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Geographical Variation in Telehealth Usage for Mental Health Care among Active Duty Service Members

March 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

The increasing reliance on telehealth for mental health care among active-duty service members highlights a pivotal shift in healthcare delivery driven by geographical disparities and the urgent need for accessible care. A detailed analysis incorporating linear probability regression models uncovers that telehealth utilization is notably higher in the Northeast and West regions, reveals a closing gap between sexes in direct care usage, and identifies service branch affiliation as a significant determinant of telehealth use. The findings highlight the dynamic changes in telehealth usage, particularly in the latter part of 2022, influenced by policy adaptations and shifting social dynamics. Recommendations include further research to evaluate the long-term impact of telehealth on military readiness and well-being, regular assessments of telehealth services to optimize effectiveness, and an investigation into the disparities between military and civilian telehealth systems to improve service delivery.

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TABLE OF CONTENTS

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LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

CAPER	Comprehensive Ambulatory/Professional Encounter Record
CPT	Current Procedural Terminology
DEERS	Defense Enrollment Eligibility Reporting System
DOD	Department of Defense
IT	Information Technology
MDR	Military Health System Data Repository
MHS	Military Health System
MTF	Military Treatment Facility
PTSD	Post-Traumatic Stress Disorder
TEDNI	TRICARE Encounter Data Non-Institutional
VHA	Veterans Health Administration

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I. INTRODUCTION

A. PURPOSE

The mental health of the United States active-duty force continues to be a concern for the Department of Defense (DOD) today and significantly impacts the service member's readiness. According to the Armed Forces Health Surveillance Branch (2021), mental health conditions have been a major cause of illness and disability, high use of healthcare resources, and withdrawal from military service. Not tending to a mental health disorder promptly or leaving it untreated could result in suicide. Although the number of suicides has been on the decline over the past three years, Secretary of Defense Lloyd Austin emphasized that mental health is an integral component of overall health and requires continued efforts toward the elimination of obstacles to seeking help, combatting stereotypes, and fostering an environment of inclusion and connection where every member of the Service can flourish (Clark, n.d.; Garamone, 2022). Therefore, it is necessary to understand current resources and the other avenues that could enhance mental health outcomes.

While there is the 988 Suicide & Crisis Lifeline, the Military Crisis Line, Military OneSource, the Psychological Health Resource Center, and the Real Warriors campaign, it is also the priority of the Military Health System (MHS) to ensure a Ready Medical Force and a Medically Ready Force commensurate with the National Defense Strategy (Military Health System, 2023). At the Military Treatment Facilities (MTF), an aspect of care that allowed the MHS to continue to sustain efforts to improve mental health outcomes was a shift from in-person visits for care to telehealth visits during the COVID-19 pandemic. Even though this rapid increase in telehealth use resulted from a pandemic, the availability may be here to stay, as the DOD has seen cost avoidance of unnecessary healthcare and, more importantly, improved clinical outcomes through the use of telehealth (Office of the Under Secretary of Defense for Personnel and Readiness, 2022). Particularly notable is the use of telebehavioral health hubs to remotely connect with active-duty service members worldwide (Office of the Under Secretary of Defense for Personnel and Readiness, 2022). This capability intends to support MTFs that lack the necessary resources to meet the

existing demand for such mental health care (Office of the Under Secretary of Defense for Personnel and Readiness, 2022).

B. RESEARCH QUESTIONS

Based on the above information, my research aim is to address the following questions:

- What are the geographical and temporal variations in telehealth usage in direct and purchased care for mental health visits among active-duty personnel?
- What community- and individual-specific characteristics are associated with active-duty personnel using telehealth for mental health care?

Exploring these questions is vital for filling existing research gaps. In addition, such knowledge is essential for effectively distributing resources within a unified healthcare system and reducing disparities across different geographical areas.

Based on linear probability regression analysis of mental telehealth use among the active-duty population, the Northeast and West regions have notably higher telehealth utilization than the Midwest and report a closing gap in service use between sexes during the latter part of 2022 within the direct care system. There are notable differences in telehealth use by Service branch, with service members from the Navy showing the highest probability of using telehealth services. The study also observes dynamic changes in telehealth use during the last nine months of 2022, possibly due to policy adaptations or shifting social dynamics. On a community and individual level, the research found that females, officers, and those from medium- and high-income families are more inclined to use telehealth services. Additionally, it notes that rural residency corresponds to lower usage rates and that the community's demographic composition and political leanings also play a role, with the final three quarters of 2022 demonstrating complex patterns that may reflect changing political impacts on telehealth adoption.

C. ORGANIZATION

This thesis comprises five distinct chapters. Chapter I provides the research's motivation and objectives, detailing the specific questions under investigation. Chapter II comprehensively explores the historical context and existing body of literature regarding telehealth and telemental health within civilian and military healthcare systems, drawing insights from prior research and reports. Chapter III explores the data sources, key variables utilized in my research, and the overarching methodology. Chapter IV contains the analysis, where I present my findings from the regression models, showing the connections between varying levels of telehealth utilization and a range of independent variables. Finally, Chapter V provides a synthesis of my results, discusses the study's limitations, and presents my recommendations.

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II. BACKGROUND AND LITERATURE REVIEW

This chapter offers a background on mental health challenges active-duty service members face. I discuss their impact on military readiness, retention, and barriers to accessing care. In the rest of the chapter, I offer a literature review of telemental health services in the civilian sector, highlighting the benefits and barriers influencing their adoption. I also examine the literature on civilian and military telehealth and telemental use trends before and during the COVID-19 pandemic.

A. MENTAL HEALTH ISSUES IN THE MILITARY

Mental health issues are highly prevalent among active-duty military populations, with post-traumatic stress disorder (PTSD), depression, and anxiety being among the most common conditions (Hoge et al., 2004). A study has found that approximately 8–19% of military personnel report a mental health problem following deployment (Hoge et al., 2006). The wars in Iraq and Afghanistan, which involved prolonged and repeated deployments in intense combat environments, have been associated with particularly high rates of mental health problems (Hoge et al., 2004; Seal et al., 2009). The incidence of depression and anxiety disorders is also significantly elevated among combat veterans (Hoge et al., 2004; Thomas et al., 2010).

The high operational tempo and stressful conditions of modern warfare put service members at risk for trauma exposures that can lead to PTSD, depression, substance abuse, and other issues (Adler et al., 2017). Frequent deployments increase the likelihood of experiencing potentially traumatic events, including exposure to combat, witnessing death or injury, threat of attack, and traumatic loss (Xue et al., 2015). A study by Hogue et al. (2004) indicated that 11–20% of military personnel deployed to conflict zones are diagnosed with PTSD, a rate more than double that of non-deployed personnel, with the risk of developing PTSD increasing significantly after each subsequent deployment. Furthermore, the occurrence of PTSD is influenced not only by the nature and intensity of the trauma experienced during deployments but also by individual factors, such as pre-existing psychological vulnerabilities, which may increase the likelihood of experiencing

difficulties post-trauma (Xue et al., 2015). Studies have linked pre-existing mental health problems, adverse childhood events, and lack of social support to increased PTSD risk among service members (Brewin et al., 2000; Xue et al., 2015).

Mental health disorders, such as PTSD, not only negatively affect the quality of life but also have detrimental effects on military readiness and retention (Hoge et al., 2002; Xue et al., 2015). PTSD symptoms such as hypervigilance, emotional numbing, insomnia, and irritability can significantly disrupt occupational and social functioning (Lange et al., 2000). Among Iraq and Afghanistan veterans with mental health issues, roughly 50% report significant difficulties carrying out daily activities and meeting work responsibilities (Thomas et al., 2010). PTSD symptoms interfere with concentration and memory, compromising the performance of duties (Marx et al., 2009). Mental health problems also have an adverse impact on attrition, with military personnel diagnosed with PTSD or depression being significantly more likely to separate early from service (Hoge et al., 2006).

In response, the U.S. military has implemented several programs and policies to address this mental health crisis. Initiatives include embedding mental health providers in operational units, conducting post-deployment screenings, expanding treatment capacity, and destigmatization efforts to promote help-seeking (Hoge et al., 2004; Seal et al., 2010; Zeiss & Karlin, 2008). However, significant gaps and barriers to care persist. Many veterans report difficulty accessing services, and only around half of those diagnosed receive minimally adequate treatment (Kim et al., 2011; Seal et al., 2010).

Moreover, stigma remains one of the most significant obstacles to military personnel and veterans seeking mental health treatment (Sharp et al., 2015). Cultural norms emphasizing self-sufficiency, stoicism, and mental toughness run counter to acknowledging vulnerability or asking for help (Greene-Shortridge et al., 2007; Sharp et al., 2015). In addition, concerns about negative career impacts and appearing weak to peers reinforce reluctance to seek care while in service (Zinzow et al., 2012). Among veterans, stigma manifests as internalized shame and fear of being judged for mental health struggles (Mittal et al., 2013). Public education campaigns aimed at reducing stigma have shown promising results but require continued effort (Corrigan, 2011).

Significantly, telehealth and telemental health services have emerged as an important approach to overcoming access barriers and increasing engagement in mental health treatment among service members (Morland et al., 2014). Virtual care's convenience, privacy, and flexibility are highly appealing for military populations worried about stigma or situated far from providers. Studies like the one by Strachan et al. (2012) demonstrate the effectiveness of telehealth in delivering psychotherapy for conditions such as PTSD and depression. Further expansion of telehealth services will be key for serving personnel scattered across global locations and rural veterans lacking local specialty care.

B. TELEHEALTH FOR MENTAL HEALTH CARE

In a world where technology increasingly serves as a bridge between human needs and services, telehealth has emerged as a pivotal innovation in mental health care. Defined by Totten et al. (2016) "as the use of information and telecommunications technology" to provide remote healthcare services, telehealth represents a significant leap forward in making mental health care accessible to all, regardless of distance (p. vi). This type of healthcare uses various electronic methods to communicate with doctors, like video calls, audio, and store-and-forward, which allows people receive their care in the privacy and comfort of their own home (Totten et al., 2016). Now that we understand what telehealth means for mental health care, I discuss the benefits and barriers associated with telehealth use.

Research indicates telehealth's benefits in the civilian healthcare settings for patients, providers, and health systems in rural or underserved areas, significantly lowering geographical barriers and providing a solution for those facing transportation or mobility challenges (Egede et al., 2015). The integration of telehealth prior to 2020 has led to proven benefits such as reduced hospital readmissions, better outcomes for chronic diseases, and increased patient satisfaction (Kichloo et al., 2020). These authors also note that telehealth further increases access by offering appointment flexibility and convenience through expanded hours and on-demand urgent care. Moreover, cost-effectiveness is a major benefit, with telepsychiatry associated with reduced costs related to travel and missed work, enhancing economic efficiency for both patients and providers (Shore et al., 2014).

For providers, telehealth improves efficiency and productivity by reducing appointment no-shows and enabling faster visits (Donelan et al., 2019). Health systems benefit from decreased costs related to overhead, medical supplies, facility fees, and case management (Kichloo et al., 2020). Telehealth also enhances care coordination and medication management through improved provider communication and remote monitoring, with the added benefit of offering discretion that empowers patients who are apprehensive about in-person visits to engage more fully in their care, thereby improving clinical outcomes (Acierno et al., 2016; Health Recovery Solutions, n.d.).

Consistent with the results of other studies, patients express high satisfaction with telehealth services. Imlach et al. (2020) conducted an anonymous online survey, along with in-depth interviews with adults 18 years and older in New Zealand who accessed primary healthcare services from March to May 2020. Out of 1,010 survey respondents in this study, 38 out of 75 randomly selected interviewees noted that 91% of patients were satisfied with COVID-19-era video telehealth services and 86% with the telephone modality. Imlach et al. (2020) also found that 80% of patients wanted telephone visits, and 69% wanted video visits in the future. However, it is essential to consider that patients who reported positive feedback and high satisfaction with telehealth during the COVID-19 lockdown were possibly influenced by the unique circumstances of the pandemic and the fear of infection.

Telehealth for mental health care has a strong evidence base demonstrating its effectiveness. A systematic review by Hubley et al. (2016) examined 21 studies, comparing telehealth to in-person psychotherapy and psychiatric assessment delivery. They categorized the studies into satisfaction, reliability, treatment outcomes, implementation outcomes, cost effectiveness, and legal issues. Although there were mixed results between the studies that employed a non-inferiority design and those that did not, the outcome leaned heavily toward telehealth as being similar or better across a range of mental health conditions, including depression, PTSD, and alcohol use disorder (Hubley et al., 2016).

Using technology acceptance models like the Unified Theory of Acceptance and Use of Technology and Technology Acceptance Model, several studies have examined the factors affecting telehealth adoption (Saigi-Rubió et al., 2016; Ward, 2013). In these

models, the users' perception of utility, ease of use, social influence, and available facilitating conditions appear to drive the likelihood of adoption. Perception of utility refers to the relative advantage of the technology. Simplicity of use relates to the perception of how easy it is to use. Social influence encompasses factors like peer effects, leadership engagement, and champion presence. Facilitating conditions include the technical and organizational infrastructure to enable the use of the technology (Venkatesh et al., 2003).

A survey of healthcare factors influencing telehealth adoption reveals a complex landscape, in which technical infrastructure, costs and reimbursement, workflow integration, organizational support, individual and patient factors, and policy regulations all play crucial roles in the successful implementation of telehealth services. Lack of adequate technical infrastructure and difficulties integrating telehealth technologies with existing health information technology (IT) systems are barriers to adoption (LeRouge & Garfield, 2013; Liu, 2011). Clinics need sufficient bandwidth, network connectivity, videoconferencing platforms, and devices to deliver telehealth services. Integration with electronic health records is also necessary for information exchange and workflow continuity. Shigekawa et al. (2018) noted that technical problems like video-quality issues hindered telehealth adoption among rehabilitation therapists. However, prior technical experience increased a clinic's likelihood of adopting telehealth (Menachemi et al., 2004). Lastly, patients also need access to smartphones, tablets, or computers and internet connectivity to engage in telehealth, contributing to disparities in use (Pierce & Stevermer, 2023).

The high costs associated with telehealth, including equipment, network access, videoconferencing licenses, and IT support, pose significant barriers to adoption, particularly for small and rural healthcare providers with limited budgets (LeRouge & Garfield, 2013; Liu, 2011). Furthermore, the uncertainty of reimbursement from insurance payers adds to the challenge, as providers cannot be certain of the return on their investment (Adler-Milstein et al., 2014; Antoniotti et al., 2014; Ranganathan & Balaji, 2020). Nevertheless, recent expansions in reimbursement policies by Medicare and Medicaid have facilitated a broader adoption of telehealth services across the country (Samson et al., 2021).

Telehealth adoption suffers when the technology does not integrate smoothly with existing workflows, or care teams do not coordinate effectively (LeRouge & Garfield, 2013). Providers' worries about the extra burden of consultations also serve as a barrier (Shigekawa et al., 2018). Successful telehealth implementation demands aligning the technology with clinical processes and staff roles (Liu, 2011). Therefore, clinics that redesign their operations to include telehealth are more likely to adopt it (Ranganathan & Balaji, 2020). Training providers to navigate updated workflows that include telehealth also fosters acceptance (Saigi-Rubió et al., 2016).

Active leadership and the advocacy of 'telehealth champions' within healthcare organizations drive the adoption of telehealth technologies (Liu, 2011; Ranganathan & Balaji, 2020). When organizations prioritize telehealth, engage in strategic planning, and establish supportive policies, they are more likely to successfully adopt these services (Alkureishi et al., 2021; LeRouge & Garfield, 2013). Furthermore, forming networks with other organizations enhances knowledge sharing and accelerates the spread of telehealth practices (Liu, 2011).

Healthcare providers' acceptance of telehealth is often affected by their concerns over the potential loss of interpersonal connection, challenges in conveying empathy, perceived quality of care, and the absence of physical examinations (Alkureishi et al., 2021; Pierce & Stevermer, 2023). However, Saigi-Rubió et al. (2016) and Alkureishi et al. (2021) noted that hands-on experience and targeted training demonstrate improved comfort and willingness to use this technology. While older providers might initially struggle with new technologies, ongoing training can improve their comfort and acceptance levels (Connolly et al., 2022).

Patient acceptance is essential for the adoption of telehealth (Wade et al., 2016). Older adults, in particular, may encounter difficulties due to technological literacy, device availability, and the challenge of navigating new interfaces (Cimperman et al., 2016). While Kruse et al. (2017) and Menachemi et al. (2004) noted that some patients are hesitant due to a desire for in-person interaction, privacy and security worries, and a limited grasp of telehealth benefits, others find the convenience and perceived advantages compelling reasons to use telehealth. Cultural influences also affect patient attitudes towards telehealth.

Educating patients and supporting them in the use of technology can significantly encourage telehealth adoption (Agarwal et al., 2013).

Variation in state telehealth policies around physician licensure, online prescribing, reimbursement parity, and modality restrictions impedes widespread adoption (Adler-Milstein et al., 2014). However, expanded reimbursement and relaxed restrictions during COVID-19 significantly increased telehealth use. Developing standards around patient privacy, informed consent, malpractice liability, etc., would enable broader adoption (LeRouge & Garfield, 2013). Telehealth-friendly licensure and payment policies are critical for sustained growth and investment in telehealth infrastructure nationwide (Pierce & Stevermer, 2023). While examining the benefits and challenges of telehealth in mental health care is essential, it is equally important to consider the broader trends over time in telemental health usage among civilians. Understanding how telehealth has evolved and its adoption patterns can shed light on its long-term impact and potential future developments.

Prior to the COVID-19 pandemic, the adoption and usage of telehealth in the civilian health system, also referred to as telemedicine or virtual care, was increasing but still relatively low. In 2016, only 61% of U.S. healthcare institutions offered some form of telehealth service (Office of Health Policy, Office of the Assistant Secretary and Planning, 2016). According to a 2016 physician survey, only 15.4% of physicians worked in practices using telehealth, with 37.4% using telemedicine to diagnose and provide treatment to patients (Kane & Gillis, 2018).

However, trends were pointing towards increased future usage. Barnett et al. (2018) studied the trends in telemedicine use in a large commercially insured population from 2005 to 2017. The researchers utilized data from the OptumLabs Data Warehouse, which serves as a repository for claims data of individuals with private insurance and Medicare Advantage coverage within a significant private U.S. healthcare program. Barnett et al. (2018) categorized telemedicine appointments according to Medicare guidelines. They grouped them into three classifications: telemental health (involving mental health professionals, Current Procedural Terminology [CPT] codes specific to mental health, or primary diagnoses related to mental health), primary care telemedicine (appointments with primary care practitioners that are not related to mental health), and miscellaneous

telemedicine. This study's use of CPT codes and mental health diagnoses is similar to my approach to identifying telehealth for mental health visits.

Using a regression model with time as a linear variable and log-transformed telemedicine visit volume as the dependent variable, Barnett et al. (2018) found that overall telehealth and telemental health utilization increased by an annual average of 52% and 56%, respectively. They also note that primary care telehealth visits before 2016 grew by an annual increase of 36%, followed by a rapid rise in the number of visits in 2017. This surge was observed after passing parity laws in 32 U.S. states as of 2016 (Barnett et al., 2018). As we continue to navigate telehealth in civilian mental health care, our attention now turns to the spatial trends accompanying these temporal shifts.

For example, Sampson et al. (2021) analyzed the utilization of telehealth services by Medicare beneficiaries in 2020, focusing on the increase in telehealth visits during the COVID-19 pandemic, the decline in in-person visits, and the disparities in telehealth use among different beneficiary characteristics and locations. They concluded that black and rural beneficiaries used telehealth services less than their white and urban counterparts. Additionally, telehealth usage was more prevalent in the Northeast and West regions, while it was less common in the Midwest and South (Samson et al., 2021). While these findings were not specific to telehealth for mental health, the researchers also examined telehealth utilization among specialty, primary care, and behavioral health. They found that behavioral health saw the largest increase at 38.1%. In the following section, I examine the comprehensive trends in telehealth usage within the active-duty service member population, considering both temporal shifts and spatial variations.

C. TELEHEALTH IN THE MILITARY

To document the potential to expand telemental health services among active-duty military, I summarize the literature on the usage of both telehealth and telemental health services within the MHS. I then provide an overview of telehealth utilization in the MHS during the pre-pandemic period, discussing the relatively limited but growing use of telehealth services. Finally, I detail how telehealth rapidly expanded in the MHS during

COVID-19, fueled by public health directives, analyzing changes in usage across specialties, providers, and modalities.

Similar to the civilian section, the MHS was using telehealth, but to a limited extent, before the COVID-19 pandemic. In 2015, only 0.3% of healthcare claims by DOD beneficiaries were for telehealth services delivered through live video conferencing (Government Accountability Office, 2017). Most of these claims (80%) were for behavioral health or psychiatry services. However, telehealth usage steadily increased in the years leading to the pandemic.

Using MHS Data Repository (MDR) healthcare claims identifying telehealth visits using the GT, GQ, and 95 CPT code modifiers for both the direct (MTF provided) and purchased (private sector provided) care system, Madsen et al. (2021) found a 19-fold increase in telehealth visits, from around 9,500 in 2006 to over 180,000 in 2018. This rise was driven largely by increased telehealth in the private sector, while growth in direct care at military treatment facilities was slower. The majority of these services were provided by physicians, with mental health diagnoses being the most common reason for telehealth visits (Madsen et al., 2021). The study concludes that telehealth in the MHS has seen increased acceptance and usage, suggesting a need for further research.

In their research, Gilder et al. (2023) exploited the same data source as the Madsen et al. (2021) study. However, they looked specifically at data between 2019 and 2021 to analyze the effects of the COVID-19 pandemic on TRICARE beneficiary telehealth use, categorized by provider type, clinical specialty, and facility characteristics—DC and PC systems. The study found that in 2020, telehealth visits within the MHS surged to over 2.8 million—a 20-fold increase from 2019. Mental health services in direct care settings saw a 337% increase, while other specialties also expanded their telehealth services (Gilder et al., 2023). Notably, advanced practice nurses and physician assistants provided a larger share of these services, evidencing a strategic shift in provider roles and a pivot towards more interactive live video consultations, as synchronous modalities became predominant over asynchronous ones like messaging, aligning with the adoption of new technologies for remote patient monitoring and video visits to reduce COVID-19 transmission.

Rosen et al. (2021) explored telehealth's role among veterans focusing on their mental healthcare needs during and after the pandemic. The Veterans Health Administration's (VHA) telemental health services expanded significantly before COVID-19, leveraging their Veterans Affairs Video Connect platform and distributing tablets to veterans for enhanced access (Rosen et al., 2021). Pre-pandemic, telemental health encounters rose eightfold between 2002 to 2019. With the onset of COVID-19, the VHA swiftly transitioned from in-person appointments to remote options, resulting in a five-fold increase in telemental visits by April 2020. Despite the surge in video visits, phone appointments remained prevalent. Research into the relative efficacy of phone versus video visits is ongoing (Rosen et al., 2021).

Apart from the increase in telehealth usage over time, there is also geographic variation in utilization across MTFs. For example, using National Plan and Provider Enumeration System, Defense Health Agency, and U.S. Census data from January 2016 to September 2020, Bacolod et al. (2023) document a significant shortage of psychiatrists available within a reasonable 30-minute drive for TRICARE beneficiaries, affecting both military personnel and civilians. This scarcity is particularly notable in economically disadvantaged and rural areas because market forces tend to attract psychiatrists to more affluent, non-rural regions, leaving vulnerable communities underserved (Bacolod et al., 2023). The research reveals that a substantial 35% of TRICARE beneficiaries reside in areas with deficits in military and civilian psychiatric care, and an alarming 6% have no access to such care at all. Here, telehealth emerges as a modern convenience and a critical lifeline, with the power to transcend the geographic and socioeconomic barriers that have long dictated access to care.

While the literature reviewed demonstrates the potential of telehealth to expand access to mental health services for military members, there are significant knowledge gaps regarding geographic and temporal trends in telehealth adoption and utilization specifically for this population. Most studies examining telehealth usage patterns in military settings, like the VHA system, look at overall trends rather than differences across regions, facilities, or geographic areas (Madsen et al., 2021; Rosen et al., 2021). Research on geographic variation often focuses on urban-rural differences or individual patient-level characteristics

affecting access rather than usage rates between military bases, surrounding communities, regional networks, etc. (Madsen et al., 2021; Rosen et al., 2021). The literature highlights disparities in telehealth access related to age and race/ethnicity among TRICARE beneficiaries (Madsen et al., 2021).

Few studies systematically analyze geographical variation in telemental health use among the active-duty population or examine temporal trends in usage over both the pre-pandemic and pandemic. My thesis will explore the nuances of telehealth utilization within the military population, using a more detailed approach to reveal geographical and temporal trends specific to mental health.

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III. DATA SOURCES AND METHODOLOGY

The central objective of this chapter is to outline the datasets employed in my analysis and regression models and to delineate the formulation of both the outcome and key independent variables. Initially, I provide an overview of the dataset. Subsequently, I identify the study sample and elaborate on the generation of the key variables used. Finally, I reveal the methodological approach employed for analysis.

A. DATA

For my analysis, I exploit a combination of datasets from three principal sources. The MHS Data Repository (MDR) serves as the primary source to track mental health visits, detailing the dates, types, and geographic specifics of these visits. I accessed the Defense Enrollment Eligibility Reporting System (DEERS), incorporated within the MDR warehouse, to explore the demographic details of active-duty service members. To further enhance this dataset, I integrate socioeconomic variables from United States Census data, such as family income levels and the proportion of the Black population within the residential zip codes of the service members. Lastly, I include state political affiliation data from the Kaiser Family Foundation website. The subsequent sections will comprehensively summarize these sources and the corresponding datasets used.

1. Military Health System Data Repository

The MDR is a comprehensive data warehouse encompassing extensive information pertaining to MHS beneficiaries and their healthcare (Kennell and Associates, 2016). I obtained four separate datasets stored within this repository. The first dataset is known as TRICARE Encounter Data Non-Institutional (TEDNI). Every entry in this dataset represents a non-denied individual service claim (excluding inpatient hospital or institutional care) rendered in the purchased care system (Analytics and Evaluation Division, 2023). The Comprehensive Ambulatory/Professional Encounter Record, also referred to as the CAPER, is the second dataset and is similar to the TEDNI only for care provided in the direct system (Lurie, 2016). The third set is the MHS GENESIS Episodic Encounter data, which consists of individual encounters in the direct care system for all

MTFs operating on MHS GENESIS. To maximize the capture of active-duty personnel's demographic characteristics for each observation, I merged each dataset individually with the DEERS data. The DEERS dataset is the last of the four and consists of one observation each month, assigned to each eligible beneficiary.

2. Federal Office of Rural Health Policy

Data accessible from the Human Resources and Services Administration (2021) website is also relevant to the focus of my research. This dataset identifies rural areas by state and zip code with 18,776 observations. I merged this dataset individually with each of the three encounter datasets from the MDR warehouse prior to the merger with the DEERS data. In this process, I created the binary variable *beneficiary residence* if the active-duty service member's zip code matched or did not match the eligible rural zip codes within this dataset. This variable allowed me to analyze the rurality associated with mental telehealth visits based on active-duty beneficiary residence.

3. United States Census

Another integral component of my analysis encompasses data derived from the United States Census spanning the years 2016 to 2020. I combined this data with the previously mentioned merged MDR datasets by zip codes and year. The inclusion of Census data enriches my analytical framework by providing a comprehensive understanding of demographic and socioeconomic factors within the study population. These variables encompass a wide range of information, including but not limited to the categorical variable for *community family income levels* and the *community share of Black population*. Table 1 outlines the variables and definitions for *community family income level* and *share of Black population*.

Table 1. Community Family Income Level and Share of Black Population Categorical Variable Definitions

	Community Family Income Levels	*Community Share of Black Population*
Low	Active-duty service members residing in a community classified as low family income level	Active-duty service members residing in a community classified as low share of Black population
Medium	Active-duty service members residing in a community classified as medium family income level	Active-duty service members residing in a community classified as medium share of Black population
High	Active-duty service members residing in a community classified as high family income level	Active-duty service members residing in a community classified as high share of Black population
Missing Info	Active-duty service members missing community family income level information	Active-duty service members missing community share of Black population information

Additionally, I created a *Census region* variable based on the *state* variable and imputed data from the last known value by the *service member's unique identifier* and *year-month* for missing values. Table 2 defines the active-duty service member state of residence Census region. This dataset and generated variable will enable a more nuanced exploration of the contextual factors that influence mental health visits among active-duty service members, enhancing the depth and comprehensiveness of the analysis.

Table 2. Active-duty Service Member State of Residence Census Region Categorical Variable Definitions

Alaska	Active-duty service members residing in Alaska
Midwest	Active-duty service members residing in Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin
Northeast	Active-duty service members residing in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont
Overseas	Active-duty service members residing in Europe and the Pacific
South	Active-duty service members residing in Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia
West	Active-duty service members residing in Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

4. State Political Affiliation

In addition to the datasets mentioned above, I incorporated information on state political affiliation to contextualize further the factors influencing mental health visits among active-duty service members. I sourced this data from the Kaiser Family Foundation website, a reputable resource for healthcare-related information (Kaiser Family Foundation, n.d.). With the information in this data, I generate the categorical variable *state*

political affiliation if there is a mixture of Democrat and Republican, all Democratic, or all Republican political affiliation in the Governor, State Senate Majority, and State House Majority within a state. Figure 1 provides a visual of the state political affiliation defined above with mixed indicated by purple, Democrat by blue, and Republican by red. The inclusion of state political affiliation data allows for a comprehensive analysis that considers potential political influences on mental telehealth care use within different regions of the United States. This information will be instrumental in exploring any correlations or patterns that may emerge during the course of my research.

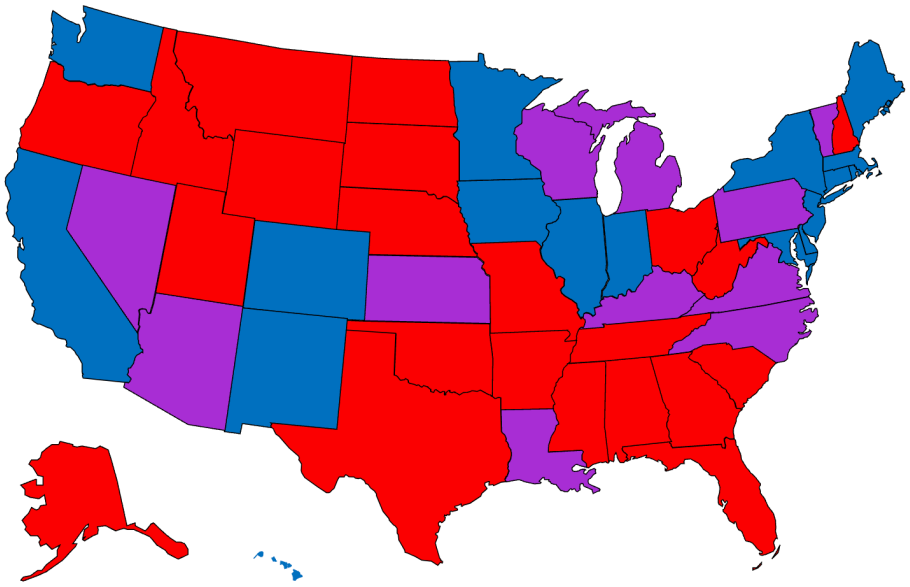


Figure 1. State Political Affiliation. Adapted from Kaiser Family Foundation (2024).

5. Drive Time

Additionally, I incorporated a unique data variable from a dataset generated for the Bacolod et al. (2023) research. This study calculated driving times between the geographical centers of each zip code community and the nearest MTFs using a web-based query. I created the categorical variable *proximity* (within a 15-minute drive, greater than 15 minutes and equal to/less than 30 minutes, and greater than 30 minutes) with this data

to define the proximity to the nearest MTF. This variable provides critical insights into the accessibility of mental health care services for active-duty service members residing in different areas. By quantifying the travel time required to reach these facilities, we gain a deeper understanding of the geographical barriers and challenges that individuals may face when seeking mental health care.

B. KEY VARIABLES

This data spans from January 1, 2016 to December 31, 2022 and initially consisted of 16,362,458 observations of active-duty service members. The study population includes a service member if they had at least one mental health care visit during the study period, defining a mental health care visit as a health care visit with the principal diagnostic code ranging from F00 through F99 according to the International Classification of Diseases, Tenth Revision (ICD-10). Each observation represents a unique mental health care visit from a service member in either the direct or purchased care setting, regardless of modality. I removed 442,764 observations due to missing identifier for the service member, which is 2.71% of observations.

Moreover, these other variables are either categorical, including demographics, or binary. The demographic variables include *sex* (female and male), *race* (White, Black, Asian, Hispanic, and 'Other'), *age group* by years (17 to 26, 27 to 36, 37 to 46, 47 to 56, and 57 and over), *branch of service* (Army, Air Force, Marine Corps, Navy, and 'Other' [mostly Coast Guard]), and *rank* (officer and enlisted). The binary variables include *post-GENESIS implementation* (encounters at the treatment MTF that occurred on/after the MHS GENESIS electronic health record's implementation date at that facility and encounters before this go-live date), *post-COVID* (encounters on/after March 11, 2020, and encounters prior), *last three quarters of 2022* (encounter date between April 1, 2022, and December 31, 2022 and on/before March 31, 2022), and direct care visits (encounters recorded within the CAPER or GENESIS dataset and encounters documented within the TEDNI dataset). These categorical and binary variables are essential for the temporal and systemic stratification of the data, allowing for more precise assessments of the impact of

systemic transitions and global health events on mental health service utilization among active-duty service members.

C. DESCRIPTIVE STATISTICS

Early analysis depicted in Table 3 provides a comprehensive overview of the overall distribution of mental health visits by care type among active-duty personnel from January 2016 to December 2022. The direct care data, with 12,645,276 recorded visits, indicates a predominance of service members receiving care in the South census region at nearly 61%, and a significant majority of those individuals resided within a 15-minute proximity to the nearest MTF. Urban residents accessing direct care were notably prevalent, comprising over 88% of the visits, while rural residents accounted for just over 11%. Examining the data by sex, males had a higher frequency of mental health visits at approximately 72%, compared to females at around 28%. When categorized by race, White individuals were the majority, with Asian and 'Other' races having the least representation. The age group data revealed a skew towards younger service members, particularly those between 17 to 26 years old. The Army was the most represented branch in the direct care setting, while the 'Other' category, mainly the Coast Guard, was the least represented. Officers made up nearly 11% of the visits, with enlisted personnel accounting for the remainder.

In contrast, the purchased care segment, encompassing 3,274,418 visits, showed a slightly different distribution. While the South still led in frequency, the percentage was lower compared to direct care. Similar to direct care, a large portion of visits occurred among service members residing within a 15-minute drive to the nearest MTF, and urban dwellers were again the majority. Females constituted a higher percentage of visits in purchased care than in direct care, although males remained the majority. The race distribution in purchased care mirrored that of direct care, with White individuals being the most frequent visitors. Younger age groups also dominated in the purchased care data but with a slight decrease in frequency compared to direct care for the 17 to 26 age group. The Army's representation was less in purchased care, while the Navy saw an increase. The

officer visits in purchased care were higher than in direct care, and enlisted visits followed a similar pattern to direct care.

The community family income level data revealed that a larger portion of service members using direct care resided in communities classified as low-income. In contrast, the medium income category was more common in purchased care. The community share of Black population was higher in direct care visits. Lastly, the state political affiliation presented a diverse picture, with Republican-leaning areas accounting for the largest percentage in direct care and Democrat-leaning areas taking the lead in purchased care.

This descriptive analysis underscores the varied utilization patterns of mental health services among active-duty personnel across different care types, with clear distinctions observed in demographics, geographical locations, service branches, and other socioeconomic factors.

Table 3. Summary Statistics of Active-duty Personnel Overall Mental Health Visit Distribution by Care Type, January 2016–December 2022

	Direct care (n = 12,645,276)		Purchased care (n = 3,274,418)	
	Frequency	% of n	Frequency	% of n
Census region				
Alaska	183,728	1.45%	45,025	1.38%
Midwest	861,634	6.81%	263,633	8.05%
Northeast	427,409	3.38%	202,427	6.18%
Overseas	46,201	0.37%	4,356	0.13%
South	7,701,211	60.90%	1,667,855	50.94%
West	3,425,093	27.09%	1,091,122	33.32%
Proximity				
Within a 15-minute drive to MTF	7,492,393	59.25%	1,746,588	53.34%
Between greater than 15- and 30-minute drive to MTF	2,627,395	20.78%	755,949	23.09%
Greater than a 30-minute drive to MTF	2,525,488	19.97%	771,881	23.57%
Beneficiary residence				
Urban	11,188,670	88.48%	2,907,227	88.79%
Rural	1,456,606	11.52%	367,191	11.21%
Sex				
Female	3,488,098	27.58%	1,053,051	32.16%
Male	9,157,178	72.42%	2,221,367	67.84%
Race				
White	6,733,428	53.25%	1,756,626	53.65%
Black	2,667,102	21.09%	608,673	18.59%
Asian	656,868	5.19%	167,977	5.13%
Hispanic	1,988,558	15.73%	519,361	15.86%
Other	599,320	4.74%	221,781	6.77%
Age groups, years				
17 to 26	5,744,859	45.43%	1,260,248	38.49%
27 to 36	4,090,477	32.35%	1,160,757	35.45%
37 to 46	2,398,567	18.97%	730,588	22.31%
47 to 56	391,160	3.09%	114,957	3.51%
57 and over	20,213	0.16%	7,868	0.24%
Branch of service				
Army	6,201,951	49.05%	914,925	27.94%
Air Force	2,487,867	19.67%	816,595	24.94%
Marine Corps	1,227,289	9.71%	300,574	9.18%
Navy	2,617,406	20.70%	996,043	30.42%
Other (mainly Coast Guard)	110,763	0.88%	246,281	7.52%
Rank				
Officer	1,369,904	10.83%	483,870	14.78%
Enlisted	11,275,372	89.17%	2,790,548	85.22%
Community family income level				
Low	4,339,406	34.32%	953,345	29.11%
Medium	3,504,662	27.72%	1,166,508	35.62%
High	2,397,383	18.96%	963,800	29.43%
Missing info	2,403,825	19.01%	190,765	5.83%
Community share of Black population				
Low	929,677	7.35%	446,251	13.63%
Medium	2,938,013	23.23%	1,125,920	34.39%
High	7,420,031	58.68%	1,618,599	49.43%
Missing info	1,357,555	10.74%	83,648	2.55%
State political affiliation				
Mixed	3,661,484	28.96%	730,430	22.31%
Democrat	4,303,019	34.03%	1,318,232	40.26%
Republican	4,680,773	37.02%	1,225,756	37.43%

Author tabulation of data discussed in Chapter III.

D. GENERAL METHODOLOGY

The methodology proceeds to examine these key variables further, employing them to generate additional descriptive statistics, conduct trend analysis, and perform linear probability regressions to understand their predictive power on the studied outcome. I have divided the descriptive statistics tables by care type, direct and purchased, to identify the frequency and percent of mental health visits associated with the key variables. The trend analysis looks specifically at mental telehealth use among various key variables. Finally, to broaden the evaluation of mental telehealth, I execute bivariate and multivariate main and interaction effects linear probability regression analysis using the outcome variable *telehealth* in terms of percentage.

1. Dependent Variables

In this study, I examine the use of telehealth for mental health services in a singular context. To accurately and directly compare direct and civilian telehealth visits, I define *telehealth* as a mental health care visit where the principle CPT code or modifier code corresponds with the virtual health CPT codes or modifier codes identified by the CarePoint (n.d.) methodology. Table 4 presents the CPT codes and code modifiers that distinguish telehealth visits per CarePoint. The *telehealth* variable is multiplied by 100 to put the results in percentage values. In the direct care records, note that the legacy system (before transitioning to GENESIS) had a separate variable that captured whether a visit was virtual. However, such information is not available in the post-GENESIS record nor the purchased care record, regardless of the period. To have a consistent comparison between the two care settings across time, I use only the CPT codes, which is a standard practice to identify telehealth in the civilian care setting.

Table 4. Current Procedural Code and Code Modifiers

CPT Codes					Modifiers
92227	95709	95724	G0406	G9482	93
92228	95710	95725	G0407	G9483	95
93264	95711	98968	G0408	G9484	FQ
93293	95712	98969	G0425	G9485	G0
93294	95713	98970	G0426	G9486	GQ
93295	95714	98971	G0427	G9487	GT
93296	95715	98972	G0459	G9488	
93297	95716	99091	G0508	G9489	
93298	95717	99453	G0509	G9868	
93299	95718	99454	G2010	G9869	
95700	95719	99457	G2012	G9870	
95705	95720	99458	G2061	Q3014	
95706	95721	D9995	G2062	S9110	
95707	95722	D9996	G2063	T1014	
95708	95723	G0071	G9481	T2025	

2. Regression Models

I perform eleven separate bivariate regression analyses and one multivariate regression analysis to examine the relationship with the dependent variable in the direct and purchased care system. In the bivariate models, specific sets of variables are examined in relation to the dependent variable, while the multivariate model considers all factors simultaneously. Equation (1) displays the structure of the bivariate models.

$$telehealth_{ijt} = \beta_0 + \beta_1 \text{ Block variable}_{ijt} + \beta_2 post\text{-}GENESIS_{jt} + \alpha_t \quad (1)$$

The shared components among all 11 models include:

$telehealth_{ijt}$ = the probability of a telehealth visit

$post\_genesis_{jt}$ = binary variable for whether the encounter date at the specified MTF is on/after the MTF's MHS GENESIS go-live date

α_t = year-quarter dummy variables

The structure of models 1 through 11 diverges as each incorporates a distinct key block variable in each model. Model 12 combines all block bivariate variables used in models 1 through 11. This approach allows for the estimation of the collective impact on telehealth usage by the various factors:

(Model 1) Census region = active-duty service member's state of residence categorized by Alaska, Midwest (reference category), Northeast, Overseas, South, and West

(Model 2) Proximity = active-duty service member's proximity to the nearest MTF distinguished by within a 15-minute drive (reference category), between greater than 15 and equal to/less than a 30-minute drive, and greater than a 30-minute drive

(Model 3) Beneficiary residence = binary variable indicating the active-duty service member's zip code as a rural zip code

(Model 4) Sex = categorical variable for whether female (reference category) or male

(Model 5) Race = categorical variable for White (reference category), Black, Asian, Hispanic, and 'Other'

(Model 6) Age group = categorical variable for age groups (in years) 17 to 26 (reference category), 27 to 36, 37 to 46, 47 to 56, and 57 and over

(Model 7) Branch of Service = categorical variable for the branch of service, identified as Army (reference category), Air Force, Marine Corps, Navy, and 'Other' (mostly Coast Guard)

(Model 8) Rank = categorical variable for whether officer or enlisted (reference category)

(Model 9) Community family income level = categorical variable with three quantiles (low [reference category], medium, high) and "missing info" indicating family income level of community in the active-duty service member's residential zip code

(Model 10) Community share of Black population = categorical variable with three quantiles (low [reference category], medium, high) and "missing info" indicating the share of Blacks in the general population of the active-duty service member's residential zip code

(Model 11) State political affiliation = categorical variable indicating state political affiliation as mixed (reference category), Democrat, and Republican

(Model 12) Represents the model derived from integrating the eleven block bivariate models into a multivariate linear regression framework

Furthermore, I perform additional analysis on four sets of block variables to explore whether the gap has changed over time for each block. In particular, I implement interaction models for the following dimensions: sex, branch of service, community's family income, and political affiliation.

The decision to employ regression models with variables like telehealth use, demographics, and socioeconomic factors was driven by a comprehensive understanding of the existing gaps in research concerning mental health care delivery within the military context. By analyzing rich data from the MDR, DEERS, Census, and other sources, it investigates telehealth's impact among active-duty members post-COVID-19, aiming to discern usage patterns and the effect of geographic access to care. The goal is to provide actionable insights that improve access and outcomes for service members, thereby boosting their mental health and operational readiness.

IV. RESULTS AND FINDINGS

A. INTRODUCTION

My research identifies trends and variations in telehealth visits for mental health care within both the military and civilian care settings among active-duty personnel. I first focus on the quantitative analyses of mental telehealth use and follow this with the findings from block bivariate and multivariate linear probability regression analyses concerning the outcome variable of mental telehealth visits. Lastly, I will examine the outcomes of interactions between four distinct key variables (male, service, community family income level, and state political affiliation) and the last three quarters of the COVID period under study.

B. TRENDS IN IN-PERSON AND TELEHEALTH VISITS

When looking at the distribution of direct care mental health visits for active-duty personnel, Table 5 exhibits the distinctive trends between in-person and telehealth visits. A significant volume of mental health services was delivered in-person (n = 11,500,119) compared to telehealth (n = 1,145,157), highlighting the predominant reliance on traditional face-to-face interactions for mental health care within the military.

The South Census region dominated telehealth visits proportionally, accounting for 63.66% (n = 729,041) of the total, comparably more than in-person visits at 60.63% (n = 6,972,170). The West followed, with 27.24% (n = 3,132,265) for in-person visits. However, the proportion of telehealth visits was less than in-person visits, 25.57% (n = 292,828). Interestingly, Alaska had a slightly higher percentage of telehealth visits (1.54%) compared to in-person visits (1.44%), which could be indicative of the geographical challenges in accessing in-person services. Urban residence was a common factor among both in-person (88.23%) and telehealth (91.00%) visits. This urban majority suggests that while telehealth aims to bridge the gap in care access for rural populations, it is still more commonly utilized by those in urban settings.

The distribution across sex was skewed towards males (72.81% in-person, 68.50% telehealth), reflecting the sex composition within the active-duty population. However,

telehealth visits had a higher percentage of female service members (31.50%) compared to in-person visits (27.19%). As for race and ethnicity, the data revealed White individuals constituted the majority of mental health visits for in-person (53.55%) care. However, the proportion of telehealth (50.22%) visits was lower than in-person visits. Notably, the percentage of Black individuals using telehealth services (22.75%) was slightly higher than in-person (20.93%), which could suggest a differential uptake of telehealth services among this group. Regarding age group usage, telehealth visits saw a higher percentage of use by service members in the 37 to 46 age group (21.23%) than in-person visits (18.74%).

The Navy had the highest proportional difference in telehealth (23.17 %) visits compared to in-person (20.45%) visits. The Army followed with the proportion of telehealth visits nearly one percentage point higher than in-person visits. Transitioning to rank, enlisted personnel demonstrate a greater proportion of in-person (89.42%) visits compared to telehealth (86.59%) visits. Compared to officers, this is consistent with the larger population of enlisted members in the military. However, officers used telehealth more (13.41%) than in-person (10.58%) visits.

Low community family income levels were the most common among both visit types, potentially indicating higher mental health service needs or more significant stressors among service members living in lower-income communities. Service members living in communities with a higher share of Black population saw a greater percentage of telehealth visits (60.00%) compared to in-person (58.55%), which could be related to community preferences. Furthermore, the data showed that Republican-affiliated states had a marginally higher percentage of telehealth visits (38.68%) compared to in-person visits (36.85%).

Table 5. Summary Statistics of Active-duty Personnel Direct Care Mental Health Visit Distribution by Type, January 2016–December 2022

	In-person (n = 11,500,119)		Telehealth (n = 1,145,157)	
	Frequency	% of n	Frequency	% of n
Census region				
Alaska	166,101	1.44%	17,627	1.54%
Midwest	800,751	6.96%	60,883	5.32%
Northeast	387,930	3.37%	39,479	3.45%
Overseas	40,902	0.36%	5,299	0.46%
South	6,972,170	60.63%	729,041	63.66%
West	3,132,265	27.24%	292,828	25.57%
Proximity				
Within a 15-minute drive to MTF	6,808,864	59.21%	683,529	59.69%
Between greater than 15- and 30-minute drive to MTF	2,373,398	20.64%	253,997	22.18%
Greater than a 30-minute drive to MTF	2,317,857	20.16%	207,631	18.13%
Beneficiary residence				
Urban	10,146,624	88.23%	1,042,046	91.00%
Rural	1,353,495	11.77%	103,111	9.00%
Sex				
Female	3,127,417	27.19%	360,681	31.50%
Male	8,372,702	72.81%	784,476	68.50%
Race				
White	6,158,329	53.55%	575,099	50.22%
Black	2,406,546	20.93%	260,556	22.75%
Asian	593,922	5.16%	62,946	5.50%
Hispanic	1,800,448	15.66%	188,110	16.43%
Other	540,874	4.70%	58,446	5.10%
Age groups, years				
17 to 26	5,262,204	45.76%	482,655	42.15%
27 to 36	3,715,094	32.30%	375,383	32.78%
37 to 46	2,155,424	18.74%	243,143	21.23%
47 to 56	349,457	3.04%	41,703	3.64%
57 and over	17,940	0.16%	2,273	0.20%
Branch of service				
Army	5,630,540	48.96%	571,411	49.90%
Air Force	2,282,415	19.85%	205,452	17.94%
Marine Corps	1,134,724	9.87%	92,565	8.08%
Navy	2,352,110	20.45%	265,296	23.17%
Other (mainly Coast Guard)	100,330	0.87%	10,433	0.91%
Rank				
Officer	1,216,307	10.58%	153,597	13.41%
Enlisted	10,283,812	89.42%	991,560	86.59%
Community family income level				
Low	3,958,976	34.43%	380,430	33.22%
Medium	3,197,550	27.80%	307,112	26.82%
High	2,148,726	18.68%	248,657	21.71%
Missing info	2,194,867	19.09%	208,958	18.25%
Community share of Black population				
Low	848,227	7.38%	81,450	7.11%
Medium	2,664,904	23.17%	273,109	23.85%
High	6,732,971	58.55%	687,060	60.00%
Missing info	1,254,017	10.90%	103,538	9.04%
State political affiliation				
Mixed	3,351,634	29.14%	309,850	27.06%
Democrat	3,910,665	34.01%	392,354	34.26%
Republican	4,237,820	36.85%	442,953	38.68%

** p<.001, * p<.05

All pairwise mean comparisons between in-person and telehealth visits are statistically significantly different at p<0.001.

Author tabulation of data discussed in Chapter III.

Table 6 analyzes the trends observed in the distribution of purchased care mental health visits between in-person (n = 2,673,215) and telehealth (n = 601,203) modes among active-duty personnel. The data indicates a higher concentration of in-person visits in the South (52.17%) and West (31.12%) Census regions, while telehealth visits were proportionally higher in the West (43.14%) compared to other regions. Notably, similar to the direct care setting, the Alaska region showed a higher percentage of telehealth visits (1.63%) than in-person visits (1.32%). A significant discrepancy is observed in the urban versus rural residence of service members, with a vast majority located in urban areas for both in-person (87.79%) and, more notably, telehealth (93.22%) visits. The data suggest that telehealth services are more utilized by urban dwellers, possibly due to better internet connectivity or awareness of telehealth options.

Moreover, the sex distribution reveals that while the majority of in-person visits were made by males (70.01%), a significantly higher proportion of females utilized telehealth services (41.80%). This may reflect the growing comfort or need among female service members for the flexibility and privacy offered by telehealth. Regarding race, Whites are the majority in both visit types, but there is a larger representation of Asians (6.29%) and Hispanics (17.54%) in telehealth visits compared to in-person. The 'Other' category also saw a higher percentage in telehealth (8.96%) visits, suggesting that telehealth may be more accessible or appealing to these groups. As for variation among age groups, younger service members (17 to 26 years) favor in-person visits. However, analysis reveals a shift in telehealth, with the 27 to 36-year-old group having the highest proportion (38.81%).

Additionally, the Navy shows a disproportionate preference for telehealth (50.88%) compared to other branches, which might be related to factors such as the unique operational requirements or the accessibility of telehealth services. When addressing rank variations, officers make up a higher percentage of telehealth users (19.38%) than in-person (13.74%), and living in a community of a higher income level correlates with a greater use of telehealth services, suggesting socioeconomic factors may influence the choice of service delivery. Also, relating to service member communities, those with a high share of Black population have a substantial representation in both in-person (50.57%) and

telehealth (44.36%) visits. As for state political affiliation, there is a notable divide, with Democrat-affiliated states showing a higher percentage of telehealth use (52.22%) compared to Republican (23.30%), potentially reflecting different health policy environments or cultural attitudes towards telehealth in these states.

Table 6. Summary Statistics of Active-duty Personnel Purchased Care Mental Health Visit Distribution by Type, January 2016–December 2022

	In-person (n = 2,673,215)		Telehealth (n = 601,203)	
	Frequency	% of n	Frequency	% of n
Census region				
Alaska	35,252	1.32%	9,773	1.63%
Midwest	232,595	8.70%	31,038	5.16%
Northeast	175,300	6.56%	27,127	4.51%
Overseas	3,586	0.13%	770	0.13%
South	1,394,706	52.17%	273,149	45.43%
West	831,776	31.12%	259,346	43.14%
Proximity				
Within a 15-minute drive to MTF	1,406,493	52.61%	340,095	56.57%
Between greater than 15- and 30-minute drive to MTF	618,294	23.13%	137,655	22.90%
Greater than a 30-minute drive to MTF	648,428	24.26%	123,453	20.53%
Beneficiary residence				
Urban	2,346,810	87.79%	560,417	93.22%
Rural	326,405	12.21%	40,786	6.78%
Sex				
Female	801,744	29.99%	251,307	41.80%
Male	1,871,471	70.01%	349,896	58.20%
Race				
White	1,467,890	54.91%	288,736	48.03%
Black	493,327	18.45%	115,346	19.19%
Asian	130,137	4.87%	37,840	6.29%
Hispanic	413,934	15.48%	105,427	17.54%
Other	167,927	6.28%	53,854	8.96%
Age groups, years				
17 to 26	1,080,397	40.42%	179,851	29.92%
27 to 36	927,409	34.69%	233,348	38.81%
37 to 46	569,833	21.32%	160,755	26.74%
47 to 56	89,477	3.35%	25,480	4.24%
57 and over	6,099	0.23%	1,769	0.29%
Branch of service				
Army	823,116	30.79%	91,809	15.27%
Air Force	722,231	27.02%	94,364	15.70%
Marine Corps	247,310	9.25%	53,264	8.86%
Navy	690,172	25.82%	305,871	50.88%
Other (mainly Coast Guard)	190,386	7.12%	55,895	9.30%
Rank				
Officer	367,381	13.74%	116,489	19.38%
Enlisted	2,305,834	86.26%	484,714	80.62%
Community family income level				
Low	828,749	31.00%	124,596	20.72%
Medium	963,363	36.04%	203,145	33.79%
High	714,665	26.73%	249,135	41.44%
Missing info	166,438	6.23%	24,327	4.05%
Community share of Black population				
Low	361,417	13.52%	84,834	14.11%
Medium	883,950	33.07%	241,970	40.25%
High	1,351,891	50.57%	266,708	44.36%
Missing info	75,957	2.84%	7,691	1.28%
State political affiliation				
Mixed	583,281	21.82%	147,149	24.48%
Democrat	1,004,282	37.57%	313,950	52.22%
Republican	1,085,652	40.61%	140,104	23.30%

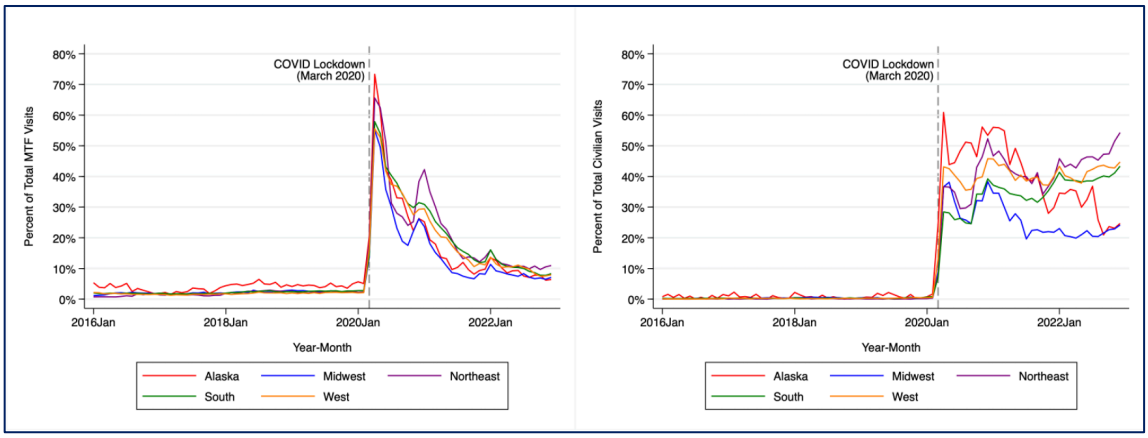
** p<.001, * p<.05

All pairwise mean comparisons between in-person and telehealth visits are statistically significantly different at p<0.001, except for the share of visits that occurred in the overseas region (p=0.24) and the proximity between greater than 15- and 30-minute drive to MTF (p=0.0011).

Author tabulation of data discussed in Chapter III.

Shifting the focus from the type and frequency of mental health visits to trends in telehealth visits, I observe a consistent share of mental telehealth visits within the military (approximately 2%) and civilian (nearly zero) care settings prior to the onset of the COVID-19 lockdown. When taking a closer look at various factors associated with the share of telehealth visits, I find a significant initial uptake of telehealth, which suggests a significant impact of the pandemic on mental health service utilization.

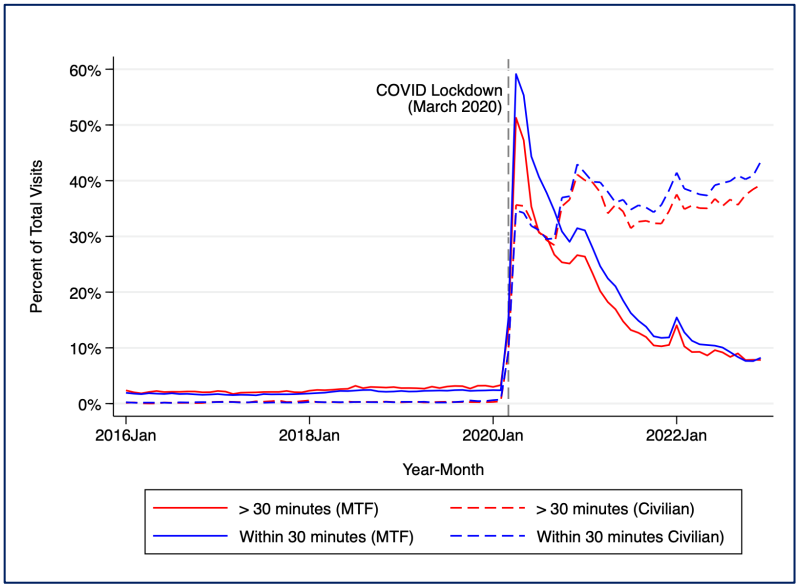
Figure 2 depicts that among MTF visits, the Alaska region accounts for the highest increase, followed by the Northeast. Towards the end of the observation period, the data indicates a recovery trend with some fluctuations, yet they do not return to pre-pandemic levels, suggesting a possible shift in how mental health services are accessed or delivered. As for civilian visits, the patterns are less uniform across regions. The initial spike is followed by variable trends across regions, with the West and Alaska experiencing more pronounced fluctuations. By 2022, the percentage of total civilian visits remains higher than pre-pandemic levels for all regions, indicating a sustained change in the pattern of mental telehealth service utilization in the civilian sector post-pandemic. The reasons behind this could include a heightened awareness of mental health, increased availability of services, or lasting impacts of the pandemic on mental health.



Author tabulation of data discussed in Chapter III.

Figure 2. Share of Mental Health Care Visits to MTFs and Civilian Providers that Were Teleconsult, by Census Region

Figure 3 displays both the share of mental telehealth visits within and beyond 30 minutes of travel time to the nearest MTF (broken down by the military and civilian setting). Here, the initial uptake is more pronounced for visits in the military care setting than the civilian setting, indicating an infrastructure ready to quickly transition to telehealth services at the onset of the pandemic. Post-lockdown, the percentage of visits within 30 minutes to civilian facilities shows a marked and sustained increase, surpassing the other categories, which could suggest a shift towards the sense of privacy associated with care in the civilian setting combined with the removal of travel time from the work site (usually close to the MTF) to a civilian care facility. In contrast, the percentage of visits within and beyond 30 minutes to MTFs gradually decreases, indicating a possible persistent reduction in MTF telehealth visit availability.

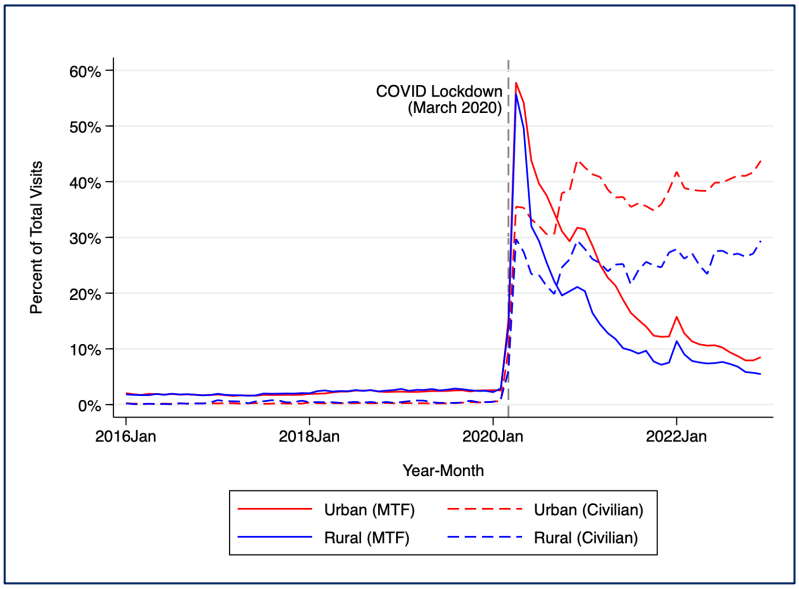


Author tabulation of data discussed in Chapter III.

Figure 3. Share of Mental Health Care Visits that Were Teleconsult, by Drive Time to MTF and Care Setting

Figure 4 focuses on the mental telehealth use variation among service members residing in urban versus rural areas between MTF and civilian care facilities. Urban visits to MTFs had the most significant initial increase, followed by rural visits in the same care setting. However, these same visits exhibit a decline towards pre-pandemic levels.

Interestingly, the trend for urban and rural civilian visits shows a more pronounced increase post-lockdown compared to urban and rural MTF visits, suggesting an increased reliance on mental telehealth services in civilian facilities in urban and rural areas during and after the lockdown period.

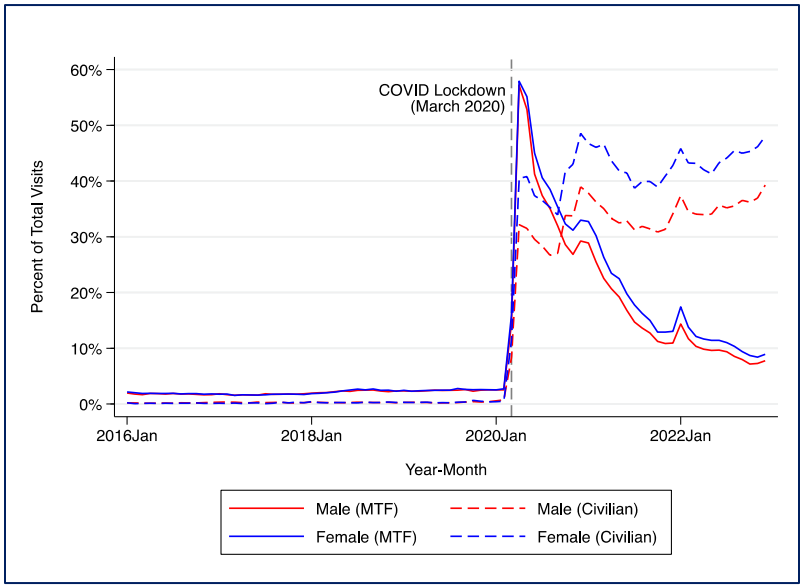


Author tabulation of data discussed in Chapter III.

Figure 4. Share of Mental Health Care Visits that Were Teleconsult, by Rurality and Care Setting

Figure 5 provides a comparative visualization of the percentage of total mental telehealth visits by sex and care setting. For both MTF and civilian services, female visits constituted a higher percentage than male visits throughout the period. The lockdown precipitated a dramatic increase in visits for both sexes across MTF and civilian facilities, with female MTF visits notably plummeting to around 9% and male MTF visits descending to approximately 8%. However, the post-lockdown period displays civilian visits for both sexes, showing a significant upward trend. Female civilian visits demonstrate a particularly notable rebound, peaking at around 48% by the end of 2022, while male civilian visits were at around 39%, suggesting a persistent sex-based difference in telehealth service utilization post-lockdown. The increased percentages, especially among civilian visits, may reflect an

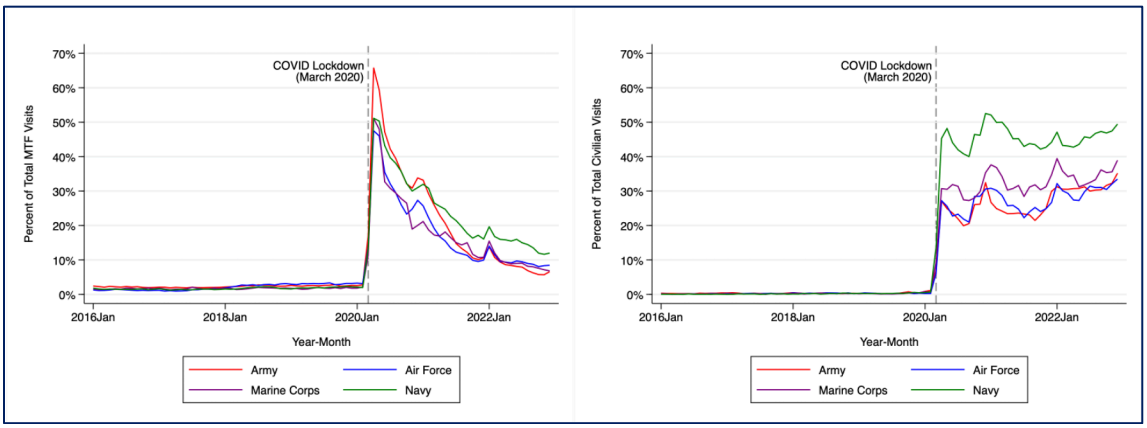
enduring shift towards mental telehealth services in civilian facilities or an increased overall demand for telehealth visits in the aftermath of the pandemic.



Author tabulation of data discussed in Chapter III.

Figure 5. Share of Mental Health Care Visits that Were Teleconsult, by Sex and Care Setting

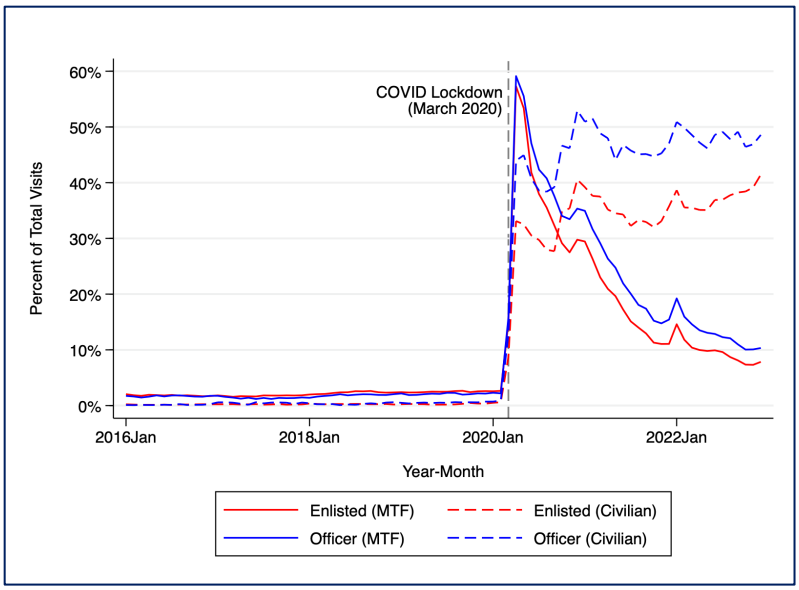
Figure 6 illustrates the percentage of total mental telehealth visits by service branch for MTFs and civilian facilities. Here, you can see the jump in MTF visits across all branches, with the Army's visits showing the steepest incline. This pattern suggests that the lockdown had a profound impact on access to or the utilization of MTF mental telehealth services across all military branches. In the civilian sector, post-lockdown, the Navy shows a distinct increase in the percentage of total visits, surpassing the pre-pandemic levels and fluctuating around 49% by the end of 2022. The Army also shows increases but with more variability. The post-lockdown trends indicate a potential shift in mental telehealth service utilization in the MTF and civilian facilities, particularly within the Navy, which could reflect changes in policy, availability, or service member preference in the wake of the pandemic.



Author tabulation of data discussed in Chapter III.

Figure 6. Share of Mental Health Care Visits to MTFs and Civilian Providers that Were Teleconsult, by Branch of Service

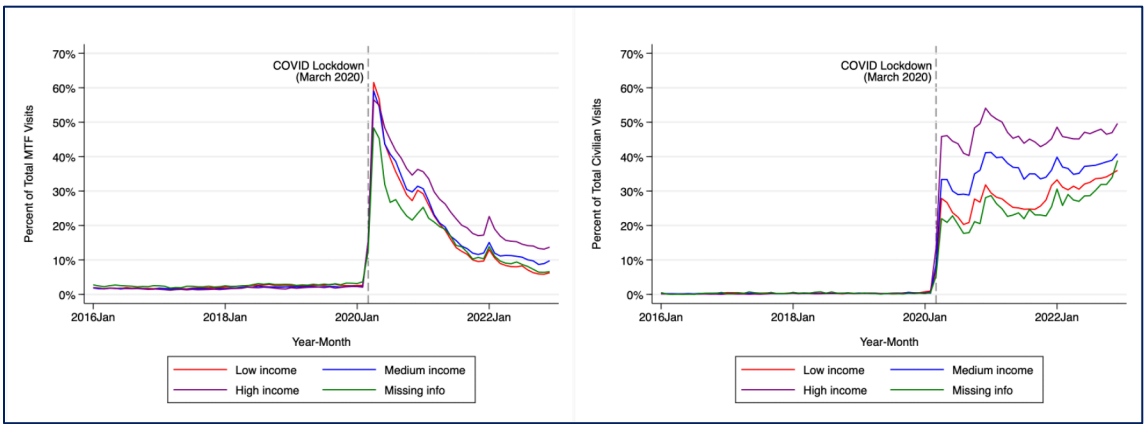
Figure 7 compares the mental telehealth usage between enlisted personnel and officers. Throughout the period, officers had a consistently higher percentage of visits to MTFs compared to enlisted personnel. Among the MTFs, officers experienced a more pronounced uptake at the onset of the COVID-19 lockdown. In the civilian sector, there is a marked increase in visits post-lockdown for both enlisted personnel and officers. However, the increase for officers is notably greater, indicating that officers might be utilizing civilian mental health services more than enlisted personnel post-lockdown. The enlisted personnel's visits show a recovery with some variability, but do not return to pre-pandemic levels, potentially indicating a shift in their telehealth service utilization preferences or availability.



Author tabulation of data discussed in Chapter III.

Figure 7. Share of Mental Health Care Visits that Were Teleconsult, by Rank and Care Setting

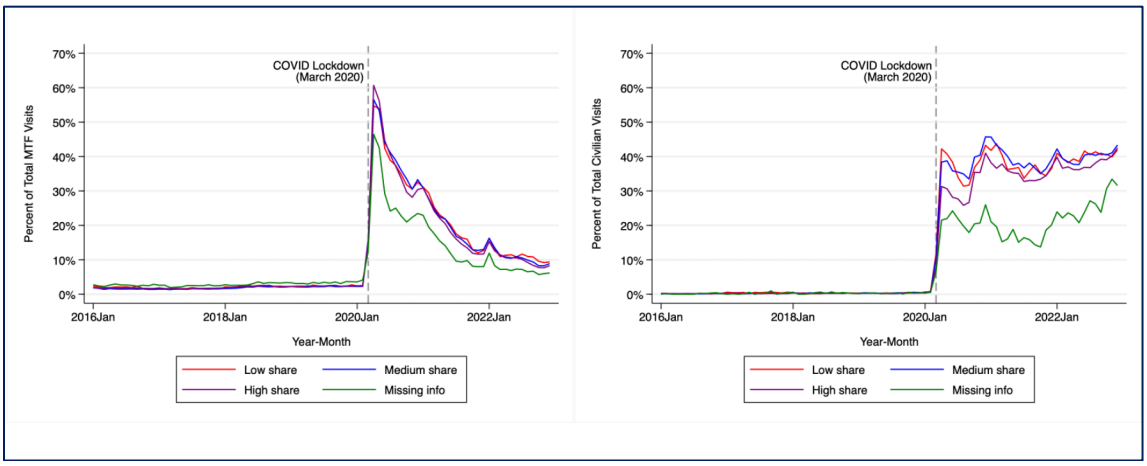
The next two sets of trend analysis look at community factors, i.e., the built environment, that might correlate with telehealth use for mental health services. Figure 8 tracks the percentage of total mental health visits categorized by the community family income levels (low, medium, high, and missing information). Following the COVID-19 lockdown, there was a somewhat more pronounced increase for the low- and medium-income categories. In the MTF setting, the post-lockdown period demonstrates a general decline across all income levels towards pre-pandemic levels. Conversely, in the post-lockdown phase, the percentage of total visits by individuals from high-income communities in the civilian setting shows a significant and sustained increase, indicating a potential shift towards greater utilization of mental telehealth services in the civilian care setting. This shift could suggest a lasting impact of the pandemic on mental telehealth utilization among the MTF and civilian care systems. Notably, by the end of 2022, the "missing info" group shows a marked increase in civilian visits, surpassing the low-income group.



Author tabulation of data discussed in Chapter III.

Figure 8. Share of Mental Health Care Visits to MTFs and Civilian Providers that Were Teleconsult, by Community Family Income Level

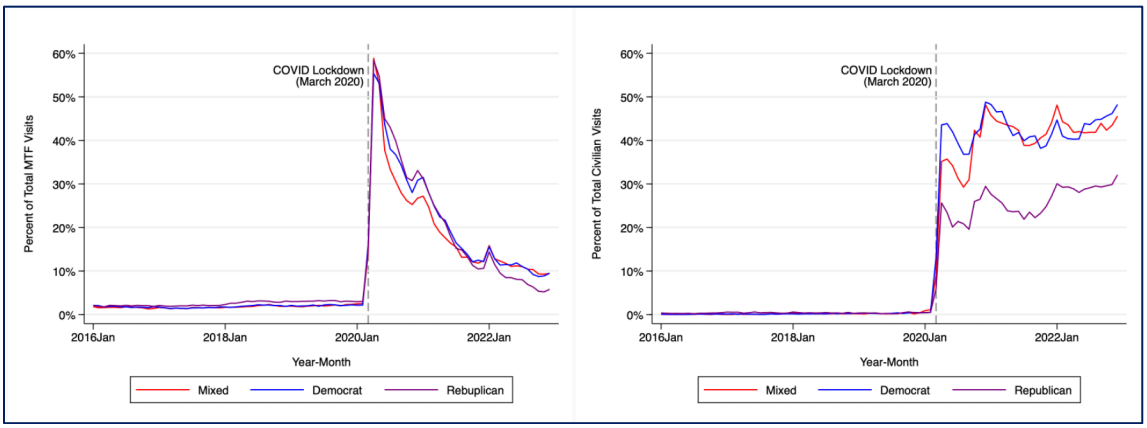
Taking into consideration another community aspect, Figure 9 depicts the percentage of mental telehealth visits by the community share of the Black population—categorized as low, medium, high share, and missing information—based on active-duty personnel's residential zip. Here, the incline is most profound for MTFs in communities with a high share of Black population. In the civilian sector, there is a marked rise in visits post-lockdown, particularly in communities with a low share of Black population, where visits increase significantly and exhibit a fluctuating upward trend. By the end of 2022, the medium-share category maintains the highest percentage of mental telehealth visits compared to the other groups, suggesting a potential shift toward increased reliance on mental telehealth services in civilian facilities.



Author tabulation of data discussed in Chapter III.

Figure 9. Share of Mental Health Care Visits to MTFs and Civilian Providers that Were Teleconsult, by Community Share of Black Population

One last factor to consider on the impact of mental telehealth use among active-duty service members is state political affiliation. This analysis is pertinent as some states were more restrictive concerning lockdowns and mask mandates than others associated with state leadership. Figure 10 illustrates the percentage of mental telehealth visits across political affiliations—Democrat, Republican, and Mixed—within the military and civilian care settings. In the civilian care setting, telehealth visits have a notable variability post-lockdown. Visits from Democrat-affiliated populations exhibit a significant increase, fluctuating to above 48% by the end of 2022, suggesting a robust rebound in telehealth service utilization within this group due to the tendency to enact more restrictive policies throughout the pandemic. Republican-affiliated visits also rise but show less variability, maintaining a level between 20% and 32%. The trends indicate not only a post-lockdown shift in the utilization of civilian mental telehealth services by the service member's residential state political affiliation but also a possible variation in how different political groups respond to the pandemic.



Author tabulation of data discussed in Chapter III.

Figure 10. Share of Mental Health Care Visits to MTFs and Civilian Providers that Were Teleconsult, by State Political Affiliation

C. REGRESSION ANALYSIS RESULTS

The regression analysis of mental telehealth use accounts for only those mental telehealth visits that occurred on/after March 11, 2020, since prior to the onset of the COVID-19 pandemic, telehealth use was close to zero and consistent. Table 7 reveals several important factors influencing the likelihood of utilizing telehealth services in the direct care system. The outcome mean percentage for telehealth use is 20.7%. When examining the block bivariate results and multivariate results together, some distinct patterns emerge.

In terms of Census region, compared to the Midwest, all other regions show a significantly higher likelihood of telehealth use, with the West (3.44 percentage points [pp]) exhibiting the highest in the multivariate model, followed by the Northeast (3.34 pp), Overseas (2.92 pp), and Alaska (2.90 pp). The South, however, shows a negative association in the block bivariate model but turns positive in the multivariate analysis at 1.60 pp, indicating other factors may mediate this relationship. As for proximity to the nearest MTF's, defined in drive time, impacts on telehealth usage, those within a 15 to 30-minute drive to an MTF do not significantly differ from those within a 15-minute drive in the multivariate model. However, those greater than a 30-minute drive are 1.33 pp less likely to use telehealth services. When looking at service member residence rurality, rural

service members are 4.33 pp less likely to use telehealth compared to their urban counterparts.

Consideration of demographic variables shows that males are less likely than females to use telehealth, with a significant difference of 2.59 pp. When race is considered, Blacks, Asians, Hispanics, and 'Other' races are more likely to use telehealth compared to Whites, with Blacks showing the highest likelihood in both the block bivariate (2.16 pp) and multivariate (1.30 pp) models. Increasing age is associated with a higher likelihood of telehealth use, except for the 57 and over age. The 47 to 56 age group is most likely to use these services by 4.64 pp. Regarding the branch of service, compared to the Army, the Air Force, Marine Corps, and 'Other' (mainly Coast Guard) are less likely to use telehealth, while the Navy is more likely. Officers are 1.51 pp more likely to use telehealth services than enlisted personnel.

Considering community factors reveals that higher community family income levels are associated with increased telehealth usage, with high-income groups showing a stronger likelihood than medium-income groups compared to low-income groups. The community share of the Black population presents mixed results; the medium share shows a slight increase in telehealth use, while the high share and missing information categories are less likely to use telehealth services. State political affiliation also plays a role; Democrat-affiliated states are 1.46 pp more likely to use telehealth compared to mixed-affiliated states, while Republican states show an even higher likelihood (2.21 pp) in the multivariate regression. The implementation of MHS GENESIS, the electronic health record system, shows a negative association with telehealth use (-1.69 pp), indicating a decrease in telehealth utilization post-implementation.

The constants and observations indicate the robustness of the model, with a constant of 17.56 pp and a large number of observations (4,729,061), providing a high level of confidence in the results. All coefficients are statistically significant at the one percent level with the exception of the multivariate coefficient (0.06) for between greater than 15- and 30-minute drive to MTF.

Table 7. Main Effects on Mental Telehealth Use in the Direct Care System

	(1) Block bivariate		(2) Multivariate	
Outcome mean (in percent)			20.7	
	Coeff.	SE	Coeff.	SE
Census region (Midwest is the reference category)				
Alaska	4.24***	(0.16)	2.90***	(0.16)
Northeast	6.53***	(0.12)	3.34***	(0.13)
South	-0.76***	(0.19)	1.60***	(0.20)
Overseas	5.77***	(0.07)	2.92***	(0.08)
West	5.73***	(0.08)	3.44***	(0.09)
Proximity (Within a 15-minute drive is the reference category)				
Between greater than 15- and 30-minute drive to MTF	1.49***	(0.05)	0.06	(0.05)
Greater than a 30-minute drive to MTF	-3.85***	(0.05)	-1.33***	(0.06)
Beneficiary residence (Urban is the reference category)				
Rural	-6.13***	(0.06)	-4.33***	(0.06)
Sex (Female is the reference category)				
Male	-2.55***	(0.04)	-2.59***	(0.04)
Race (White is the reference category)				
Black	2.16***	(0.05)	1.30***	(0.05)
Asian	1.80***	(0.08)	0.46***	(0.08)
Hispanic	0.72***	(0.05)	0.51***	(0.05)
Other	1.70***	(0.08)	0.62***	(0.08)
Age group years (17 to 26 is the reference category)				
27 to 36	3.31***	(0.04)	2.55***	(0.04)
37 to 46	5.40***	(0.05)	4.14***	(0.05)
47 to 56	7.04***	(0.10)	4.64***	(0.11)
57 and over	6.03***	(0.42)	2.99***	(0.42)
Branch of service (Army is reference category)				
Air Force	-3.59***	(0.05)	-3.85***	(0.05)
Marine Corps	-3.77***	(0.06)	-3.22***	(0.07)
Navy	2.77***	(0.05)	1.84***	(0.05)
Other (mainly Coast Guard)	-1.27***	(0.16)	-4.63***	(0.16)
Rank (Enlisted is the reference category)				
Officer	4.05***	(0.05)	1.51***	(0.06)
Community family income level (Low is the reference category)				
Medium	0.82***	(0.02)	0.26***	(0.02)
High	2.16***	(0.02)	1.51***	(0.02)
Missing info	-0.47***	(0.01)	0.25***	(0.02)
Community share of Black population (Low is the reference category)				
Medium	0.24***	(0.04)	0.20***	(0.04)
High	-0.16***	(0.03)	-0.09***	(0.03)
Missing info	-1.82***	(0.02)	-1.40***	(0.03)
State political affiliation (Mixed is the reference category)				
Democrat	2.61***	(0.05)	1.46***	(0.06)
Republican	1.25***	(0.04)	2.21***	(0.05)
Post-GENESIS implementation (Pre-GENESIS is the reference category)				
Post-GENESIS			-1.69***	(0.06)
Constant			17.56***	(0.13)
Observations	4729061		4729061	

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

The regression analysis for mental telehealth use within the purchased care system, as outlined in Table 8, provides insights into the factors influencing telehealth utilization specific to the civilian care setting. The average percentage of telehealth use in the system

is 36.5. Both block bivariate and multivariate analyses highlight key patterns and determinants of telehealth service adoption.

Geographically, relative to the Midwest, regions such as Alaska and the West show a substantial increase in telehealth use in both bivariate and multivariate models, at 16.31 and 18.84 pp, respectively. In the multivariate model, Alaska is substantially more likely to use telehealth, while the West falls behind Overseas compared to the Midwest. The Northeast region also shows significantly higher use, while the South exhibits a consistent negative association. Proximity to MTFs and residency type are significant predictors of telehealth usage. Individuals living more than a 15-minute drive away from an MTF and those residing in rural areas are less likely to use telehealth services, as indicated by negative coefficients (-1.22 pp for between greater than 15- and 30-minute drive, -2.10 pp for greater than 30-minute drive, and -4.25 pp for rural areas).

Furthermore, sex plays a critical role, with males being 7.82 pp less likely than females to use telehealth. In terms of race, Blacks, Asians, Hispanics, and 'Others' are more likely to use telehealth compared to Whites, with the 'Other' population showing the most substantial decrease in likelihood from the bivariate to multivariate model, from 6.90 pp to 0.57 pp. As for age groups, there is a higher likelihood of using telehealth beyond the reference category, with the 47 to 56 age group having the highest increase (12.19 pp). Compared to the Army, the Navy and 'Other' services, and to a lesser extent the Marine Corps and Air Force, are more likely to use telehealth services. Officers have a higher likelihood of telehealth use than enlisted members (6.37 pp).

The community characteristics reveal that higher family income levels correlate with increased telehealth use. Interestingly, communities with a medium share of Black population show a positive association in the bivariate model, which turns to a negative 0.27 pp in the multivariate model, while high-share communities show a consistent negative association. The state's political affiliation also impacts telehealth usage, with Democrat-affiliated states showing higher usage (2.72 pp) and Republican states exhibiting an 11.23 pp decrease. The implementation of MHS GENESIS is associated with a decrease in telehealth usage by 5.14 pp.

With a constant of 22.05 pp and over 1.6 million observations, the analysis provides strong statistical evidence to support these findings. All coefficients are statistically significant at the one percent level. The analysis underscores the complex interplay between geographic, demographic, socioeconomic, and political factors in determining telehealth utilization in the direct and purchased care system. The results point toward specific groups that may require targeted interventions to improve telehealth access and usage.

Table 8. Main Effects on Mental Telehealth Use in the Purchased Care System

	(1) Block bivariate		(2) Multivariate	
Outcome mean (in percent)			36.5	
	Coeff.	SE	Coeff.	SE
Census region (Midwest is the reference category)				
Alaska	16.31***	(0.33)	24.44***	(0.33)
Northeast	14.50***	(0.23)	4.89***	(0.23)
South	-7.93***	(0.73)	-8.00***	(0.71)
Overseas	8.84***	(0.15)	8.54***	(0.16)
West	18.84***	(0.15)	5.89***	(0.17)
Proximity (Within a 15-minute drive is the reference category)				
Between greater than 15- and 30-minute drive to MTF	-2.19***	(0.09)	-1.22***	(0.09)
Greater than a 30-minute drive to MTF	-3.81***	(0.10)	-2.10***	(0.11)
Beneficiary residence (Urban is the reference category)				
Rural	-12.16***	(0.13)	-4.25***	(0.13)
Sex (Female is the reference category)				
Male	-8.74***	(0.08)	-7.82***	(0.08)
Race (White is the reference category)				
Black	2.94***	(0.10)	2.08***	(0.10)
Asian	5.70***	(0.17)	1.01***	(0.16)
Hispanic	2.17***	(0.10)	1.34***	(0.10)
Other	6.90***	(0.14)	0.57***	(0.14)
Age group, years (17 to 26 is the reference category)				
27 to 36	10.33***	(0.09)	8.79***	(0.09)
37 to 46	13.35***	(0.10)	11.65***	(0.10)
47 to 56	16.47***	(0.21)	12.19***	(0.22)
57 and over	14.85***	(0.78)	6.03***	(0.76)
Branch of service (Army is reference category)				
Air Force	0.50***	(0.11)	2.59***	(0.12)
Marine Corps	5.77***	(0.14)	4.95***	(0.15)
Navy	18.16***	(0.10)	13.08***	(0.11)
Other (mainly Coast Guard)	21.13***	(0.16)	15.11***	(0.17)
Rank (Enlisted is the reference category)				
Officer	11.03***	(0.10)	6.37***	(0.11)
Community family income level (Low is the reference category)				
Medium	3.46***	(0.05)	1.13***	(0.05)
High	5.80***	(0.03)	2.43***	(0.04)
Missing info	-0.67***	(0.04)	-0.47***	(0.05)
Community share of Black population (Low is the reference category)				
Medium	0.55***	(0.06)	-0.27***	(0.06)
High	-1.29***	(0.04)	-0.17***	(0.04)
Missing info	-4.14***	(0.07)	-1.66***	(0.08)
State political affiliation (Mixed is the reference category)				
Democrat	4.36***	(0.10)	2.72***	(0.13)
Republican	-13.74***	(0.10)	-11.23***	(0.11)
Post-GENESIS implementation (Pre-GENESIS is the reference category)				
Post-GENESIS			-5.14***	(0.11)
Constant			22.05***	(0.24)
Observations	1635021		1635021	

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

D. DIFFERENTIAL ANALYSIS

Table 9 examines the abbreviated interaction effects of male service members on mental telehealth use by care type, comparing direct care and purchased care systems. The analysis incorporates block bivariate and multivariate models and introduces an interaction term for the last three quarters of 2022 to discern any temporal variations in male telehealth use. This discussion centers on the interaction terms as the remaining results are consistent with the analyses previously detailed in the sections on block bivariate, model 4, and the multivariate models.

In the direct care system, males are consistently less likely than females to use telehealth services, with a significant 2.91 pp less likely in the block bivariate and 2.90 pp in the multivariate models. The interaction effect of being male in the last three quarters of 2022 is positive and significant at 1.40 pp higher in bivariate and 1.21 pp in multivariate, suggesting that the gap in telehealth utilization between males and females has narrowed over this period. The purchased care system shows the negative association for males is even stronger than in the direct care system, indicated by a decreased use at 8.77 pp in the bivariate and 7.61 pp in the multivariate models. However, the interaction effect in the last three quarters of 2022 reveals a nuanced pattern: the bivariate model shows a non-significant coefficient (0.11 pp), while the multivariate model displays a statistically significant decrease of 0.62 pp in male telehealth use over this period.

The analysis highlights a significant sex-based disparity in mental telehealth utilization across both direct and purchased care systems, with males less likely to use these services than females. However, the interaction term suggests that recent trends may be altering this dynamic, particularly within the direct care system. These findings underscore the importance of considering temporal and contextual factors in assessing and addressing disparities in telehealth use.

Table 9. Sex Interaction Effects on Mental Telehealth Use by Care Type

	Direct care				Purchased care			
	Block bivariate		Multivariate		Block bivariate		Multivariate	
Outcome mean (in percent)	20.7		20.7		36.5		36.5	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Sex (Female is the reference category)								
Male	-2.91***	(0.05)	-2.90***	(0.05)	-8.77***	(0.10)	-7.61***	(0.09)
Male*Last 3 quarters of 2022 interaction	1.40***	(0.09)	1.21***	(0.09)	0.11	(0.16)	-0.62***	(0.16)

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All multivariate models include census region, proximity, beneficiary residence, race, age group (years), branch of service, rank, community family income level and share of Black population, state political affiliation, and the post-GENESIS variables.
3. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

Similar to the male-last three quarters of 2022 interaction, Table 10 focuses on the interaction effects of the branch of service on mental telehealth use. It examines the core effects of service branch as well as the interaction with the last three quarters of 2022, which may reveal evolving trends in telehealth usage. Within direct care, compared to the Army, members of the Air Force and Marine Corps are less likely to use telehealth services by 5.74 pp and 4.61 pp, respectively, in the multivariate model. Conversely, members of the Navy are 0.54 pp more likely to use telehealth services. Those classified as 'Other' (mainly Coast Guard) are 5.63 pp less likely. Notably, the interaction terms for the last three quarters of 2022 indicate a substantial increase in telehealth usage for the Air Force (7.32 pp), Marine Corps (5.63 pp), Navy (5.11 pp), and 'Other' (3.52 pp), suggesting a temporal change in usage patterns.

In the purchased care system, the pattern differs. The Navy and 'Other' show a particularly high likelihood of using telehealth services (14.46 pp and 17.05 pp, respectively), while the Air Force and Marine Corps demonstrate a positive but smaller effect (3.17 pp and 6.18 pp, respectively). However, the interaction effects for the last three quarters of 2022 display a narrowing of the gap between the Army and the other branches: the Air Force by 1.82, the Marine Corps by 3.88, the Navy by 4.27, and 'Other' by 6.17 pp. The results of the analysis suggest that service branch affiliation plays a significant role in mental telehealth utilization, with distinct patterns emerging between direct and purchased care. The interaction with the latter part of 2022 reveals dynamic shifts,

potentially related to policy changes, evolving service delivery models, or broader social factors influencing telehealth adoption.

Table 10. Branch of Service Interaction Effects on Mental Telehealth Use by Care Type

	Direct care				Purchased care			
	Block bivariate		Multivariate		Block bivariate		Multivariate	
Outcome mean (in percent)	20.7		20.7		36.5		36.5	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Branch of service (Army is reference category)								
Air Force	-5.47***	(0.05)	-5.74***	(0.06)	1.16***	(0.14)	3.17***	(0.14)
Marine Corps	-5.47***	(0.07)	-4.61***	(0.08)	7.02***	(0.17)	6.18***	(0.17)
Navy	1.45***	(0.05)	0.54***	(0.06)	19.89***	(0.12)	14.46***	(0.13)
Other (mainly Coast Guard)	-1.77***	(0.21)	-5.63***	(0.21)	23.13***	(0.20)	17.05***	(0.20)
Air Force*Last 3 quarters of 2022 interaction	7.16***	(0.11)	7.32***	(0.10)	-1.97***	(0.25)	-1.82***	(0.24)
Marine Corps*Last 3 quarters of 2022 interaction	6.78***	(0.15)	5.63***	(0.15)	-3.81***	(0.30)	-3.88***	(0.30)
Navy*Last 3 quarters of 2022 interaction	5.17***	(0.11)	5.11***	(0.11)	-5.16***	(0.21)	-4.27***	(0.21)
Other (mainly Coast Guard)*Last 3 quarters of 2022 interaction	2.39***	(0.33)	3.52***	(0.33)	-6.40***	(0.35)	-6.17***	(0.34)

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All multivariate models include census region, proximity, beneficiary residence, sex, race, age group (years), rank, community family income level and share of Black population, state political affiliation, and the post-GENESIS variables.
3. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

Taking the analysis another step forward, Table 11 provides an analysis of how community family income level, along with its interaction with the last three quarters of 2022, affects mental telehealth use across the direct and purchased care systems. In the direct care context, service members among medium-income family communities are 0.09 pp more likely to use telehealth than those from low-income families, as shown in the multivariate model, and the gap widened in the last three quarters of 2022 by another 0.76 pp. Among high-income family communities, service members are 1.40 pp more likely to utilize telehealth services, and the gap widened slightly by 0.46 pp in the last three quarters of 2022. For those with missing income information, there is no significant difference in telehealth usage compared to low-income families in the multivariate model.

In the purchased care system, service members among medium- and high-income family-level communities exhibit significantly more telehealth usage within the multivariate model by 1.84 pp and 3.01 pp, respectively. However, those with missing

income information are 0.40 pp less likely to use telehealth services. The interaction effects for the last three quarters of 2022 demonstrate the gap in telehealth usage narrowing by 2.14 pp for medium and 1.70 pp for high-income levels in the purchased care system. The bivariate model has no significant interaction effect for those with missing income information. The regression analysis indicates that community family income level significantly impacts the likelihood of using mental telehealth services, with medium- and high-income individuals generally more likely to utilize these services in direct and purchased care settings. The interaction term for the last three quarters of 2022 reveals shifts in this trend, particularly in the purchased care system, suggesting that economic factors may influence the adaptability and sustainability of telehealth usage over time.

Table 11. Community Family Income Level Interaction Effects on Mental Telehealth Use by Care Type

	Direct care				Purchased care			
	Block bivariate		Multivariate		Block bivariate		Multivariate	
Outcome mean (in percent)	20.7		20.7		36.5		36.5	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Community family income level (Low is the reference category)								
Medium	0.62***	(0.03)	0.09***	(0.03)	4.17***	(0.06)	1.84***	(0.06)
High	2.10***	(0.02)	1.40***	(0.02)	6.45***	(0.04)	3.01***	(0.04)
Missing info	-0.76***	(0.01)	0.01	(0.02)	-0.65***	(0.05)	-0.40***	(0.06)
Medium*Last 3 quarters of 2022 interaction	0.84***	(0.06)	0.76***	(0.06)	-2.16***	(0.10)	-2.14***	(0.10)
High*Last 3 quarters of 2022 interaction	0.25***	(0.04)	0.46***	(0.04)	-1.92***	(0.07)	-1.70***	(0.07)
Missing*Last 3 quarters of 2022 interaction	0.96***	(0.03)	0.68***	(0.03)	0.07	(0.09)	-0.21**	(0.09)

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All multivariate models include census region, proximity, beneficiary residence, sex, race, age group (years), branch of service, rank, community share of Black population, state political affiliation, and the post-GENESIS variables.
3. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

Lastly, Table 12 presents the interaction effects of state political affiliation on mental telehealth use. In direct care, compared to mixed-affiliation states, Democratic states show an increased likelihood of telehealth use by 1.96 pp, with the gap narrowed in the last three quarters of 2022 by 1.84 pp. The Republican states show an even higher likelihood at 3.40 pp in the multivariate model, and the gap narrowed by 4.75 in the last three quarters of 2022.

For purchased care, Democratic states are more likely to use telehealth services (2.55 pp), contrasting sharply with Republican states, which show a substantial decrease (-12.22 pp). The interaction terms for the last three quarters of 2022 are intriguing; they indicate that for service members residing in Democratic states, the gap widened by another 0.49 pp, while in Republican states, the gap narrowed by 3.08 pp, suggesting a potential shift in behavior or policy impacting telehealth utilization in Republican states. The regression analysis underscores that state political affiliation has a significant interaction effect on the use of mental telehealth services, with different patterns emerging between direct and purchased care. The interaction with the latter part of 2022 highlights the evolving nature of these effects. The robust findings suggest that policy makers and health care providers should consider these dynamic political influences when planning and implementing telehealth services.

Table 12. State Political Affiliation Interaction Effects on Mental Telehealth Use by Care Type

	Direct care				Purchased care			
	Block bivariate		Multivariate		Block bivariate		Multivariate	
Outcome mean (in percent)	20.7		20.7		36.5		36.5	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
State political affiliation (Mixed is the reference category)								
Democrat	3.30***	(0.05)	1.96***	(0.07)	4.42***	(0.12)	2.55***	(0.15)
Republican	2.69***	(0.05)	3.40***	(0.05)	-14.83***	(0.12)	-12.22***	(0.13)
Democratic*Last 3 quarters of 2022 interaction	-2.91***	(0.10)	-1.84***	(0.10)	0.04	(0.20)	0.49**	(0.20)
Republican*Last 3 quarters of 2022 interaction	-5.71***	(0.10)	-4.75***	(0.10)	3.40***	(0.22)	3.08***	(0.21)

Standard errors in parentheses.
1. All block bivariate models include the post-GENESIS variable.
2. All multivariate models include census region, proximity, beneficiary residence, sex, race, age group (years), branch of service, rank, community family income level and share of Black population, and the post-GENESIS variables.
3. All models control for time trends (quarter-year indicators).
* p<.10, ** p<.05, *** p<.01

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V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This thesis explored the geographical and temporal variations in mental telehealth use among the active-duty population in both the direct and purchased care system, revealing significant insights into the adoption of telehealth services within the military. The analysis does indicate mental telehealth use disparities among various factors, including geographic location and trends over time. There is significant geographical variation in telehealth usage, with the Northeast and West regions showing a higher likelihood of utilization compared to the Midwest. Temporally, the gap in telehealth utilization between males and females has narrowed over the last three quarters of 2022, particularly within the direct care system. The service branch affiliation plays a significant role in mental telehealth utilization, with distinct patterns emerging between direct and purchased care. The Navy and 'Other' (mainly Coast Guard) show a particularly high likelihood of using telehealth services. Finally, the interaction with the last three quarters of 2022 indicates dynamic shifts potentially related to policy changes, evolving service delivery models, or broader social factors influencing telehealth adoption.

The community- and individual-specific characteristics also show an impact on telehealth use among the active-duty population. Males are consistently less likely than females to use telehealth services across both direct and purchased care systems. A rural residence is associated with a lower likelihood of telehealth usage compared to urban residence. Officers are more likely to use telehealth services compared to enlisted personnel. Community family income level significantly impacts telehealth usage, with medium- and high-income individuals generally more likely to utilize these services. The community's share of Black population and state political affiliation also influence telehealth usage, with complex interaction effects observed for the last three quarters of 2022, suggesting evolving political influences on telehealth utilization.

B. LIMITATIONS

My research is not without limitations. First, I employ a broad array of data sources, which, despite their extensive nature, are not completely free from errors in measurement. For instance, the clinical data pulled from the MDR relies on creditable diagnosis and procedure coding at the provider level. Additionally, I restrict the identification of telehealth to the CPT and modifier codes identified by CarePoint (n.d.), excluding appointment type, resulting in an underestimation of telehealth use in this population. Next, it is necessary to note that the drive time data sourced from previous work assumes normal traffic patterns. Lastly, active-duty personnel may choose to seek mental health at an out-of-pocket expense due to the stigma, which would also add to an underestimation of the use of telehealth.

C. RECOMMENDATIONS

In light of the findings from this study, I recommend a series of measures to improve telehealth services for mental health care among active-duty service members. First, there is a need for additional research to investigate the long-term efficacy of telehealth in this context and its effects on service members' readiness and overall well-being. Second, it's essential to create a systematic approach for continuous evaluation of telehealth services, which should include assessing their effectiveness and user satisfaction and identifying potential areas for improvement. Importantly, this framework should also incorporate feedback mechanisms that allow service members to contribute their personal experiences and suggestions. Third, a thorough investigation into the reasons behind the varying usage rates of telehealth between MTFs and civilian healthcare systems is crucial. This investigation should focus on identifying both the obstacles and the facilitators that affect these rates and devising strategies to ensure that telehealth services are consistent across different healthcare settings. Lastly, it is vital to promote partnerships that can lead to telehealth innovation, specifically forging collaborations among the military sector, healthcare technology experts, and academic circles to develop telehealth solutions tailored to meet the unique needs of military personnel.

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