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Geographical Variations in Mental Health Resource Capacity at the Military Treatment Facilities

March 2022

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Department of Defense Management

Naval Postgraduate School

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ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
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ABSTRACT

Mental health is an integral part of medical readiness. Over the last two decades, the demand for mental health services has increased across the board. The supply of mental health resources must match the growing demand to provide military members and other TRICARE beneficiaries with timely access to mental health services. This research examines geographical and temporal variations in mental health resource capacity at the Military Treatment Facilities (MTF) on national, regional, and catchment area levels. Furthermore, I determine what percentage of TRICARE beneficiaries who reside within MTF's catchment areas are at risk of inadequate access to mental health resources and what geographic, military-specific, demographic, and socio-economic characteristics are associated with those shortage areas.

The results show no increase in mental health provider capacity over time and do not indicate significant temporal variations. The Northeast region records an insufficient number of mental health providers; the Northeast and Midwest demonstrate the shortage of psychiatrists. Around 7.4% and 41.2% of TRICARE recipients live in the MTF's catchment areas with a deficiency of mental health providers and psychiatrists, respectively. MTF's catchment areas with the U.S. Navy (USN) as a predominant service are more likely to experience a shortage of mental health providers compared to the U.S. Army (USA).

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LIST OF ACRONYMS AND ABBREVIATIONS

1Q	first (lower) quantile
2Q	second (medium) quantile
3Q	third (upper) quantile
APA	American Psychological Association
BUMED	Bureau of Medicine and Surgery
CDC	Centers for Disease Control and Prevention
CONUS	continental United States
DEERS	Defense Enrollment Eligibility Reporting System
DHA	Defense Health Agency
DMHRSi	Defense Medical Human Resources System Internet
DOD	Department of Defense
FTE	full-time equivalent
FY	fiscal year
FYM	fiscal year month
GAO	Government Accountability Office
HRSA	Health Resources and Services Administration
Log	logarithm transformed
MEPRS	Medical Expense and Performance Reporting System
MHS	Military Health System
MSMR	Medical Surveillance Monthly Report
MTF	military treatment facility
NAMI	National Alliance on Mental Illness
NDAA	National Defense Authorization Act
NPI	national provider identifier
Prob	probability
PTSD	post-traumatic stress disorders
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
ZCTA	zip code tabulation area

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EXECUTIVE SUMMARY

A.   OVERVIEW

The primary mission of the Military Health System is to ensure the medical readiness of every active-duty and reserve service member. Mental health is an integral part of medical readiness. According to the Medical Surveillance Monthly Report (2021) published by the Defense Health Agency (DHA), mental health disorders accounted for nearly half (49.3%) of all hospital bed days in 2020. In the same year, over 110,000 active-duty members were diagnosed with at least one mental health disorder (Medical Surveillance Monthly Report, 2021). With the increasing pressures coming from the home front (i.e., the COVID-19 pandemic and its second- and third-order effects), and challenges to U.S. global military dominance (i.e., the rising threat from China and Russia), the ability to provide appropriate mental health services on time will be paramount in meeting the military's mission. Individual military branches and the DHA emphasize the importance of mental health services. For example, the Bureau of Medicine and Surgery's (BUMED) *Human Capital Strategy 2020–2025* stresses the expansion of mental health capabilities and an increase of "mental healthcare awareness and treatment capacity within Fleet and Fleet Marine Force embedded mental health units and MTFs" (Bureau of Medicine and Surgery [BUMED], 2020, p. 15).

The recent Department of Defense (DOD) Inspector General Report on Evaluation of Access to Mental Health in the DOD revealed that "the DOD did not consistently meet outpatient mental health access to care standards for active-duty service members and their families" (Department of Defense Inspector General [DODIG], 2020, p. i). The report has identified that the primary reason for the DOD's inability to meet these standards was a lack of "an MHS-wide model to identify appropriate levels of staffing in direct care" (p. i). The staffing levels are determined by several factors, including the supply of mental health providers and their availability in each medical facility as well as the overall demand for mental health services. With the Defense Health Agency (DHA) recently undertaking the responsibilities of ensuring improved access to care and health care outcomes in Military Treatment Facilities (MTF) across the globe, it becomes crucial to understand the state of

mental health capacity at MTFs and address the issues related to inadequate supply of mental health providers.

B.   PURPOSE

In this research, I attempt to answer three questions. First, what are the geographical variations in the availability of mental health providers at the MTFs, and how do they vary over time? Second, what percentage of beneficiaries is at risk of inadequate access to mental and behavioral health care resources in MTF's catchment areas? Third, what geographic, military service-specific, demographic, and socio-economic characteristics are associated with MTF's mental health providers shortage areas? The findings of my study will inform the DHA on the current state of the supply of mental health providers. This research will also contribute to closing the mental health care provider gap and ensuring that service members in need receive timely mental health services per federal regulations.

C.   SCOPE

This research examines geographical and temporal variations of mental health resource capacity measures in continental United States MTFs, including Alaska and Hawaii, at the national, regional, and local levels from FY2016 to FY2020. The population for the macro- and regional-level analyses includes 8.8 million TRICARE beneficiaries; the number of beneficiaries is reduced to 5.4 million people to capture TRICARE recipients who reside within MTF's catchment areas (i.e., 20-mile radius) for the micro-level analysis. Mental health providers of interest include active-duty and civilian (i.e., general schedule and contractor) specialists employed by the MHS in the following occupations: psychiatrist, psychiatric nurse practitioner, psychologist, and social worker. The study excludes a civilian network of mental health providers, so-called purchased care.

D.   METHODOLOGY

In my study, I develop several mental health resource capacity measures, using the Health Resources and Services Administration's guidelines for mental health providers shortage areas (Health Resources and Services Administration, n.d.). The capacity measures include the number of mental health providers per 6,000 TRICARE beneficiaries,

the number of mental health clinical staff per 6,000 TRICARE beneficiaries, and the number of psychiatrists per 20,000 TRICARE beneficiaries. I use three different statistics to calculate the number of mental health providers: assigned full-time equivalents (FTE), available FTEs, and provider headcounts.

For the macro- and regional-level analyses, I aggregate these indicators for CONUS and four census regions (Alaska is grouped separately as a fifth category), respectively. I calculate capacity measures based on a parent MTF's 20-mile catchment area for the micro-level analysis. My study then utilizes bivariate and multivariate linear and logistic regressions as a primary method of statistical analysis to detect potential associations between the capacity measures and various MTF's catchment areas characteristics (e.g., geography, TRICARE beneficiaries by type, demographic, and socio-economic attributes of the general population). I estimate the regressions and create visuals using the statistical software STATA version 16.1.

E.   RESULTS

My analysis does not demonstrate significant temporal variation of capacity measures during the observation period. The capacity indicators consistently stay above the shortage threshold on a national level. Nevertheless, the Northeast region shows a deficient number of mental health providers 54 out of 57 observation months on a regional level. When looking at the ratio of psychiatrists, Northeast and Midwest demonstrate inadequate capacity per the measures used in my analysis and can be classified as regions with a shortage of psychiatrists in MTFs.

Based on my calculations, 7.4% of TRICARE recipients live in the MTF's catchment areas with a shortage of mental health providers. The majority reside in the South and West regions (over 89%) and about 10.5% in the Northeast. Nearly two-thirds of TRICARE beneficiaries in the areas with an inadequate supply of military mental health providers live in the MTF's catchment areas with a majority of USN active-duty members (compared to other service branches). I also find that 41.2% of TRICARE beneficiaries reside in the MTF's catchment areas that experience a shortage of psychiatrists. They are distributed across census regions proportionally to the total TRICARE population. The

catchment areas where the USAF is a dominant service branch host nearly half (46%) of those who live in the psychiatrist shortage areas, with the USA and USN accounting for 23% and 24%, respectively.

The micro-level regression analysis confirms most of these macro findings. MTF's catchment areas with a shortage of mental health providers are more likely to be located in the South and Northeast regions. Some models confirm the negative correlation between the ratio of mental health providers to TRICARE beneficiaries and the areas with the USN as a dominant service. As for TRICARE recipients' characteristics, the areas with the highest share of adult dependent beneficiaries (excluding retirees) are eight times more likely to fall under the shortage area category than those with the lowest share. Several models establish a significant positive association between the areas with the highest percentage of dependents under 18 and the numbers of mental health providers. For the general socio-economic characteristics of MTF's catchment areas, those with the highest share of the population under poverty are less likely to be mental health providers shortage areas. Similar trends apply to the psychiatrist shortage area's metric.

F. LIMITATIONS AND RECOMMENDATIONS

My study has several limitations. First, I only focus on mental health providers directly employed by MTFs in CONUS, Hawaii, and Alaska, omitting overseas locations and operational platforms. Second, my TRICARE population sample for the micro-analysis excludes 3.3 million beneficiaries who reside outside the 20-mile MTF catchment areas. Third, my research emphasizes military mental health resource capacity (i.e., direct care services) and neglects the capacity of a civilian network of providers (i.e., purchased care). Fourth, to calculate mental health capacity measures, I utilize a very comprehensive set of data that are not without measurement errors. Finally, my research focuses on the geographic access to care, while there are other forms of barriers to care, such as referral processing speed and referral wait times.

My findings show that a significant number of MTF's catchment areas experience a shortage of psychiatrists. I recommend the examination of the civilian mental health capacity in those areas to determine whether the same trend applies to purchased care. The

DHA should consider increasing the number of psychiatrists in those areas that experience a shortage in both settings. I also recommend further analysis of the reasons for the disparity between the MTFs that predominantly serve the USN and USAF populations vs. other services regarding the numbers and capacity measures of mental health providers and psychiatrists. Finally, I suggest collecting better data on the mental health provider FTEs and headcounts to conduct more accurate research in the future.

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I.   INTRODUCTION

A.   PURPOSE

Over the last two decades, the prevalence of mental health diseases and the demand for mental health services have been gradually increasing across the board, especially amongst military and former military populations (Government Accountability Office [GAO], 2021). The COVID-19 pandemic substantially contributed to this trend (Department of Defense, 2022; Hill et al., 2019). The Defense Health Agency (DHA) has recently undertaken the responsibilities of ensuring improved access to care and health care outcomes in Military Treatment Facilities (MTFs) across the globe. These initiatives apply to mental health services as well. The supply of mental health resources, an essential attribute of access to care, must keep up with the growing demand to provide military members and other TRICARE beneficiaries with timely access to mental health and behavioral health services.

The Military Health System (MHS) employs in the MTFs various types of mental health providers by specialty (e.g., psychiatrists, psychologists, psychiatric nurse practitioners, etc.) and by status (i.e., active duty, general schedule, civilian contractors). MTFs are located across the continental United States (CONUS), Hawaii, Alaska, and overseas military bases. Depending on a geographical area, various factors might impact the supply of military mental health providers, from the number of TRICARE beneficiaries to the local demographic and socio-economic characteristics.

In my thesis, I develop mental health resource capacity measures and detect their geographical and temporal variations at the MTFs within CONUS, Hawaii, and Alaska on a national, regional, and local levels. I identify mental health provider shortage areas and determine whether any of the geographical, military service-specific, demographic, and socio-economic characteristics are associated with the regions lacking adequate mental health specialists. The study results will inform the DHA of the current state of the supply of mental health providers; the research outcomes can be further compared with the demand for mental health services to identify what regions and catchment areas are

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consistently understaffed or overstaffed. This research will contribute to closing the mental health care provider gap and ensure that service members in need receive timely mental health services per federal regulations.

B. RESEARCH QUESTIONS

I address the following questions in this thesis:

- What are the geographical variations in the availability of mental health providers at the MTFs and how do they vary over time?

- What percent of beneficiaries is at risk of inadequate access to mental and behavioral health care resources in MTF's catchment areas?

- What geographic, military service specific, demographic, and socio-economic characteristics are associated with MTF's mental health providers shortage areas?

C. ORGANIZATION

This thesis consists of five chapters. Chapter II provides comprehensive institutional background and literature review of mental health resources capacity in prior studies and reports. Chapter III dives into the data sources, main variables used in the research, and general methodology. Chapter IV covers the macro-, regional- and micro-level analyses, including regression models' results, describing the relationship between high and low-capacity measures and various independent variables. Finally, Chapter V outlines a summary of the results, limitations, and conclusions.

II.   INSTITUTIONAL BACKGROUND AND LITERATURE REVIEW

A.   INTRODUCTION

Mental health has been growing in importance in the last several decades. According to the Centers for Disease Control and Prevention, nearly half of all Americans will be diagnosed with a mental health illness in their lifetime (Centers for Disease Control and Prevention [CDC], n.d.). In August 2020, the U.S. Department of Health and Human Services launched the Healthy People 2030 initiative, outlining several hundred objectives for improving health outcomes and the overall well-being of Americans (The U.S. Department of Health and Human Services, n.d.). A significant portion of them is dedicated to addressing mental health and mental disorders. The Healthy People 2030 emphasizes improving access to mental health, increasing mental health illness screening rates, reducing the suicide rate, etc. Addressing issues with mental health access is especially imperative. Per the National Institute of Mental Health's 2018 statistical report, only half of individuals with mental health illness receive treatment.

Mental health in the military is an important topic of discussion. Timely access to appropriate mental health services is paramount to ensuring a medically ready force. The U.S. Armed Forces personnel, dependents, retirees, and their families are representatives of the U.S. populations; however, they also have their distinct characteristics due to the nature of military service, including serving in dangerous areas with the risk of serious injury or death and working long hours with sleep deprivation (Bureau of Labor Statistics, 2021). Hence, the military population (including retirees) faces similar mental health challenges as civilians and unique problems related to their military obligations.

This section introduces the Military Health System's institutional background, an overview of mental health resources, and prevalent mental health conditions. It provides a literature review of prior reports and studies pertaining to health resources capacity. Section II.B.1 covers the institutional details about the Military Health System, including a summary of its mission, serviced populations, and healthcare assets (physical and manpower). Section II.B.2 describes a recent DHA transition and its potential effects on

mental health access. Sections II.B.3 and II.B.4 present the current mental health state in the U.S. Armed Forces and mental health providers. Section II.C.1 introduces the definition of the term "health care access" and defines minimum health care resource capacity standards. The final part is a review of health capacity measures and methods used in the academic literature.

B.   INSTITUTIONAL BACKGROUND

1.   Military Health System

The MHS is one of the most robust healthcare systems in the U.S. Its priorities align with the National Defense Strategy, stressing "a Medically Ready Force, a Ready Medical Force," and enhancing the health of all its beneficiaries (Military Health System, 2021). The MHS's mission consists of the three distinct but interrelated components:

- Ensuring medical readiness of active-duty and reserve service members, enabling them to respond to military operations or humanitarian crises around the globe. Medical readiness includes both the physical and mental health of the Armed Forces personnel.

- Providing appropriate training to the active and reserve medical personnel to ensure they are trained and equipped to support operational forces. The MHS places a significant emphasis on trauma, damage control resuscitation, and damage control surgery.

- Delivering high-quality care to service members, dependents, and retirees.

There are three types of MTFs within the MHS, including medical centers (provide the most comprehensive set of health care services), hospitals, and outpatient clinics. The care rendered at MTFs is referred to as direct care. The DOD also maintains a civilian provider network to complement the MTFs; the care received from civilian providers is called purchased care. This research will focus on direct care.

The MHS provides care to approximately 9.6 million beneficiaries (health.mil, 2021). Figure 1 represents beneficiaries by type. The MHS health facilities include 49

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hospitals and inpatient care facilities, 465 ambulatory and occupational health facilities, 192 dental clinics, and 250 veterinary facilities (Military Health System, 2021). The MHS employs a large number of clinical and non-clinical support personnel. According to the Government Accountability Office (GAO) report (Government Accountability Office [GAO], 2020), the DOD's Defense Health Program-funded workforce totaled over 174,000 personnel, including active-duty service members, general schedule civilian employees, and private-sector contractors.
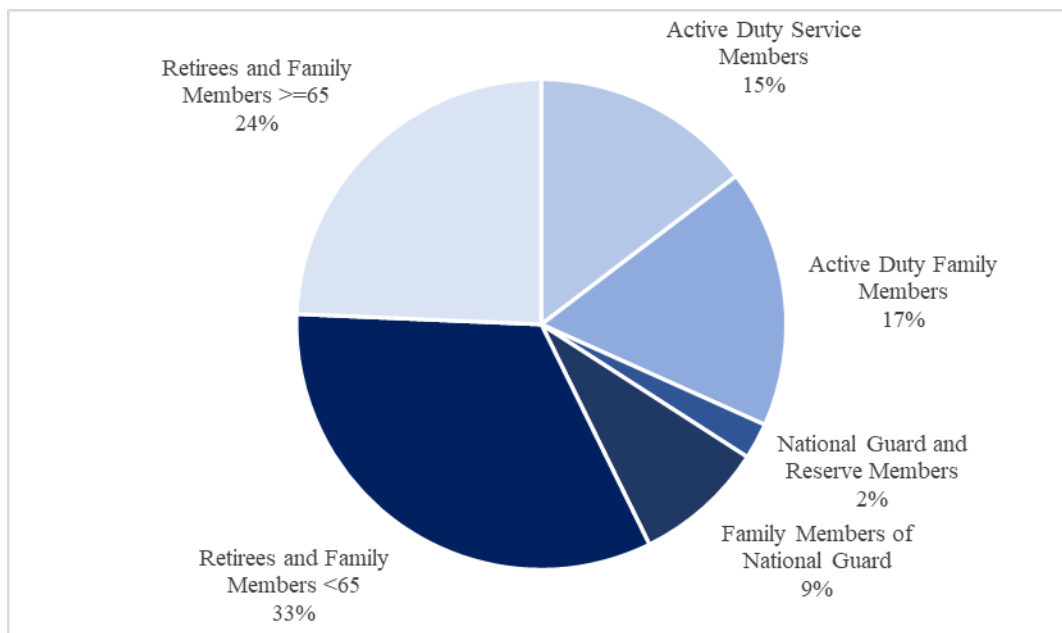
Figure 1.   MHS Beneficiaries by Type. Adapted from DHA (2021).

2.   MHS Transition

The MHS has recently undergone a colossal transformation from a segregated entity, where each of three services (i.e., Navy, Air Force, and Army) was overseeing their respective MTFs, to a centralized system under the DHA's control. The FY 2017 National Defense Authorization Act (NDAA) ordered the DHA to take over administration of MTFs, including budgetary matters, information technology, health care administration and management, administrative policy and procedures, military medical construction, and others. Commanders of each military treatment facility are now responsible for the

readiness of military members and civilian employees at their respective unit and for "furnishing the health care and medical treatment provided as such facility" (National Defense Authorization Act [NDAA], 2016).

Congress initiated the push for a more centralized administration and management under the DHA to accomplish several objectives. The overall goal for the transfer of administrative and management authority to the DHA is to enhance medical readiness of active and reserve military members and operational readiness of the military medical force. Other objectives include improving "access to care" and overall "experience of care," boost health outcomes, and eliminate redundant medical costs across three military medical system run by individual services (NDAA, 2016).

The MHS transition was implemented in several phases, with the DHA gradually assuming direct management and administration of hospitals and clinics within the continental United States. The COVID-19 pandemic impeded the transition, delaying the target date by seven months. The DHA established a market-based structure to operate MTFs, including single-service and multi-service markets. Markets are groups of MTFs that work together with TRICARE partners, Veterans Affairs hospitals, other federal health care organizations, civilian teaching hospitals, medical universities, and civilian health care partners in their area (MHS, 2021). The idea behind markets is that they function as one system, implying the sharing of patients, staff, budget, etc.

Operating as part of a health care market should increase access to care by making all the resources from that market available to beneficiaries. This particularly applies to specialized services (including mental health). For instance, if a treatment option is not available in a local MTF, but a civilian or VA hospital offers that treatment, a beneficiary will receive easy and quick access to it. There is currently no statistical data available to measure the improvements of access to care.

3. Mental Health in the Armed Forces

The primary mission of military medicine is to ensure the medical readiness of every active-duty and reserve service member. Mental health is an integral part of medical readiness. With amplified pressures coming from the home front (i.e., the COVID-19

pandemic and its second-and third-order effects), and challenges to U.S. global military dominance (i.e., the increasing threat from China and Russia), the ability to provide timely and suitable mental health services will be paramount in meeting the military's mission. Individual military branches, as well as the DHA, emphasize the importance of mental health services. For example, the Bureau of Medicine and Surgery's (BUMED) Human Capital Strategy 2020–2025 stresses the expansion of mental health capabilities and an increase of "mental healthcare awareness and treatment capacity within Fleet and Fleet Marine Force embedded mental health units and MTFs" (BUMED, 2020, p. 15).

According to the Medical Surveillance Monthly Report (MSMR) on "Absolute and Relative Morbidity Burdens Attributed to Various Illnesses and Injuries for the Active Component U.S. Armed Forces" personnel, "mental health disorders accounted for more hospital bed days than any other morbidity category and nearly half (49.3%) of all hospital bed days overall" (MSMR, 2021a, p.3). The number of active component service members affected by various mental health disorders from 2016 to 2020 reached 456,293 (diagnosed with at least one mental health disorder), with 43.8% diagnosed with more than one (MSMR, 2021a).

The list of mental health illnesses is extensive. Figure 2 represents top 11 types of mental health disorders by prevalence in the force. It includes the following diagnoses in descending order: adjustment disorders, anxiety disorders, depressive disorders, alcohol-related disorders, post-traumatic stress disorders (PTSD), etc. Adjustment disorders, being the most frequent mental health diagnosis with 427 per 10,000 person-years (MSMR, 2021b), contain adjustment disorder with depressed mood, adjustment disorder with anxiety, separation anxiety disorder, and others. Anxiety disorders include phobic anxiety disorders, obsessive-compulsive disorders, panic disorder, etc. Depressive disorders include depressive episodes, major depressive episodes, dysthymic disorder, persistent mood disorders, and others.

As stated in the MSMR report, service members diagnosed with alcohol-related and substance-related disorders were likely to be diagnosed with other mental health disorders. For example, out of those diagnosed with alcohol-related disorders, "37.6% were also diagnosed with adjustment disorders and 27.6% with depressive disorders" (MSMR,

2021b). Depressive disorders, personality disorders, and adjustment disorders were common comorbidities as well.

In general, the report states that female service members were more likely to be diagnosed with a mental health illness than males except for schizophrenia and alcohol- and substance-related disorders. The rate of mental health disorder diagnoses, for the most part, declined with age except for PTSD and anxiety disorders. The Army had the highest rate of mental health diagnoses among other branches.
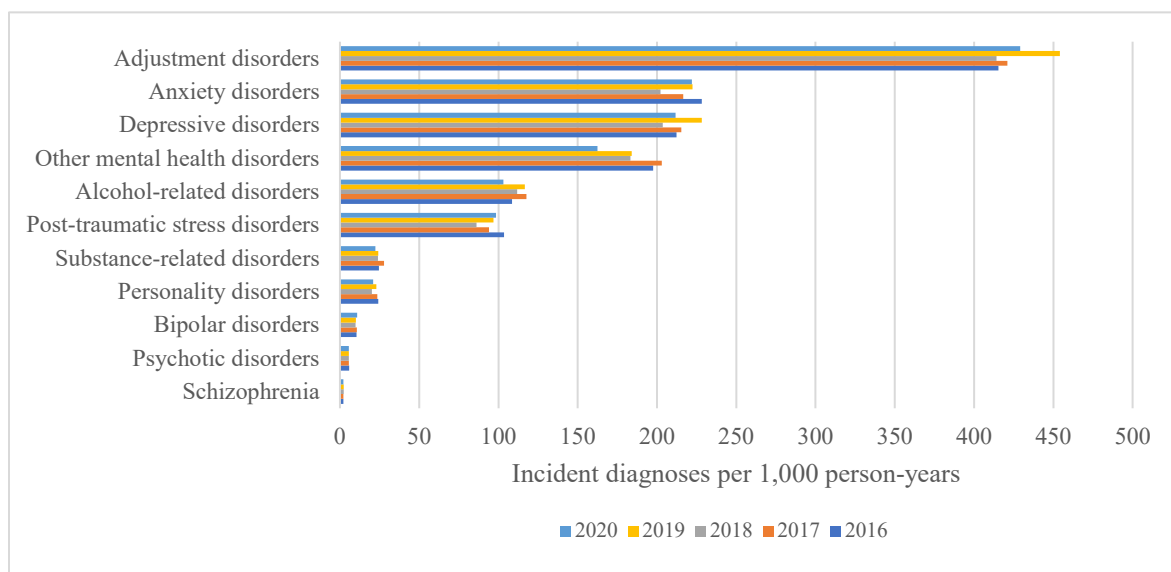
Figure 2.   Annual Incidence Rates of Mental Health Disorder Diagnoses, Active Component, U.S. Armed Forces 2016–2020. Adapted from MSMR (2021a).

The military population's mental health diagnoses trends align with the U.S. population. According to the National Alliance on Mental Health (NAMI), 19.1% (48 million) of U.S. adults suffer from anxiety disorders. The second mental health condition by annual prevalence is depressive disorders, impacting 7.8% (19.4 million) of adults. Around 3.6% (9 million) of the adult population are diagnosed with PTSD, followed by bipolar disorder (2.8% or 7 million), borderline personality disorders (1.4% or 3.5 million), obsessive-compulsive disorder (1.2% or 3 million), and schizophrenia (National Alliance on Mental Illness [NAMI], 2021).

4. Mental Health Providers

According to the National Alliance on Mental Illness, mental health care services can be grouped into two major categories (NAMI, 2020). The first category of services includes general mental health counseling, assessment, and diagnosis of mental health conditions. These services are often performed by clinical psychologists, clinical social workers, and several types of counselors (e.g., licensed clinical alcohol & drug abuse counselor). The second group of services entails prescription of psychiatric medication; they, however, can also include therapy and diagnosis of mental health disorders. Among those mental health professionals, who can prescribe psychiatric medication, are psychiatrists and psychiatric and mental health nurse practitioners. In addition, primary care physicians, family nurse practitioners, and physician assistants can prescribe medication to treat mental health disorders. They also act as gatekeepers, meaning that a patient must see a primary care provider first before being referred to a mental health specialist. While the third group plays a critical role of getting patients to mental health specialists, for this thesis, I will focus on the first two groups of medical providers that specialize in mental health care.

Psychiatrists are medical doctors who specialize in mental health. Their education entails four years of medical school and four years of post-graduate education (i.e., psychiatric residency). Their training emphasizes biological aspects of mental illness. Psychiatrists are trained to assess the mental and physical aspects of psychological problems, prescribe, and monitor psychiatric medication, and provide therapy (American Psychiatric Association, 2021). Psychiatric mental health nurse practitioners are nurse practitioners who have completed a master's or doctoral degree in psychiatric nursing. They provide assessment, diagnosis, therapy for mental health conditions, and prescribe and monitor medications. Psychiatric mental health nurse practitioners work under the supervision of a licensed psychiatrist (NAMI, 2020).

Clinical psychologists possess a doctoral degree in clinical psychology. Their graduate training "focuses on all aspects of human behavior, with an emphasis on research and scientific methods" (American Psychological Association [APA], 2021). Psychologists evaluate a patient's mental health condition utilizing clinical interviews,

psychological evaluations, and testing. They can diagnose mental health disorders and provide individual and group therapy. Clinical social workers obtain a master's level degree and require a two-year supervised training before earning their license. They perform psychotherapy, with a specific focus on "connecting people with the community and support services available there" (APA, 2021). The summary of the licensing requirements for the four types of mental health providers is in Table 1.

Table 1.   Education and Licensing Requirements for Mental Health Providers. Adapted from Congressional Research Service (2018).

Provider Type	Degree	Supervised Practice	Exam
Psychiatrist	Medical Doctorate (MD) or Doctor of Osteopathic Medicine (DO); 4 years	3-4 years of post-doctorate degree supervised clinical training in psychiatry	The American Board of Psychiatry and Neurology exam
Psychiatric Mental Health Nurse Practitioner	Master of Science in nursing; 2 years of coursework and 50 clinical hours	Not required	American Nurses Credentialing Center exam
Clinical Psychologist	Doctoral degree in psychology 5–7 years	2 years or 3,000 hours of supervised clinical training	Examination for Professional Practice in Psychology
Clinical Social Worker	Master of Social Work; 2 years	2 years or 3,000 post-degree supervised clinical hours	The Clinical Exam of the Association of Social Work Boards

C.   LITERATURE REVIEW

1.   Health Care Access and Mental Health Resources Capacity Standards

There are several dimensions of access to care. Per Healthy People 2020, they include coverage, services availability, timeliness, and workforce capacity. The coverage component includes whether an individual has health insurance. Services availability includes having a "usual source of care" (i.e., assigned primary care clinic or hospital) and a "usual primary care provider" (Healthy People 2020, n.d.). The timeliness component is described as "the system's capacity to provide care quickly after a need is recognized"

(Healthy People 2020, n.d.). Timeliness is often dependent on the demand of a particular service, the availability of providers, and the referral processing speed. Finally, workforce capacity includes a "well-distributed capable and qualified workforce and organizational capacity to support culturally competent services and ongoing improvement efforts" (Agency for Healthcare Research and Quality, 2018).

The Institute of Medicine's report on Access to Health Care in America, 1993, outlines several barriers of access to care, including health insurance, low-income, and non-financial impediments such as culture and geographic isolation. Therefore, we can assume geography (i.e., location) as another aspect of health care access. Geographical variation can be viewed in terms of the differences of the Census regions (i.e., Northeast Census region typically scores high on health care access reports) or proximity to an urban center.

When it comes to the MHS beneficiaries, the healthcare coverage element of access to care is negated since active-duty members, dependents, and retirees are all covered by TRICARE insurance (with zero or minimum co-pays). The services availability component is more prominent, especially for active-duty service members and their dependents because military members relocate every two to four years on average and cannot maintain a long-term relationship with the local network of providers. Upon permanent change of station, they get assigned to a new MTF and a new primary care provider. The difficulty in maintaining continuity with the same provider is especially problematic for mental health care (compared to acute care). Timeliness and workforce capacity affect MHS customers the same as the civilian population. In this thesis I will focus on two access components outlined above: geography and availability of mental health providers (as part of timeliness component).

The Health Resources and Services Administration (HRSA) establishes the minimum acceptable ratio of the population to mental health providers. The most common capacity measures include the population to psychiatrist ratio, the population to core mental health providers (i.e., psychiatrists, clinical psychologists, clinical social workers, psychiatric nurse practitioners, and marriage and family therapists) ratio, and the population to both ratios (Health Resources and Services Administration [HRSA], 2021).

According to the HRSA's quarterly report on designated health professional shortage areas, geographical areas with the population to psychiatrist ratio of 30,000 to one and below are considered to have a shortage of psychiatrists; for the areas with the unusually high needs of mental health services, this indicator is 20,000 to one and below (HRSA, 2021). When looking at the ratio of the population to the core mental health providers, the minimum adequate capacity is 9,000 to one and 6,000 to one in areas with unusually high needs. When utilizing both ratios, the threshold is set up at 20,000 to one (psychiatrist) and 6,000 to one (core mental health providers); in the areas "with unusually high demands," these ratios are 15,000 to one and 4,500 to one respectively (HRSA, 2021, pp. 14). In this research I analyze both ratios.

2. Mental Health Access Concerns in the Department of Defense

In light of an increased emphasis on mental health, the recent DOD Inspector General Report on "Evaluation of Access to Mental Health in the DOD" revealed that "the DOD did not consistently meet outpatient mental health access to care standards for active-duty service members and their families" (DODIG, 2020, p. i). Title 32 Code of Federal Regulations establishes access to care standards that dictate "the wait time for an urgent care visit must generally not exceed 24 hours, a routine visit must not exceed one week, and a specialty care referral must not exceed four weeks (28 days)" (DODIG, 2020, p. i). The report has identified that the primary reason for the DOD's inability to meet these standards was a lack of "an MHS-wide model to identify appropriate levels of staffing in direct care" (DODIG, 2020, p. i). The staffing levels are determined by several factors, including the supply of mental health providers and their availability in a given medical facility, as well as the overall demand for mental health services.

This report focused on assessing the access to ambulatory mental health care services rendered by providers directly employed by MTFs for military members and other TRICARE beneficiaries. The research team conducted site visits at 13 locations and analyzed appointment booking and referral data for the visited MTFs. Seven out of 13 MTFs "did not meet the specialty mental health access to care standards" each month (DODIG, 2020, p. 15). Projecting these results, the evaluation team concluded that nearly

half of active-duty members and their dependents experience delays in receiving mental health care. The delays might have attributed to numerous members not receiving mental care at all, not obtaining timely follow-up treatment, or obtaining care from the right provider.

The research team provided several recommendations. The first one was developing an MHS-wide model to detect "appropriate staffing levels" to estimate the number of appointments and personnel required to meet demands for mental health services (DODIG, 2020, p. ii). Another recommendation included updating and clarifying existing DOD and DHA policies, covering mental health access standards. The DOD Inspector General report team also suggested "standardizing the outpatient mental health care process of providing behavioral health services from first patient contact through follow-up care" and "developing standardized mental health access to care measures" (DODIG, 2020, p.38; DODIG, 2020, p.41).

3. Medical Capacity Measures and Methodologies in Literature

Geographic peculiarities of the supply of civilian medical providers and health care utilization rates in the U.S. have been previously explored by several reports. Andrilla et al. (2018) studied geographic variation in the supply of psychiatrists, psychologists, and psychiatric nurse practitioners. They developed several capacity measures, defined as the number of selected mental health providers per 100,000 people at the county-level. The researchers utilized the National Plan and Provider Enumeration System National Provider Identifier (NPI) data to calculate the supply of selected providers. "The county-level Federal Information Processing standard code for every provider was determined based on the practice location's ZIP code" (Andrilla et al., 2018, p. S200). Providers were grouped into three categories based on the location of their practice, including metropolitan (counties with a large or small metro area centers,) micropolitan (counties with the urban core between 10,000 and 50,000 people,) and non-core (counties with the urban core with less than 10,000 people). The authors utilized Claritas 2014 U.S. and the Census Division population data to compute the provider-to-population ratio for each provider type at the

county and geographic regions, respectively. This study's capacity measures most closely resemble the capacity measures developed for the purpose of this research.

The findings suggest that non-metropolitan counties (i.e., micropolitan and non-core) had a much higher shortage of mental health providers than metropolitan counties. For example, nearly a third (27%) of metropolitan counties did not record any psychiatrists, compared with 65% of non-metropolitan counties. The same trend was evident for psychologists and psychiatric nurse practitioners. Looking at the mental health providers' supply disparities across Census Divisions, Andrilla et al. (2018) found even more significant inequalities. New England showed the highest concentration of psychiatrists, psychologists, and psychiatric nurse practitioners among nine Census Divisions. Taking the U.S. average, the ratio of psychiatrists per 100,000 people is 15.6, with 34,1 in New England (the highest proportion) and 9.8 in East South Central. Only 6% of counties in New England lacked a psychiatrist compared to 69% of counties in West North Central, demonstrating an elevenfold difference. Similar was true for psychologists and psychiatric nurse practitioners.

Naylor et al. (2019) analyzed geographic variation in spatial accessibility of U.S. healthcare providers (e.g., internal medicine physicians, primary care, specialist physicians, nurse practitioners, etc.) utilizing the Variable Distance Enhanced 2 step Floating Catchment Area method. This method is claimed to be superior to a simple per capita estimate (i.e., the number of providers per 1,000 people) since it places less emphasis on administrative boundaries, allows for cross-border interactions, and accounts for distance decay of utilization behavior. They concluded that spatial accessibility varied by provider type and wasn't evenly distributed. Family medicine had the highest concentration in the Midwestern states; internal medicine and specialist physicians had the highest spatial accessibility in the Northeast Region. Nurse practitioners demonstrated even distribution across the South, Midwest, and Northeast regions, with the lowest accessibility in the West.

Naylor et al. (2019) constructed several linear regression models to study the relationships between spatial accessibility for different provider types, population characteristics (e.g., age, sex, ethnicity, poverty status, and education,) and regional factors (e.g., rurality and the proximity of a professional school). For specialist and internal

medicine physicians, the proximity of professional schools, predominantly concentrated in urban and higher racially and ethnically diverse areas, was linked to 70% higher spatial accessibility. Higher spatial accessibility of primary care providers (i.e., family physicians and nurse practitioners) was more associated with rural and less racially and ethnically diverse areas.

Cummings et al. (2017) looked at "geographic access to specialty mental health care across high- and low-income U.S. communities." The researchers used the data from the Substance Abuse and Mental Health Services Administration Behavioral Health Treatment Service Locator and the 2013 Zip Code Business Patterns database to determine the "geographic availability of outpatient mental health treatment resources" (Cummings et al., 2017, p. 477). They identified over 18,000 outpatient mental health facilities and aggregated these data into 33,000 zip code tabulation areas (ZCTA). The authors also added the ZCTA sociodemographic variables, including median household income, urban/ rural areas, racial/ethnic composition, age distribution, marital status, etc.). All mental health treatment facilities were separated into four groups and mapped using ArcGIS software on the ZCTA level. This particular study didn't develop standard capacity measures, rather looked at the presence or absence of a particular mental health treatment facility in an individual ZCTA. The authors then constructed several logistic regression models to evaluate the relationship between each community-level variable and "whether a ZCTA had a specific type of mental health treatment resource" (Cummings et al., 2017, p. 471). The bivariate model looked at the independent variable "median household income"; the multivariable models added state indicators, urban/rural setting, total population, and sociodemographic characteristics.

Cummings et al. (2017) determined that over 40% of ZCTAs with the highest income quartile had at least one specialty mental health treatment facility compared to 23% of ZCTAs in the lowest quartile. The bivariate regression showed that mental health treatment facilities had a higher concentration in urban and suburban ZCTAs vs. rural. However, the study wasn't without limitations due to measurement errors, self-reporting of services provided, and limited information of mental health resources capacity at each facility.

The findings of studies described above confirmed that geographical variations in health resources capacity (including mental health) is an issue that can't be overstated. The authors establish an association between the levels of capacity measures and geographical regions, urban and rural areas, and higher and lower income areas. However, all these studies were not without limitations. For example, Andrilla et al. (2018) noted that the NPI dataset wasn't designed to track health professional workforce (some providers with an active NPI might not be practicing; multiple providers might be practicing under one NPI, etc.). As a result, the calculated capacity measures can't be deemed accurate, which could skew the results. The same applies to Cummings et al., whose counts of mental health practices might contain errors due to differences in data collection. Also, even though they "were able to identify the number of mental health treatment facilities," there was no "information about their treatment capacity or waiting times" (Cummings et al., 2017, p. 483).

Despite the limitations, these studies of civilian mental health capacities provide valuable insight about the civilian mental health capacity. My thesis will follow some of their approaches and apply them to address mental health capacity in the military health system. The provider and mental health services data in my study, provided by the DHA, is uniformed across regions and contains only practicing providers with codded assigned and available hours, allowing for the development of more precise capacity measures.

III.   DATA SOURCES AND METHODOLOGY

A.   DATA SOURCES

I utilize four data sources to conduct my analysis. To capture provider information, including a type of provider, the respective geographic location of an MTF, and the number of hours assigned and worked, I use the Medical Expense and Performance Reporting System (MERPS). The data on provider headcounts comes from the Defense Medical Human Resources System – Internet (DMHRSi). To capture the counts and locations of TRICARE beneficiaries, I utilize Defense Enrollment Eligibility Reporting System (DEERS). Finally, I supplement the provider and beneficiary data with the U.S. Census to add general demographic and socio-economic characteristics of the MTF's catchment areas. A more detailed description of the four data sources follows.

1.   The Medical Expense and Performance Reporting System

The Medical Expense and Performance Reporting System (MEPRS) is a comprehensive monthly data system that offers two types of information. First, it reports the standardized cost data across all MTFs within the MHS. Second, it provides detailed data on personnel and workload utilization by work centers for each month (i.e., medical departments within individual MTFs). For this research, I focus on the MEPRS Personnel Detail data obtained from the DHA from FY2016 to FY2020 (60 months across five fiscal years). This portion of MEPRS data includes full-time equivalents (FTE) for every MTF (i.e., each MTF is listed by a defense medical information system identifier, functional cost codes (outlines healthcare services by inpatient/outpatient, as well as a healthcare specialty), personnel category (e.g., civilian, active-duty military, contractor, etc.), service occupation codes (medical specialty prescribed by individual military services), and DOD occupation codes (medical specialty by military service prescribed by the DOD).

The FTE, a key indicator in this dataset, is broken into three categories: assigned FTEs, available FTEs, and non-available FTEs. Assigned FTEs represent clinical and non-clinical personnel that are listed on the facility's manning and staffing documents. Available FTEs depict the amount of labor dedicated to a work center based on personnel

reporting time. Non-available FTEs represent the number of hours expended on official leave, activities unrelated to healthcare mission (e.g., military administrative duties, etc.), and sick time. One FTE is the equivalent of 168 hours of one person-month.

The original panel dataset contained 8,661,323 MTF-month observations, representing 909 unique reporting MTFs and 133 parent MTFs. Parent MTFs are larger medical facilities (i.e., medical centers, hospitals, etc.) that provide inpatient and outpatient primary and specialty care services. They are also accountable for managing outpatient and satellite clinics (i.e., the reporting MTFs) in their geographical area (Abiero et al., 2020). The term MTF is applicable to all medical treatment facilities regardless of size or services they provide.

After data cleaning, I generated two separate datasets, capturing FTEs by mental health providers and FTEs by mental health services. The mental health providers' data includes 31,500 observations, broken down by fiscal year/month, unique MTF, parent MTF, and available and assigned FTEs per military or civilian mental health and primary care providers. The number of unique MTFs and parent MTFs drops to 525 and 110, respectively, because of the final dataset excluded overseas MTFs and those MTFs that don't employ mental health or primary health providers, such as dental clinics, blood centers, and administrative facilities. Mental health providers comprise psychiatrists, psychiatric nurse practitioners, clinical psychologists, and clinical social workers. Primary care providers include general practice physicians, internists, family medicine physicians, physician assistants, and family nurse practitioners. The mental health services dataset contains 22,980 observations, organized by fiscal year/month, individual MTFs, parent MTFs, and available and assigned inpatient and outpatient mental health services. This dataset includes 383 unique MTFs and 109 parent MTFs.

The differences in sample size between the mental health provider and mental health services dataset is due to the following. Provider data include all MTFs that employed mental health specialists and primary care clinicians. The latter providers are so-called "gate-keepers" to specialized mental health services; they must refer a patient to see a specialist. Smaller MTFs like outpatient clinics are only staffed with primary care

providers and don't offer specialized mental health services. This fact explains why the first dataset has more unique MTFs.

2. Defense Medical Human Resources System – Internet

The DHA also provided the data on provider headcounts that was derived from the DMHRSi database. DMHRSi is a human resources (HR) management application that is intended to manage HR information, including individual medical staff members and their work location. The provider headcount panel dataset consists of 878,292 observations from FY2016 to FY2020 and represents monthly data of individual mental health providers and their assigned MTFs. After further data analysis, I discovered that about 23% of providers in the data were missing a unique MTF identifier; therefore, this dataset is only used to calculate the total numbers of mental health providers on the national level.

3. Defense Enrollment Eligibility Reporting System

In order to calculate mental health resources capacity measures, it is necessary to obtain counts of TRICARE beneficiaries by geographic locations. Beneficiary information between CY2016 to CY2020 were obtained from DEERS. The beneficiary data contain all TRICARE-covered personnel, such as active-duty military service members, dependents, and retirees. The individual beneficiary data were aggregated to monthly-MTF level based on the assigned MTF. The monthly data are broken into two parts – one contained monthly counts of all TRICARE beneficiaries other than active-duty personnel, and the other included active-duty personnel. The non-active dataset contained 18,468 observations. The variables included fiscal year/month, individual MTFs, and a total number of dependents in an MTF catchment area, broken down by military service, age, and dependent status. The data on active-duty members had 18,012 observations; it had a similar organization to the dependent data. Two datasets were merged to calculate the total beneficiary counts per the MTF catchment area. The catchment area is defined as an area within 20 miles of an MTF (which is considered an adequate commuting distance).

4. United States Census Data

My analysis' last set of variables comes from the United States Census from 2016 to 2020, aggregated to an MTF's catchment area (20-mile radius). The Census provides demographic and socio-economic information about the population. This information includes population by gender and race, population under the poverty line, average income per individual, and population over 65 years old. In order to define demographic and socio-economic information around an MTF's 20-mile catchment area, the PI of the parent project of this thesis obtained longitude and latitude coordinates of each MTF through online map queries and longitude and latitude coordinates of the interior center of ZIP code of each beneficiary from the Census. Any ZIP code which spherical straight-line distance is within 20-mile of a given MTF's geographical coordinates is part of the catchment area.

To show aggregate trend by regions, I group MTFs and their catchment areas by the United States census regions. The Census divides the U.S. into four regions, Northeast, Midwest, South, and West (United Sates Census Bureau, 2010). I separate Alaska from the West region into a fifth category since TRICARE defines Alaska as a unique region. The Northeast region includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, and Pennsylvania. The total average number of TRICARE beneficiaries in this region is 650,159 (7.3%). The Midwest region contains Indiana, Illinois, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota, with the average number of beneficiaries accounting for 1,107,175 (12.4%). The South region includes Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas. The South region is the largest region with 4,899,481 (54.8%) TRICARE active-duty and dependent beneficiaries. The West region incorporates the following states: Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, Wyoming, California, Hawaii, and Washington. This region accounts for 2,202,413 (24.6%) beneficiaries. Finally, the Alaska region services 82,908 (0.9%) TRICARE beneficiaries on average.

Table 2 shows the distribution of TRICARE beneficiaries by census regions and, in contrast, the distribution of the U.S. total population. The table illustrates that TRICARE beneficiaries are not proportionally distributed across census regions compared to the total U.S. population. A disproportionate number of TRICARE recipients reside in the South region, exceeding the share of the total population by 16.5 pp. Midwest and Northeast include a smaller percentage of TRICARE beneficiaries than the total number of the general population. The share of West is relatively similar in both categories. Finally, Alaska enjoys a more significant portion of TRICARE users than its total population share.

Table 2.   Distribution of the U.S. Total Population and TRICARE Beneficiaries by the U.S. Census Regions. Adapted from U.S. Census (2020).

Census Region	Total Population (2020)		TRICARE Beneficiaries (2016-2020)	
	Number	Share (%)	Number	Share (%)
Northeast	57,159,838	17.2	650,159	7.3
South	127,225,329	38.3	4,899,481	54.8
Midwest	68,841,444	20.7	1,107,175	12.4
West	77,933,743	23.5	2,202,413	24.6
Alaska	733,391	0.3	82,908	0.9

B.   CAPACITY MEASURES

My study analyzes the geographical variations and temporal changes of mental health resource capacity measures in MTFs. I develop several capacity indicators, including the number of providers in assigned FTEs per 6,000 TRICARE beneficiaries within the 20-mile catchment area, the number of providers in available FTEs per 6,000 TRICARE beneficiaries, and the number of provider headcounts per 6,000 TRICARE beneficiaries, and the number of psychiatrists in assigned/available FTEs and headcounts per 20,000 TRICARE beneficiaries. Utilizing the dataset with mental health services FTEs, I also look at the number of clinical staff in available and assigned FTEs for inpatient and outpatient mental health services (regardless of the clinician's specialty area) per 6,000 TRICARE beneficiaries.

Note that the provider and service FTE measures reveal two different facets of mental health capacity, even though there are some overlaps. The provider FTE capacity shows mental health capacity in terms of provider specialty—some of these mental health specialists might work to support primary care clinics. The service FTE capacity shows mental health capacity in terms of specialty clinics—the clinical staff in these clinics are not all mental health providers. For example, registered nurses without subspecialty could support the mental health clinic. I analyze the above capacity measures on a national level (i.e., the total number of mental health providers and the total number of TRICARE beneficiaries in CONUS), on a regional level (i.e., total numbers broken down by four census regions and Alaska), and on micro-level (i.e., the total number of mental health providers broken down by parent MTF's catchment areas).

Another important methodology decision is to aggregate the provider and beneficiary counts to the parent MTF for the micro-level analysis. I choose to aggregate to the parent MTF vs. unique MTF for the following reason. Many unique MTFs are small satellite clinics that operate under the umbrella of a parent MTF. The majority of small branch clinics don't employ any mental health providers; patients attached to these clinics are typically referred to a parent MTF for specialized mental health services. Therefore, aggregating the number of providers and beneficiary counts to unique MTFs would produce deflated and inaccurate capacity measures.

C.   DESCRIPTIVE STATISTICS

After combining the four datasets, the final panel dataset for the analysis includes 6,282 observations and numerous variables broken down into several groups. The main variable categories include parent MTF, date, mental health provider counts (in FTEs and headcounts), TRICARE beneficiary service and demographic characteristics, demographic and socioeconomic characteristics of the general population, and mental health capacity measures. There are 111 unique parent MTFs studied from January 2016 to September 2020 (57 months). Figure 3 depicts the locations of parent MTFs, where the size of the location point varies by the number of TRICARE recipients. TRICARE beneficiary counts and local population counts are aggregated to a parent MTF catchment area. Tables 3 and

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4 represent the distribution of the beneficiary population used in the final regression analysis, both overall and by whether the catchment area has adequate mental health and psychiatric capacity. The tables describe the studied populations' catchment areas in terms of their geographic region, service characteristics, and demographic and socioeconomic attributes.

In the final sample, the average number of mental health providers is four per 6,000 TRICARE beneficiaries, ranging from 0.7 in the shortage areas and 4.3 in the areas with adequate capacity. Overall, 7.4% of TRICARE recipients live in areas with a shortage of mental health providers. Regarding the distribution of TRICARE beneficiaries across census regions, the South region records 57.2%, West – 28.8%, Midwest – 8.8%, Northeast – 4.1%, and Alaska 1.2% in the whole sample. However, when looking at the TRICARE recipients in the mental health providers shortage areas, the share of the South region increases by 19 pp (76%), the share of West decreases by 16 pp (12.8%), the percentage of Northeast doubles (10.7%), and Midwest and Alaska record 0. The distribution of the TRICARE population in shortage areas is not proportionate to the overall sample.
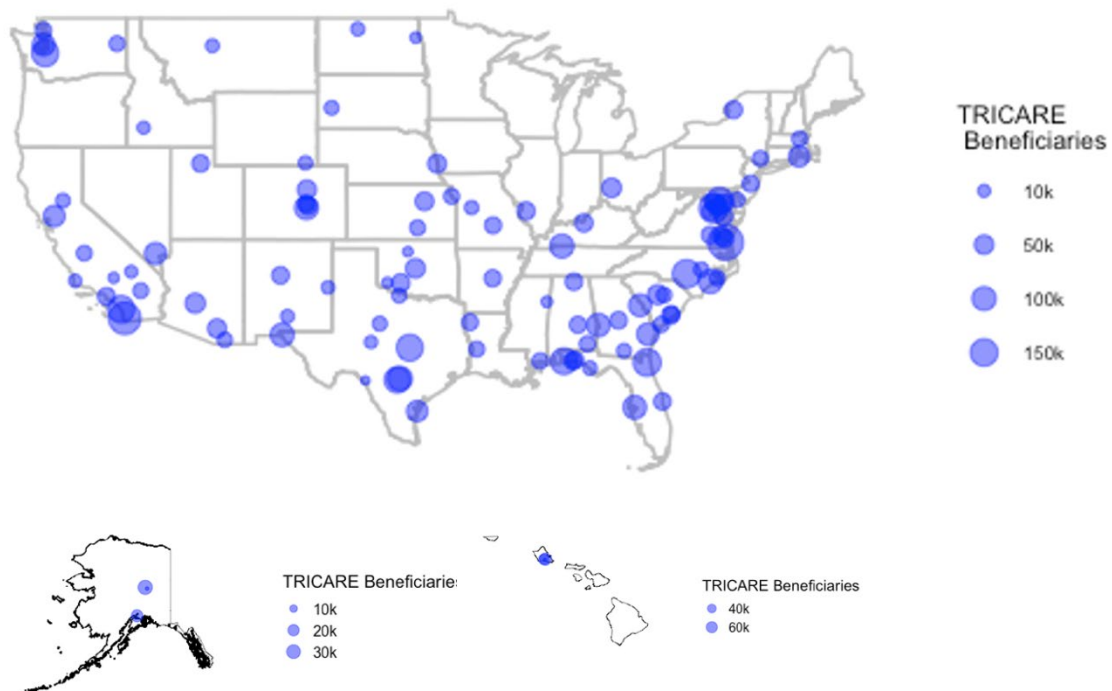
Figure 3.   Parent MTFs by TRICARE Population (in 1,000 Beneficiaries).

The majority (61.3%) of beneficiaries in the mental health providers under-capacity areas live in the areas with the USN as a predominant service (i.e., where USN service members constitute the majority of active-duty personnel). It's worth noting that in the whole sample, the share of the USN is only 22.6%. Nearly a third of TRICARE recipients reside in the areas where the USA is a servicing branch; however, this indicator is 0 for the shortage areas. The distribution of TRICARE beneficiaries in the mental health providers shortage areas is as follows: 15.2% of active duty and 84.8% of non-active duty, including 40.6% of adult dependents, 24.4% of retirees, and 19.8% of dependents under the age of 18. In contrast, in the whole sample, the average share of active-duty personnel is 22.2%; out of 77.8% of non-active-duty members, the share of retirees is 19.3%, the percentage of dependents under the age of 18 – 22.5%, and the share of adult dependents – 36%.

The analysis of demographic and socioeconomic characteristics of the general population in the MTF catchment areas reveals that the share of the White people in the shortage areas is higher (71%), compared to 66% in the areas with an adequate supply of mental health providers. The shares of Blacks and Asians don't fluctuate much, decreasing from 17.6% to 15.3% and 5.6% to 4.7% in the shortage areas. The percentage of Hispanics increases in the under-capacity areas (20.5% vs. 17.9%). The slight change in racial distribution of the general population in the shortage areas is not surprising since the white population gravitates towards rural areas, which often face shortages of mental health providers (Naylor et al., 2019). On average, the shortage areas have a slightly higher share of the elderly population, 14.3%, compared to 12.8% in the areas with adequate mental health providers capacity. The median household income is higher in the under-capacity areas with a lower share of the population living under the poverty line. See Table 3.

Table 3.   Descriptive Statistics for TRICARE Beneficiaries by Overall,
Under- , and Adequate Mental Health Provider Capacity in MTF's
Catchment Areas

Number of Observations	6,282					
	Whole Sample		**Under**		**Adequate**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Capacity Measures						
Number of Mental Health Providers per 6,000	3.976	3.582	0.723	0.206	4.252	3.597
Under Capacity	0.074	0.262				
Census Region						
Northeast	0.041	0.198	0.107	0.310	0.036	0.185
South	0.572	0.495	0.765	0.425	0.557	0.497
Midwest	0.088	0.283	0.000	0.000	0.095	0.293
West	0.288	0.453	0.128	0.335	0.300	0.458
Alaska	0.012	0.107	0.000	0.000	0.012	0.111
Beneficiary distribution						
Total	99212.77	76789.94	87693.54	42938.52	100140.1	78815.47
Active Duty	22351.88	20964.35	13852.18	9357.54	23036.1	21484.27
Dependents/Retirees	76860.89	58268.85	73841.36	34812.95	77103.97	59753.84
USA	0.370	0.483	0.000	0.000	0.400	0.490
USAF	0.317	0.465	0.184	0.388	0.327	0.469
USMC	0.066	0.248	0.036	0.188	0.068	0.252
USN	0.226	0.418	0.613	0.488	0.195	0.396
Joint	0.021	0.143	0.166	0.373	0.009	0.096
Share of Active Duty	0.222	0.089	0.152	0.068	0.228	0.088
Share of Non-Active Duty	0.778	0.089	0.848	0.068	0.772	0.088
Share of Retirees	0.193	0.059	0.244	0.033	0.189	0.058
Share of Children	0.225	0.033	0.198	0.020	0.227	0.033
Share of Other	0.360	0.047	0.406	0.038	0.356	0.046
Share of TRICARE Remote Population	0.009	0.019	0.010	0.011	0.009	0.020
Census Demographic and Socio-Economic Characteristics						
Total population	1034558	993838.5	1195662	1707561	1021415	910376.2
White	0.661	0.141	0.707	0.121	0.657	0.142
Black	0.175	0.129	0.153	0.075	0.176	0.133
Asian	0.055	0.073	0.047	0.057	0.056	0.074
Hispanic	0.181	0.169	0.205	0.214	0.179	0.165
Share of Elderly	0.129	0.026	0.143	0.018	0.128	0.027
Share of Population Under Poverty	0.142	0.036	0.130	0.036	0.143	0.036
Median Family Income	30020.04	6681.356	31300.71	5352.834	29915.56	6768.079

Author tabulation of data combined from sources discussed in Chapter III Section A.

Table 4 represents the same descriptive statistics, focusing on the psychiatrist shortage areas. On average, an MTF catchment area records 2.2 psychiatrists per 20,000 TRICARE beneficiaries, with 0.5 physiatrists in the shortage areas and 3.4 psychiatrists in the areas with an adequate supply of psychiatrists. 41.2% of TRICARE beneficiaries live in areas with a shortage of psychiatrists, which is glaring compared to the same indicator in Table X. The distribution of the TRICARE population, who live in the shortage areas,

by census regions is as follows: South (61.1%), West (24.8%), Northeast (7.5%), Midwest (6.2%), and Alaska (0.4%). Out of those, 45.6% live in the areas where the USAF is a dominant branch of service. The share of active-duty and non-active-duty beneficiaries in the shortage areas follows the same trend described above. Demographic and socio-economic characteristics don't fluctuate much for the areas with adequate and inadequate psychiatric capacity.

Table 4.   Descriptive Statistics for TRICARE Beneficiaries by Overall, Under-, and Adequate Psychiatrist Capacity in MTF's Catchment Areas

Number of Observations	6,282					
	Whole Sample		Under		Adequate	
	Mean	SD	Mean	SD	Mean	SD
Capacity Measures						
Number of Psychiatrists per 20,000	2.171	4.023	0.494	0.291	3.45	4.969
Under Capacity	0.412	0.492				
Census Region						
Northeast	0.041	0.198	0.075	0.264	0.017	0.128
South	0.572	0.495	0.611	0.488	0.545	0.498
Midwest	0.088	0.283	0.062	0.242	0.106	0.308
West	0.288	0.453	0.248	0.432	0.316	0.465
Alaska	0.012	0.107	0.004	0.065	0.017	0.128
Beneficiary distribution						
Total	99212.77	76789.94	73190.49	49306.9	117414.6	86700.86
Active Duty	22351.88	20964.35	13886.21	12218.6	28273.36	23609.11
Dependents/Retirees	76860.89	58268.85	59304.28	38968.4	89141.23	65896.32
USA	0.370	0.483	0.227	0.419	0.471	0.499
USAF	0.317	0.465	0.456	0.498	0.219	0.414
USMC	0.066	0.248	0.044	0.206	0.081	0.272
USN	0.226	0.418	0.242	0.428	0.215	0.411
Joint						
Share of Active Duty	0.222	0.089	0.186	0.079	0.248	0.087
Share of Non-Active Duty	0.778	0.089	0.814	0.079	0.752	0.087
Share of Retirees	0.193	0.059	0.223	0.053	0.173	0.053
Share of Children	0.225	0.033	0.210	0.027	0.235	0.033
Share of Other	0.360	0.047	0.382	0.044	0.345	0.043
Share of TRICARE Remote Population	0.009	0.019	0.007	0.018	0.010	0.019
Census Demographic and Socio-Economic Characteristics						
Total population	1034558	993838.5	1029518	1086379	1038159	922193.3
White	0.661	0.141	0.668	0.140	0.656	0.141
Black	0.175	0.129	0.187	0.134	0.166	0.125
Asian	0.055	0.073	0.045	0.059	0.062	0.081
Hispanic	0.181	0.169	0.161	0.145	0.196	0.184
Share of Elderly	0.129	0.026	0.138	0.023	0.122	0.026
Share of Population Under Poverty	0.142	0.036	0.144	0.037	0.141	0.035
Median Family Income	30020.04	6681.356	30074.75	5305.23	29980.96	7512.185

Author tabulation of data combined from sources discussed in Chapter III Section A.

D.   GENERAL METHODOLOGY

Multivariate regression models are used to perform the micro-level analysis. I run five models to detect whether the mental health capacity measures defined above have any association with a set of independent variables. I use the same set of independent variables for all models. The variables of interest in the first three models are the total number of mental health providers, the total number of mental health services clinical staff, and the total number of psychiatrists. The other two models look at a binary indicator of whether a catchment area is considered an area with an adequate supply of mental health providers or psychiatrists. The numbers of mental health providers, psychiatrists, and mental health services clinical staff are measured in available FTEs. I utilize statistical software STATA version 16.1 to perform the analysis.

1.   Dependent Variables

In this research, I study five mental health capacity outcomes. The first outcome is the number of mental health providers in a MTF's catchment area. This continuous variable ranges from 1.47 to 267.03 with a mean of 32.94 mental health providers. The two MTFs that record the highest numbers are Walter Reed National Military Medical Center, which accounts for 216 mental health providers on average, and Tripler Army Medical Center, with an average of 213 providers. Both are large medical centers located in densely populated areas. In contrast, the two MTFs with the lowest numbers of mental health providers are Naval Health Clinic Annapolis and Naval Health Clinic Corpus Christi, with an average number of providers of 3.13 and 5.47, respectively.

The second outcome is the number of mental health services clinical staff in a parent MTF's catchment area. This variable shows the mean of 44 clinicians, ranging from zero to 344.53. Walter Reed National Military Medical Center and Tripler Army Medical Center account for the highest number of clinical providers, 232.5 and 199.85 on average. Naval Health Clinic Annapolis, Naval Health Clinic Corpus Christi, and El Segundo Clinic (USAF 61st Medical Squadron) are among parent MTFs with the lowest mental health clinical staff indicators.

The third studied dependent variable is the number of psychiatrists. The average number of physiatrists is 5.4, ranging from zero to 103.36. Walter Reed National Military Medical Center (79.3) and Tripler Army Medical Center (79.34) record the highest numbers of psychiatrists. A total of 48 MTF catchment areas show zero psychiatrists at least once during the observation period (57 months), with seven parent MTFs reporting zero psychiatrists every month throughout the studied timeline. They include Vandenberg Clinic (USAF 30th Medical Group), Altus Clinic (USAF 97th Medical Group), Ellsworth Clinic (USAF 28th Medical Group), El Segundo Clinic (USAF 61st Medical Squadron), Naval Health Clinic Annapolis, and Vance Clinic (USAF 71st Medical Group), and Ross Clinic (USAF 17th Medical Group). Except for El Segundo and Annapolis, most of these facilities are in remote areas away from large urban centers.

The fourth dependent variable is a binary indicator with a value of 1 if an MTF's catchment area is considered a shortage area (i.e., the number of mental health providers per 6,000 beneficiaries is less than one) and a value of 0 for the areas with an adequate number of providers (i.e., the number of mental health providers per 6,000 beneficiaries is more than one). The final sample includes 11 parent MTFs, covering 14.5% of TRICARE beneficiaries, which catchment areas are classified as shortage areas during at least one month of the observation period; three MTF's consistently recorded under-capacity measures during the entire observation period (57 months). The three MTFs include Naval Health Clinics Corpus Christi and Annapolis and the USAF Clinic El Segundo.

Finally, the last outcome is a binary variable indicating whether an MTF's catchment area is a shortage area (1) or an area with adequate psychiatrists (0) capacity. In the dataset, 93 parent MTFs experience a shortage of psychiatrists at least one month during the observation period (covering 73% of TRICARE beneficiaries) and 27 parent MTFs – throughout the entire observation period. Most MTF's catchment areas that consistently demonstrated the shortage of psychiatrists (27 MTFs) are small clinics in remote geographical areas.

2.   Regression Models

a.   *Bivariate and Multivariate Linear Regression Models*

For each dependent variable, I construct six bivariate and one multivariate regression models. The bivariate models relate blocks of variables accounting for certain factors, while the multivariate model simultaneously relates all factors. The three outcome variables are log-transformed to "normalize" the skewed data. Standard errors in all models are clustered around parent MTF's catchment areas. The six bivariate models take on the following form:

Log(Total Number of Providers) = f (β_0 + β_1Block variables + β_2FY + β_3FYM + β_4Log(TRICARE Total) + u   (1)

Where the common elements across all 6 models are:

> *Log(Total Number of Providers)* = Number of mental health providers, number of mental health services clinical staff, or number of psychiatrists in an MTF's catchment area log-transformed

> *FY* = a vector of fiscal year fixed effects for FY2016 through FY2020

> *FYM* = a vector of fiscal year months fixed effects for January through December

> *Log(TRICARE Total)* = Number of TRICARE beneficiaries in an MTF's catchment area log-transformed

Models 1 through 6 differ by the key block variables that are entered in each model to estimate the overall differences in capacity (if any) by each set of factors:

(Model 1) MTF's catchment area located in Northeast (reference group), South, Midwest, West, or Alaska.

(Model 2) *Military Branch* = Binary variable for whether the primary service providers are USA (reference group), USN, USAF, USMC, or Joint service.

(Model 3) Distribution of TRICARE beneficiary categories in the catchment area TRICARE beneficiary characteristics variables include:

> *Share of retirees* = categorical variable with three quantiles (low, medium, high) representing the share of retirees in the total number of TRICARE beneficiaries (active-duty is a reference category)

Share of children = categorical variable with three quantiles (low, medium, high) representing the share of dependents under the age of 18 in the total number of TRICARE beneficiaries (active-duty is a reference category)

Share of other dependents = categorical variable with three quantiles (low, medium, high) representing the share of other adult dependents in the total number of TRICARE beneficiaries (active-duty is a reference category)

(Model 4) Catchment area's General population demographic distribution:

Share of Blacks = binary variable with 1 representing third top quantile of the share of Blacks in an MTF's catchment area's general population

Share of Hispanics = binary variable with 1 representing third top quantile of the share of Hispanics in an MTF's catchment area's general population

(Model 5) Catchment area's poverty condition:

Share of General Population Under Poverty = categorical variable with three quantiles (low, medium, high) representing the share of population under poverty in the total number of general populations in an MTF's catchment area

(Model 6) Catchment area's income distribution:

Median Income = categorical variable with three quantiles (low, medium, high) representing median household income of general populations in an MTF's catchment area

The multivariate linear regression model combines the five block bivariate models. The empirical model is in Equation (2):

Log(Total Number of Providers) = f $(\beta_0 + \beta_1 West + \beta_2 Military\ Branch + \beta_3 TRICARE$ Beneficiary Characteristics + β_4 General Population Demographics + β_5 Share of Population Under Poverty + $\beta_6 FY + \beta_7 FYM + \beta_8 Log(TRICARE\ Total) + u)$ (2)

b.   *Bivariate and Multivariate Logistic Regression Models*

I use bivariate and multivariate logistic regressions to analyze the two binary outcomes. The construction of the logistic regressions follows the same principle as linear regression models. I utilize the same set of independent variables for bivariate and multivariate models. The empirical model is shown in Equation (3):

Prob(Under Capacity) = f $(\beta_0 + \beta_1 \text{West} + \beta_2 \text{Military Branch} + \beta_3 \text{TRICARE Beneficiary}$
Characteristics $+ \beta_4 \text{General Population Demographics} + \beta_5 \text{Share of Population Under}$
Poverty $+ \beta_6 \text{FY} + \beta_7 \text{FYM} + u)$ (3)

where:

Prob(Under Capacity) = Probability of an MTF's catchment area to be classified as an area with a shortage of mental health providers or psychiatrists

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IV.   RESULTS AND FINDINGS

A.   INTRODUCTION

My study determines geographical and temporal variations in mental health resource capacity in the MTF's catchment areas. I conduct three levels of analyses to portray any variation. The *macro-trend* analysis looks at geographical and temporal variations of mental health providers on a national level. I develop capacity measures based on the total number of TRICARE beneficiaries and the total number of mental health providers assigned to the MTFs. The *regional-trend* analysis breaks down the national trend into four census regions and Alaska to distinguish regional variations. This portion of my study looks further at the state-level to provide a more detailed regional variation picture. The *micro-level* analysis looks at the mental health capacity at the parent MTF level (which include all mental health providers in the satellite clinic and TRICARE beneficiaries covered by both the parent and child MTF). I estimate multiple regression models to discover possible associations between mental health capacity measures and geographic, military service-specific, demographic, and socio-economic characteristics of MTF's catchment areas.

B.   MACRO-TREND ANALYSIS RESULTS

My study analyzes the geographical variations and temporal changes of mental health resource capacity measures in MTFs. I developed several capacity indicators, including the number of providers in assigned FTEs per 6,000 TRICARE beneficiaries, the number of available FTEs per 6,000 TRICARE beneficiaries, and the number of provider headcounts per 6,000 TRICARE beneficiaries. Utilizing the dataset with mental health services FTEs, I also looked at the number of clinical staff in available and assigned FTEs for inpatient and outpatient mental health services per 10,000 TRICARE beneficiaries. Note that the provider and service FTE measures reveal two different facets of mental health capacity, even though there are some overlaps. The provider FTE capacity shows mental health capacity in terms of provider specialty—some of these mental health specialists might work to support primary care clinics. The service FTE capacity shows mental health capacity in terms of specialty clinics—the clinical staff in these clinics are not all mental health providers. For example,

registered nurses without subspecialty could support the mental health clinic. I analyze the above capacity measures on a national level (i.e., the total number of mental health providers and the total number of TRICARE beneficiaries in CONUS) and a regional level (i.e., total numbers broken down by four census regions and Alaska). The next section of this chapter focuses on these measures on a parent MTF level.

Figure 4 represents the overall monthly trends of mental health provider availability (including psychiatrists) in MTFs per 6,000 TRICARE beneficiaries. The three trend lines depict available FTEs and assigned FTEs in clinical hours (i.e., excluding FTEs in non-clinical capacity such as administration), as well as headcounts. The capacity measures don't show significant temporal fluctuation. There is a slight growth in numbers from the beginning of 2016 through the first several months of 2017, followed by a slight decline until January 2020. Mental health provider numbers in available FTEs range from 1.91 to 2.83 providers per 6,000 people, with a mean of 2.3 during the observation period. The number of providers in assigned FTEs is close to the available FTE measure, with an average number of 2.21 providers, ranging from 1.99 to 2.49 providers per 6,000 TRICARE beneficiaries. It's worth noting that the availability of mental health providers surpasses assignment during 39 out of 58 observable months. One possible explanation might be that medical providers work longer hours than initially assigned (potentially seeing more patients or spending more time on administrative duties, like writing patient notes).

The number of providers in headcounts per 6,000 beneficiaries is twice as high as the number of providers in available and assigned FTEs. The average number of providers equals 4.08, with a minimum of 63.84 and a maximum of 4.49 mental health providers per 6,000 individuals. Two reasons can cause this disparity. First, provider headcounts don't distinguish between part-time and full-time mental health providers (this only applies to civilian providers since active-duty members are considered full-time employees). As mentioned above, one FTE is equivalent to 168 hours per month; therefore, a part-time employee will be assigned a fraction of an FTE. Second, my data that capture providers in FTE only include clinical hours, meaning that mental health providers assigned to other than clinical duties (i.e., administrative) will not be captured in my final FTE counts.

The HRSA classifies the areas with a ratio of mental health providers below one to 6,000 people (to 4,500 for regions with unusually high demands) as areas that experience a shortage of mental health providers. My macro-level analysis outcomes show that the three capacity measures in Figure 4 consistently stay above the shortage classification. Provider numbers in FTEs exceed this measure 2.3 times; provider numbers in headcounts: 4 times.
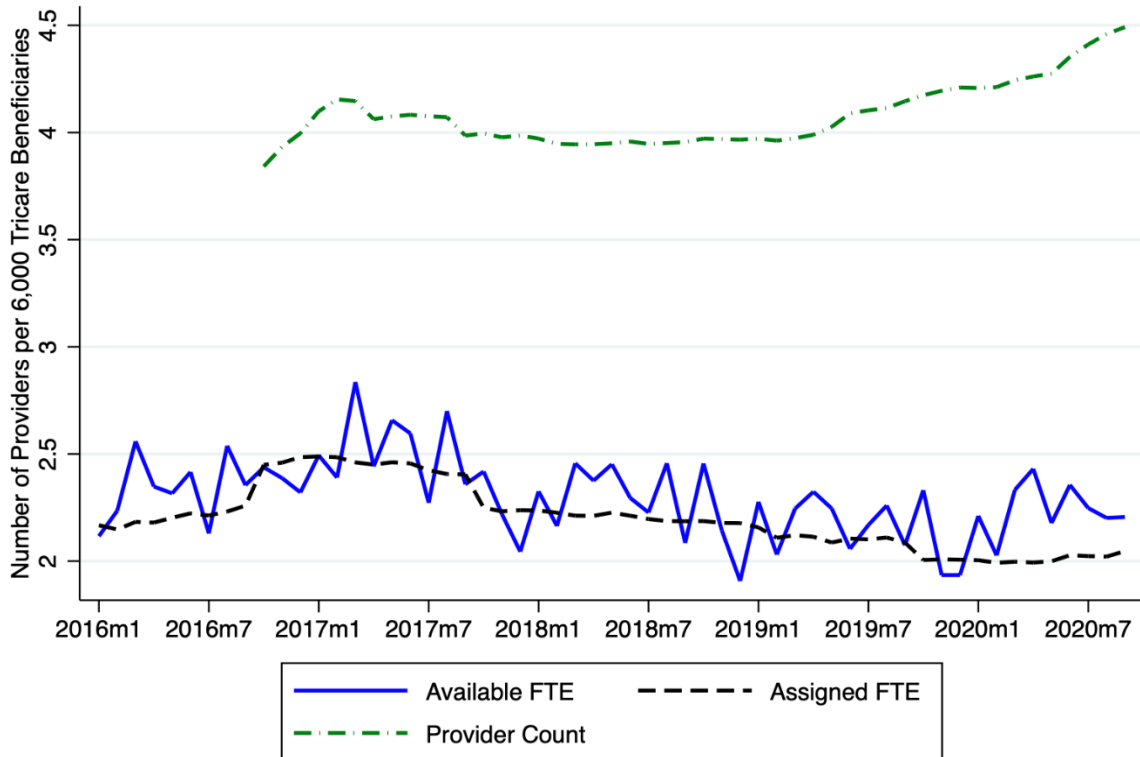
1 FTE (Full Time Equivalent = 168 hours or one person-month)
Mental Health Providers include psychiatrists, psychiatric nurse practitioners, psychologists, and social workers

Figure 4.   Number of Mental Health Providers in MTFs per 6,000 Beneficiaries

Figure 5 depicts the monthly trend in terms of the number of psychiatrists per 20,000 TRICARE beneficiaries in available FTEs, assigned FTEs, and headcounts. The three trend lines behave similarly to the overall mental health provider capacity in Figure 4, increasing through March 2017 and gradually declining almost until the end of the observation period. The FTE availability measure records an upward spike in the last six months of the observation period. The mean of the psychiatrists in available FTEs is 1.25 FTEs per 20,000 beneficiaries, ranging from 1.08 to 1.48. When comparing this measure to the HRSA's

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shortage classification (for psychiatrists, it is less than one per 20,000 in the areas with steady), the average availability capacity slightly exceeds the required threshold in the areas with steady demands.
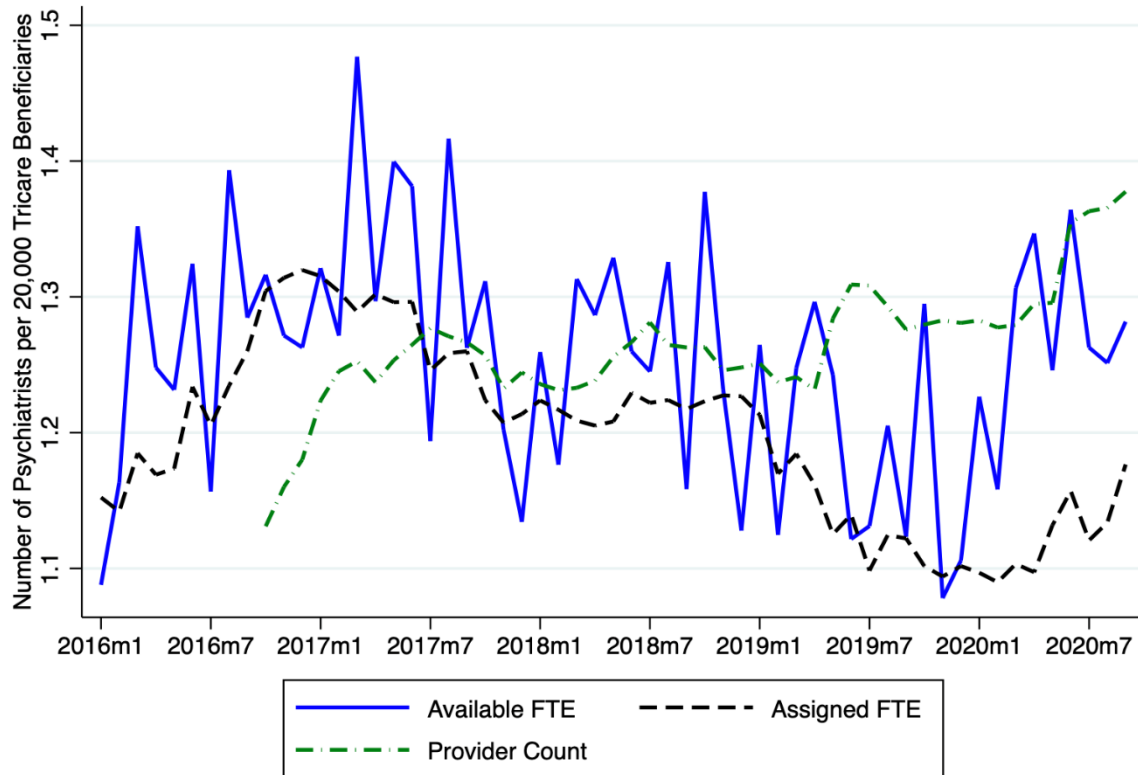
Figure 5. Number of Psychiatrists in MTFs per 20,000 Beneficiaries

The number of psychiatrists measured in assigned FTE rarely exceeds the FTE availability. The average number of providers is 1.2 psychiatrists per 20,000 beneficiaries, ranging from 1.09 to 1.32, above the HRSA shortage standard for the areas with the steady demands. The third capacity measure (the number of psychiatrists per 20,000 TRICARE beneficiaries in headcounts) records very similar values, with an average of 1.26 psychiatrists per 20,000. It's important to note that Figure 5 does not demonstrate a large gap between the number of psychiatrists measured in FTEs and headcounts. The possible explanation is that most psychiatrists are directly involved in clinical care, where other mental health professionals can be pulled to perform administrative or other not clinical duties.

C.   REGIONAL-TREND ANALYSIS RESULTS

Figure 6 illustrates the number of mental health providers by Census regions in available FTEs, with Alaska grouped separately. On a regional level, I only use datasets with provider counts in FTEs and exclude the data on providers in headcounts. As previously mentioned, about 23% of headcount observations were missing an MTF association, which made it impossible to map them to any region.
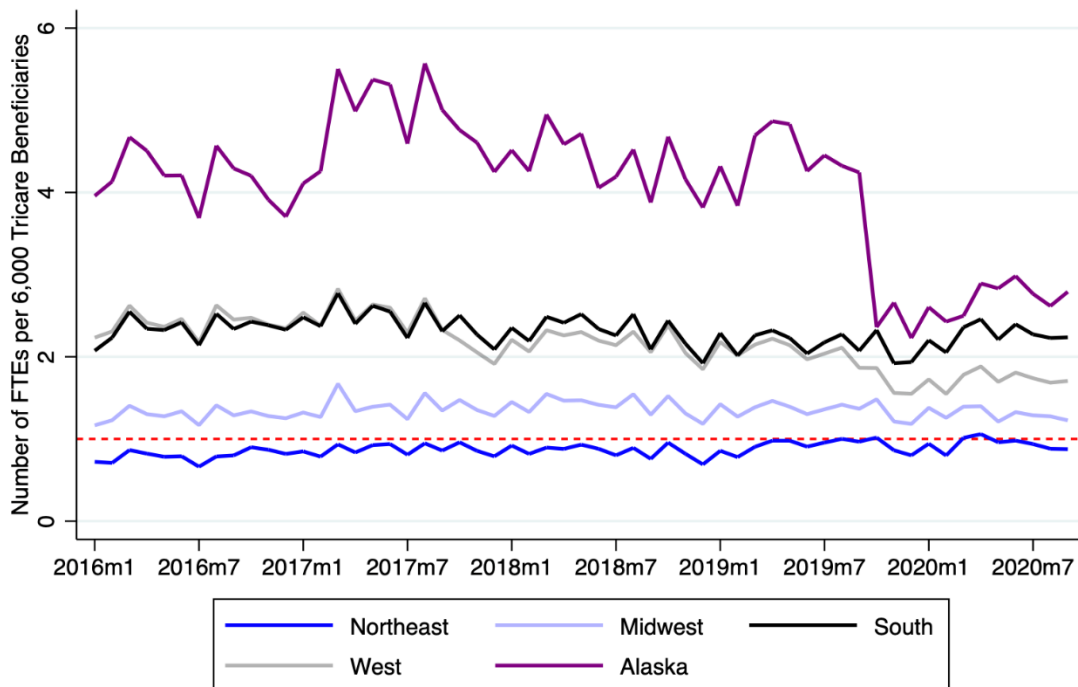
1 FTE(Full Time Equivalent)=168 hours or one person-month
Mental Health Providers include psychiatrists, psychiatric nurse practitioners, psychologists, and social workers
The area below the red-dotted line represents the mental health providers under-capacity values according to
the HRSA's shortage definition

Figure 6.   Number of Available Mental Health Providers in MTFs per 6,000
Beneficiaries by Regions

Except for Alaska, provider numbers don't demonstrate much temporal variation. The values for Alaska are significantly higher in the first four years of the observation period, with a sharp decline starting October of 2019. In the last 12 months of the studied period, its number of psychiatrists aligns with the South region. The sharp decline can be attributed to data discrepancies or a different method of accounting for providers. It's also worth noting that Alaska represents less than 1% of the TRICARE population; therefore, the number of

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providers might be slightly inflated. The average number of providers in Alaska is 4.07 per 6,000 people, ranging from 2.23 to 5.57. This indicator remains well above the HRSA's shortage classification.

The South and West regions (account for 80% of the TRICARE population) have very similar mental health providers per beneficiary ratios, with South staying just slightly above. The average number of mental health providers in these regions is 2.3 and 2.1 per 6,000 beneficiaries. Capacity measures in the South and West exceed the shortage area classification two times. The number of providers in the Midwest is lower than in the regions described above. However, with an average of 1.35 providers per 6,000 beneficiaries, Midwest does not fall below the threshold. Finally, the smallest region, the Northeast, which accounts for 7% of TRICARE beneficiaries, records an average of 0.87 mental health providers, exceeding the shortage threshold only three out of 57 months of the observation period. Therefore, the Northeast can be categorized as a region that experiences a shortage of mental health providers according to the HRSA's guidelines. The red dotted line the graph (Figure 6) represents the one to 6,000 beneficiary's threshold; observations that fall below the line are considered regions with the shortage of mental health providers.

Figure 7 depicts the number of psychiatrists in MTFs per 20,000 TRICARE beneficiaries by census Regions in available FTEs. This graph demonstrates high disparity between regions, with the West's capacity measure exceeding Northeast 5 times. Alaska experiences the highest temporal fluctuation, with the biggest amplitude of one (ranging from 0.58 to 1.59 psychiatrists per 20,000 beneficiaries). West records the highest average number of providers during the observation period with the value of 1.44 psychiatrists, followed by South with 1.33 psychiatrists per 20,000 beneficiaries. Midwest and Northeast regions show the lowest numbers, 0.67 and 0.26 respectively. These values put Midwest and Northeast in a category of the areas with a shortage of psychiatrists per HRSA's standards. For Northeast, the number of psychiatrists per 20,000 people is three times smaller than the shortage standard. I must note that these capacity measures are slightly deflated since I use the total number of TRICARE beneficiaries by regions, regardless of their proximity to an MTF. Based on the data on TRICARE beneficiaries, 30% of eligible beneficiaries live outside of a 20-mile radius of an MTF (i.e., they don't reside in an MTF's catchment area).
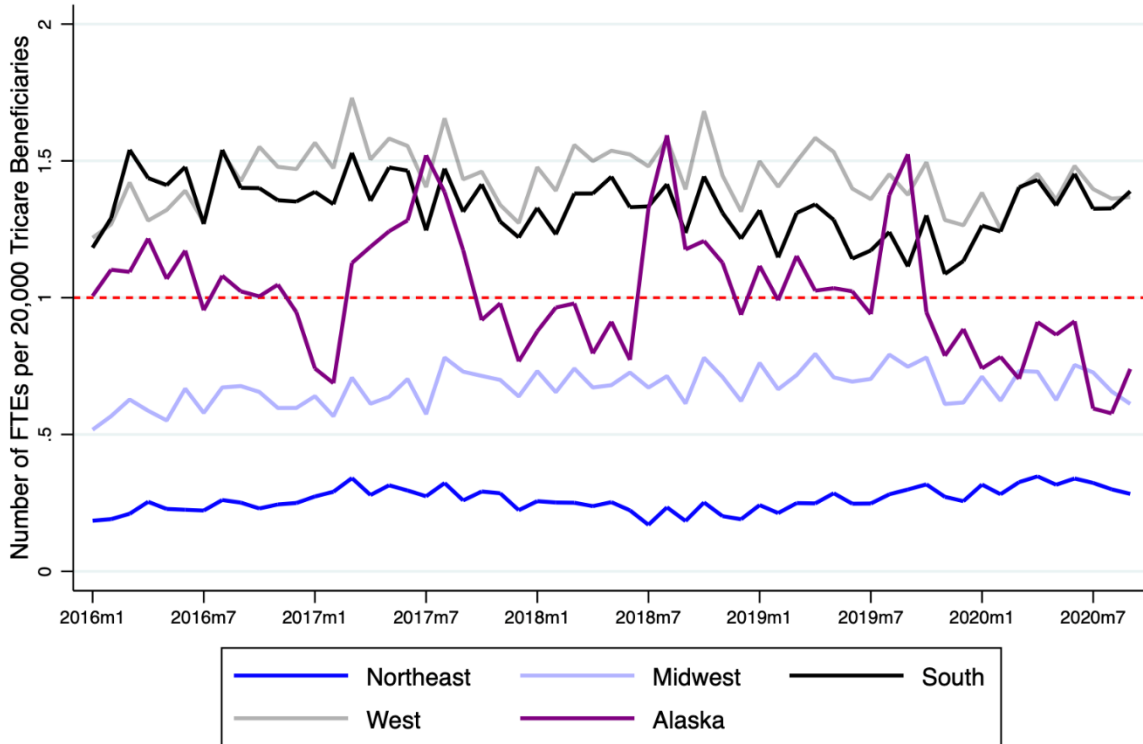
1 FTE(Full Time Equivalent)=168 hours or one person-month
The area below the red dotted line represents the mental health providers under-capacity values according to
the HRSA's shortage definition

Figure 7.   Number of Available Psychiatrists in MTFs per 20,000 Beneficiaries
by Regions

D.   MICRO-LEVEL ANALYSIS RESULTS

I ran five sets of regression models to study different mental health resource outcomes in my analysis. The first three linear regression models look at the number of mental health providers, mental health clinical staff, and psychiatrists, respectively, based on 110 MTF's catchment areas. The last two logistic regression models study two binary variables, mental health providers shortage area and psychiatrists' shortage area. Regression results and findings follow.

1.   Number of Mental Health Providers Linear Regression Model Results

Table 5 represents two sets of results for the first linear model. The first column depicts the regression coefficients of block bivariate models; the second column – multivariate regression model. The studied dependent variable is the number of mental health providers in

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an MTF's catchment area. Each panel under "Block Bivariate" column represents a separate model depicted in equation (1) in the previous Chapter; whereas "Multivariate" column represents the results from one model that simultaneously include all variables. I first describe significant coefficients in block bivariate models and then cover significant coefficients in the multivariate model.

Table 5.   The Association between the Number[1] of Mental Health Providers and Geographic, Military Service Specific, Demographic, and Socio-Economic Characteristics of the MTF's Catchment Areas[2, 3]

	(1) Block Bivariate	(2) Multivariate
Regions (East regions is reference category)		
U.S. West Regions	0.214 (0.167)	0.113 (0.110)
Branch of Service (USA is reference category)		
Service: USN	-1.060*** (0.247)	-0.916*** (0.175)
Service: USMC	-0.695*** (0.150)	-0.892*** (0.204)
Service: USAF	-0.522** (0.185)	-0.001 (0.142)
Service: Joint	-0.625 (1.397)	0.074 (1.251)
TRICARE Beneficiary Characteristics		
Share of Retirees 2Q (1Q is reference category)	-0.110 (0.120)	-0.191+ (0.107)
Share of Retirees 3Q	-0.094 (0.287)	-0.309 (0.195)
Share of Children 2Q (1Q is reference category)	0.179 (0.177)	0.135 (0.118)
Share of Children 3Q	0.615*** (0.179)	0.239 (0.160)
Share of Other Adult Dependents 2Q (1Q is reference category)	0.041 (0.117)	0.017 (0.107)
Share of Other Adult Dependents 3Q	-0.561* (0.237)	-0.616*** (0.139)
General Population Demographics		
Share of Blacks 3Q (1-2Q is reference category)	-0.064 (0.247)	-0.075 (0.142)
Share of Hispanics 3Q (1-2Q is reference category)	0.009 (0.250)	-0.029 (0.117)
General Population Demographics		
Share of Population Under Poverty 2Q (1Q is reference category)	-0.209 (0.235)	-0.061 (0.132)
Share of Population Under Poverty 3Q	0.203 (0.231)	-0.074 (0.176)

	(1) Block Bivariate	(2) Multivariate
General Population Socio-Economic Characteristics		
Median Household Income 2Q (1Q is reference category)	-0.259	
	(0.192)	
Median Household Income 3Q	-0.355	
	(0.263)	
Observations	5925	5925

Standard errors in parentheses

$^+ p < 0.1,$ $^* p < 0.05,$ $^{**} p < 0.01,$ $^{***} p < 0.001$

1. The number of mental health providers is log-transformed.

2. All models control for time trend (fiscal year and month indicators) and catchment area beneficiary size (log transformed).

3. All regressions are weighted by TRICARE beneficiary size, so regression coefficients are representative of TRICARE population.

The first bivariate block model with significant coefficients looks at the association between the studied dependent variable and a branch of service (with the USA as a reference category). In this model, the relationship between the number of mental health providers and a catchment area where the USN, USMC, or USAF is a dominant branch of service (in terms of TRICARE beneficiaries) is statistically significant and negatively correlated. Compared to the USA, catchment areas with the USN, USMC, and USAF as a dominant service have 106%, 69.5%, and 52.2% less mental health providers, respectively.

The bivariate model that studies the association between the number of mental health providers and TRICARE beneficiary characteristics shows two significant coefficients. MTF's catchment areas with the highest share of the dependent population under 18 (upper 3rd quantile) have 61.5% more mental health providers than the areas with the lowest share of children (1st quantile). Catchment areas with the highest percentage of adult dependent population (upper 3rd quantile) have 56.1% fewer mental health providers than the areas with the smallest share of adult dependents (excluding retirees).

The multivariate regression model produces several statistically significant coefficients, including some matching the bivariate models. In this model, catchment areas, where the USN or USMC is a dominant branch of service, have 91% and 89.2%

fewer mental health providers than catchment areas with the USA as a prevalent military branch. Catchment areas with the highest share of adult dependent population (upper 3rd quantile) have 61% fewer mental health providers than the areas with the lowest percentage of adult dependents. Finally, catchment areas with the medium share of adult dependent population (2nd quantile) have 19.1% fewer mental health providers than the areas with the smallest percentage of adult dependents. Once I control for other service and area characteristics, number of mental health providers do not differ by the share of TRICARE beneficiaries under 18 years old.

2. Number of Mental Health Clinical Staff Linear Regression Model Results

This model assesses the association between the number of mental health clinical staff (medical providers who render mental health services) in an MTF's catchment area and the same set of independent variables. Table 6 depicts the results.

Table 6.   The Association between the Number[1] of Mental Health Clinical Staff and Geographic, Military Service Specific, Demographic, and Socio-Economic Characteristics of the MTF's Catchment Areas[2, 3]

	(1) Block Bivariate	(2) Multivariate
Regions (South is reference category)		
Census Region: Northeast	-0.336	-0.222
	(0.385)	(0.289)
Census Region: Midwest	0.338*	0.086
	(0.168)	(0.151)
Census Region: West	0.133	0.103
	(0.168)	(0.121)
Census Region: Alaska	1.113***	0.318
	(0.225)	(0.292)
Branch of Service (USA is reference category)		
Service: USN	-0.544*	-0.342
	(0.251)	(0.219)
Service: USMC	-0.270	-0.337
	(0.205)	(0.260)
Service: USAF	-0.550**	-0.025
	(0.165)	(0.149)
Service: Joint	-0.424	0.239
	(1.205)	(1.058)

	(1) Block Bivariate	(2) Multivariate
TRICARE Beneficiary Characteristics		
Share of Retirees 2Q (1Q is reference category)	-0.089	-0.097
	(0.129)	(0.116)
Share of Retirees 3Q	-0.113	-0.168
	(0.237)	(0.218)
Share of Children 2Q (1Q is reference category)	0.309*	0.259*
	(0.127)	(0.120)
Share of Children 3Q	0.648***	0.497*
	(0.184)	(0.203)
Share of Other Adult Dependents 2Q (1Q is reference category)	-0.001	-0.005
	(0.119)	(0.123)
Share of Other Adult Dependents 3Q	-0.502*	-0.544***
	(0.196)	(0.157)
General Population Demographics		
Share of Blacks 3Q (1-2Q is reference category)	-0.070	-0.001
	(0.213)	(0.152)
Share of Hispanics 3Q (1-2Q is reference category)	-0.062	0.050
	(0.207)	(0.118)
General Population Socio-Economic Characteristics		
Share of Population Under Poverty 2Q (1Q is reference category)	-0.217	-0.083
	(0.210)	(0.190)
Share of Population Under Poverty 3Q	-0.054	-0.175
	(0.201)	(0.219)
General Population Socio-Economic Characteristics		
Median Household Income 2Q (1Q is reference category)	-0.102	
	(0.160)	
Median Household Income 3Q	-0.232	
	(0.281)	
Observations	5923	5923

Standard errors in parentheses

[+] $p < 0.1$, [*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

1. The number of mental health providers is log-transformed.

2. All models control for time trend (fiscal year and month indicators) and catchment area beneficiary size (log transformed).

3. All regressions are weighted by TRICARE beneficiary size, so regression coefficients are representative of TRICARE population.

The first bivariate model with significant results is the model that analyzes census regions, with the South region being a reference category. Compared to the South region, MTF's catchment areas in the Midwest have 33.8% more mental health

clinical staff and catchment areas in Alaska – 111% more mental health clinical staff. Alaska returns a statistically significant coefficient; however, this coefficient might be inflated because of a relatively small number of observations in this state. It's worth noting that the multivariate regression does not produce any statistically significant coefficients in the "Regions" category.

The service branch bivariate model shows significance for the USN and USAF dominant catchment areas. Compared to the USA, catchment areas with the USN or USAF as a dominant branch of service have 54.4% and 55% less mental health clinical staff, respectively. However, these coefficients are no longer significant in the multivariate regression model.

The bivariate model with the TRICARE beneficiary characteristics returns three statistically significant coefficients. Catchment areas with the medium and highest shares of the dependent population under 18 (2nd and 3rd quantiles) have 30.9% and 64.8% more mental health clinical staff than the areas with the smallest share of children. Catchment areas with the highest percentage of adult dependent population (upper 3rd quantile) have 50.2% fewer mental health providers than the areas with the smallest share of adult dependents. The multivariate regression model retains the shares of children (medium and upper quantiles) and adult dependents (upper 3rd quantile) as significant.

3.   Number of Psychiatrists Linear Regression Model Results

The third model studies the relationship between the number of psychiatrists in an MTF's catchment area and the same set of independent variables. The number of psychiatrists is already included in the total number of mental health providers described in the first regression model. However, the HRSA distinguishes psychiatrists as a separate group of mental health providers and uses it to calculate mental health resources capacity measures and the total number of mental health providers. Table 7 represents the results for block bivariate and multivariate regression models. In general, psychiatric capacity does not appear to vary by the area characteristics

examined below. The number of statistically significant coefficients is less than in the two models discussed earlier.

Table 7.   The Association between the Number[1] of Psychiatrists and Geographic, Military Service Specific, Demographic, and Socio-Economic Characteristics of the MTF's Catchment Areas[2,3]

	(1) Block Bivariate	(2) Multivariate
Regions (South is reference category)		
Census Region: Northeast	-0.327	-0.466[+]
	(0.255)	(0.255)
Census Region: Midwest	0.303	0.145
	(0.251)	(0.279)
Census Region: West	0.155	-0.087
	(0.249)	(0.227)
Census Region: Alaska	0.585[*]	-0.272
	(0.276)	(0.343)
Branch of Service (USA is reference category)		
Service: USN	-0.247	-0.100
	(0.345)	(0.277)
Service: USMC	-0.147	-0.340
	(0.239)	(0.394)
Service: USAF	-0.126	0.300
	(0.289)	(0.241)
Service: Joint	0.473	0.941
	(1.434)	(1.230)
TRICARE Beneficiary Characteristics		
Share of Retirees 2Q (1Q is reference category)	-0.152	-0.239
	(0.165)	(0.157)
Share of Retirees 3Q	-0.046	-0.269
	(0.386)	(0.294)
Share of Children 2Q (1Q is reference category)	0.234	0.178
	(0.213)	(0.179)
Share of Children 3Q	0.415	0.325
	(0.258)	(0.242)
Share of Other Adult Dependents 2Q (1Q is reference category)	0.283[*]	0.280[+]
	(0.139)	(0.164)
Share of Other Adult Dependents 3Q	-0.399	-0.468[*]
	(0.301)	(0.236)
General Population Demographics		
Share of Blacks 3Q (1-2Q is reference category)	-0.319	-0.359
	(0.276)	(0.248)
Share of Hispanics 3Q (1-2Q is reference category)	-0.187	-0.456[+]
	(0.263)	(0.271)

	(1) Block Bivariate	(2) Multivariate
General Population Socio-Economic Characteristics		
Share of Population Under Poverty 2Q (1Q is reference category)	-0.098	-0.104
	(0.261)	(0.205)
Share of Population Under Poverty 3Q	0.078	0.131
	(0.258)	(0.203)
General Population Socio-Economic Characteristics		
Median Household Income 2Q (1Q is reference category)	0.094	
	(0.221)	
Median Household Income 3Q	-0.108	
	(0.321)	
Observations	5925	5925

Standard errors in parentheses

$^+ p < 0.1$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

1. The number of mental health providers is log-transformed.

2. All models control for time trend (fiscal year and month indicators) and catchment area beneficiary size (log transformed).

3. All regressions are weighted by TRICARE beneficiary size, so regression coefficients are representative of TRICARE population.

Alaska is the only region that produces a statistically significant coefficient in the regional bivariate model. Compared to the South region, MTF's catchment areas in Alaska have 58.5% more psychiatrists after controlling for beneficiary size. However, this coefficient might be overstated because of a relatively small number of observations. The multivariate regression model does not replicate this result for Alaska. The only other statistically significant coefficient is the medium share of adult dependents (2nd quantile) produced by the bivariate model with TRICARE beneficiary characteristics. According to this model, catchment areas with the medium share of adult dependent population have 28.3% more psychiatrists compared to the areas with the smallest share of adult dependents.

The multivariate regression model shows several statistically significant coefficients. MTF's catchment areas in the Northeast have 46.6% fewer psychiatrists than a reference category (South). This coefficient is statistically significant at the 0.10 level. The areas with a medium and upper share of adult dependents have 28% more and 46.8%

fewer psychiatrists contrasted to the areas with the lowest share of adult dependents, respectively. Finally, the areas with the highest share of Hispanics have 45.6% fewer psychiatrists than the areas with the lowest share of Hispanics.

4. Mental Health Providers Shortage Areas Logistic Regression Model Results

Table 8 presents the results for the first logistic regression model that studies the relationship between a dependent binary variable indicating that an MTF's catchment area has a shortage of mental health providers and the same set of independent variables except for "Branch of Service." The "Branch of Service" bivariate model assigns the USA as a reference category. In this logistic regression analysis dataset, no MTF's catchment areas fall under the mental health providers shortage category with the USA being a dominant service. Hence, the model returns highly inflated service coefficients for the other services that cannot be correctly interpreted. Analogous to the linear models above, the model results don't list fiscal years and fiscal months fixed effects. All presented coefficients report the odds ratio.

Table 8. Probability of Mental Health Provider Shortage: Odds Ratios[1, 2]

	(1) Block Bivariate	(2) Multivariate
Regions (East regions is reference category)		
West Regions	0.297 (0.275)	0.110[*] (0.116)
TRICARE Beneficiary Characteristics		
Share of Retirees 2Q (1Q is reference category)	0.430 (0.395)	0.225[+] (0.189)
Share of Retirees 3Q	4.370 (4.957)	2.668 (2.458)
Share of Children 2Q (1Q is reference category)	1.395 (1.195)	1.579 (1.257)
Share of Children 3Q	1.599 (2.344)	0.710 (0.963)
Share of Other Adult Dependents 2Q (1Q is reference category)	0.594 (0.508)	0.579 (0.577)
Share of Other Adult Dependents 3Q	5.102[*] (3.753)	8.310[*] (7.379)
General Population Demographics		
Share of Blacks 3Q (1-2Q is reference category)	0.938 (0.985)	0.474 (0.540)
Share of Hispanics 3Q (1-2Q is reference category)	1.850 (1.609)	5.173[+] (4.531)

	(1) Block Bivariate	(2) Multivariate
General Population Demographics		
Share of Population Under Poverty 2Q (1Q is reference category)	0.499 (0.449)	0.168[+] (0.172)
Share of Population Under Poverty 3Q	0.474 (0.448)	0.171[+] (0.170)
General Population Socio-Economic Characteristics		
Median Household Income 2Q (1Q is reference category)	1.878 (1.847)	
Median Household Income 3Q	7.001[*] (6.711)	
Observations	6282	6120

Exponentiated coefficients from logistic regression; Standard errors in parentheses

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

1. All models control for time trend (fiscal year and month indicators) and catchment area beneficiary size (log transformed).

2. All regressions are weighted by TRICARE beneficiary size, so regression coefficients are representative of TRICARE population.

The TRICARE beneficiary characteristics bivariate model produces one statistically significant coefficient. According to this model, the odds of an MTF's catchment area with the medium share of the adult dependent population being classified as a mental health providers shortage areas are 5.1 times larger than for an area with the lowest share of adult dependents. The only other statistically significant coefficient was returned by the last bivariate model with general population socio-economic characteristics. The odds of an MTF's catchment area with the highest share of median household income being classified as mental health shortage area are seven times larger than for an area with the lowest share of median income.

The multivariate regression model produced several statistically significant coefficients, including regions, the shares of retirees, adult dependents, Hispanics, and the population under poverty. MTF's catchment areas in the West regions have very low odds of being classified as mental health shortage areas than those in the East (OR=0.11). For the areas with the highest share of adult dependents, the odds of being labeled as a mental health providers shortage area are 8.3 times more than for the areas with the lowest share of adults. When it comes to the general population demographic characteristics, the odds of an MTF's catchment areas with the highest share of

Hispanics being classified as a shortage is 5.2 times as great as for an area with the lowest share of Hispanics. Finally, the odds of an MTF's catchment area with the medium and high shares of the population under poverty (2nd and 3rd quantiles) being classified as a mental health providers shortage area are low—with odds ratio of 0.16 and 0.17, respectively, compared to an area with the lowest share of the population under poverty.

5.   Psychiatrists Shortage Areas Logistic Regression Model Results

My last model pictures the association between psychiatrist's shortage areas and a set of independent variables. Table 9 depicts the results.

Table 9.   Probability of Psychiatrists Shortage: Odds Ratios[1,2]

	(1) Block Bivariate	(2) Multivariate
Region (South is reference category)		
Census Region: Northeast	2.160	1.978
	(1.796)	(1.418)
Census Region: Midwest	0.545	1.003
	(0.275)	(0.662)
Census Region: West	0.624	0.455
	(0.226)	(0.241)
Census Region: Alaska	0.506	1.894
	(0.586)	(2.393)
Branch of Service (USA is reference category)		
Service: USN	3.285*	4.078*
	(1.871)	(2.563)
Service: USMC	0.784	1.382
	(0.663)	(1.256)
Service: USAF	3.229**	2.107
	(1.262)	(0.998)
Service: Joint	2.414	0.455
	(3.530)	(0.600)
TRICARE Beneficiary Characteristics		
Share of Retirees 2Q (1Q is reference category)	1.907	1.754
	(1.044)	(1.025)
Share of Retirees 3Q	2.608	2.394
	(1.964)	(2.012)
Share of Children 2Q (1Q is reference category)	0.865	0.825
	(0.328)	(0.335)
Share of Children 3Q	0.471+	0.439
	(0.209)	(0.227)
Share of Other Adult Dependents 2Q (1Q is reference category)	1.316	1.372
	(0.668)	(0.681)
Share of Other Adult Dependents 3Q	2.296	2.700
	(1.473)	(1.706)

	(1) Block Bivariate	(2) Multivariate
General Population Demographics		
Share of Blacks 3Q (1-2Q is reference category)	1.723	1.062
	(0.669)	(0.521)
Share of Hispanics 3Q (1-2Q is reference category)	1.521	1.665
	(0.619)	(0.855)
General Population Socio-Economic Characteristics		
Share of Population Under Poverty 2Q (1Q is reference category)	0.858	0.528
	(0.361)	(0.262)
Share of Population Under Poverty 3Q	1.088	0.885
	(0.426)	(0.447)
General Population Socio-Economic Characteristics		
Median Household Income 2Q (1Q is reference category)	1.007	
	(0.347)	
Median Household Income 3Q	1.349	
	(0.709)	
Observations	6282	6120

Exponentiated coefficients from logistic regression; Standard errors in parentheses

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

1. All models control for time trend (fiscal year and month indicators) and catchment area beneficiary size (log transformed).

2. All regressions are weighted by TRICARE beneficiary size, so regression coefficients are representative of TRICARE population.

In the branch of service bivariate model, two coefficients return significant results. The odds of an MTF's catchment area with the USN or USAF as a dominant service being classified as a psychiatrist's shortage area are 3.3 and 3.2 times larger than for an area with the USA as a dominant service. In the multivariate regression model that control for other area characteristics, USAF and USA have comparable likelihood of being under capacity, while the USN remains to have 4.1 times larger odds of being classified as shortage areas when compared with the USA.

The only other statistically significant coefficient is produced by the TRICARE beneficiary characteristics bivariate model. According to the model, the odds of an MTF's catchment area with the highest share of the population under the age of 18 being classified as a psychiatrists' shortage area are 0.47 compared to an area with lowest share.

V.   CONCLUSIONS AND RECOMMENDATIONS

A.   CONCLUSIONS

This study explores geographical and temporal variations of mental health resources capacity in the MTFs. Using the HRSA guidelines, I develop several mental health capacity measures and follow them over five fiscal years and across census regions and parent MTF's catchment areas. My data analysis does not show much temporal variation on the national, regional, or local levels. The national-level analysis demonstrates adequate numbers of mental health providers, including psychiatrists, as a separate group. The ratios of mental health providers and psychiatrists to TRICARE beneficiaries consistently exceed the HRSA's shortage classification. However, on a regional level, the Northeast region (the smallest census region by population) records an insufficient number of mental health providers 54 out of 57 observation months. When looking at the ratio of psychiatrists, Northeast and Midwest demonstrate inadequate capacity and can be classified as regions with a shortage of psychiatrists in MTFs. I must note that the national- and regional-level analyses included the total number of TRICARE beneficiaries regardless of their proximity to MTF's catchment areas (the total number of Tricare beneficiaries is 8.8 million in the sample).

My second question aims at calculating the percentage of TRICARE beneficiaries at risk of inadequate access to mental health resources. Unlike in the national and regional analyses, I only account for TRICARE beneficiaries who reside in the MTF's catchment areas. In this case, the studied TRICARE population includes 5.4 million beneficiaries or 57% of the total TRICARE recipients. My study finds that 7.4% of TRICARE beneficiaries live in the MTF's catchment areas with a shortage of mental health providers. Most of them (89%) live in the South and West regions (which makes sense since these two regions account for over 80% of TRICARE recipients). About 10.5% reside in the Northeast; Alaska and Midwest don't record any TRICARE beneficiaries in mental health providers shortage areas. Regarding the dominant branch of service, 61% of TRICARE recipients in mental health shortage areas live in MTF's catchment areas with the majority of the USN active-duty members. In contrast, this indicator for the USA is zero.

When exploring the psychiatrist capacity measure, I find that 41.2% of TRICARE beneficiaries reside in the MTF's catchment areas that experience the shortage of psychiatrists (less than one psychiatrist per 20,000 people). They are distributed across census regions proportionally to the total TRICARE population. The catchment areas where the USAF is a dominant service branch host nearly half (46%) of those who live in the psychiatrist shortage areas, with the USA and USN accounting for 23% and 24%, respectively.

The third research question attempts to identify geographic, military service-specific, demographic, and socio-economic characteristics that are more associated with MTF's mental health providers shortage areas through linear and logistic regression analyses. The MTF's catchment areas classified as mental health providers shortage areas are less likely to be located in the western regions (i.e., West, Midwest, or Alaska) than the Eastern regions. Several models confirm the negative relationship between the areas where the USN is the dominant branch of service and the lower ratio of mental health providers to TRICARE beneficiaries. The areas with the highest share of adult dependent beneficiaries (excluding retirees) are eight times more likely to fall under the shortage area category than the areas with the lowest share. Some models find a significant positive association between the areas with the highest share of dependents under 18 and the numbers of mental health providers. For the general socio-economic characteristics of MTF's catchment areas, those with the highest share of the population under poverty are less likely to be mental health providers shortage areas. Similarly, the areas with the highest share of median per-capita income are more likely to be mental health providers shortage areas.

Analogous trends apply to the psychiatrist shortage area's metric. The catchment areas with the USN as a dominant service are four times more likely to be classified as deficient areas than the USA. Some models find that the areas with the highest share of dependent children are less likely to fall under the shortage area classification; on the contrary, the sites with the highest share of adult dependents record lower ratios of psychiatrists to the total number of TRICARE beneficiaries.

B.   LIMITATIONS

This research has several limitations. My study focuses on mental health resources capacity at the MTFs in CONUS, including Alaska and Hawaii. I do not examine the overseas MTFs or operational platforms that offer mental health services (e.g., aircraft carriers, Marine medical battalions). Future research must include overseas locations and operational units to paint a fuller picture of mental health resources availability for active-duty service members and their dependents. While those service members and dependents stationed in CONUS and assigned to an MTF for treatment have an option to see civilian providers, who accept TRICARE insurance, active-duty military assigned to overseas locations exclusively resort to providers directly employed by MTFs. When deployed, those stationed at operational units are limited to mental health providers assigned to operational platforms.

My micro-level analysis focus on TRICARE beneficiaries who reside in the MTF's catchment areas. In the TRICARE population sample, about 3.3 million beneficiaries (37%) reside outside the commutable to an MTF distance. Hence, I cannot assess whether nearly a third of eligible TRICARE recipients have adequate access to mental health services. Moreover, my study centers on the military mental health capacity (i.e., mental health services rendered at MTFs). It is important to stress that a lot of TRICARE beneficiaries, especially non-active-duty members, rely on civilian providers (purchased care). The parent project by the NPS team will account for civilian mental health capacity measures and assess the shortages of mental health providers in a more comprehensive analysis.

In my study I utilize a very comprehensive set of data sources that are not without measurement errors. The provider headcounts dataset had a lot of missing observations and variables (23% of all providers were missing an MTF association, which made it impossible to use this measurement for regional- and micro-level analyses). For that reason, I choose to focus on the available FTE measure for provider counts, which might not be the ideal indicator to assess the adequacy of mental health resource capacity. Available FTEs are self-reported by individual providers and might under- or overestimate the actual number of hours spent on rendering mental health services. However, the

available FTE is still a more precise measure than the assigned FTE, since assigned FTE doesn't account for the time mental health providers spend on not mental health-related activities (including deployments and other operational commitments of active-duty mental health providers).

Finally, it is also essential to acknowledge that my research exclusively focuses on the geographic and mental health providers availability aspects of access to care. I don't account for referral wait times, which are composed of the supply and availability of mental health providers components and the demand for mental health services and other factors (i.e., referral processing speed). I do not analyze the MTF's catchment areas from the point of the demand levels (i.e., low, medium, high) for mental health services that depend on various factors, from geography to socio-economic and demographic characteristics of an area. Therefore, applying a one size fits all approach to addressing the issue of mental health providers shortage areas might not work in every instance.

C. RECOMMENDATIONS

With the growing concerns over the DOD's ability to provide timely and appropriate mental health services to the TRICARE beneficiaries, and especially to active-duty service members, it is paramount that the DHA identifies and addresses the shortages of MTF's mental health providers on regional and local levels. I provide the following recommendations:

- It is evident from my results and findings that a significant number of MTF's catchment areas experience a shortage of psychiatrists (based on the HRSA definition of a shortage area). It is prudent to further examine the civilian mental health capacity in these markets to determine whether the same trend applies to civilian counterparts. Under several TRICARE insurance plans, TRICARE beneficiaries are referred to a network of civilian providers, who accept military insurance, when military providers are not available (purchased care). After determining what MTF's catchment areas suffer the shortages of psychiatrists in both military and civilian settings, the DHA leadership might consider increasing the

numbers of psychiatrists directly employed by the MTFs as well as restructuring manpower requirements and billets in those MTFs that demonstrate unusually high psychiatric capacity (e.g., Walter Reed National Military Medical Center, Tripler Army Medical Center).

- Scrutinize the reasons for the disparity between the MTFs that predominantly serve the USN and USAF population and other services regarding the numbers and capacity measures of mental health providers and psychiatrists. The areas with the USN or USAF as prevailing service may rely more on the civilian providers (purchased care) than other military branches. If this hypothesis turns out wrong, consider addressing the manpower and manning requirements in those MTFs to ensure the USN active-duty members and dependents have adequate access to mental health services.

- Collect better data on the mental health provider FTEs and headcounts to conduct more accurate research in the future. The data on the headcounts of mental health providers were missing on regional and parent MTFs levels, which precluded using this measure in the regional capacity and regression analyses. My research utilized FTEs as a primary measure of the number of mental health providers that heavily rely on provider's self-reporting and might not be totally accurate.

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