continued) - Variable Definitions/Construction for Chapter 4 (Paper 2)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)



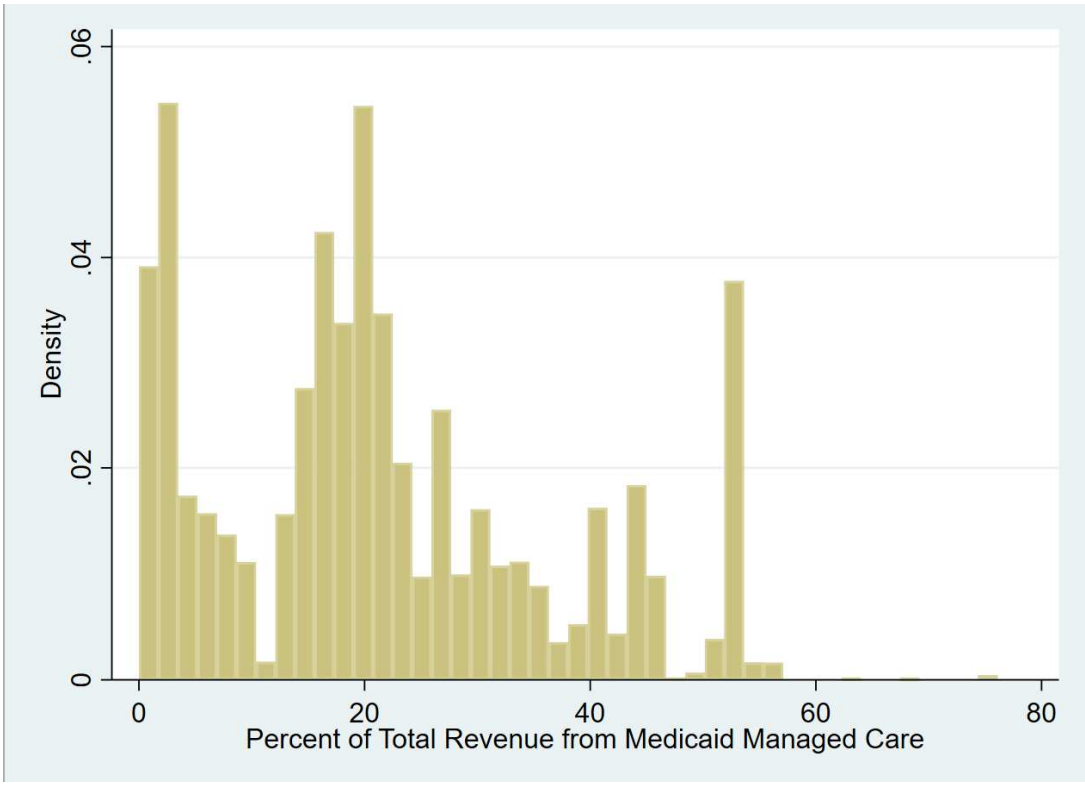
Number of MH Encounters per 2K Patients

	Percentiles	Smallest		
1%	0	0		
5%	32.9849	0		
10%	51.20557	0	Obs	26,833
25%	85.15168	0	Sum of Wgt.	26,833
50%	213.3333		Mean	335.2903
		Largest	Std. Dev.	607.1995
75%	319.4749	11524.43		
90%	725.3445	11524.43	Variance	368691.3
95%	1023.095	11524.43	Skewness	11.35575
99%	3484.21	28015.15	Kurtosis	275.8348

Appendix B (Continued) - Variable Definitions/Construction for Chapter 4 (Paper 2)

Histograms and Distributions Used to Construct of Health Center (Organizational Level) Variables

Data Source: 2012 Primary Care Clinic Annual Utilization Data provided by California's Office of Statewide Health Planning and Development (OSHPD)



Percent of Total Revenue from Medicaid Managed Care

Percentiles		Smallest		
1%	0	0		
5%	1.543689	0		
10%	2.140865	0	Obs	26,833
25%	9.766294	0	Sum of Wgt.	26,833
50%	19.90177		Mean	21.56953
		Largest	Std. Dev.	15.24775
75%	30.68892	76.10183		
90%	44.23177	76.10183	Variance	232.4939
95%	53.58162	76.10183	Skewness	.5910818
99%	53.58162	76.10183	Kurtosis	2.624818

Appendix B (Continued) – Variable Definitions/Construction for Chapter 4 (Paper 2)

Independent Variables

Patient Characteristics

Data Source: California Low-Income Health Program (LIHP) Data 2011-2013

Variable	Description /Construction
Mental Health or Substance Use Disorder Diagnosis	(based on ICD9 codes, CMS Place of Service (POS) codes, and Current Procedural Technology (CPT) codes) --- Reference Category: no *versus* Category 1: yes
Diabetes	(based on ICD9 codes) --- Reference Category: no *versus* Category 1: yes
Hypertension	(based on ICD9 codes) --- Reference Category: no *versus* Category 1: yes
Asthma/COPD	(based on ICD9 codes) --- Reference Category: no *versus* Category 1: yes
CAD/CHF	(based on ICD9 codes) --- Reference Category: no *versus* Category 1: yes
Dyslipidemia	(based on ICD9 codes)

	--- Reference Category: no *versus* Category 1: yes
2 or more chronic conditions	(based on ICD9 codes) --- Reference Category: no *versus* Category 1: yes
CDPS index at least .62	(variables created by CHPR using ICD9 codes) --- Reference Category: no *versus* Category 1: yes
High utilization of outpatient visits	Based on CMS Place of Service (POS) codes, and Current Procedural Technology (CPT) codes) --- Reference Category: less than 10 outpatient visits in year 1* *versus* Category 1: 10 or more outpatient visits in year 1*
High utilization of emergency department (ED)	Based on CMS Place of Service (POS) codes, and Current Procedural Technology (CPT) codes) --- Reference Category: less than 2 ED visits in year 1* *versus* Category 1: 2 or more ED visits in year 1*
Hospitalization	Based on CMS Place of Service (POS) codes, and Current Procedural Technology (CPT) codes) --- Reference Category: no hospitalizations in year 1* *versus* Category 1: any hospitalizations in year 1*

Sex	Reference Category: male *versus* Category 1: female
Age	Reference Category: ages 40-49 *Versus* Category 1: ages 19-39 Category 2: ages 50-64
Race/Ethnicity	Reference Category: non-Hispanic white *versus* Category 1: Hispanic/Latino Category 2: Asian American or Pacific Islander Category 3: Black or African American Category 4: other race/ethnicity or missing
English Language Proficiency	Reference Category: not limited English proficiency (based on patient indicating their preferred language of communication was English) *versus* Category 1: limited English proficiency (based on patient indicating their preferred language of communication was not English, or missing response)
Income level at or below 133% Federal Poverty Level (FPL) (based on LIHP versus HCCI enrollment)	Reference Category: FPL 133% -200% (HCCI enrollment) *versus* Category 1: FPL 133% or less (LIHP enrollment)

APPENDIX C

Appendix Tables for Chapters 3 and 4 (Papers 1 and 2)

Appendix Table 1: VIF Multicollinearity Check - Association Between Staffing of Licensed Mental Health (MH) Providers at Patient's HC and Patients Receiving Mental Health Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services)

Variable	VIF	1/VIF
Sample Size	**4,575**	
Health Center Characteristics		
Total licensed MH providers per 2,000 patients (reference: no MH providers)		
less than 1 MH FTE	1.99	0.50
at least 1 MH FTE	2.21	0.45
PCP Panel Size (reference: less than 1,200 patients)		
At least 1,200 patients, but less than 2,000 patients	2.25	0.44
At least 2,000 patients	2.82	0.36
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)		
ratio greater than 2, but no more than 4	1.74	0.57
ratio greater than 4	2.02	0.49
Rural location	1.28	0.78
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)		
More than 10, but less than 20 sites	1.25	0.80
20 or more sites	1.55	0.64
Percent of patients diagnosed with depression (reference: 5% or less)		
More than 5% , less than 15%	1.6	0.63
15% or more	1.54	0.65
Percent of total revenue from Medicaid Managed Care (reference: no revenue)		
Less than 25%	1.44	0.70
25% or more	1.25	0.80
Patient Characteristics		
Sex (reference: male)	1.08	0.93
Age (reference: 26-49)		
18-25	1.13	0.88
50-64	1.15	0.87
Race/Ethnicity (reference: non-Hispanic white)		
Hispanic/Latino	2.61	0.38
non-Hispanic Black	1.67	0.60
Other	1.73	0.58
Marital status: not married or domestic partner (reference: married or living with a domestic partner)	1.21	0.83
Education (reference: less than high school)		
High school	1.3	0.77
More than high school	1.42	0.70
Limited English proficiency (speaks English well, not well, not at all, versus very well)	2.1	0.48

Would not definitely recommend HC to family or friends (reference: would definitely recommend)	1.03	0.97
Federal poverty level less than or equal to 100% (reference: above 100% FPL)	1.16	0.86
Coverage status (reference: uninsured)		
Medicaid	1.59	0.63
Other or missing response	1.5	0.67
MH Status by Kessler severity score (reference: mild or no psychological distress)		
Moderate psychological distress	1.23	0.82
Severe psychological distress	1.28	0.78
Reported wanting or needing counseling or treatment for drugs and/or alcohol	1.09	0.92
Fair or poor health (reference: good, very good, or excellent health)	1.07	0.93
Mean VIF	1.56	

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider

Appendix Table 2: Staffing of Licensed MH Providers at HCs and Predicted Probabilities of HC Patients Receiving Mental Health Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services) Model 1)

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group*	p-value for difference
Sample Size	**4,575**			
Health Center Characteristics				
Total licensed MH providers per 2,000 patients (reference: no MH Providers)	22%	2%	ref	ref
Less than 1 MH FTE	24%	1%	2	0.379
At least 1 MH FTE	32%	4%	10	0.047
PCP Panel Size (reference: less than 1,200 patients)	30%	3%	ref	ref
At least 1,200 patients, but less than 2,000 patients	24%	1%	-6	0.079
At least 2,000 patients	24%	2%	-5	0.208
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)	24%	2%	ref	ref
ratio greater than 2, but no more than 4	26%	1%	2	0.437
ratio greater than 4	28%	3%	4	0.249
Non-rural location for HC (reference)	25%	1%	ref	ref
Rural location for HC	25%	2%	0	0.961
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)	27%	2%	ref	ref
More than 10, but less than 20 sites	24%	2%	-2	0.304
20 or more sites	24%	2%	-3	0.320
Percent of patients diagnosed with depression (reference: 5% or less)	19%	2%	re f	ref
More than 5%, but less than 15%	27%	1%	8	0.001
15% or more	29%	4%	10	0.021
Percent of total revenue from Medicaid Managed Care (reference: no revenue)	24%	1%	ref	ref
Less than 25%	27%	2%	3	0.203
25% or more	23%	4%	-1	0.766
Patient Characteristics				
MH Status by Kessler severity score (reference: mild or no psychological distress)	14%	1%	ref	ref
moderate psychological distress	29%	2%	15	0.000
severe psychological distress	48%	3%	34	0.000
Self-reported desire for counseling or treatment for drugs and/or alcohol (reference: no)	23%	1%	ref	ref
yes	48%	4%	25	0.000
Self-reported health status (reference: good, fair, poor health)	26%	1%	ref	ref
very good or excellent health, or "don't know"	22%	2%	-4	0.141
Sex (reference: male)	24%	2%	ref	ref
female	26%	1%	2	0.447

Age (reference: 26-49)	27%	1%	ref	ref
18-25	22%	3%	-5	0.112
50-64	23%	2%	-4	0.027
Race/Ethnicity (reference: non-Hispanic white)	30%	2%	ref	ref
Hispanic/Latino	22%	2%	-7	0.011
non-Hispanic Black	20%	2%	-9	0.000
Other	26%	3%	-4	0.201
Limited English proficiency (reference: speaks English very well)	27%	1%	ref	ref
speaks English well, not well, or not at all	16%	3%	-12	0.000
Personal recommendation of HC (reference: would definitely recommend)	26%	1%	ref	ref
would not definitely recommend or only somewhat recommend HC to family or friends	24%	2%	-2	0.443
Marital status: (reference: married or living with domestic partner)	23%	2%	ref	ref
not married or living with domestic partner	26%	1%	3	0.123
Education (reference: less than high school)	23%	1%	ref	ref
high school	23%	2%	0	0.973
more than high school	29%	2%	6	0.006
Federal poverty level (reference: above 100%)	24%	2%	ref	ref
less than or equal to 100%	26%	1%	2	0.398
Coverage status (reference: uninsured)	17%	2%	ref	ref
Medicaid	29%	1%	12	0.000
other or missing response	21%	2%	4	0.089

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider
*Point differences are rounded to closest whole number

Appendix Table 3: Associations Between Staffing of Licensed Mental Health (MH) Providers at HCs and Patients Receiving Any MH Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services)

Stratified by Level of Psychological Distress (Based on K6 Score

Weighted Multilevel GSEM Logistic Regression

	Entire Sample			Mild or Moderate Psychological Distress			Moderate Psychological Distress			Severe Psychological Distress		
Sample Size	**4,575**			**3,826**			**1,797**			**749**		
	OR	***Robust SE***	***p-value***	***OR***	***Robust SE***	***p-value***	***OR***	***Robust SE***	***p-value***	***OR***	***Robust SE***	***p-value***
Health Center Characteristics												
Total licensed MH providers per 2,000 patients (reference: no MH providers)												
Less than 1 MH FTE	1.22	0.28	0.39	1.26	0.36	0.42	1.71	0.67	0.17	1.15	0.70	0.82
At least 1 MH FTE	2.24	0.88	0.04	2.53	1.07	0.03	4.62	2.64	0.01	0.98	0.74	0.98
PCP Panel Size (reference: less than 1,200 patients)												
At least 1,200 patients, but less than 2,000 patients	0.62	0.16	0.07	0.55	0.14	0.02	0.45	0.17	0.03	1.11	0.58	0.85
At least 2,000 patients	0.66	0.22	0.20	0.69	0.23	0.26	0.48	0.21	0.09	0.51	0.34	0.32
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)												
ratio greater than 2, but no more than 4	1.17	0.24	0.44	1.23	0.26	0.33	1.44	0.45	0.25	1.32	0.57	0.52
ratio greater than 4	1.39	0.40	0.25	1.50	0.50	0.22	1.15	0.50	0.75	2.50	1.53	0.13
Rural location	0.99	0.18	0.96	1.00	0.21	0.98	0.85	0.26	0.58	1.31	0.54	0.50
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)												
More than 10, but less than 20 sites	0.82	0.16	0.31	0.74	0.17	0.18	0.55	0.17	0.06	1.40	0.65	0.47
20 or more sites	0.78	0.20	0.33	0.72	0.20	0.23	0.58	0.22	0.16	1.22	0.55	0.65
Percent of patients diagnosed with depression (reference: 5% or less)												
More than 5% , less than 15%	2.07	0.46	0.00	2.05	0.51	0.00	2.17	0.72	0.02	4.44	2.12	0.00

15% or more	2.38	0.84	0.01	2.54	0.97	0.02	2.24	1.10	0.10	4.54	2.93	0.02
Percent of total revenue from Medicaid Managed Care (reference: no revenue)												
Less than 25%	1.29	0.25	0.20	1.24	0.26	0.30	1.32	0.40	0.35	1.46	0.63	0.38
25% or more	0.90	0.34	0.77	0.64	0.24	0.23	0.91	0.40	0.84	1.42	0.95	0.60
Patient Characteristics												
MH Status by Kessler severity score (reference: mild or no psychological distress)												
Moderate psychological distress	3.55	0.64	0.00	3.52	0.64	0.00	-	-	-	-	-	-
Severe psychological distress	11.22	2.69	0.00				-	-	-	-	-	-
Reported wanting or needing counseling or treatment for drugs and/or alcohol	5.40	1.26	0.00	5.89	1.62	0.00	8.74	3.34	0.00	5.86	2.97	0.00
Excellent or very good health (reference: good, fair, or poor health)	0.73	0.16	0.15	0.84	0.18	0.43	0.67	0.22	0.23	0.44	0.25	0.14
Female (reference: male)	1.15	0.21	0.45	1.10	0.23	0.64	1.18	0.33	0.56	1.39	0.44	0.29
Age (reference: 26-49)												
18-25	0.66	0.18	0.13	0.56	0.17	0.06	0.58	0.21	0.12	2.04	1.29	0.26
50-64	0.72	0.11	0.03	0.72	0.12	0.06	0.66	0.15	0.07	0.78	0.26	0.45
Race/Ethnicity (reference: non-Hispanic white)												
Hispanic/Latino	0.57	0.13	0.01	0.53	0.13	0.01	0.42	0.12	0.00	1.31	0.78	0.65
non-Hispanic Black	0.46	0.10	0.00	0.37	0.08	0.00	0.27	0.08	0.00	0.99	0.38	0.98
Other	0.75	0.17	0.21	0.64	0.16	0.07	0.70	0.21	0.23	2.20	1.25	0.17
Limited English proficiency	0.36	0.11	0.00	0.45	0.15	0.02	0.39	0.14	0.01	0.10	0.06	0.00
Would not definitely recommend HC to family or friends (reference: would definitely recommend)	0.86	0.18	0.45	0.85	0.20	0.48	0.71	0.22	0.26	0.71	0.31	0.44
Federal poverty level less than or equal to 100% (reference: above 100%)	1.16	0.21	0.40	1.15	0.24	0.50	1.00	0.25	0.99	0.98	0.32	0.95
Marital status: not married or living domestic partner (reference: married or living with domestic partner)	1.32	0.24	0.12	1.34	0.28	0.15	1.42	0.40	0.22	1.33	0.42	0.37
Education (reference: less than high school)												
High school	0.99	0.17	0.97	0.78	0.16	0.24	0.62	0.16	0.06	2.19	0.96	0.07
More than high school	1.65	0.30	0.01	1.37	0.28	0.12	1.24	0.33	0.42	2.81	1.18	0.01
Coverage status (reference: uninsured)												

Medicaid	2.88	0.59	0.00	3.03	0.67	0.00	3.39	0.96	0.00	3.70	1.32	0.00
Other or missing response	1.49	0.35	0.09	1.45	0.39	0.17	1.94	0.69	0.06	1.54	0.71	0.36
M1[grantee_id]	2.72			2.72			2.72			2.72		
_cons	0.03	0.02	0.00	0.04	0.02	0.00	0.14	0.09	0.00	0.05	0.05	0.00
var(M1[grantee_id])	2.19	0.37	0.00	2.44	0.50	0.00	4.83	1.94	0.00	4.73	2.57	0.00

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider

Appendix Table 4: Associations Between Staffing of Licensed Mental Health (MH) Providers at HCs and Patients Receiving Any MH Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services)

Stratified by Type of MH Diagnosis (Self-Reported)

Weighted Multilevel GSEM Logistic Regression

	Entire Sample			**Patients with Depression or Generalized Anxiety**			**Patients with Panic Disorder, Schizophrenia, or Bipolar Disorder**		
Sample Size	**4,575**			**2,071**			**1,013**		
	OR	***Robust SE***	***p-value***	***OR***	***Robust SE***	***p-value***	***OR***	***Robust SE***	***p-value***
Health Center Characteristics									
Total licensed MH providers per 2,000 patients (reference: no MH providers)									
Less than 1 MH FTE	1.22	0.28	0.39	1.30	0.34	0.31	2.11	0.93	0.09
At least 1 MH FTE	2.24	0.88	0.04	2.55	1.11	0.03	3.37	2.30	0.07
PCP Panel Size (reference: less than 1,200 patients)									
At least 1,200 patients, but less than 2,000 patients	0.62	0.16	0.07	0.80	0.22	0.41	0.67	0.27	0.33
At least 2,000 patients	0.66	0.22	0.20	0.80	0.29	0.54	0.65	0.35	0.43
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)									
ratio greater than 2, but no more than 4	1.17	0.24	0.44	1.31	0.30	0.25	1.05	0.43	0.91
ratio greater than 4	1.39	0.40	0.25	1.55	0.55	0.22	1.59	0.98	0.46
Rural location	0.99	0.18	0.96	0.87	0.18	0.50	0.91	0.29	0.76
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)									
More than 10, but less than 20 sites	0.82	0.16	0.31	0.90	0.21	0.64	0.74	0.29	0.43
20 or more sites	0.78	0.20	0.33	0.86	0.27	0.63	0.64	0.31	0.37

Percent of patients diagnosed with depression (reference: 5% or less)									
More than 5% , less than 15%	2.07	0.46	0.00	1.87	0.45	0.01	1.75	0.65	0.13
15% or more	2.38	0.84	0.01	1.94	0.71	0.07	1.12	0.73	0.87
Percent of total revenue from Medicaid Managed Care (reference: no revenue)									
Less than 25%	1.29	0.25	0.20	1.38	0.32	0.16	1.71	0.62	0.14
25% or more	0.90	0.34	0.77	0.89	0.38	0.78	1.31	0.99	0.72
Patient Characteristics									
MH Status by Kessler severity score (reference: mild or no psychological distress)									
Moderate psychological distress	3.55	0.64	0.00	1.68	0.36	0.01	1.59	0.61	0.23
Severe psychological distress	11.22	2.69	0.00	3.41	0.93	0.00	3.00	1.11	0.00
Reported wanting or needing counseling or treatment for drugs and/or alcohol	5.40	1.26	0.00	3.78	1.09	0.00	7.23	3.52	0.00
Excellent or very good health (reference: good, fair, or poor health)	0.73	0.16	0.15	1.18	0.39	0.61	1.22	0.54	0.65
Female (reference: male)	1.15	0.21	0.45	0.81	0.15	0.26	1.12	0.31	0.67
Age (reference: 26-49)									
18-25	0.66	0.18	0.13	0.64	0.21	0.18	1.16	0.61	0.78
50-64	0.72	0.11	0.03	0.63	0.11	0.01	0.78	0.24	0.43
Race/Ethnicity (reference: non-Hispanic white)									
Hispanic/Latino	0.57	0.13	0.01	0.72	0.22	0.28	0.88	0.49	0.82
non-Hispanic Black	0.46	0.10	0.00	0.77	0.19	0.28	0.84	0.29	0.63
Other	0.75	0.17	0.21	1.31	0.34	0.30	2.12	1.02	0.12
Limited English proficiency	0.36	0.11	0.00	0.46	0.18	0.04	0.28	0.17	0.03
Would not definitely recommend HC to family or friends (reference: would definitely recommend)	0.86	0.18	0.45	0.94	0.21	0.77	0.90	0.32	0.76
Marital status: not married or living with domestic partner (reference: married or living with domestic partner)	1.32	0.24	0.12	1.28	0.25	0.22	1.05	0.28	0.87

Education (reference: less than high school)									
High school	0.99	0.17	0.97	1.31	0.26	0.18	0.66	0.25	0.28
More than high school	1.65	0.30	0.01	1.75	0.40	0.02	1.31	0.52	0.50
speaks English well, not well, or not at all	0.36	0.11	0.00	0.46	0.18	0.04	0.28	0.17	0.03
Federal poverty level less than or equal to 100% (reference: above 100%)	1.16	0.21	0.40	1.09	0.20	0.62	1.29	0.36	0.36
Coverage status (reference: uninsured)									
Medicaid	2.88	0.59	0.00	2.91	0.74	0.00	3.73	1.33	0.00
Other or missing response	1.49	0.35	0.09	1.83	0.57	0.05	1.26	0.54	0.59
M1[grantee_id]	2.72			2.72			2.72		
_cons	0.03	0.02	0.00	0.11	0.06	0.00	0.20	0.17	0.06
var(M1[grantee_id])	2.19	0.37	0.00	2.39	0.59	0.00	5.25	2.09	0.00

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider

Appendix Table 5: Staffing of Specific Types of Licensed MH Providers at HCs and Predicted Probabilities of HC Patients Receiving Mental Health Services Anywhere within Last 12 Months (versus Not Receiving Any MH Services) (Model 1a)

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group*	p-value for difference
Sample Size		**4,575**		
Health Center Characteristics				
Any psychiatrist FTE on staff (reference: no)	24%	2%	Ref	ref
yes	26%	2%	2	0.377
Any clinical psychologist FTE on staff (reference: no)	25%	1%	ref	ref
yes	25%	2%	-1	0.814
Any other licensed MH provider FTE on staff (reference: no)	25%	3%	ref	Ref
yes	25%	1%	0	0.977
PCP Panel Size (reference: less than 1,200 patients)	30%	3%	ref	Ref
At least 1,200 patients, but less than 2,000 patients	24%	1%	-7	0.055
At least 2,000 patients	24%	2%	-6	0.143
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)	24%	2%	ref	Ref
ratio greater than 2, but no more than 4	26%	1%	2	0.510
ratio greater than 4	27%	3%	3	0.391
Non-rural location for HC (reference)	25%	2%	Ref	Ref
Rural location for HC	25%	2%	0	0.954
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)	26%	2%	ref	Ref
More than 10, but less than 20 sites	24%	2%	-2	0.336
20 or more sites	24%	3%	-2	0.529
Percent of patients diagnosed with depression (reference: 5% or less)	18%	2%	Ref	Ref
More than 5%, but less than 15%	27%	1%	9	0.001
15% or more	30%	4%	12	0.013
Percent of total revenue from Medicaid Managed Care (reference: no revenue)	24%	1%	Ref	ref
Less than 25%	27%	2%	3	0.192
25% or more	22%	4%	-2	0.653
Patient Characteristics				
MH Status by Kessler severity score (reference: mild or no psychological distress)	14%	1%	ref	ref
moderate psychological distress	29%	2%	15	0.000
severe psychological distress	48%	3%	34	0.000
Self-reported desire for counseling or treatment for drugs and/or alcohol (reference: no)	23%	1%	ref	ref

yes	48%	4%	25	0.000
Self-reported health status (reference: good, fair, poor health)	26%	1%	ref	ref
very good or excellent health, or "don't know"	22%	2%	-4	0.159
Sex (reference: male)	24%	2%	ref	ref
female	26%	1%	2	0.483
Age (reference: 26-49)	27%	1%	ref	ref
18-25	22%	3%	-5	0.107
50-64	23%	2%	-4	0.026
Race/Ethnicity (reference: non-Hispanic white)	30%	2%	ref	ref
Hispanic/Latino	22%	2%	-7	0.011
non-Hispanic Black	20%	2%	-10	0.000
Other	26%	3%	-4	0.222
Limited English proficiency (reference: speaks English very well)	27%	1%	ref	ref
speaks English well, not well, or not at all	16%	3%	-12	0.000
Personal recommendation of HC (reference: would definitely recommend)	26%	1%	ref	ref
would not definitely recommend or only somewhat recommend HC to family or friends	24%	2%	-2	0.428
Marital status: (reference: married or living with domestic partner)	23%	2%	ref	ref
not married or living with domestic partner	26%	1%	3	0.129
Education (reference: less than high school)	23%	2%	ref	ref
high school	23%	2%	0	0.997
more than high school	23%	2%	6	0.005
Federal poverty level (reference: above 100%)	24%	2%	ref	ref
less than or equal to 100%	26%	1%	2	0.402
Coverage status (reference: uninsured)	17%	2%	ref	ref
Medicaid	30%	1%	12	0.000
other or missing response	21%	2%	4	0.092

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider
*Point differences are rounded to closest whole number

Appendix Table 6: Staffing of Licensed MH Providers at HCs and Predicted Probabilities of At Least Some On-Site Patient Utilization of Mental Health Services (versus All Off-Site) Among HC Patients Receiving Any Mental Health Services (Model 2)

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group*	p-value for difference
Sample Size			**1,130**	
Health Center Characteristics				
Total licensed MH providers per 2,000 patients (reference: no MH Providers)	28%	6%	ref	ref
Less than 1 MH FTE	49%	3%	22	0.001
At least 1 MH FTE	65%	7%	38	0.000
PCP Panel Size (reference: less than 1,200 patients)	56%	5%	ref	ref
At least 1,200 patients, but less than 2,000 patients	48%	3%	-8	0.196
At least 2,000 patients	47%	6%	-8	0.302
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)	53%	5%	ref	ref
ratio greater than 2, but no more than 4	47%	3%	-6	0.302
ratio greater than 4	57%	7%	4	0.660
Non-rural location for HC (reference)	46%	3%	ref	ref
Rural location for HC	57%	4%	10	0.063
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)	47%	4%	ref	ref
More than 10, but less than 20 sites	50%	4%	4	0.505
20 or more sites	55%	5%	9	0.195
Percent of patients diagnosed with depression (reference: 5% or less)	46%	5%	ref	ref
More than 5%, but less than 15%	49%	3%	3	0.641
15% or more	58%	6%	12	0.144
Percent of total revenue from Medicaid Managed Care (reference: no revenue)	51%	3%	ref	ref
less than 25%	49%	4%	-2	0.682
25% or more	50%	7%	-1	0.893
Patient Characteristics				
MH Status by Kessler severity score (reference: mild or no psychological distress)	43%	4%	ref	ref
moderate psychological distress	47%	3%	4	0.416
severe psychological distress	57%	3%	14	0.011
Self-reported desire for counseling or treatment for drugs and/or alcohol (reference: no)	51%	2%	ref	ref
yes	45%	4%	-7	0.170

Self-reported health status (reference: good, fair, poor health)	52%	2%	ref	ref
very good or excellent health, or "don't know"	38%	5%	-14	0.012
Sex (reference: male)	46%	3%	ref	ref
female	52%	3%	5	0.139
Age (reference: 26-49)	53%	3%	ref	ref
18-25	33%	6%	-20	0.001
50-64	52%	4%	-2	0.743
Race/Ethnicity (reference: non-Hispanic white)	45%	3%	ref	ref
Hispanic/Latino	56%	4%	10	0.022
non-Hispanic Black	51%	4%	6	0.224
Other	65%	5%	19	0.004
Limited English proficiency (reference: speaks English very well)	48%	3%	ref	ref
speaks English well, not well, or not at all	69%	7%	21	0.005
Personal recommendation of HC (reference: would definitely recommend)	54%	2%	ref	ref
would not definitely recommend or only somewhat recommend HC to family or friends	31%	4%	-23	0.000
Marital status: (reference: married or living with domestic partner)	51%	4%	ref	ref
not married or living with domestic partner	49%	3%	-2	0.734
Education (reference: less than high school)	48%	3%	ref	ref
high school	51%	4%	2	0.618
more than high school	50%	3%	2	0.670
Federal poverty level (reference: above 100%)	55%	4%	ref	ref
less than or equal to 100%	47%	2%	-8	0.036
Coverage status (reference: uninsured)	50%	5%	ref	ref
Medicaid	49%	3%	-2	0.771
other or missing response	57%	5%	6	0.404

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider
*Point differences are rounded to closest whole number

Appendix Table 7 - Staffing of Specific Types of Licensed MH Providers at HCs and Predicted Probabilities of At Least Some On-Site Patient Utilization of Mental Health Services (versus All Off-Site) Among HC Patients Receiving Any Mental Health Services (Model 2a)

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group*	p-value for difference
Sample Size			**1,130**	
Health Center Characteristics				
Any psychiatrist FTE on staff (reference: no)	40%	4%	ref	ref
yes	58%	4%	17	0.002
Any clinical psychologist FTE on staff (reference: no)	50%	3%	ref	ref
yes	50%	3%	0	0.935
Any other licensed MH provider FTE on staff (reference: no)	42%	5%	ref	ref
yes	51%	3%	9	0.133
PCP Panel Size (reference: less than 1,200 patients)	58%	5%	ref	ref
At least 1,200 patients, but less than 2,000 patients	48%	3%	-9	0.115
At least 2,000 patients	46%	6%	-12	0.162
Clinic support staff to PCP FTE ratio (reference: ratio of 2 or less)	55%	5%	ref	ref
ratio greater than 2, but no more than 4	47%	3%	-9	0.158
ratio greater than 4	53%	8%	-3	0.782
Non-rural location for HC (reference)	46%	3%	ref	ref
Rural location for HC	57%	5%	11	0.051
Number of clinic sites per Health Center greater than 10 (reference: 10 sites or fewer)	48%	3%	ref	ref
More than 10, but less than 20 sites	51%	5%	3	0.569
20 or more sites	54%	5%	6	0.373
Percent of patients diagnosed with depression (reference: 5% or less)	46%	5%	ref	ref
More than 5%, but less than 15%	49%	3%	3	0.655
15% or more	60%	5%	13	0.077
Percent of total revenue from Medicaid Managed Care (reference: no revenue)	50%	3%	ref	ref
less than 25%	50%	4%	0	0.977
25% or more	47%	7%	-4	0.653
Patient Characteristics				
MH Status by Kessler severity score (reference: mild or no psychological distress)	44%	4%	ref	ref
moderate psychological distress	48%	3%	4	0.434

severe psychological distress	57%	3%	14	0.016
Self-reported desire for counseling or treatment for drugs and/or alcohol (reference: no)	51%	3%	ref	ref
yes	45%	5%	-7	0.165
Self-reported health status (reference: good, fair, poor health)	52%	3%	ref	ref
very good or excellent health, or "don't know"	38%	5%	-14	0.012
Sex (reference: male)	47%	3%	ref	ref
female	52%	3%	5	0.140
Age (reference: 26-49)	53%	3%	ref	ref
18-25	33%	5%	-21	0.001
50-64	52%	4%	-2	0.697
Race/Ethnicity (reference: non-Hispanic white)	46%	3%	ref	ref
Hispanic/Latino	56%	4%	10	0.018
non-Hispanic Black	51%	4%	6	0.231
Other	65%	5%	20	0.003
Limited English proficiency (reference: speaks English very well)	49%	2%	ref	ref
speaks English well, not well, or not at all	68%	7%	19	0.010
Personal recommendation of HC (reference: would definitely recommend)	54%	3%	ref	ref
would not definitely recommend or only somewhat recommend HC to family or friends	31%	4%	-23	0.000
Marital status: (reference: married or living with domestic partner)	51%	4%	ref	ref
not married or living with domestic partner	50%	3%	-2	0.718
Education (reference: less than high school)	49%	3%	ref	ref
high school	51%	4%	3	0.563
more than high school	50%	3%	2	0.683
Federal poverty level (reference: above 100%)	55%	4%	ref	ref
less than or equal to 100%	48%	3%	-8	0.044
Coverage status (reference: uninsured)	51%	5%	ref	ref
Medicaid	49%	3%	-3	0.653
other or missing response	57%	5%	5	0.466

Notes:
Results are based on a multilevel generalized structural equation model with logistic specification and robust standard errors to address variation due to clinic differences
Source: Uniform Data System 2013 and Health Center Patient Survey 2014
MH = Mental Health, FTE= Full Time Employee, HC = Health Center, PCP = Primary Care Provider
*Point differences are rounded to closest whole number

Appendix Table 8: VIF Multi Collinearity Check - Association Between Co-Location of Licensed Mental Health Providers at HCs and 15 or More Outpatient Visits by Health Center Patients*

Variable	**VIF**	**1/VIF**
Sample Size	**26,833**	
Health Center Characteristics		
Total licensed MH providers per 2,000 patients (reference: no MH provider)		
Less than 0.5 MH FTE per 2,000 patients	1.65	0.61
At least 0.5 MH FTE per 2,000 patients	1.46	0.68
Clinic support staff to PCP FTE ratio (reference: 2 or less)		
ratio greater than 2 but less than 3.5	1.57	0.64
ratio of 3.5 or greater	1.52	0.66
Southern California region (versus Northern or Central)	1.49	0.67
Number of clinic sites in overall health center organization (reference: 1 site)		
more than 1 site but less than 5	1.85	0.54
5 or more sites	1.93	0.52
More than 300 mental health encounters per 2,000 patients	1.40	0.72
Percent of total revenue from Medicaid Managed Care at least 20%	1.26	0.80
Patient Characteristics		
Female	1.90	0.53
Age (reference: 40-49)		
19-39	1.74	0.58
50-64	1.69	0.59
Race/Ethnicity (reference: non-Hispanic White)		
Hispanic/Latino	2.29	0.44
Asian American/ Pacific Islander	2.13	0.47
non-Hispanic Black/African American	1.33	0.75
Other or Missing Response	1.62	0.62
Limited English Proficiency (English not preferred language)	1.35	0.74
LIHP Enrollment income level above 133% FPL (versus HCCI Enrollment - income level between 134%-200% FPL)	1.17	0.85
Mental health or substance abuse diagnosis	1.31	0.76
Diabetes diagnosis	1.56	0.64
Hypertension diagnosis	2.03	0.49
Asthma/COPD diagnosis	1.25	0.80
CAD/CHF diagnosis	1.17	0.86

Dyslipidemia diagnosis	1.81	0.55
2 or more chronic conditions	3.9	0.26
CDPS Index at least .62	2.33	0.43
10 or more outpatient visits in year 1**	1.12	0.89
2 or more emergency department visits in year 1**	1.12	0.90
Any hospitalization in year 1**	1.12	0.90
Mean VIF	1.66	

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013

** Year 1 was from July 1, 2011-June 30, 2012

Appendix Table 9: Association Between Patient Characteristics and Attending a Clinic with Any Mental Health Provider (Treatment Model to Calculate Inverse Propensity Treatment Weight)

	OR	*SE*	*p-value*	*95% Confidence Interval*	
Sample Size	**26,833**				
Patient Characteristics					
Female	0.91	0.03	0.01	0.84	0.98
Age (reference: 40-49)					
19-39	1.14	0.06	0.01	1.03	1.25
50-64	0.91	0.03	0.02	0.85	0.98
Race/Ethnicity (reference: non-Hispanic White)					
Hispanic/Latino	0.62	0.02	0.00	0.57	0.67
Asian American/ Pacific Islander	3.49	0.19	0.00	3.13	3.89
non-Hispanic Black/African American	1.53	0.09	0.00	1.36	1.72
Other or Missing Response	1.10	0.05	0.04	1.00	1.21
Limited English Proficiency (English not preferred language)	2.06	0.06	0.00	1.93	2.18
LIHP Enrollment income level above 133% FPL (versus HCCI Enrollment - income level between 134%-200% FPL)	1.45	0.05	0.00	1.36	1.54
Mental health or substance abuse diagnosis	1.37	0.05	0.00	1.28	1.48
Diabetes diagnosis	0.93	0.03	0.04	0.86	0.99
Hypertension diagnosis	1.08	0.04	0.04	1.00	1.17
Asthma/COPD diagnosis	0.99	0.05	0.80	0.90	1.08
CAD/CHF diagnosis	0.91	0.06	0.14	0.81	1.03
Dyslipidemia diagnosis	0.91	0.03	0.01	0.85	0.98
2 or more chronic conditions	0.99	0.05	0.81	0.89	1.10
CDPS Index at least .62	1.17	0.05	0.00	1.08	1.28
10 or more outpatient visits in year 1**	0.97	0.04	0.48	0.89	1.06
2 or more emergency department visits in year 1**	0.85	0.05	0.01	0.76	0.95
Any hospitalization in year 1**	0.95	0.06	0.40	0.83	1.07
_cons	1.00	0.06	0.94	0.89	1.11

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

** Year 1 was from July 1, 2011-June 30, 2012

Appendix Table 10: Covariate Balancing from Using Inverse Probability Weight

Treatment-effects estimation						
Number of observation : 26,833						
Estimator: IPW regression adjustment						
Outcome model: Linear						
Treatment model: logit						
Outcome: 15 or more outpatient visits in last 18 months of study						
	Coef.	**Robust Std. Error**	**z**	**pvalue**	**95% CI**	
ATE Any Licensed MH Provider (versus None)	0.01	0.00	1.61	0.11	0.00	0.02
Po mean No Licensed MH Provider	0.10	0.00	22.53	0.00	0.09	0.11
Overidentification test for covariate balance:						
H0: Covariates are balanced:						
chi2(21) = 256.968						
Prob > chi2 = 0.0000						
Covariate Balance Summary	**Raw**		**Weighted**			
Number of obs	26,833		26,833.00			
Treated obs	17,877		13,573.40			
Control obs	8,956		13,259.60			
Continued on Next Page						

Appendix Table 10 (Continued): Covariate Balancing Covariate Balancing from Using Inverse Probability Weight

Variable	Standardized Differences		Variance Ratio	
	Unweighted	Weighted	Unweighted	Weighted
Female	0.02	-0.01	0.99	1.01
Age (reference: 40-49)				
19-39	-0.04	-0.01	0.93	0.98
50-64	0.03	0.00	0.98	1.00
Race/Ethnicity (reference: non-Hispanic White)				
Hispanic/Latino	-0.36	-0.02	0.92	0.99
Asian American /Pacific Islander	0.50	0.05	2.94	1.08
non-hispanic Black/African American	0.06	0.01	1.23	1.04
Other or Missing Response	0.01	-0.02	1.03	0.97
Limited English Proficiency (English not preferred language)	0.31	0.04	0.94	0.99
LIHP Enrollment income level above 133% FPL (versus HCCI Enrollment - income level between 134%-200% FPL)	0.14	0.02	0.86	0.98
Mental health or substance abuse diagnosis	0.11	0.02	1.15	1.03
Diabetes diagnosis	-0.06	-0.01	0.95	0.99
Hypertension diagnosis	0.05	0.01	1.01	1.00
Asthma/COPD diagnosis	-0.01	0.00	0.97	1.00
CAD/CHF diagnosis	-0.01	0.00	0.97	1.02
Dyslipidemia diagnosis	0.04	0.04	1.03	1.02
2 or more chronic conditions	0.01	0.02	1.01	1.01
CDPS Index at least .62	0.06	-0.02	0.98	1.01
10 or more outpatient visits in year 1**	0.00	0.01	1.00	1.02
2 or more emergency department visits in year 1**	-0.03	0.00	0.88	1.00
Any hospitalization in year 1**	-0.01	0.01	0.97	1.02

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

** Year 1 was from July 1, 2011-June 30, 2012

Appendix Table 11: Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of 15 or More Outpatient Visits by Health Center Patients (Model 1)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group***	p-value for difference
Sample Size		**26,833**		
Health Characteristics				
Total licensed MH providers per 2,000 patients (reference: no staff)	10%	1%	ref	ref
Less than 0.5 MH FTE per 2,000 patients	11%	1%	0	0.797
At least 0.5 MH FTE per 2,000 patients	15%	2%	5	0.029
Clinic support staff to PCP FTE ratio (reference: 2 or less)	12%	1%	ref	ref
ratio greater than 2 but less than 3.5	9%	1%	-3	0.013
ratio of 3.5 or greater	11%	1%	-1	0.634
California region (reference: Northern or Central California)	4%	1%	ref	ref
Southern California	13%	1%	8	0.000
Number of clinic sites in overall health center organization (reference: 1 site)	11%	1%	ref	ref
more than 1 site but less than 5	12%	1%	0	0.805
5 or more sites	9%	1%	-2	0.107
Mental health encounters per 2,000 patients (reference: no more than 300)	11%	1%	ref	ref
more than 300	11%	1%	1	0.534
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	10%	1%	ref	ref
at least 20%	12%	1%	2	0.058
Patient Characteristics				
Sex (reference: male)	11%	1%	ref	ref
female	11%	1%	0	0.653
Age (reference: 40-49)	11%	1%	ref	ref
19-39	9%	1%	-2	0.030
50-64	11%	1%	0	0.549
Race/Ethnicity (reference: non-Hispanic White)	115	1%	ref	ref

Hispanic/Latino	11%	1%	-1	0.269
Asian American/ Pacific Islander	10%	1%	-2	0.169
non-Hispanic Black/African American	12%	1%	0	0.876
Other or Missing Response	11%	1%	-1	0.327
Limited English Proficiency (reference: English preferred language)	11%	1%	ref	ref
English not preferred language	11%	1%	0	0.873
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	11%	1%	ref	ref
LIHP enrollment – income level 133% FPL or less	11%	1%	-1	0.215
Mental health or substance abuse diagnosis (reference: no)	9%	0%	ref	ref
yes	16%	1%	7	0.000
Diabetes diagnosis (reference: no)	10%	1%	ref	ref
yes	12%	1%	2	0.000
Hypertension diagnosis (reference: no)	9%	1%	ref	ref
yes	12%	1%	3	0.000
Asthma/COPD diagnosis (reference: no)	10%	0%	ref	ref
yes	15%	1%	5	0.000
CAD/CHF diagnosis (reference: no)	10%	0%	ref	ref
yes	14%	1%	3	0.000
Dyslipidemia diagnosis (reference: no)	10%	1%	ref	ref
yes	12%	1%	2	0.000
2 or more chronic conditions (reference: no)	10%	1%	ref	ref
yes	11%	1%	1	0.195
CDPS Index at least .62 (reference: no)	9%	1%	ref	ref
yes	11%	1%	2	0.001
10 or more outpatient visits in year 1** (reference: no)	8%	0%	ref	ref
yes	26%	1%	18	0.000
2 or more emergency department visits in year 1** (reference: no)	10%	0%	ref	ref
yes	13%	1%	3	0.000
Any hospitalization in year 1** (reference: no)	11%	0%	ref	ref
yes	12%	1%	1	0.102

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
Notes:
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
** Year 1 was from July 1, 2011-June 30, 2012Notes:
***Point differences are rounded to closest whole number

Appendix Table 12: - Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of 15 or More Outpatient Visits by Health Center Patients (Model 1a)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group***	p-value for difference
Sample Size		**26,833**		
Health Center Characteristics				
Any psychiatrist FTE on staff (reference: no)	10%	1%	ref	ref
yes	12%	1%	2	0.224
Any clinical psychologist FTE on staff (reference: no)	11%	1%	ref	ref
yes	10%	1%	-1	0.463
Any LCSW FTE on staff (reference: no)	11%	1%	ref	ref
yes	11%	1%	0	0.766
Clinic support staff to PCP FTE ratio (reference: 2 or less)	12%	1%	ref	ref
ratio greater than 2 but less than 3.5	9%	1%	-3	0.013
ratio of 3.5 or greater	12%	1%	0	0.755
California region (reference: Northern or Central California)	5%	1%	ref	ref
Southern California	13%	1%	8	0.000
Number of clinic sites in overall health center organization (reference: 1 site)	11%	1%	ref	ref
more than 1 site but less than 5	12%	1%	0	0.752
5 or more sites	9%	1%	-2	0.108
Mental health encounters per 2,000 patients (reference: no more than 300)	10%	1%	ref	ref
more than 300	12%	1%	2	0.150
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	10%	1%	ref	ref
at least 20%	12%	1%	2	0.133
Patient Characteristics				
Sex (reference: male)	11%	1%	ref	ref
female	11%	1%	0	0.662
Age (reference: 40-49)	11%	1%	ref	ref
19-39	9%	1%	-2	0.029
50-64	11%	1%	0	0.551
Race/Ethnicity (reference: non-Hispanic White)	11%	1%	ref	ref
Hispanic/Latino	11%	1%	-1	0.273

Asian American/ Pacific Islander	10%	1%	-1	0.176
non-Hispanic Black/African American	12%	1%	0	0.880
Other or Missing Response	11%	1%	-1	0.328
Limited English Proficiency (reference: English preferred language)	11%	1%	ref	ref
English not preferred language	11%	1%	0	0.900
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	11%	1%	ref	ref
LIHP enrollment – income level 133% FPL or less	11%	1%	-1	0.216
Mental health or substance abuse diagnosis (reference: no)	9%	0%	ref	ref
yes	16%	1%	7	0.000
Diabetes diagnosis (reference: no)	10%	0%	ref	ref
yes	12%	1%	2	0.000
Hypertension diagnosis (reference: no)	9%	1%	ref	ref
yes	12%	1%	3	0.000
Asthma/COPD diagnosis (reference: no)	10%	0%	ref	ref
yes	15%	1%	5	0.000
CAD/CHF diagnosis (reference: no)	10%	0%	ref	ref
yes	14%	1%	3	0.000
Dyslipidemia diagnosis (reference: no)	105	1%	ref	ref
yes	12%	1%	2	0.000
2 or more chronic conditions (reference: no)	10%	1%	ref	ref
yes	11%	1%	1	0.197
CDPS Index at least .62 (reference: no)	9%	1%	ref	ref
yes	11%	1%	2	0.001
10 or more outpatient visits in year 1** (reference: no)	8%	0%	ref	ref
yes	26%	1%	18	0.000
2 or more emergency department visits in year 1** (reference: no)	11%	0%	ref	ref
yes	13%	1%	3	0.000
Any hospitalization in year 1** (reference: no)	11%	0%	ref	ref
yes	12%	1%	1	0.103

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013

** Year 1 was from July 1, 2011-June 30, 2012Notes:

***Point differences are rounded to closest whole number

Appendix Table 13: Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of Three or More ED Visits by Health Center Patients (Model 2)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group***	p-value for difference
Sample Size	**26,833**			
Health Center Characteristics				
Total licensed MH providers per 2,000 patients (reference: no staff)	5%	1%	ref	ref
Less than 0.5 MH FTE per 2,000 patients	5%	0%	0	0.923
At least 0.5 MH FTE per 2,000 patients	6%	1%	1	0.427
Clinic support staff to PCP FTE ratio (reference: 2 or less)	4%	0%	ref	ref
ratio greater than 2 but less than 3.5	5%	0%	0	0.532
ratio of 3.5 or greater	5%	1%	1	0.346
California region (reference: Northern or Central California)	5%	1%	ref	ref
Southern California	5%	0%	-1	0.350
Number of clinic sites in overall health center organization (reference: 1 site)	5%	1%	ref	ref
more than 1 site but less than 5	4%	0%	-1	0.150
5 or more sites	5%	0%	0	0.777
Mental health encounters per 2,000 patients (reference: no more than 300)	5%	0%	ref	ref
more than 300	5%	1%	1	0.282
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	4%	0%	ref	ref
at least 20%	5%	0%	1	0.090
Patient Characteristics				
Sex (reference: male)	5%	0%	ref	ref
female	5%	0%	0	0.109
Age (reference: 40-49)	6%	0%	ref	ref
19-39	6%	1%	0	0.399
50-64	4%	0%	-2	0.000
Race/Ethnicity (reference: non-Hispanic White)	5%	0%	ref	ref
Hispanic/Latino	5%	0%	0	0.886
Asian American/ Pacific Islander	4%	1%	-1	0.429
non-Hispanic Black/African American	6%	1%	1	0.188

Other or Missing Response	4%	0%	-1	0.178
Limited English Proficiency (reference: English preferred language)	5%	0%	ref	ref
English not preferred language	5%	0%	0	0.286
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	5%	0%	ref	ref
LIHP enrollment – income level 133% FPL or less	5%	0%	0	0.642
Mental health or substance abuse diagnosis (reference: no)	3%	0%	ref	ref
yes	7%	0%	4	0.000
Diabetes diagnosis (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.192
Hypertension diagnosis (reference: no)	4%	0%	ref	ref
yes	5%	0%	1	0.173
Asthma/COPD diagnosis (reference: no)	4%	0%	ref	ref
yes	7%	1%	3	0.000
CAD/CHF diagnosis (reference: no)	5%	0%	ref	ref
yes	6%	1%	1	0.031
Dyslipidemia diagnosis (reference: no)	5%	0%	ref	ref
yes	4%	0%	-1	0.053
2 or more chronic conditions (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.676
CDPS Index at least .62 (reference: no)	4%	0%	ref	ref
yes	5%	0%	1	0.024
10 or more outpatient visits in year 1** (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.844
2 or more emergency department visits in year 1** (reference: no)	4%	0%	ref	ref
yes	17%	1%	13	0.000
Any hospitalization in year 1** (reference: no)	5%	0%	ref	ref
yes	7%	1%	2	0.001

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013

** Year 1 was from July 1, 2011-June 30, 2012Notes:

***Point differences are rounded to closest whole number

Appendix Table 14: Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of Three or More ED Visits by Health Center Patients (Model 2a)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group**	p-value for difference
Sample Size	**26,833**			
Health Center Characteristics				
Any psychiatrist FTE on staff (reference: no)	4%	0%	ref	ref
yes	7%	1%	2	0.014
Any clinical psychologist FTE on staff (reference: no)	5%	0%	ref	ref
yes	4%	1%	0	0.522
Any other licensed MH provider FTE on staff (reference: no)	6%	1%	ref	ref
yes	4%	0%	-2	0.033
Clinic support staff to PCP FTE ratio (reference: 2 or less)	4%	0%	ref	ref
ratio greater than 2 but less than 3.5	5%	0%	1	0.365
ratio of 3.5 or greater	5%	1%	1	0.195
California region (reference: Northern or Central California)	5%	1%	ref	ref
Southern California	5%	0%	-1	0.429
Number of clinic sites in overall health center organization (reference: 1 site)	5%	1%	ref	ref
more than 1 site but less than 5	4%	0%	-1	0.210
5 or more sites	5%	0%	0	0.785
Mental health encounters per 2,000 patients (reference: no more than 300)	5%	0%	ref	ref
more than 300	5%	1%	1	0.221
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	4%	0%	ref	ref
at least 20%	5%	0%	1	0.199
Patient Characteristics				
Sex (reference: male)	5%	0%	ref	ref
female	5%	0%	0	0.105
Age (reference: 40-49)	6%	0%	ref	ref
19-39	6%	1%	0	0.398
50-64	4%	0%	-2	0.000
Race/Ethnicity (reference: non-Hispanic White)	5%	0%	ref	ref
Hispanic/Latino	5%	0%	0	0.943
Asian American/ Pacific Islander	4%	1%	-1	0.456

non-Hispanic Black/African American	6%	1%	1	0.202
Other or Missing Response	4%	0%	-1	0.179
Limited English Proficiency (reference: English preferred language)	5%	0%	ref	ref
English not preferred language	5%	0%	0	0.257
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	5%	0%	ref	ref
LIHP enrollment – income level 133% FPL or less	5%	0%	0	0.619
Mental health or substance abuse diagnosis (reference: no)	3%	0%	ref	ref
yes	7%	0%	4	0.000
Diabetes diagnosis (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.190
Hypertension diagnosis (reference: no)	5%	0%	ref	ref
yes	5%	0%	1	0.173
Asthma/COPD diagnosis (reference: no)	4%	0%	ref	ref
yes	7%	1%	3	0.000
CAD/CHF diagnosis (reference: no)	5%	0%	ref	ref
yes	6%	1%	1	0.032
Dyslipidemia diagnosis (reference: no)	5%	0%	ref	ref
yes	4%	0%	-1	0.051
2 or more chronic conditions (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.680
CDPS Index at least .62 (reference: no)	4%	0%	ref	ref
yes	5%	0%	1	0.023
10 or more outpatient visits in year 1** (reference: no)	5%	0%	ref	ref
yes	5%	0%	0	0.826
2 or more emergency department visits in year 1** (reference: no)	4%	0%	ref	ref
yes	17%	1%	13	0.000
Any hospitalization in year 1** (reference: no)	5%	0%	ref	ref
yes	7%	1%	2	0.001

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development
MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System
* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013
** Year 1 was from July 1, 2011-June 30, 2012Notes:
***Point differences are rounded to closest whole number

Appendix Table 15 - Co-Location of Licensed MH Providers at HCs and Predicted Probabilities of Any Hospitalization by Health Center Patients (Model 3)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group***	p-value for difference
Sample Size	**26,833**			
Health Center Characteristics				
Total licensed MH providers per 2,000 patients (reference: no staff)	7%	1%	ref	ref
Less than 0.5 MH FTE per 2,000 patients	7%	1%	0	0.821
At least 0.5 MH FTE per 2,000 patients	5%	1%	-1	0.169
Clinic support staff to PCP FTE ratio (reference: 2 or less)	7%	1%	ref	ref
ratio greater than 2 but less than 3.5	6%	0%	-1	0.328
ratio of 3.5 or greater	7%	1%	1	0.492
California region (reference: Northern or Central California)	7%	1%	ref	ref
Southern California	6%	0%	-1	0.440
Number of clinic sites in overall health center organization (reference: 1 site)	7%	1%	ref	ref
more than 1 site but less than 5	5%	0%	-2	0.065
5 or more sites	8%	1%	1	0.565
Mental health encounters per 2,000 patients (reference: no more than 300)	6%	0%	ref	ref
more than 300	7%	1%	1	0.219
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	6%	0%	ref	ref
at least 20%	7%	1%	1	0.052
Patient Characteristics				
Sex (reference: male)	8%	0%	ref	ref
female	6%	0%	-2	0.000
Age (reference: 40-49)	6%	0%	ref	ref
19-39	7%	1%	1	0.420
50-64	7%	0%	0	0.690
Race/Ethnicity (reference: non-Hispanic White)	8%	1%	ref	ref
Hispanic/Latino	6%	0%	-2	0.002
Asian American/ Pacific Islander	6%	1%	-2	0.001

non-Hispanic Black/African American	6%	1%	-2	0.019
Other or Missing Response	6%	1%	-2	0.001
Limited English Proficiency (reference: English preferred language)	7%	0%	ref	ref
English not preferred language	6%	0%	-1	0.140
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	6%	0%	ref	ref
LIHP enrollment – income level 133% FPL or less	7%	0%	1	0.136
Mental health or substance abuse diagnosis (reference: no)	5%	0%	ref	ref
yes	9%	1%	4	0.000
Diabetes diagnosis (reference: no)	6%	0%	ref	ref
yes	8%	0%	2	0.000
Hypertension diagnosis (reference: no)	5%	0%	ref	ref
yes	8%	0%	2	0.000
Asthma/COPD diagnosis (reference: no)	6%	0%	ref	ref
yes	85	0%	1	0.000
CAD/CHF diagnosis (reference: no)	6%	0%	ref	ref
yes	15%	1%	9	0.000
Dyslipidemia diagnosis (reference: no)	7%	0%	ref	ref
yes	7%	0%	0	0.738
2 or more chronic conditions (reference: no)	7%	1%	ref	ref
yes	6%	0%	-1	0.060
CDPS Index at least .62 (reference: no)	5%	0%	ref	ref
yes	8%	0%	2	0.000
10 or more outpatient visits in year 1** (reference: no)	6%	0%	ref	ref
yes	7%	1%	1	0.203
2 or more emergency department visits in year 1** (reference: no)	6%	0%	ref	ref
yes	10%	1%	4	0.000
Any hospitalization in year 1** (reference: no)	6%	0%	ref	ref
yes	13%	1%	7	0.000

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013

** Year 1 was from July 1, 2011-June 30, 2012Notes:

***Point differences are rounded to closest whole number

Appendix Table 16: Type of Co-Located Licensed MH Providers at HCs and Predicted Probabilities of Any Hospitalization by Health Center Patients (Model 3a)*

	Predicted Probability	Robust Std. Error	Percentage Point Difference from Reference Group***	p-value for difference
Any psychiatrist FTE on staff (reference: no)	6%	0%	ref	ref
yes	8%	1%	1	0.122
Any clinical psychologist FTE on staff (reference: no)	6%	0%	ref	ref
yes	7%	1%	0	0.835
Any other licensed MH provider FTE on staff (reference: no)	7%	1%	ref	ref
yes	6%	0%	-2	0.012
Clinic support staff to PCP FTE ratio (reference: 2 or less)	7%	1%	ref	ref
ratio greater than 2 but less than 3.5	6%	0%	0	0.497
ratio of 3.5 or greater	7%	1%	1	0.421
California region (reference: Northern or Central California)	7%	1%	ref	ref
Southern California	7%	0%	0	0.734
Number of clinic sites in overall health center organization (reference: 1 site)	7%	1%	ref	ref
more than 1 site but less than 5	6%	0%	-1	0.094
5 or more sites	8%	0%	1	0.513
Mental health encounters per 2,000 patients (reference: no more than 300)	6%	0%	ref	ref
more than 300	7%	1%	1	0.433
Percent of total revenue from Medicaid Managed Care (reference: less than 20%)	6%	0%	ref	ref
at least 20%	7%	0%	1	0.061
Patient Characteristics				
Sex (reference: male)	8%	0%	ref	ref
female	6%	0%	-2	0.000
Age (reference: 40-49)	6%	0%	ref	ref
19-39	7%	1%	1	0.419
50-64	7%	0%	0	0.693
Race/Ethnicity (reference: non-Hispanic White)	8%	1%	ref	ref
Hispanic/Latino	6%	0%	-2	0.002

Asian American/ Pacific Islander	6%	1%	-2	0.001
non-Hispanic Black/African American	6%	1%	-2	0.017
Other or Missing Response	6%	1%	-2	0.001
Limited English Proficiency (reference: English preferred language)	7%	0%	ref	ref
English not preferred language	6%	0%	-1	0.130
Enrollment type (reference: HCCI - income level between 134%-200% FPL)	6%	0%	ref	ref
LIHP enrollment – income level 133% FPL or less	7%	0%	1	0.144
Mental health or substance abuse diagnosis (reference: no)	5%	0%	ref	ref
yes	9%	1%	4	0.000
Diabetes diagnosis (reference: no)	6%	0%	ref	ref
yes	8%	0%	2	0.000
Hypertension diagnosis (reference: no)	5%	0%	ref	ref
yes	8%	0%	2	0.000
Asthma/COPD diagnosis (reference: no)	6%	0%	ref	ref
yes	8%	0%	1	0.000
CAD/CHF diagnosis (reference: no)	6%	0%	ref	ref
yes	15%	1%	9	0.000
Dyslipidemia diagnosis (reference: no)	7%	0%	ref	ref
yes	7%	0%	0	0.752
2 or more chronic conditions (reference: no)	7%	1%	ref	ref
yes	6%	0%	-1	0.061
CDPS Index at least .62 (reference: no)	5%	0%	ref	ref
yes	8%	0%	2	0.000
10 or more outpatient visits in year 1** (reference: no)	7%	0%	ref	ref
yes	7%	1%	1	0.204
2 or more emergency department visits in year 1** (reference: no)	6%	0%	ref	ref
yes	10%	1%	4	0.000
Any hospitalization in year 1** (reference: no)	6%	0%	ref	ref
yes	13%	1%	7	0.000

Data Source: California's Low Income Health Program (LIHP) Evaluation Data from UCLA Center for Health Policy and 2012 Clinic Annual Utilization Data from California's Office of Statewide Health Planning and Development

Notes:

MH = Mental Health, FTE = Full Time Employee, PCP = Primary Care Provider, HCCI = Health Care Coverage Initiative, FPL = Federal Poverty Line, COPD = Chronic Obstructive Pulmonary Disease, CAD = Coronary Artery Disease, CHF = Congestive Heart Failure, CDPS = The Chronic Illness & Disability Payment System

* Utilization was measured in the last 18 months of LIHP program from July 1, 2012 – December 31, 2013

** Year 1 was from July 1, 2011-June 30, 2012Notes:

***Point differences are rounded to closest whole number

REFERENCES

1. SAMHSA-HRSA. Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health (HHS Publication No. PEP19-5068, NSDUH Series H-54). In: Quality CfBHSa, editor. Rockville, MD: Substance Abuse and Mental Health Services Administration.; 2019.

2. Han B, Compton WM, Blanco C, Colpe LJ. Prevalence, treatment, and unmet treatment needs of US adults with mental health and substance use disorders. Health affairs. 2017;36(10):1739-47.

3. Walker ER, Cummings JR, Hockenberry JM, Druss BG. Insurance status, use of mental health services, and unmet need for mental health care in the United States. Psychiatric Services. 2015;66(6):578-84.

4. Cunningham P, McKenzie K, Taylor EF. The struggle to provide community-based care to low-income people with serious mental illnesses. Health affairs. 2006;25(3):694-705.

5. Felland LE, Felt-Lisk S, McHugh M. Health care access for low-income people: significant safety net gaps remain. Issue Brief Cent Stud Health Syst Change. 2004;84:1-4.

6. Goldman W. Economic grand rounds: Is there a shortage of psychiatrists? Psychiatric Services. 2001;52(12):1587-9.

7. Wells KB, Sherbourne CD, Sturm R, Young AS, Audrey Burnam M. Alcohol, drug abuse, and mental health care for uninsured and insured adults. Health Services Research. 2002;37(4):1055-66.

8. Wells K, Klap R, Koike A, Sherbourne C. Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care. American Journal of Psychiatry. 2001;158(12):2027-32.

9. Gonzales JJ, Papadopoulos AS. Mental health disparities. Mental health services: A public health perspective. 2010:443-64.

10. Hodgkinson S, Godoy L, Beers LS, Lewin A. Improving mental health access for low-income children and families in the primary care setting. Pediatrics. 2017;139(1):e20151175.

11. Santiago CD, Kaltman S, Miranda J. Poverty and mental health: how do low□income adults and children fare in psychotherapy? Journal of Clinical Psychology. 2013;69(2):115-26.

12. Boswell EB, Stoudemire A. Major depression in the primary care setting. The American journal of medicine. 1996;101(6):3S-9S.

13. Gary FA. Stigma: Barrier to mental health care among ethnic minorities. Issues in mental health nursing. 2005;26(10):979-99.

14. Bird DC, Dempsey P, Hartley D. Addressing mental health workforce needs in underserved rural areas: Accomplishments and challenges: Citeseer; 2001.

15. Kepley HO, Streeter RA. Closing behavioral health workforce gaps: A HRSA program expanding direct mental health service access in underserved areas. American journal of preventive medicine. 2018;54(6):S190-S1.

16. Kessler R, Stafford D. Primary care is the de facto mental health system. 2008.

17. Borowsky SJ, Rubenstein LV, Meredith LS, Camp P, Jackson-Triche M, Wells KB. Who is at risk of nondetection of mental health problems in primary care? Journal of general internal medicine. 2000;15(6):381-8.

18. Smolders M, Laurant M, Verhaak P, Prins M, van Marwijk H, Penninx B, et al. Adherence to evidence-based guidelines for depression and anxiety disorders is associated with recording of the diagnosis. General Hospital Psychiatry. 2009;31(5):460-9.

19. Mitchell AJ, Vaze A, Rao S. Clinical diagnosis of depression in primary care: a meta-analysis. The Lancet. 2009;374(9690):609-19.

20. Eisenberg L. Treating depression and anxiety in primary care: closing the gap between knowledge and practice. Mass Medical Soc; 1992.

21. Goodell S, Druss BG, Walker ER, Mat M. Mental disorders and medical comorbidity. Robert Wood Johnson Foundation: Princeton. 2011.

22. Hardy M, Cho A, Stavig A, Bratcher M, Dillard J, Greenblatt L, et al. Understanding frequent emergency department use among primary care patients. Population health management. 2018;21(1):24-31.

23. Robinson RL, Grabner M, Palli SR, Faries D, Stephenson JJ. Covariates of depression and high utilizers of healthcare: impact on resource use and costs. Journal of psychosomatic research. 2016;85:35-43.

24. Watson LC, Amick HR, Gaynes BN, Brownley KA, Thaker S, Viswanathan M, et al. Practice-based interventions addressing concomitant depression and chronic medical conditions in the primary care setting: a systematic review and meta-analysis. Journal of primary care & community health. 2013;4(4):294-306.

25. Ciechanowski PS, Katon WJ, Russo JE, Hirsch IB. The relationship of depressive symptoms to symptom reporting, self-care and glucose control in diabetes. General hospital psychiatry. 2003;25(4):246-52.

26. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Archives of internal medicine. 2000;160(14):2101-7.

27. Katon WJ. Epidemiology and treatment of depression in patients with chronic medical illness. Dialogues in clinical neuroscience. 2011;13(1):7.

28. Yoon J, Yano EM, Altman L, Cordasco KM, Stockdale SE, Chow A, et al. Reducing costs of acute care for ambulatory care-sensitive medical conditions: the central roles of comorbid mental illness. Medical care. 2012:705-13.

29. Ford JD, Trestman RL, Steinberg K, Tennen H, Allen S. Prospective association of anxiety, depressive, and addictive disorders with high utilization of primary, specialty and emergency medical care. Social science & medicine. 2004;58(11):2145-8.

30. Owens PL, Mutter R, Stocks C. Mental health and substance abuse-related emergency department visits among adults, 2007. HCUP statistical brief. 2010;92:1-12.

31. Mann C. Targeting Medicaid super-utilizers to decrease costs and improve quality [Internet] Baltimore (MD): Centers for Medicare and Medicaid Services; 2013. Jul 24,[cited 2014 Jan 13].(CMCS Informational Bulletin).

32. Johnson TL, Rinehart DJ, Durfee J, Brewer D, Batal H, Blum J, et al. For many patients who use large amounts of health care services, the need is intense yet temporary. Health Affairs. 2015;34(8):1312-9.

33. Capp R, Hardy R, Lindrooth R, Wiler J. National trends in emergency department visits by adults with mental health disorders. The Journal of emergency medicine. 2016;51(2):131-5. e1.

34. Druss BG. Improving medical care for persons with serious mental illness: challenges and solutions. The Journal of clinical psychiatry. 2007.

35. Berren MR, Santiago JM, Zent MR, Carbone CP. Health care utilization by persons with severe and persistent mental illness. Psychiatric Services. 1999;50(4):559-61.

36. Pincus T, Esther R, DeWalt DA, Callahan LF. Social conditions and self-management are more powerful determinants of health than access to care. Annals of Internal Medicine. 1998;129(5):406-11.

37. Lorig KR, Ritter P, Stewart AL, Sobel DS, Brown Jr BW, Bandura A, et al. Chronic disease self-management program: 2-year health status and health care utilization outcomes. Medical care. 2001:1217-23.

38. Detweiler-Bedell JB, Friedman MA, Leventhal H, Miller IW, Leventhal EA. Integrating co-morbid depression and chronic physical disease management: identifying and resolving failures in self-regulation. Clinical psychology review. 2008;28(8):1426-46.

39. Capp R, Misky GJ, Lindrooth RC, Honigman B, Logan H, Hardy R, et al. Coordination program reduced acute care use and increased primary care visits among frequent emergency care users. Health Affairs. 2017;36(10):1705-11.

40. Hudon C, Chouinard M-C, Pluye P, El Sherif R, Bush PL, Rihoux B, et al. Characteristics of Case Management in Primary Care Associated With Positive Outcomes for Frequent Users of Health Care: A Systematic Review. The Annals of Family Medicine. 2019;17(5):448-58.

41. Egede LE. Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. General hospital psychiatry. 2007;29(5):409-16.

42. Shen C, Sambamoorthi U, Rust G. Co-occurring mental illness and health care utilization and expenditures in adults with obesity and chronic physical illness. Disease Management. 2008;11(3):153-60.

43. Knutson KH. Payment for integrated care: Challenges and opportunities. Child and Adolescent Psychiatric Clinics. 2017;26(4):829-38.

44. Unützer J, Schoenbaum M, Druss BG, Katon WJ. Transforming mental health care at the interface with general medicine: report for the presidents commission. Psychiatric services. 2006;57(1):37-47.

45. Baird M, Blount A, Brungardt S, Dickinson P, Dietrich A, Epperly T, et al. Joint principles: integrating behavioral health care into the patient-centered medical home. The Annals of Family Medicine. 2014;12(2):183-5.

46. Blount A. Integrated primary care: organizing the evidence. Families, Systems, & Health. 2003;21(2):121.

47. Ahgren B, Axelsson R. Evaluating integrated health care: a model for measurement. International journal of integrated care. 2005;5.

48. Pourat N, Hadler MW, Dixon B, Brindis C. One-stop shopping: efforts to integrate physical and behavioral health care in five California community health centers. Policy brief (UCLA Center for Health Policy Research). 2015(PB2015-1):1-11.

49. Ader J, Stille CJ, Keller D, Miller BF, Barr MS, Perrin JM. The medical home and integrated behavioral health: advancing the policy agenda. Pediatrics. 2015;135(5):909-17.

50. Strosahl K, Robinson P. The primary care behavioral health model: Applications to prevention, acute care and chronic condition management. Collaborative medicine case studies: Springer; 2008. p. 85-95.

51. Butler M, Kane RL, McAlpine D, Kathol RG, Fu SS, Hagedorn H, et al. Integration of mental health/substance abuse and primary care. Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]: Centre for Reviews and Dissemination (UK); 2008.

52. Peek CJ, Cohen DJ, deGruy III FV. Research and evaluation in the transformation of primary care. American Psychologist. 2014;69(4):430.

53. Reiter JT, Dobmeyer AC, Hunter CL. The primary care behavioral health (PCBH) model: An overview and operational definition. Journal of clinical psychology in medical settings. 2018;25(2):109-26.

54. Unützer J, Harbin H, Schoenbaum M, Druss B. The collaborative care model: An approach for integrating physical and mental health care in Medicaid health homes. Health Home Information Resource Center. 2013:1-13.

55. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. Jama. 2002;288(14):1775-9.

56. Barr V, Robinson S, Marin-Link B, Underhill L, Dotts A, Ravensdale D, et al. The expanded chronic care model. Hosp Q. 2003;7(1):73-82.

57. Davis K, Schoenbaum SC, Audet AM. A 2020 vision of patient□centered primary care. Journal of general internal medicine. 2005;20(10):953-7.

58. Lawn S, Schoo A. Supporting self-management of chronic health conditions: common approaches. Patient education and counseling. 2010;80(2):205-11.

59. McDaniel SH, deGruy III FV. An introduction to primary care and psychology. American Psychologist. 2014;69(4):325.

60. Simon GE, Katon WJ, VonKorff M, Unützer J, Lin EH, Walker EA, et al. Cost-effectiveness of a collaborative care program for primary care patients with persistent depression. American Journal of Psychiatry. 2001;158(10):1638-44.

61. Katon W, Von Korff M, Lin E, Walker E, Simon GE, Bush T, et al. Collaborative management to achieve treatment guidelines: impact on depression in primary care. Jama. 1995;273(13):1026-31.

62. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. Archives of internal medicine. 2006;166(21):2314-21.

63. Katon WJ, Seelig M. Population-based care of depression: team care approaches to improving outcomes. Journal of Occupational and Environmental Medicine. 2008;50(4):459-67.

64. Katon W, Unützer J, Wells K, Jones L. Collaborative depression care: history, evolution and ways to enhance dissemination and sustainability. General hospital psychiatry. 2010;32(5):456-64.

65. Ray-Sannerud BN, Dolan DC, Morrow CE, Corso KA, Kanzler KE, Corso ML, et al. Longitudinal outcomes after brief behavioral health intervention in an integrated primary care clinic. Families, Systems, & Health. 2012;30(1):60.

66. Pomerantz A, Cole BH, Watts BV, Weeks WB. Improving efficiency and access to mental health care: combining integrated care and advanced access. General hospital psychiatry. 2008;30(6):546-51.

67. Areán PA, Ayalon L, Jin C, McCulloch CE, Linkins K, Chen H, et al. Integrated specialty mental health care among older minorities improves access but not outcomes: results of the PRISMe study. International Journal of Geriatric Psychiatry: A journal of the psychiatry of late life and allied sciences. 2008;23(10):1086-92.

68. Reiss-Brennan B, Brunisholz KD, Dredge C, Briot P, Grazier K, Wilcox A, et al. Association of integrated team-based care with health care quality, utilization, and cost. Jama. 2016;316(8):826-34.

69. Bogner HR, de Vries HF. Integration of depression and hypertension treatment: a pilot, randomized controlled trial. The Annals of Family Medicine. 2008;6(4):295-301.

70. Bogner HR, Morales KH, de Vries HF, Cappola AR. Integrated management of type 2 diabetes mellitus and depression treatment to improve medication adherence: a randomized controlled trial. The Annals of Family Medicine. 2012;10(1):15-22.

71. Katon WJ, Lin EH, Von Korff M, Ciechanowski P, Ludman EJ, Young B, et al. Collaborative care for patients with depression and chronic illnesses. New England Journal of Medicine. 2010;363(27):2611-20.

72. Program HRaSAHC. 2017 Health center data. Rockville: Health Services and Resources Administration; 2019.

73. Proser M, Cox L. Health centers' role in addressing the behavioral health needs of the medically underserved. Washington, DC: National Association of Community Health Centers. 2004.

74. Schuffman D, Druss BG, Parks JJ. State mental health policy: mending Missouri's safety net: transforming systems of care by integrating primary and behavioral health care. Psychiatric Services. 2009;60(5):585-8.

75. Adashi EY, Geiger HJ, Fine MD. Health care reform and primary care—the growing importance of the community health center. N Engl J Med. 2010;362(22):2047-50.

76. Hennessy J. FQHCs and health reform: up to the task. Nw JL & Soc Pol'y. 2013;9:i.

77. Scharf DM, Eberhart NK, Schmidt Hackbarth N, Horvitz-Lennon M, Beckman RL, Han B, et al. Evaluation of the SAMHSA Primary and Behavioral Health Care Integration (PBHCI) grant program: final report (task 13). 2014.

78. Robinson PJ, Strosahl KD. Behavioral health consultation and primary care: Lessons learned. Journal of Clinical Psychology in Medical Settings. 2009;16(1):58-71.

79. SAMHSA-HRSA. SAMHSA-HRSA Center for Integrated Health Solutions Washington DC: SAMHSA-HRSA; 2019 [Available from: https://www.integration.samhsa.gov/.

80. Thielke S, Vannoy S, Unützer J. Integrating mental health and primary care. Primary care: Clinics in office practice. 2007;34(3):571-92.

81. Ramanuj P, Ferenchik E, Docherty M, Spaeth-Rublee B, Pincus HA. Evolving Models of Integrated Behavioral Health and Primary Care. Current psychiatry reports. 2019;21(1):4.

82. Bishop TF, Press MJ, Keyhani S, Pincus HA. Acceptance of insurance by psychiatrists and the implications for access to mental health care. JAMA psychiatry. 2014;71(2):176-81.

83. Horevitz E, Manoleas P. Professional competencies and training needs of professional social workers in integrated behavioral health in primary care. Social Work in Health Care. 2013;52(8):752-87.

84. Wallyn S, Massant D, Oosterlinck T. The pivotal role of the Primary care Psychologist in integrated care: from an experience in Flanders towards policy development. International Journal of Integrated Care. 2017;17(5).

85. Raney L. Integrated care: the evolving role of psychiatry in the era of health care reform. Psychiatric Services. 2013;64(11):1076-8.

86. Siantz E, Aranda MP. Chronic disease self-management interventions for adults with serious mental illness: a systematic review of the literature. General hospital psychiatry. 2014;36(3):233-44.

87. Cortes DE, Mulvaney-Day N, Fortuna L, Reinfeld S, Alegría M. Patient—provider communication: understanding the role of patient activation for Latinos in mental health treatment. Health Education & Behavior. 2009;36(1):138-54.

88. Aikens JE, Bingham R, Piette JD. Patient-provider communication and self-care behavior among type 2 diabetes patients. The Diabetes Educator. 2005;31(5):681-90.

89. Hausmann LR, Hannon MJ, Kresevic DM, Hanusa BH, Kwoh CK, Ibrahim SA. Impact of perceived discrimination in health care on patient-provider communication. Medical care. 2011;49(7):626.

90. Machledt D. Addressing the social determinants of health through Medicaid Managed Care. Issue Brief (Commonwealth Fund). 2017;2017:1-9.

91. Croghan TW, Brown JD. Integrating mental health treatment into the patient centered medical home: Agency for Healthcare Research and Quality Rockville, MD; 2010.

92. Berry LL, Rock BL, Houskamp BS, Brueggeman J, Tucker L, editors. Care coordination for patients with complex health profiles in inpatient and outpatient settings. Mayo Clinic Proceedings; 2013: Elsevier.

93. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. The Milbank Quarterly. 2005;83(4):Online□only-Online□only.

94. Wu IH, Bathje GJ, Kalibatseva Z, Sung D, Leong FT, Collins-Eaglin J. Stigma, mental health, and counseling service use: A person-centered approach to mental health stigma profiles. Psychological services. 2017;14(4):490.

95. Pascoe EA, Smart Richman L. Perceived discrimination and health: a meta-analytic review. Psychological bulletin. 2009;135(4):531.

96. Bustamante AV, Fang H, Garza J, Carter-Pokras O, Wallace SP, Rizzo JA, et al. Variations in healthcare access and utilization among Mexican immigrants: the role of documentation status. Journal of Immigrant and Minority Health. 2012;14(1):146-55.

97. Kangovi S, Barg FK, Carter T, Long JA, Shannon R, Grande D. Understanding why patients of low socioeconomic status prefer hospitals over ambulatory care. Health affairs. 2013;32(7):1196-203.

98. Gary TL, Narayan K, Gregg EW, Beckles GL, Saaddine JB. Racial/ethnic differences in the healthcare experience (coverage, utilization, and satisfaction) of US adults with diabetes. Ethnicity & disease. 2003;13(1):47-54.

99. Ricketts TC. Accessing health care. A Companion to health and medical geography. 2009:521-39.

100. Garfield RL, Lave JR, Donohue JM. Health reform and the scope of benefits for mental health and substance use disorder services. Psychiatric Services. 2010;61(11):1081-6.

101. Croft B, Parish SL. Care integration in the Patient Protection and Affordable Care Act: Implications for behavioral health. Administration and Policy in Mental Health and Mental Health Services Research. 2013;40(4):258-63.

102. Katon WJ, Unützer J. Health reform and the Affordable Care Act: the importance of mental health treatment to achieving the triple aim. Journal of psychosomatic research. 2013;74(6).

103. Gurewich D, Prottas J, Sirkin JT. Managing care for patients with substance abuse disorders at community health centers. Journal of substance abuse treatment. 2014;46(2):227-31.

104. Lardiere M, Jones E, Perez M. NACHC 2010 Assessment of Behavioral health services in federally qualified health centers. Washington, DC: National Organization of Community Health Centers; 2011.

105. Mauch D, Bartlett J. Integrated behavioral health in public health care contexts: Community health and mental health safety net systems. Integrated Behavioral Health in Primary Care: Springer; 2013. p. 131-65.

106. Han X, Ku L. Enhancing staffing in rural community health centers can help improve behavioral health care. Health Affairs. 2019;38(12):2061-8.

107. Bruckner TA, Singh P, Snowden LR, Yoon J, Chakravarthy B. Rapid growth of mental health services at community health centers. Administration and Policy in Mental Health and Mental Health Services Research. 2019;46(5):670-7.

108. Wells R, Morrissey JP, Lee I-H, Radford A. Trends in behavioral health care service provision by community health centers, 1998–2007. Psychiatric Services. 2010;61(8):759-64.

109. International RTI. Health Center Patient Survey. 2018 [Available from: https://www.rti.org/impact/health-center-patient-survey.

110. Care BoPH. UDS Reporting Instructions for Health Centers Rockville: Health Resources and Services Administration 2013.

111. Wu P, Hoven CW, Bird HR, Moore RE, Cohen P, Alegria M, et al. Depressive and disruptive disorders and mental health service utilization in children and adolescents. Journal of the American Academy of Child & Adolescent Psychiatry. 1999;38(9):1081-90.

112. Zima BT, Murphy JM, Scholle SH, Hoagwood KE, Sachdeva RC, Mangione-Smith R, et al. National quality measures for child mental health care: background, progress, and next steps. Pediatrics. 2013;131(Supplement 1):S38-S49.

113. Duarte C. Community Health Centers and Payment for Integrated Care. Enhancing Behavioral Health in Latino Populations: Springer; 2016. p. 95-103.

114. Prochaska JJ, Sung HY, Max W, Shi Y, Ong M. Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. International journal of methods in psychiatric research. 2012;21(2):88-97.

115. Corrigan PW, Watson AC. The stigma of psychiatric disorders and the gender, ethnicity, and education of the perceiver. Community mental health journal. 2007;43(5):439-58.

116. Szymanski BR, Bohnert KM, Zivin K, McCarthy JF. Integrated care: treatment initiation following positive depression screens. Journal of general internal medicine. 2013;28(3):346-52.

117. Bartels SJ, Coakley EH, Zubritsky C, Ware JH, Miles KM, Areán PA, et al. Improving access to geriatric mental health services: a randomized trial comparing treatment engagement with integrated versus enhanced referral care for depression, anxiety, and at-risk alcohol use. American Journal of Psychiatry. 2004;161(8):1455-62.

118. Burke BT, Miller BF, Proser M, Petterson SM, Bazemore AW, Goplerud E, et al. A needs-based method for estimating the behavioral health staff needs of community health centers. BMC Health Services Research. 2013;13(1):245.

119. Bhandari A, Wagner T. Self-reported utilization of health care services: improving measurement and accuracy. Medical Care Research and Review. 2006;63(2):217-35.

120. Gusmano MK, Fairbrother G, Park H. Exploring the limits of the safety net: community health centers and care for the uninsured. Health affairs. 2002;21(6):188-94.

121. Horvitz-Lennon M, Kilbourne AM, Pincus HA. From silos to bridges: meeting the general health care needs of adults with severe mental illnesses. Health affairs. 2006;25(3):659-69.

122. Williams J, Shore SE, Foy JM. Co-location of mental health professionals in primary care settings: three North Carolina models. Clinical pediatrics. 2006;45(6):537-43.

123. Vogel ME, Kanzler KE, Aikens JE, Goodie JL. Integration of behavioral health and primary care: Current knowledge and future directions. Journal of Behavioral Medicine. 2017;40(1):69-84.

124. Pathman DE, Konrad TR. Growth and changes in the national health service corps (NHSC) workforce with the American recovery and reinvestment act. The Journal of the American Board of Family Medicine. 2012;25(5):723-33.

125. Hubley SH, Miller BF. Implications of healthcare payment reform for clinical psychologists in medical settings. Journal of clinical psychology in medical settings. 2016;23(1):3-10.

126. Ivey SL, Scheffler R, Zazzali JL. Supply dynamics of the mental health workforce: Implications for health policy. The Milbank Quarterly. 1998;76(1):25-58.

127. Crane DR, Christenson JD. The medical offset effect: Patterns in outpatient services reduction for high utilizers of health care. Contemporary Family Therapy. 2008;30(2):127-38.

128. Fleury M-J, Fortin M, Rochette L, Grenier G, Huỳnh C, Pelletier É, et al. Assessing quality indicators related to mental health emergency room utilization. BMC Emergency Medicine. 2019;19(1):8.

129. Katon W, Von Korff M, Lin E, Lipscomb P, Russo J, Wagner E, et al. Distressed high utilizers of medical care: DSM-III-R diagnoses and treatment needs. General hospital psychiatry. 1990;12(6):355-62.

130. Lefevre F, Reifler D, Lee P, Sbenghe M, Nwadiaro N, Verma S, et al. Screening for undetected mental disorders in high utilizers of primary care services. Journal of general internal medicine. 1999;14(7):425-31.

131. Pearson SD, Katzelnick DJ, Simon GE, Manning WG, Helstad CP, Henk HJ. Depression among high utilizers of medical care. Journal of general internal medicine. 1999;14(8):461-8.

132. Kolbasovsky A, Reich L, Romano I, Jaramillo B. Integrating behavioral health into primary care settings: A pilot project. Professional Psychology: Research and Practice. 2005;36(2):130.

133. Kreyenbuhl J, Nossel IR, Dixon LB. Disengagement from mental health treatment among individuals with schizophrenia and strategies for facilitating connections to care: a review of the literature. Schizophrenia bulletin. 2009;35(4):696-703.

134. Lynch CS, Wajnberg A, Jervis R, Basso-Lipani M, Bernstein S, Colgan C, et al. Implementation science workshop: a novel multidisciplinary primary care program to improve care and outcomes for super-utilizers. Journal of general internal medicine. 2016;31(7):797-802.

135. Lorig KR, Sobel DS, Stewart AL, Brown Jr BW, Bandura A, Ritter P, et al. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. Medical care. 1999:5-14.

136. Simon GE, Manning WG, Katzelnick DJ, Pearson SD, Henk HJ, Helstad CP. Cost-effectiveness of systematic depression treatment for high utilizers of general medical care. Archives of general psychiatry. 2001;58(2):181-7.

137. Reiss-Brennan B, Briot P, Cannon W, James B. Mental health integration: rethinking practitioner roles in the treatment of depression: the specialist, primary care physicians, and the practice nurse. Ethnicity and Disease. 2006;16(2):S3.

138. Sampalli T, Fox RA, Dickson R, Fox J. Proposed model of integrated care to improve health outcomes for individuals with multimorbidities. Patient preference and adherence. 2012;6:757.

139. Kominski GF, Pourat N, Roby DH, Cabezas L, Chen X, Hadler M, et al. Interim evaluation report on California's low income health program (LIHP). 2013.

140. LaCalle E, Rabin E. Frequent users of emergency departments: the myths, the data, and the policy implications. Annals of emergency medicine. 2010;56(1):42-8.

141. Druss BG, Bornemann T, Fry-Johnson YW, McCombs HG, Politzer RM, Rust G. Trends in mental health and substance abuse services at the nation's community health centers: 1998–2003. American journal of public health. 2008;98(Supplement_1):S126-S31.

142. Kronick R, Gilmer T, Dreyfus T, Lee L. Improving health-based payment for Medicaid beneficiaries: CDPS. Health care financing review. 2000;21(3):29.