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# COST BENEFIT ANALYSIS OF TELEHEALTH

## March 2020–September 2020

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# Telehealth Cost-Benefit Study

## Executive Summary

The pandemic incited an unprecedented and historic shift in how health care is delivered, and increased acceptance of health care services delivered virtually. The exponential growth in the use of telehealth has underscored the need to understand better how telehealth has affected health care access and quantify the impact of telehealth on health care costs. The pandemic also exposed the need to consider the impact of telehealth on costs, quality, and outcomes compared to in-person care and *in the absence of in-person care*. Even after the pandemic, a significant portion of the population- residing in both urban and rural counties- will continue to face barriers to accessing health care. This study sought to better understand and quantify how patients, providers, and organizations used telehealth during the pandemic and its impact on access, costs, and quality.

## Data

Analyses were performed on telehealth encounters provided by six large health systems and Arizona Medicaid reflecting services delivered between March and September 2020. Data elements include encounter date, patient, and provider location at the time of service, procedure codes billed for telehealth service(s), patient diagnoses and demographics (gender, age, race, ethnicity), and payer billed for the encounter.

## Methods

We received the data from seven organizations, including the Arizona Health Care Cost Containment System (AHCCCS – Arizona Medicaid), Baptist Health South Florida (Jacksonville, FL), BJC HealthCare (St. Louis, MO), Gunderson Health System (La Crosse, WI), MercyVirtual (Chesterfield, MO), Northwell Health (New York), and the University of Mississippi Medical System (Jackson, MS). We cleaned the data by generating a single encounter for each row of a spreadsheet and used *tidyverse* within RStudio to confirm that each column was restricted to a single element. We conducted the analysis using Tableau©, Microsoft Excel©, and RStudio. Our methodology, including variables included in the cost-benefit analysis, was derived from analytical approaches described in peer-reviewed publications. Where necessary, we made assumptions regarding data elements that could not be identified for a singular value at a point in time. All estimates were based on the most recently available research.

We used the following cost variables in our analysis:

| Cost Savings Variables | Fixed Costs |
|---|---|
| **Reduced hospitalizations** | Provider salaries and fringe benefits |
| **Reduced patient travel** | Broadband costs |
| **Patient Productivity** | Maintenance Costs |
| **Reduced emissions** | Carbon dioxide production |

This cost-benefit analysis is restricted to Medicare and Medicaid programs within each State due to the variability in commercial pay reimbursement for telehealth services.

## Results:

The final data set included a total of 1.43 million encounters delivered between March and September 2020. Encounters reflect ambulatory care provided by telehealth to patients residing in urban and rural counties across all 50 states. Telehealth utilization peaked in April of 2020, with a marginal decrease in each of the consecutive months through the spring and summer, followed by a precipitous decline in the number of telehealth encounters in September. Medicaid and private pay accounted for more than two-thirds of all encounters, followed by commercial insurance. More than half of patients receiving telehealth services were fifty or older, while the remaining encounters were closely divided across different age groups. Women were the predominant recipient of telehealth services consistent with national data indicating higher health care utilization by women than men. Nearly half of telehealth services were provided to patients who identify as White, followed by Latinx and Black/African-American (non-Hispanic) patients.

Half of all telehealth encounters were either outpatient visits for established patients or for the purposes of case management. More than one in ten telehealth encounters were related to treatment for mental and behavioral health. Patients diagnosed with mental or behavioral health (including substance use disorder) accounted for nearly one-third of all telehealth encounters.

Given the volume of telehealth services provided to individuals with a behavioral and mental health diagnosis, we performed additional analyses to assess the characteristics of this patient group. More than one-third of all encounters with patients with behavioral or mental health diagnoses were children under 18. White patients accounted for four out of five encounters for patients with a behavioral or mental health diagnosis. Two-thirds of all telehealth encounters with a patient diagnosed with a behavioral or mental health condition were reimbursed by public insurance.

Our cost benefit analysis focused on prevalent conditions in each of the states representing the largest proportion of encounter data. The results of our cost-benefit analysis by State, payer, and clinical area are shown below:

| State | Population | Diagnosis | Net Savings |
|---|---|---|---|
| **Arizona** | Medicaid | Mental and Behavioral Disorders | $191,211,514.09 |
| **New York** | Medicare | Diseases of the Circulatory System | ($6,930,314.57) |
| **New York** | Medicaid | Neoplasms | ($1,304,252.60) (Personal vehicle)<br>($1,444,644,.44) (Public transport) |
| **Florida** | Medicare | Neoplasms | $33,158,015.73 |
| **Florida** | Medicaid | Neoplasms | $15,491,428.79 (Personal vehicle)<br>$16,750,732.13 (Public transport) |
| **Missouri** | Medicare | Diseases of the Circulatory System | $684,071.33 |
| **Missouri** | Medicaid | Diseases of the Respiratory System | $1,637.804.80 |
| **Mississippi** | Medicare | Diseases of the Circulatory System | $3,488,809.33 |

| State | Population | Diagnosis | Net Savings |
|---|---|---|---|
| **Mississippi** | Medicaid | Endocrine, Nutritional, and Metabolic Disorders | $154,881.61 |
| **Wisconsin** | Medicare | Endocrine, Nutritional, and Metabolic Disorders | $445,269.45 |

## Findings

The analysis shows significant cost savings with the use of telehealth, particularly within the Medicaid program and in areas such as Mental and Behavioral Health, Neoplasms, and Diseases of the Circulatory System. The savings were significant in counties classified as non-metropolitan areas, with a low population density and a low provider to patient ratio (defined as the number of clinical providers per 100,000 residents). The most significant savings came from reduced hospitalizations; for each condition, we set the estimated reduction in hospitalizations at 10%. Based on published literature, this represents an underestimate of hospitalizations associated with lack of treatment, as avoidable hospitalizations from each of the counties we studied were higher than national averages in 2019.[1] However, it was difficult to ascertain the severity of the conditions from the data, so establishing a 10% threshold represented a modest and reasonable standard to apply.

After savings associated with reduced hospitalizations, a decrease in travel resulting from use of telehealth accounts for substantial cost savings. Access to specialty providers, particularly psychiatrists, cardiologists, and oncologists, is limited for Medicaid beneficiaries residing in both urban and rural locations across America. Many of the providers that accept Medicaid are not located within a short travel distance to patients' residences and, therefore, accessing care requires a substantial investment in travel time, either through private or public transportation. The greater the population density within a county, the more vehicle emissions are released, adversely affecting the environment, and increasing out-of-pocket expenditures for patients with personal vehicles due to the high costs of gas used for a round-trip in-person visit.

The only areas where telehealth did not produce significant cost savings were urban areas with high population density and a substantial number of providers. For example, in New York, the data found high levels of cardiovascular disease among patients who received telehealth services. The majority of patients with this diagnosis who used telehealth resided in one of the five boroughs of New York City or in Long Island. Access to a cardiologist did not pose a barrier, as multiple specialists have practices only a few miles away from each patient and are easily accessible by car or public transportation. While the use of telehealth to deliver care to Medicare beneficiaries with cardiovascular disease living in New York generated cost savings, it did not produce a positive cost-benefit as its overall utility was low.

However, it should be noted that the fixed costs associated with telehealth operations (clinician salaries, fringe benefits, maintenance, and broadband) do not accrue directly to the Medicaid or Medicare program. These are not reimbursable by either Medicare or Medicaid, and thus the direct financial impact to either program is minimal. The sensitivity analysis shows that even as the utilization rate declines, there are still savings to the program, independent of the increased access to specialty providers and care coordination from telehealth modalities.

## Conclusion

The pandemic provided a unique opportunity to demonstrate the value of telehealth as an alternative to in-person care. Even though overall utilization has decreased since the inception of the pandemic, the data indicates that telehealth continues to be a widely accepted method for receiving health care. Research suggest that more than two thirds of services previously only provided in person could be delivered virtually. Timely access to telehealth improves the ability of providers to effectively manage patients with chronic health conditions and triage and treat non-acute conditions by removing the barriers that time, transportation, competing priorities (such as childcare, eldercare, and missed work), and mobility issues can present to a patient. Data has demonstrated that telehealth reduces no show rates and increases compliance with medication management. Given its accessibility, telehealth provides a means to initiate necessary health care without travel, provide focused and frequent patient education when needed, and facilitate shared decision-making between the patient, family members, and the provider.

It is important to acknowledge that telehealth will not completely replace in-person care, and patients do not expect to attend only virtual visits. In-person encounters such as physical exams, preventive health services including mammograms and colonoscopies, and specific treatments for cancer, respiratory diseases, and endocrine disorders will need to be performed in-person. The personal interaction between a patient and a provider cannot be discounted from a mental and emotional standpoint. The use of telehealth increases access to care and, when used in combination with in-person care for those visits that cannot be conducted virtually (e.g., well-child visits) can increase access, quality, and care coordination resulting in improved health outcomes.

## Introduction

Telehealth uses electronic information and telecommunication technologies to provide health care services[2]. This definition includes the provision of live (or synchronous) medical care using audio-video and audio-only devices, the use of store and forward (or asynchronous technologies) to transmit information that is to be reviewed at a later time (e.g., sending digital images, test results, or patient /provider communication), as well as ongoing transmission of health-related data (remote monitoring). While the use of telehealth in the United States is not a new phenomenon, its widespread adoption has been hindered by several factors, including reimbursement policy and patient and provider receptivity to the remote provision of healthcare.

Before the COVID-19 pandemic, telehealth use, and adoption were growing slowly but steadily. Over the past decade, the Centers for Medicare & Medicaid Services (CMS) has gradually expanded the list of telehealth services eligible for Medicare reimbursement. Medicaid coverage for some telehealth services was authorized in all States and DC, and many private payers, notably managed care plans, were initiating programs to facilitate the use of telehealth. There was consensus among federal and private stakeholders that increasing telehealth adoption required large-scale studies demonstrating the impact of telehealth on access, quality, and costs. However, researchers were hindered in their capacity to measure the impact on costs and quality as scientifically rigorous studies were restricted to limited sample sizes and employed different methodologies and measures, which made it impossible to aggregate the findings from each of these individual studies. Further, policies limiting the delivery of care using telehealth, which services were provided via telehealth, which populations received those services, the location of the patient at the time of service, and a variety of other factors impeded the ability to conduct larger-scale studies with bigger sample sizes.

The pandemic incited an unprecedented and historic shift in healthcare delivery and public and provider acceptance of virtual health care. The need for social distance resulted in overall growth in the use of telehealth for outpatient care 78 times higher than the previous year and, even after the reopening of provider offices for in-person care, telehealth utilization continues to be 38 times higher than it was pre-pandemic.[3] Public insurers saw similar rates of astronomical growth in the use of telehealth following the public health emergency (PHE) announcement.[4] Medicaid programs in all states and DC expanded their coverage for telehealth, including employing waivers to allow providers licensed in another state to deliver care to Medicaid recipients.[5]

The exponential growth in the use of telehealth has underscored the need to quantify how the use of telehealth impacts overall health care costs. Before the pandemic, preliminary studies investigated whether care delivered by telehealth generated the same outcomes as care provided in-person.[6] [7] The pandemic shifted the landscape of this line of inquiry, altering the investigation from focusing solely on a comparison of in-person and virtual care to a deeper investigation into what would have happened during the pandemic *in the absence of telehealth*. The onset of the pandemic underscored the need to understand not just the costs but also the potential benefit of telehealth, without restrictions, on access, cost, and quality compared to both in-person and the absence of care. While the pandemic inhibited access to in-person care for all Americans, access to care in a medical office has and will continue to remain challenging in some regions of the country. Additionally, unanticipated events (such as natural disasters, large-scale accidents) may necessitate the use of telehealth to facilitate timely access to care.

Therefore, a comprehensive financial analysis requires consideration of telehealth's impact on access, costs, and health outcomes compared to-- and in the absence of-- in-person care.

Analytic models to evaluate the value of telehealth must consider an array of factors that directly (and indirectly) impact access, costs, and quality including, but not limited to, costs of delivering care (e.g., clinician time, services, and equipment), the effect of the care on future health (e.g., prevention or exacerbation of other health conditions), potential impact in preventing adverse events (e.g., hospitalization), consequences on non-clinical factors that affect costs (e.g., missed work, travel, and wait times), and cost offsets (e.g., carbon emissions, lost productivity, emergency transport). This analysis will not consider patient and provider experience of care as there is extensive evidence that this impacts provider uptake of telehealth. Preliminary evaluations of patients' experiences during the pandemic have shown that telehealth was widely perceived as an acceptable alternative to in-person care[8]. Multiple reports have documented patient confirmations that they would like to continue to use telehealth to access health care services.[9] [10]

One unintended consequence of this rapid growth in the use of telehealth is the potential for creating or exacerbating existing disparities in health care.[11] [12] Many studies have found that specific patient characteristics, including race, age, primary language, and socioeconomic status, are associated with lower levels of telehealth use.[13] [14] [15] These differences in telehealth adoption and use have been attributed to various factors, including lack of a regular care provider, limited access to technology and broadband, digital literacy, comfort using telehealth, and trust in the technology.[16] Therefore, when considering the impact of telehealth on costs, quality, and outcomes, it is necessary to assess factors associated with lower levels of telehealth use and adoption, such as race, socioeconomic status, and broadband accessibility.

As the nation moves beyond the COVID-19 pandemic, the future of telehealth will depend on several policy considerations, including reimbursement, licensure, and authorization that affect services, clinicians, and locations approved for telehealth care. Consumers will likely continue to seek medical services enabled by technology, and clinicians will continue to offer telemedicine services to expand access and increase efficiencies. As stated by one telehealth physician advocate: "When care moves online, it democratizes those services."[17] Continued high levels of telehealth utilization, favorable consumer perceptions of virtual care, and system-wide investments are likely to contribute to the continued growth of telehealth. Policymakers, practitioners, health insurers, and other stakeholders need actionable information to inform future decisions regarding telehealth. This information includes: (1) an understanding of the demographics and geographic distribution of patients using telehealth as compared to national statistics; (2) an understanding of how telehealth was used during the pandemic including services delivered and the clinical conditions of patients receiving this care; (3) analyses on how telehealth affects costs and quality in comparison with both in-person care AND the absence of other sources of care; (4) as well as a deeper understanding of how telehealth impacts access across different populations to anticipate and mitigate any unintended consequences moving forward. Ultimately, this information will provide critical information that will shape how America approaches virtual healthcare moving forward.

## Telehealth Landscape Before 2020

Before the pandemic, less than ten percent of the U.S. population used telehealth for clinical care, and only 18 percent of physicians delivered health care using telehealth.[18] Multiple factors contributed to these low rates of telehealth use, including reimbursement rates, state licensure laws, and other policy restrictions. State licensure laws prohibited physicians from delivering care to patients across state lines.

### Reimbursement

Federal, state, and local policies regarding telehealth reimbursement changed significantly because of the pandemic. While Medicare reimbursement for telehealth services before March 2020, these services were subject to many restrictions-- including requirements that limited eligible services to rural areas[1], approved care delivery sites and specific providers, and discounted reimbursement rates-- the list of services suitable for reimbursement had grown over time. Innovative payment and service delivery models like Accountable Care Organizations allowed providers to offer telehealth services under a shared saving payment model. Before the pandemic, payors within all fifty states and the District of Columbia (DC) were reimbursed for some telehealth services through Medicaid. Still, there was wide variation both in what services were covered and the reimbursement rate. States also varied in the approved settings where primary and specialty care could be provided. For example, while Medicare did not reimburse for telehealth services delivered to individuals in their residence, 26 states and DC reimbursed for home-based telehealth. While federal law did not require that private payers cover telehealth services, some states had mandated that private payers reimburse for some telehealth services. Some insurers, notably managed care plans with capitated payment models, had higher utilization of telehealth than fee-for-service models.

### Licensure

Different state licensure laws created challenges as providers licensed in one state were prohibited from providing services (including filling prescriptions) via telehealth for established patients when they were out of state. While some states had established reciprocity laws allowing a provider certified in one state to qualify for licensure in another state automatically, these agreements were not consistent.

### Policy Changes

As a result of the pandemic, federal officials employed the Public Health Emergency Act (PHE) to authorize the temporary suspension of many of Medicare's more restrictive policies that had previously hampered widespread adoption of telehealth. As a result, those states and insurers that employed these same policies followed Medicare's lead. The key changes are described below.

- **Geographic restrictions**. Telehealth services can be provided in both urban and rural communities.
- **Care setting (i.e., Site of Service)**. The patient's telehealth location was expanded to include additional settings, including the patient's residence.
- **Provider types**. Non-physician clinicians, including those providing behavioral health and physical or occupational therapy, can deliver approved care using telehealth.

- **Payment parity**. Providers delivering care through video-enabled telehealth are reimbursed at the same rate as the standard, approved fee for an in-patient office visit.
- **Cost-sharing.** While patients are still required to cover any copayments, the government waived cost-sharing for telehealth visits.
- **Services and technologies**. The number and types of services approved for delivery via telehealth were expanded, and patients can access care using a more comprehensive range of communication tools, including personal mobile phones.
- **Established patient**. Providers can deliver telehealth services to new patients who have not had a prior in-person encounter with the treating clinician.
- **Patient-provider interactions**. Medicare waived the requirement that a second "presenting" clinician be at the location at which the patient is receiving care.
- **State licensure requirements**. Many states modified their state licensure requirements, allowing providers without a state-specific medical license to provide patient care through telehealth.
- **Behavioral health**. To expand access to treatment for substance use disorder (SUD), providers can prescribe medication-assisted therapies without an in-person encounter and authorize refills for up to 6 months.

As a result of more restrictive policies in place through 2019, telehealth was limited both in volume and the types of services that were accessed. In December 2019, telehealth accounted for 0.22% of all privately insured medical claims.[19] An analysis of Medicare claims data indicated similarly low levels of telehealth use with an average of only 13,000 telehealth services each week across all Medicare fee-for-service claims.[3] Similarly, the types of services provided via telehealth dramatically shifted. Before the pandemic, an analysis of private insurance data indicated that the top telehealth diagnosis was acute

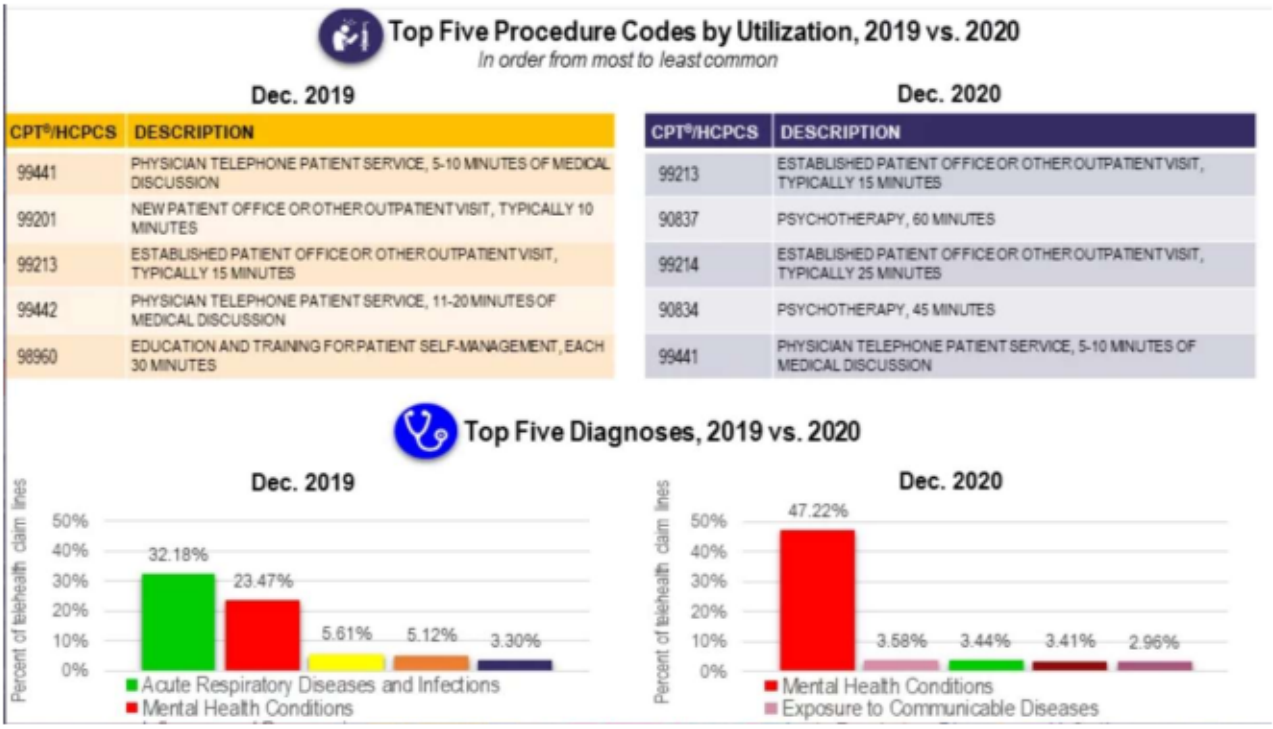



**Exhibit 1: Changes in telehealth utilization from 2019 to 2020 based on commercial claims**

Source: FAIRHealth

respiratory diseases which accounted for 32% of all telehealth encounters in December 2019. The subsequent most common diagnosis, mental health conditions, accounted for less than a quarter (23%) of all telehealth visits, followed by influenza and pneumonia (6%), urinary tract infections (5%), and eye infections (3%). One year later, mental health accounted for nearly half (47%) of all telehealth encounters covered by private insurance, followed by exposure to infectious diseases (4%), acute respiratory disease (3.5%), joint/soft tissue issues (3%), and COVID-19 (3%) (Exhibit 1).[19]

## Use of Telehealth for Specific Medical Services and Patient Populations

The word telehealth is sometimes used interchangeably with telemedicine. While telemedicine refers to delivering health care by a professional to a patient who is not in the same room, telehealth encompasses a broader array of technology-enabled health care services, including remote patient monitoring, virtual education and training, and online group sessions. Below we provide a few examples of how telehealth is used to support care for different health states.

*Mental and behavioral health*. The use of telehealth to meet behavioral health needs (frequently referred to as telebehavioral health) grew exponentially during the pandemic. A survey of over 2,000 Americans found that more than half of individuals with a behavioral health condition used telehealth to access care during the first few months of the pandemic.[20] The federal government categorizes telebehavioral health into three classifications.[21]

- *Individual therapy* involves one-on-one interactions between the provider and patient and includes psychiatric evaluations, diagnoses, medication management services; psychosocial counseling sessions with a psychologist, social worker, or other approved behavioral health professional; and individual coaching sessions such as behavior modification. Individual therapy can be conducted by audio-video or by mobile phone.
- *Group telebehavioral health* sessions engage a group of individuals working together with a behavioral health provider (or a team of providers). Given the dynamic nature of these sessions, they are typically conducted using audio-video technology.
- *Substance use disorders (SUD) treatment* can be conducted via telehealth using both individual and group therapy. Under the pandemic, additional authorizations allow approved providers to prescribe and manage controlled substances to increase access to timely treatment.

In addition to direct interactions with a behavioral health professional, telehealth tools can also be used asynchronously to support behavioral health needs, including applications that can track anxiety, provide coping strategies, or connect individuals with online support groups and 24/7 support as needed.

*Chronic disease.* Chronic conditions including cardiovascular disease, diabetes, HIV infection, chronic kidney disease, asthma, and hypertension have been effectively managed through telehealth.[22] While synchronous (audio-video) consults between patients and providers, or providers and specialists, enable care coordination, asynchronous tools can be used to transmit digital images to specialists. Remote patient monitoring allows patients to regularly monitor their health information (e.g., blood pressure, hemoglobin A1c) for subsequent review by the clinician. Mobile health applications have been effectively used to help patients with lifestyle changes that can affect chronic diseases such as exercise, diet, and medication compliance.

*Sexual and reproductive health.* Telehealth has also been a practical resource to support sexual and reproductive health. Telehealth is increasingly used across many obstetrical and gynecological services; these include its use to conduct pre-and postnatal care visits, asynchronously transmit ultrasound recordings and blood pressure monitoring, and remotely provide medication-induced abortions. At-home kits allow individuals to screen for sexually transmitted infections in privacy, while online fertility tracking and pregnancy apps are frequently downloaded to mobile devices.[23]

*Geriatric care.* Telehealth also provides significant benefits for older adults.[24] For degenerative disorders like Alzheimer's and Parkinson's disease, telehealth enables patients in the early stages of the disease to consult with a specialist without the need to travel.[25] [26] Telehealth reduces the burden on patients and their caregivers by decreasing the burden and cost of travel, increasing access to specialty care, and facilitating care coordination while avoiding changes that may trigger adverse events such as falls, anxiety, or confusion. Telehealth devices such as medication management prompting devices and motion detectors can help individuals age in place, preventing adverse events that could lead to hospitalization. Older adults often experience several chronic diseases and, therefore, also benefit from remote monitoring devices such as those described earlier.

## Background for Study

In 2015, the Center for Telehealth and e-Health Law (CTeL) was asked by congressional staff to provide telehealth cost impact research to the Congressional Budget Office (CBO) to enable more accurate scoring of telehealth legislation. CTeL is a 501(c)3 non-profit, political- and vendor-agnostic research institute. For over 25 years, CTeL has been committed to expanding high-quality, accessible virtual care through data- and research-backed policy initiatives. To address CBO's request, CTeL recognized the need to initiate a set of research studies that would meet rigorous academic standards and be funded through a neutral source. In 2017, CTeL started a five-year process to estimate telehealth's cost impact, benefit, and effectiveness. Work was conducted in three phases.

***Phase I: Literature Review*.** Following an exhaustive review process, a team of researchers from Mercer University in Georgia reviewed 16,900 telehealth studies from 2007-2017, finding that only a small fraction of published literature provided sufficient information to assess the costs associated with telehealth versus in-person treatment. Mercer University found cost savings for patients, providers, and payers. However, given the variability in how the data was collected and reported, the authors concluded that there was insufficient data to perform a meaningful analysis of costs.

***Phase II: Data Dictionary***. The literature review identified the need to harmonize telehealth data to perform meaningful and reliable analyses across health systems, practitioners, and payment sources. Using data from large health systems, a team of researchers identified a set of common elements that could be standardized to enable data aggregation across different health systems. The resulting data dictionary provides a roadmap to normalize telehealth data to effectively analyze its impact on access, utilization, costs, and quality.

***Phase III: Financial Assessment*** This paper represents the final phase of this work, analyzing the costs and benefits of telehealth services. Working with health systems across the United States, we captured standardized encounter data to better understand telehealth utilization and services provided before and during the pandemic. The robust data file includes current and past diagnoses, payer type (both public and private), reimbursement for the telehealth service, and patient characteristics, including

demographics and county of residence. More details on the data set are included below in the methods section.

## Study Objectives

The research findings presented in this paper serve multiple objectives. At the most basic level, the analysis provides answers to the following fundamental questions:

(1) Telehealth Prevalence
    a. How was telehealth used during the pandemic?
    b. What conditions were most common among patients receiving telehealth services during the pandemic?
(2) Patient Characteristics
    a. Was the patient population receiving telehealth services representative of the communities in which they reside?
    b. If not, which populations were less likely to access care during the pandemic?
(3) Distance and Travel
    a. How did access to care at home impact travel costs and time?
    b. How would the elimination of the originating site waiver affect patient access, productivity, and the environment?
(4) Geographic Variation
    a. Are there differences in telehealth utilization (volume, services) based on the geographic region of the county?
    b. How did the waivers affect telehealth utilization in urban versus rural communities?

More importantly, however, this study provides reliable data on the **cost-benefit of telehealth** by employing peer-reviewed models to identify the appropriate variables and assess costs. By utilizing the data dictionary developed for CTeL, this study represents the most robust and extensive cost study to date employing data from 1.43 million telehealth encounters, including data on all payers and service types. **Cost-benefit analysis (CBA)** is a method for quantifying and comparing the costs of an intervention expressed in monetary units.[27] Our analysis considers the cost-benefit of telehealth in the absence of available in-person care (during the public health emergency) and relative to in-person care (the future state after the public health emergency ends). CBA is measured as both total cost savings as well as averted costs associated with prevented events.

The results of this research provide essential and timely insights for policymakers. Specifically, the CBO should consider using the cost analysis to inform the scoring of telehealth legislation under consideration by the House and Senate. The findings will also inform CMS' decisions regarding payment reform and the role of telehealth in controlling costs while increasing access and improving outcomes. The results also provide information on the role of telehealth during the pandemic with regards to critical public health issues, including behavioral health and substance use disorder. Finally, the results offer crucial insights on factors affecting the nation's health, including telehealth's role in changing demographics, the need for improved care integration, and assessing the impact of telehealth on health disparities.

## Data and Methods

In response to a request from CTeL, six health care systems and one state Medicaid program voluntarily provided telehealth encounter data from March through September 2020. All systems were provided a structured format for the data based on the Data Dictionary previously developed and tested. The data was uploaded to a secure, password-protected file cloud-storage system with restricted access to the independent research team. Table 1 provides a list of the variables included in the data sets. All variables fall within the Safe Harbor provision of the Health Insurance Portability and Accountability Act (HIPAA)[28] and do not contain individually identifiable health information.

**Table 1. Standardized Format for Data Files**

| Variable | Definition |
|---|---|
| **ZIP Code** | First three digits of the zip code of the patient's primary residence. [2] |
| **Patient's Age** | Patient age is categorized into bands. |
| **Patient's Race** | Patient self-identified race. |
| **Patient's Ethnicity** | Ethnic category with which patient identifies. |
| **Patient Gender** | The gender with which the patient identifies. |
| **Date of Telehealth Encounter** | The date that the telehealth encounter took place. |
| **Beginning Time of the Telehealth Encounter** | The time that the telehealth encounter began |
| **End Time of the Telehealth Encounter** | The time that the telehealth encounter ended |
| **ZIP Code of Originating Site** | First three digits of the ZIP code of the facility or residence in which the telehealth encounter occurred |
| **Patient Diagnoses** | The diagnoses (ICD-10) codes of the patient in the telehealth encounter |
| **Medical Procedures** | The procedure(s) (CPT-4 or HPPCS) [3] used during the telehealth encounter |
| **Medications Prescribed** | Medications (NDC/RxNorm) prescribed to the patient during the telehealth encounter |
| **Laboratory Test Orders** | Laboratory orders (CPT-4, HL7, LOINC, or SNOMED-CT format) signed off by a provider during a telehealth encounter |
| **Laboratory Test Results** | Laboratory results that are generated from the original order signed off by the provider |
| **Past Patient Diagnoses** | Past diagnoses of the patient in the telehealth encounter |
| **Past Medical Procedures** | Past medical procedures were performed on the patient before the telehealth encounter. |

The data received through each program was cleaned using the *tidyverse* package within RStudio to ensure that one encounter was entered into each spreadsheet row, with one variable per column. We used Microsoft Excel to merge the data and performed a careful review to ensure the integrity of each spreadsheet was intact. The statistical approach and the variables used in the CBA are discussed in the cost-benefit framework section of this report.

[2] The first three digits of the patient's zip codes are allowable under the HIPAA Privacy Rule. Those zip codes that have under 20,000 individuals were left blank.

[3] CPT-4 is the Current Procedural Terminology, maintained by the American Medical Association (AMA). HCPCS is the Health Care Procedural Healthcare Common Procedure Coding System maintained by CMS

The final data set includes a total of 1.43 million encounters delivered between March and September 2020. Encounters reflect the care provided to patients residing in all fifty states. Data includes services reimbursed by both public (Medicare, Medicaid, Tricare, Veteran's Health Administration) and private (commercial) payers, as well as services reimbursed by the patient (self-pay) and provided as charitable care. Encounter data includes outpatient services and reflects the care provided by various provider types, including physicians, nurse practitioners, and physician assistants, non-clinical behavioral health providers, and registered dieticians.[4] Data was voluntarily provided from six large health systems and one state Medicaid program:

- Arizona Medicaid Health Care Cost Containment System (AHCCCS), Arizona
- BJC HealthCare, St. Louis, Missouri
- Gunderson Health System, La Crosse, Wisconsin
- MercyVirtual, Chesterfield, Missouri
- Baptist Health South Florida, Jacksonville, Florida
- Northwell Health, Long Island, New York
- University of Mississippi Medical Center, Jackson, Mississippi

Data was transmitted through a secure cloud-based platform. The final data set includes telehealth encounters across the United States, representing a diverse patient population.

## Descriptive Analysis of Final Data Set

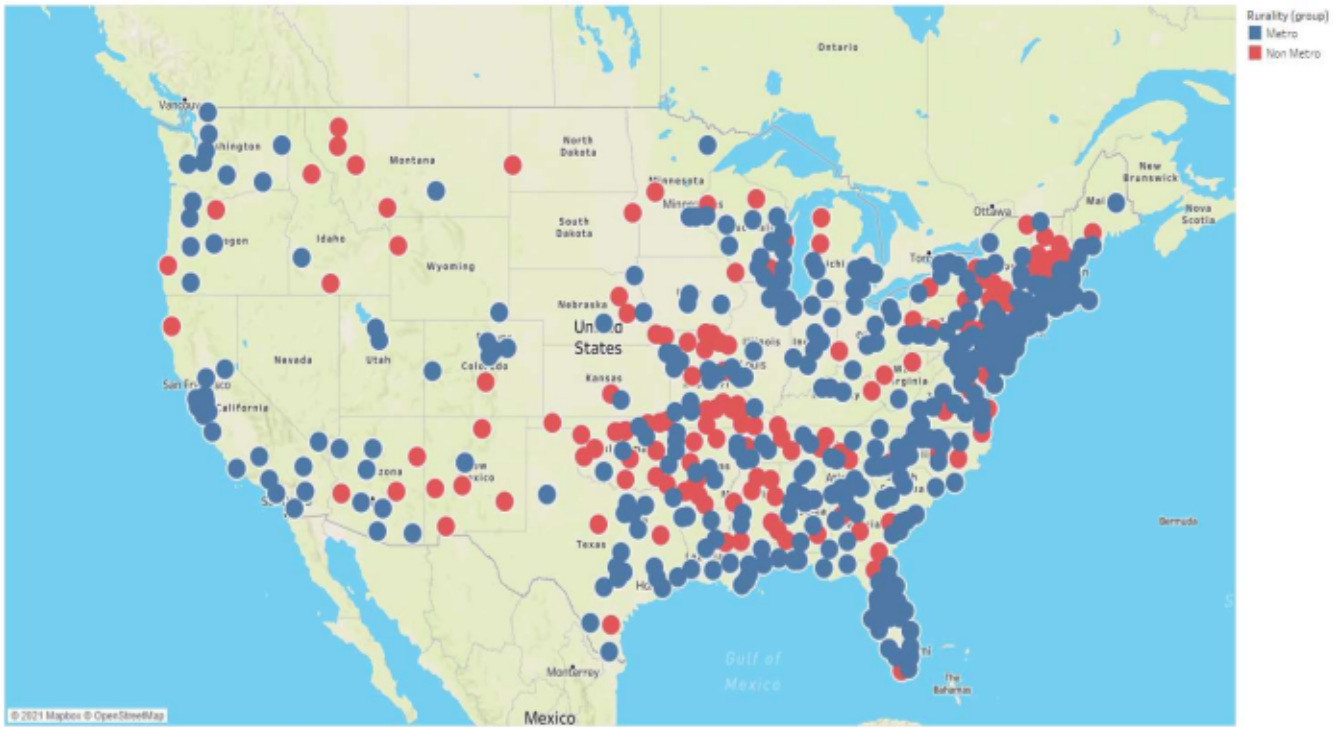
Below, we provide descriptive statistics comparing the encounter data to national data before presenting the cost-benefit analysis results.

### Geographic Distribution

Services were delivered across both urban and rural communities. The majority of encounters took place in the eastern part of the country, with a high proportion of services occurring in the Northeast and South. Many of the services provided on the eastern and southern seaboards took place in metropolitan areas; however, multiple encounters occurred in rural communities in the South, upper New England, and the Western states. Overall, programs provided 82% of telehealth services in urban areas, and 18% were delivered in rural counties. This indicates a distribution of services consistent with Census Bureau data which indicates that 80% of the U.S. population resides in non-rural areas.[29]

[4] Provider credentials were not included in the data

**Exhibit 2: Distribution of Telehealth Encounters by Health System**



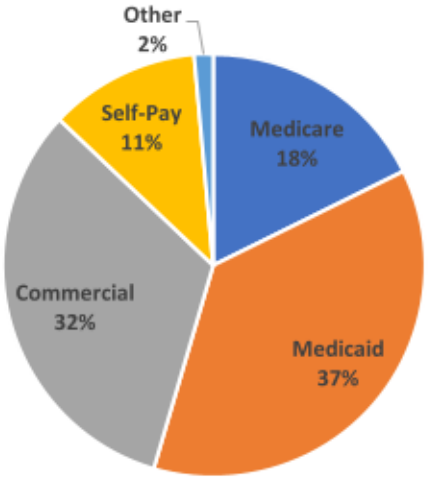




**Exhibit 3: Payor Breakdown of Telehealth Encounters**

Medicaid and private pay accounted for more than two-thirds of all encounters, followed by commercial insurance (32%). Medicare (both fee-for-service and Medicare Advantage) accounted for 18% of all encounters. More than one in ten encounters (11%) were paid out of pocket. In contrast, only a fraction of encounters was reimbursed by other payment sources, including Tricare, charitable care, and Veterans Health Administration. Analysis by the Congressional Research Service indicated that before the start of the pandemic (2019), private health insured covered approximately 33% of all healthcare care expenditures (HCEs) followed by Medicare which covered 21% of HCEs and Medicaid which accounted for 16% of total HCEs in the United States .[30] Out-of-pocket spending (other than premiums) accounted for 11% of HCEs.[31] Based on this information, the final data included a greater volume of Medicaid recipients- attributable to AHCCCS data which included all telehealth services reimbursed by Medicaid in the state of Arizona during the study period- but was representative of the nation for all other payer groups.

## Service Volume

While there was significant variability in telehealth use over time, the data is consistent with other published reports. [3] [24] Exhibit 4 illustrates the volume of telehealth encounters following the public health emergency declaration (PHE). As reported elsewhere, service volume peaked in April 2020 with a slight but consistent decline in utilization through the summer months. Consistent with other published reports, there was a precipitous decline in the use of telehealth beginning in September; however, commercial data indicate that the volume of telehealth encounters has stabilized since the fall of 2020 with sustained use that is 38 times higher than telehealth utilization before February 2020.[3] Further, data reported by CMS and the Centers for Disease Control and Prevention (CDC) confirm that current telehealth use remains nearly double pre-pandemic levels[4] [32]

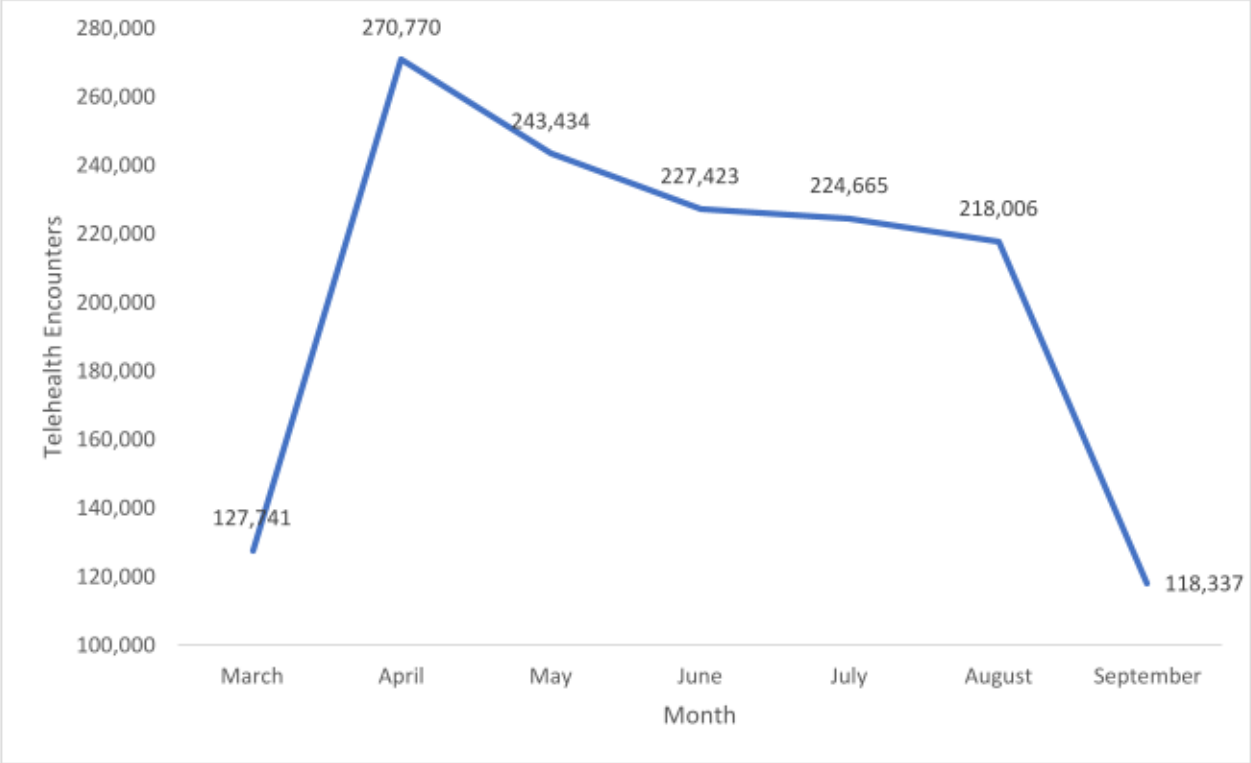



**Exhibit 4: Volume of Telehealth Encounters by Month**

## Patient Demographics

More than half of patients receiving telehealth services were fifty or older (51%). In comparison, the remaining encounters were closely divided across different age groups, with 17% of services delivered to children under 18, 15% to young adults aged 18-34, and 17% to adults aged 35-49. Exhibit 5 compares the distribution of telehealth encounters by age group with 2019 data from the U.S. Census.[33] While the volume of telehealth encounters represents a higher percentage of adults aged 50 and over, health expenditure data indicates increased health care utilization by older adults.[34]

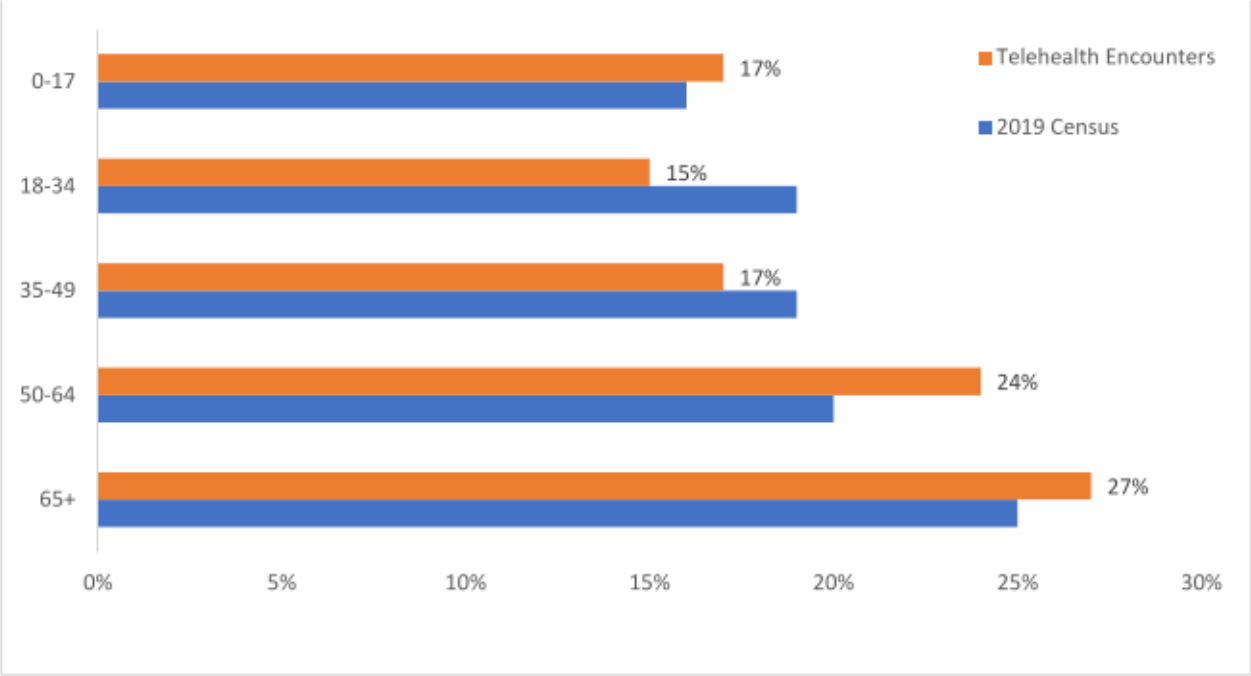



**Exhibit 5: Age Range of Telehealth Encounters**

As shown in Exhibit 6, more females received telehealth services, consistent with CDC data on in-person care documenting historically higher utilization of ambulatory care services.[35]

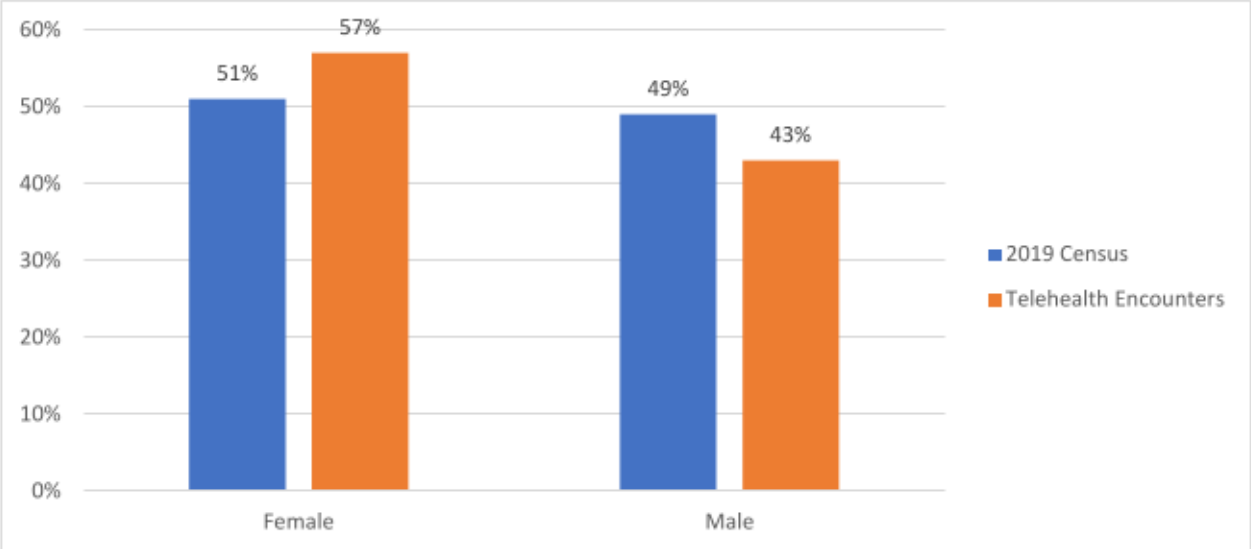



**Exhibit 6: Gender Breakdown of Telehealth Services**

Race and Ethnicity

Nearly half of telehealth services were provided to patients who identify as White (49%), followed by Latinx (16%) and Black (12%) patients. With regards to patient ethnicity, 60% of all patients identified as non-Hispanic. In 2019, White, non-Hispanic individuals accounted for 60% of U.S. residents while Black, non- Hispanic patients accounted for 13% of the U.S. population. According to Census data, the data

closely resemble the racial and ethnic distribution across Americans except for Asians (2% in the data set), who comprise 6% of the U.S. population.[36]

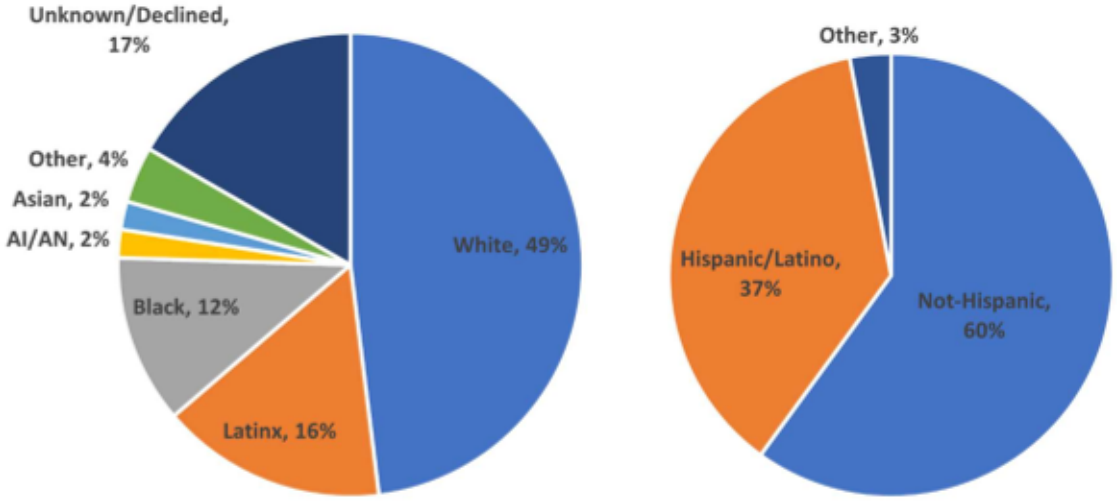
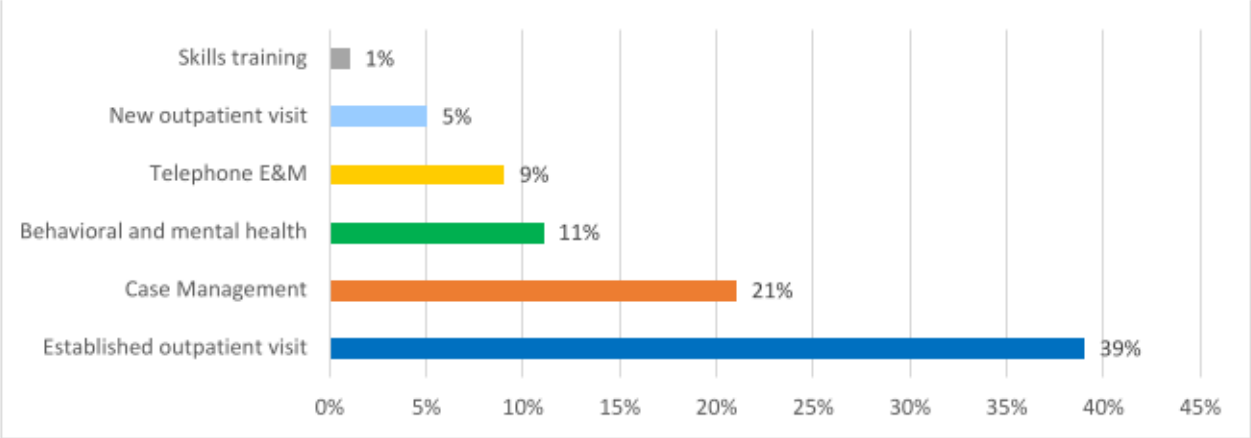



**Exhibit 7: Telehealth Encounters by Patient Race and Ethnicity**

## Procedures

The most frequently billed procedure codes for telehealth services were outpatient visits for established patients (39%) followed by case management (21%). The benefits for treatment of mental and behavioral health, including therapeutic counseling, psychotherapy, and mental health assessment, accounted for one in ten telehealth encounters (11%), followed closely by evaluation and management (E&M) services provided via telephone (9%).

**Exhibit 8: Most Frequent Procedure Codes Billed for Telehealth Services**

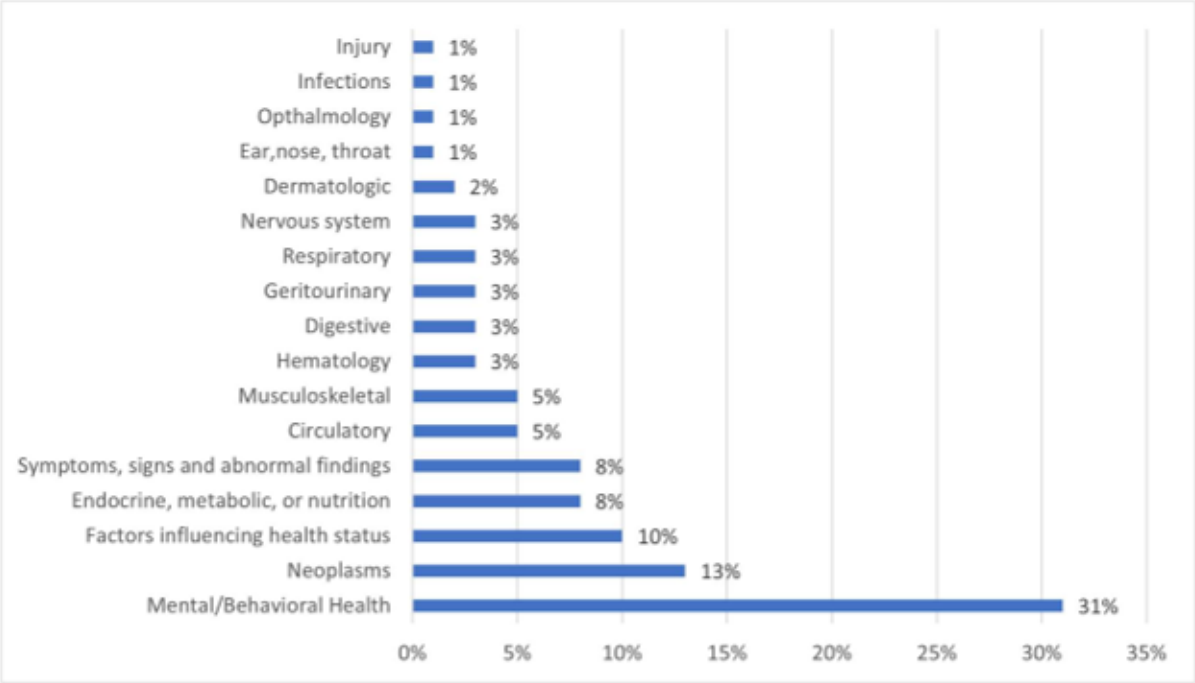



## Patient Diagnoses

Documented diagnoses ranged from one to over a dozen active diagnoses for each telehealth encounter. For this reason, we focused on the top five diagnoses across all patients who received a telehealth encounter. Patients with a diagnosis of mental or behavioral health (including substance use

disorder) accounted for nearly one-third (31%) of all telehealth encounters, more than twice the subsequent most common diagnosis of neoplasms (13%). These findings are consistent with research that documented the high prevalence of patients seeking services for behavioral health during the pandemic [37] One in ten patients presented with a condition that influenced health status (10%), followed by a diagnosis of endocrine, nutritional, or metabolic disorder (8%) and symptoms, signs, and abnormal lab findings (8%). All other diagnoses occurred in 5% or fewer of all patient encounters. Exhibit 9 includes the top five diagnoses across all telehealth encounters. Diagnoses not included in the figure represented less than 1% of the diagnoses for patients who received telehealth encounters included in the data set.

**Exhibit 9: Top Five Diagnosis Codes for Telehealth Service Recipients**




## Descriptive Analysis of Encounters for Patients with a Behavioral/Mental Health Diagnosis

Given the volume of telehealth services provided to individuals with a behavioral and mental health diagnosis, we performed additional analyses to assess the characteristics of this patient group relative to the complete data set. More than one-third of all encounters with patients with behavioral or mental health diagnoses were children (35%), double the percent of patients in this age group represented in the complete data set. High levels of telehealth utilization were also observed for patients aged 18-34 with a behavioral or mental health diagnosis. In contrast, older adults (65 and over) receiving telehealth services were far less likely to have a documented behavioral or mental health disorder. These findings are inconsistent with the literature, which has found that 24% of people aged 65 or older experience some type of mental health concern.[38]

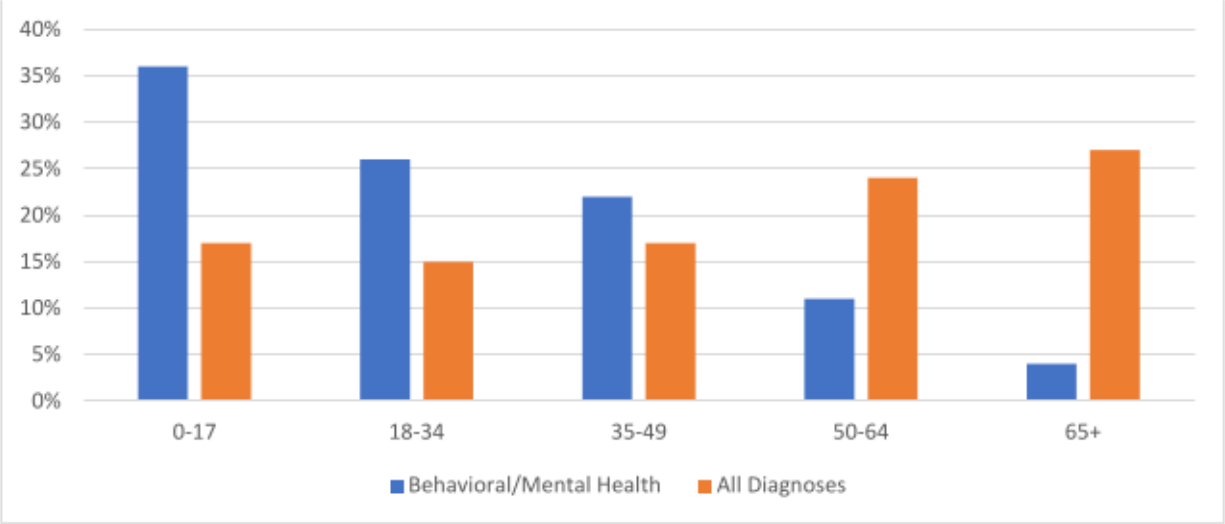



**Exhibit 10: Distribution of Patient Age for Encounters with a Diagnosis of Behavioral/Mental Health**

Two-thirds of all encounters with a patient with a behavioral or mental health diagnosis were reimbursed by public insurance (66%). While the percent of encounters reimbursed by Medicaid were similar for those with a behavioral or mental health diagnosis versus all diagnoses (36% vs. 37%, respectively), Medicare was nearly twice as likely to be the payer of record for encounters with patients with a behavioral or mental health diagnosis as compared with encounters for patients with all diagnoses (30% vs. 18%, respectively). Given the increased volume of encounters reimbursed by Medicare, it is likely that some of the patients under the age of 65 were eligible for Medicare because the patient had a qualifying disability or end-stage renal disease. Fewer encounters with patients with a behavioral or mental health diagnosis were reimbursed by self-pay as compared to all encounters in the complete data set (26% vs. 32%, respectively)

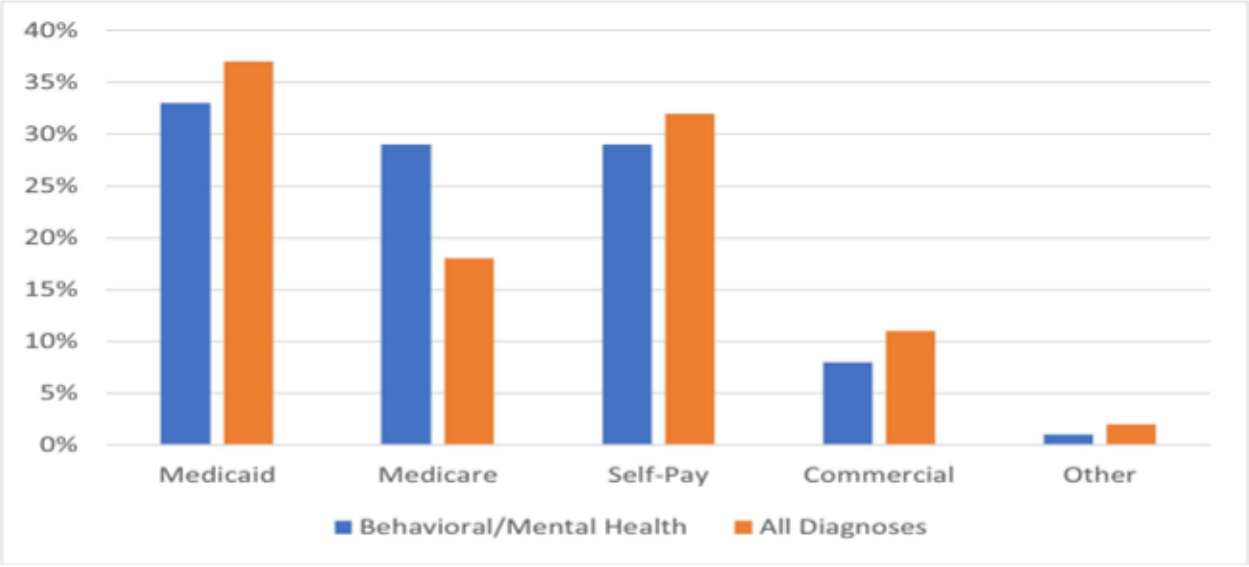



**Exhibit 11: Payor Source for Encounters with a Behavioral/Mental Health Diagnosis**

White patients accounted for 4 out of 5 encounters for patients with a behavioral or mental health diagnosis (80%). This finding was eight times the number of encounters for Black patients with a

behavioral or mental health disorder (10%) and more than 20 times the number of encounters for behavioral and mental health diagnoses for all other patients with their race identified in the data set. While there is limited data on the actual prevalence of behavioral and mental health by race, data prior to the pandemic showed health disparities in receipt of behavioral health use with White adults more than twice as likely to receive mental health services compared with Black adults.[39]

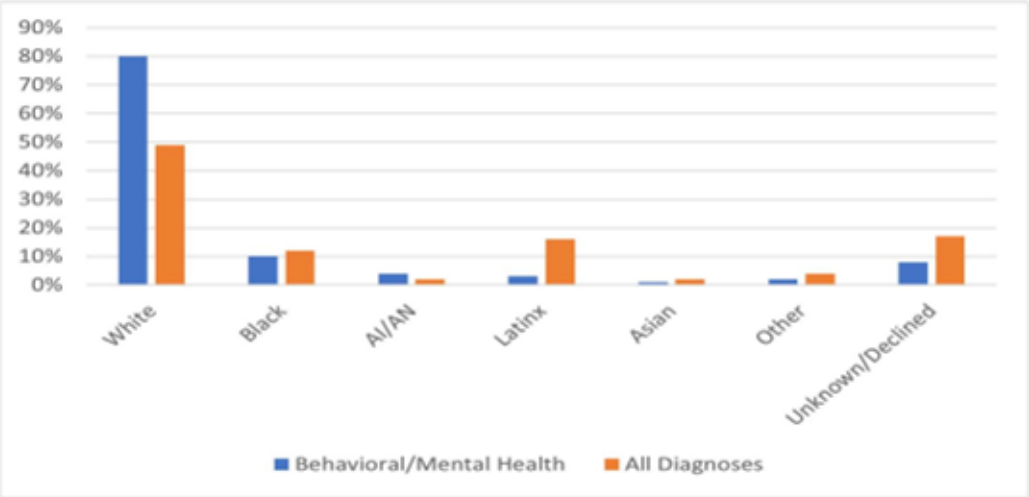



**Exhibit 12: Patient Race for Encounters with a Behavioral/Mental Health Diagnosis**

## The Cost-Benefit of Telehealth Services During COVID-19

Apart from examining the summary statistics of telehealth utilization within the United States from March 2020 through September 2020, this report also studies the cost-benefit of telehealth across both specific clinical conditions and payer types. There is a lack of understanding of the economic effects of telehealth on patients, providers, and patients due to a lack of data from full-fidelity systems operating at a consistent state.[40] For years, most telehealth systems within the United States had not achieved their full utilization. They were thought of as either a complementary method of care or to be used only for specific clinical conditions such as mental and behavioral health.

Data for this report came from seven primary sources: the Arizona Health Care Cost Containment System, Baptist Health South Florida Gunderson Health System, BJC HealthCare, MercyVirtual, Northwell Health, and the University of Mississippi Medical Center. While the initial data request asked for numerous variables describing the patient encounter, several programs could not provide all the data variables iterated in the data dictionary. The data came from each system within their program and consisted of the following variables, as shown in Table 2.

**Table 2: Data Variables Included in the Cost-Benefit Analysis**

| Variable | Definition |
|---|---|
| **Patient Zip Code** | The first three digits of the patient's zip code were provided in alignment with the acceptable provisions of a limited data set under the Health Insurance Portability and Accountability Act (HIPAA) |

| Variable | Definition |
|---|---|
| **Patient Age** | Age was grouped into the following categories: 0-17, 18-34, 35-64, 65 and over |
| **Patient Race** | Patient race was grouped into the following categories: White, Black/African-American, American Indian/Alaskan Native, Pacific Islander/Native Hawaiian, Hispanic/Latino, Asian, Other, Declined to State |
| **Patient Ethnicity** | Patient ethnicity was grouped into the following categories: Hispanic/Latino, Not Hispanic/Latino, Other, Unknown, Declined to State |
| **Patient Gender** | Patient gender was grouped into the following categories: Male, Female, Other, Declined to State |
| **Date** | The date of the patient's telehealth encounter was recorded |
| **Diagnosis** | The patient's principal diagnosis was recorded using codes from the International Classification of Diseases, Volume 10 (ICD-10) during the telehealth encounter. |
| **Procedure** | The primary procedure for the patient during the telehealth encounter was recorded using codes from either the Current Procedural Terminology, Volume 4 (CPT-4), or the Health Care Procedural Cost System (HCPCS) |
| **Insurance** | The payer of record was recorded |

Additionally, we procured data on the rate of hospitalizations for specific clinical conditions; the salaries of physicians, nurses, social workers, physician assistants, and nurse practitioners by region of the country; the cost of broadband services for patients and providers; and the maintenance costs for telehealth platforms through published and unpublished sources, web sites, and reimbursement schedules. We used the most current data and leveraged sources from the specific programs and states referenced within the report.

## The Framework for Cost-Benefit Analysis

This research utilizes a framework to assess telehealth services' cost-benefit from March 2020 through September 2020. Specifically, we were interested in exploring the potential cost-benefits based on patient utilization of telehealth services, and the location where patients would likely have received in-person services prior to the pandemic. We were also interested in the specific clinical conditions of patients, the provider types delivering the care, the use of vehicles and public transportation, the patient's travel time and distance to engage in an in-person visit in the absence of telehealth, and the type of insurance billed for the services provided. Several previous studies researched ways to estimate cost-benefit and cost-effectiveness. For example, de la Torre et al. (2004) used a comprehensive cost-analysis framework based on empirical evidence from several small and rural sites throughout Arizona.[41] Dullet, Geragthy et al. (2017) focused on time savings, travel costs, and environmental pollutants when analyzing the outpatient telemedicine program at the University of California Davis Health System.[42]

Research by Cameron, Bashshur, et al. (1998) developed a simulation methodology to assess the economic effects of the Mountaineer Doctor TeleVision (MDTV) system in West Virginia. This specific framework examined both inpatient and outpatient telehealth and focused on both fixed and variable costs.[43]

In general, the principal technique used for cost-benefit analysis takes the measured costs and benefits of a program and translates them into economic terms. The data collected in the study were encounter data for seven months (March through September) in 2020 and did not include outcomes. This inhibited our ability to conduct a cost-effectiveness analysis, where program costs are measured, and the analysis accounts for the program's average or incremental cost. Without outcomes data, we also could not perform a cost-utility study, which measures the impact of telehealth in the quality-adjusted life years of an individual.

The cost data reviewed included the number of cases per site within each program, diagnoses, procedures, race, age, ethnicity, clinical services, specialty services, payer, and the overall cost of the encounter. The goal of the analysis was to assess the cost-benefit of telehealth versus conventional in-person encounters. For this framework, we assumed that a telehealth encounter is comparable with a traditional in-person consultation. The analysis considered two specific cost categories: direct and indirect costs. Direct costs are resource costs directly incurred by the providers of the service or those accessing or benefiting from the consultations. Indirect costs include lost income associated with taking time off from work to visit a provider and the expenses incurred in traveling to the provider's location. We used peer-reviewed methods to ascertain the value and cost of those resources, the annual maintenance cost of the telehealth platform used for the visit, and the utilization of telehealth services within different communities and programs. This analysis focuses on Medicare and Medicaid programs as pending telehealth legislation within the United States Congress concentrates on policies regarding public reimbursement for telehealth.

### Cost Variable Definitions

We used several variables to calculate costs and benefits attributable to telehealth utilization during the pandemic within the framework.

***Personnel Costs.*** We assessed personnel costs through a combination of published information and assumptions based on historical data. The median salaries of providers came from Salary.com and aligned with both a specific profession and State. For example, we identified psychiatrists' wages in Arizona, oncologists in Miami, and cardiologists in New York City and its outlying suburbs. We also identified salaries for nurse practitioners, physician assistants, and nurses, in addition to licensed clinical social workers for mental and behavioral health conditions. We used an average of $90,000 for physician assistants and nurse practitioners, which overestimates the median salary with some states but is an adequate representation across each program included in the study. Salary and fringe benefit rates (which are assumed to be 30% of an annual salary) were based on 2,080 hours a year. The study covers seven months, so annual salaries and fringe benefits were multiplied by 58% to represent the appropriate proportion of the calendar year.

***Broadband Costs.*** We researched broadband costs for both individuals and providers through several websites of the most frequently used networks, such as Spectrum, Cox, and AT&T. The appropriate bandwidth to accommodate telehealth video encounters is between 100 Mbps and 1000 Mbps, so we

identified companies that provided a bandwidth at least 100 Mbps and used their monthly service rate. Additionally, we used a flat rate of $50.00 per month broadband subscription rate for individual providers. With the single exception of New York, it was challenging to determine the availability of discounted rates for broadband to low-income patients. Furthermore, a significant percentage of patients used audio-only telehealth services instead of video, which does not require broadband and, therefore, did not incur the same expense.[44] To calculate costs, we took the single household monthly rate for broadband and multiplied it by the number of patients in the clinical cohort (i.e., the number of telehealth encounters for Medicare patients with cardiovascular disease in Wisconsin) and the rate per provider rate multiplied by the number of providers. This calculation represents the broadband costs for one month that we reduced by 10% to accommodate audio-only visits and multiplied by the monthly rate by seven to define the seven-month study period. We understand that this may underestimate the actual number of audio-only visits and may be higher than what is charged, but it reflects the best estimate of broadband costs based on published data.

***Operating Costs.*** Resources representing recurring operating costs such as personnel salaries and fringe benefits, were calculated using existing cost data. For resources with utility extending beyond the study period, such as the telehealth equipment used by each program, we derived the cost amount following Generally Accepted Accounting Principles. These principles require that all costs incurred to implement the telehealth network are expensed in the year of acquisition.[45] The annualized cost figures (also known as depreciation) account for the utility of the technology after an initial year. The failure to appropriately allocate a portion of these costs to this analysis underestimates the annual expenses of the telehealth network. The assumption is that none of the program participants in this study acquired a new technology platform in 2020 and leveraged their existing telehealth capabilities. We assigned a $100,000 acquisition expense per site (not program) and used a five-year straight-line depreciation to calculate a $20,000 maintenance cost per program site. We multiplied that amount per program site by 0.58 to account for the fact that we are calculating the costs associated with a seven-month (March-September) time period rather than a full calendar year. An example of this is shown in Table 3.

**Table 3: An Example of Deriving Telehealth Maintenance Costs for Cost-Benefit Analysis**

| Maintenance Costs | Amount |
|---|---|
| **Acquisition Cost Per Site** | $100,000 |
| **Depreciated Amount (Five-Year)** | $20,000 |
| **Number of Sites** | 20 |
| **Subtotal Amount** | **$400,000** |
| **Study Period (58%)** | **$232,000** |
| **TOTAL MAINTENANCE COSTS** | **$232,000** |

## Estimates of Outpatient Savings

Using frameworks developed and previously employed by Cameron et al. (1998) and Dullet et al. (2017), we ascertained patient outpatient telehealth savings by calculating the cost associated with reduced hospitalizations, reductions in patient travel costs, increased patient productivity for those who were employed (due to avoided time off from work), and cost-per-gallon reductions in carbon dioxide and nitrous oxide emissions[4647]. Numerous studies described the decline in hospitalization rates, across clinical areas, resulting from increased access to specialty care through telehealth. The patient's costs

associated with travelling to an in-person visit, either through personal or public transportation, will decrease if patients have access to care within their residence. These costs include car mileage and gas (personal vehicle) or the fare paid for using public transportation. Finally, there is a potential reduction in pollution and greenhouse gas emissions due to contaminants not being emitted into the atmosphere as a result of the reduced need to travel. Each of these outpatient savings is described in more detail below.

***Reduced Hospitalizations.*** A critical component of cost-benefit analysis for telehealth is estimating its impact on patients' health in the future. There has been extensive research outlining the effective use of telehealth as a method for reducing hospital admissions associated with chronic obstructive pulmonary disease[48], heart failure[49], diabetes[50], and mental health disorders.[51] To the extent that telehealth improves timely patient access to care, improving disease management and preventing avoidable adverse events associated with unmanaged care, it is reasonable to assume that continued telehealth utilization will reduce future hospitalization rate. Research on the exact percentage of the reduction of hospitalization rates is difficult to obtain, so we set the initial assumption that telehealth use during the COVID-19 pandemic, potentially reduced hospitalizations for chronic conditions by 10%. Our analysis only looks at patients that actively sought care (and therefore were likely sicker than those with the same conditions, such as diabetes or hypertension, that did not access care during this time period.

***Patient Travel.*** The telehealth waivers enacted by CMS under the PHE allowed patients to initiate encounters from their homes. The reduction in patient travel as a result of these changes generated another source of savings. To determine costs associated with patient travel, we assumed that, in the absence of telehealth, patients would use their vehicle (or public transportation) to make one round-trip visit to a provider closest to their residence. We calculated travel distance by identifying a provider address using a State's Medicaid site or Medicare.gov (dependent upon the payer source for the encounter) and randomly choosing an address within the same county. Google Maps provided mileage and time for the fastest route assuming 55 miles per hour (MPH) on non-freeway lanes and 65 MPH on highways. We used the Internal Revenue Service (IRS) rate of $0.68 per mile to determine the travel cost.

***Patient Productivity.*** Another source of savings comes from the increased productivity of patients when they receive a telehealth visit at home and do not spend time away from work. This analysis assumes that, on average, wages are lost each time a patient travels to a location for an in-person visit. The productivity analysis also shows that wages are an adequate proxy for a patient's benefits when actively working. Given that many Medicare beneficiaries are retirees, we focused this analysis solely on Medicaid populations and used information from State Medicaid programs to determine the salary thresholds to qualify for the program. For this salary threshold, we assumed that a family comprised of four individuals qualified for Medicaid. We identified the annual amount and divided the salary threshold by 12 to derive a monthly income. That figure was then divided by 160 to calculate an hourly rate. We used the following formula to determine the total wages lost:

*Time in hour increments to travel to in-person location* (calculated using the Google Maps fastest route estimate divide by 60 minutes)

Multiplied by calculated *hourly wage* (based on threshold for Medicaid eligibility)

Multiplied by two (to account for *round trip* travel).

This calculation provides the wages lost for a round-trip visit to a provider per patient enrolled in Medicaid.

***Environmental Impact of Telehealth.*** We used the 2008 Average Annual Emission and Fuel Consumption for Gasoline-Fueled Passenger Car and Light-Trucks Report, produced by the United States Environmental Protection Agency, Office of Transportation of Air Quality.[52] The data within this report provides information on the average pollutant values of passenger vehicles. This report focuses on carbon dioxide ($CO_2$), the transportation sector's primary contribution to climate change[53], and nitrous oxide ($N_20$), a greenhouse gas that depletes the ozone layer to cause global warming.[54] We determine the emissions per mile driven (g) by multiplying the miles driven to and from a provider location with the amount of $CO_2$ and $N_20$ emitted. We then converted that amount to pounds and used the US EPA Greenhouse Gas Equivalencies Calculator[55] to derive the gallons of gas used for each trip from the amount pounds of $CO_2$ and $N_20$ used . We multiplied that amount by the current rate of gasoline per gallon ($3.17/mile)[5] to calculate the number of dollars saved.

## Results

During the time period of focus, telehealth was widely used by patients enrolled in both Medicare and Medicaid. Table 4 summarizes each of the States included in the analysis, the population of interest, the primary diagnoses, and the net outpatient savings resulting from the use of telehealth.

**Table 4: Overview of Cost-Benefit Analysis by State, Payer, Diagnosis and Net Savings**

| State | Population | Diagnosis | Net Savings |
|---|---|---|---|
| **Arizona** | Medicaid | Mental and Behavioral Disorders | $191,211,514.09 |
| **New York** | Medicare | Diseases of the Circulatory System | ($6,930,314.57) |
| **New York** | Medicaid | Neoplasms | ($1,304,252.60) (Personal vehicle)<br>($1,444,644,.44) (Public transport) |
| **Florida** | Medicare | Neoplasms | $33,158,015.73 |
| **Florida** | Medicaid | Neoplasms | $15,491,428.79 (Personal vehicle)<br>$16,750,732.13 (Public transport) |
| **Missouri** | Medicare | Diseases of the Circulatory System | $684,071.33 |
| **Missouri** | Medicaid | Diseases of the Respiratory System | $1,637.804.80 |
| **Mississippi** | Medicare | Diseases of the Circulatory System | $3,488,809.33 |
| **Mississippi** | Medicaid | Endocrine, Nutritional, and Metabolic Disorders | $154,881.61 |
| **Wisconsin** | Medicare | Endocrine, Nutritional, and Metabolic Disorders | $445,269.45 |

[5] Cost was based on data procured on September 7, 2021

In most of these States, especially for Medicaid populations, the use of telehealth provided significant cost benefits. Psychiatry was the most common specialty service provided via telehealth, representing one of the top three patient diagnoses among telehealth encounters across the States were focused on within this study. Cardiology accounted for the next most frequent diagnosis among patients receiving telehealth services and was highly prevalent for encounters billed to Medicare. Types of services accessed via telehealth varied across racial and ethnic groups. With the exception of White patients, Native Americans and Latinx were the two largest population groups to utilize mental and behavioral health services. Black/African Americans and Hispanic/Latinos enrolled in Medicaid frequently received telehealth services from either an oncologist or endocrinologist. Through the cost benefit analysis, we identified several valuable insights with regards to the use of telehealth:

- Cost savings were higher in areas where there is a shortage of specialty providers, such as cardiologists or psychiatrists, within close geographical proximity to patients, particularly those enrolled in Medicaid.
- Most geographic areas with high utilization of telehealth are designated as Health Professional Shortage Areas (HPSAs) or Mental Health Professional Shortage Areas (MHSAs).
- The highest driver of cost-savings is a reduction in avoidable hospitalizations, while the highest driver of accrued costs is broadband access
- Among the States we focused on with Medicaid populations, there is limited public transportation to see a provider

In counties with a high population density and large volume of specialty providers in close geographic proximity to patients, our analysis did not find cost savings. In each of these cases, the travel distance to a provider was less than five miles, and the more frequent payer source was Medicare (thus, we did not assume any lost wages). Within these populous counties, the cost for monthly broadband as well as salaries for physicians were extremely high, offsetting potential savings. Despite the lack of cost savings, telehealth still has the potential to provide tremendous value to residents in these communities. Telehealth increases access for patients who have difficulty accessing care due to limited mobility or competing responsibilities (such as care for a family member)[56] and increases ease of use which, according to the literature, has been associated with a reduction in missed appointments and better compliance with disease management appointments.[57] [58]

## State Profiles

The cost-benefit analysis focused on States with the highest volume of telehealth utilization from March 2020 through September 2020.

### Arizona

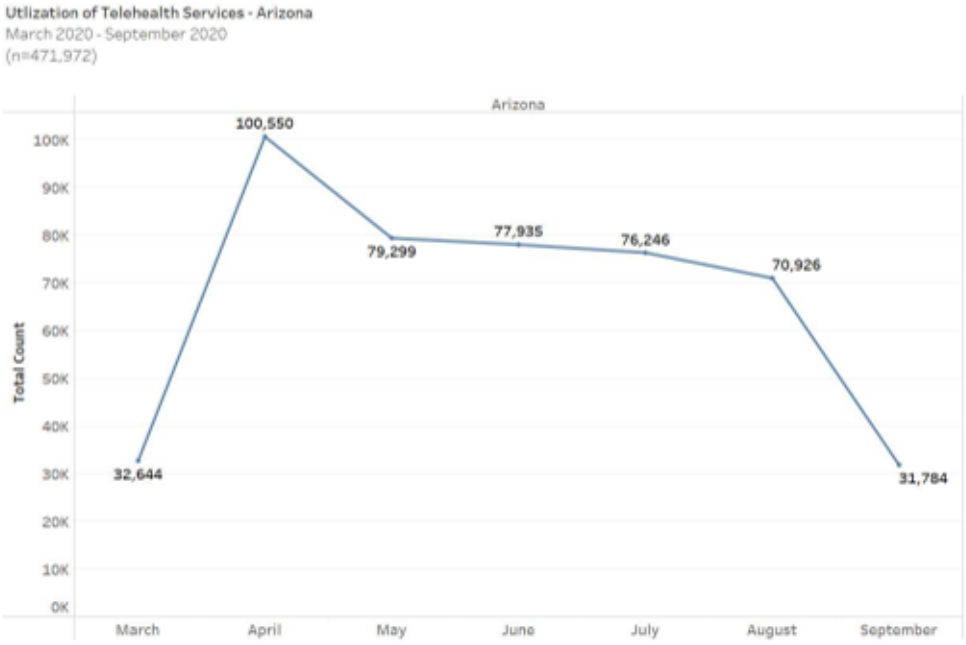
In 1982, Arizona implemented a prepaid, competitively bid medical care program known as the Arizona Health Care Cost Containment System (AHCCCS).[59] The goal of AHCCCS is to provide poor and underserved individuals with appropriate and equitable health care. Before adopting AHCCCS, each of the counties within Arizona imposed restrictive financial requirements on beneficiaries of publicly supported care.[60] Only individuals with incomes of less than 50 percent of the Federal Poverty Level (FPL) were eligible. Each county within Arizona had its own eligibility requirements with some variation in financial formulas.[61] The AHCCCS initiative made the financial eligibility requirements uniform throughout the State.

Currently, to qualify for AHCCCS, the annual income of a patients must be at or below 138% of the FPL ($17,774 for an individual in 2021, $36,570 for a family of four). In the Federal Fiscal Year 2019, AHCCCS provided coverage to nearly 1,900,000 beneficiaries or 26% of Arizona's 7.2 million residents.[62] Arizona comprises 15 counties, with approximately 74% of its residents living in Maricopa or Pima County.[63] The overall population density of the State is 63 residents per square mile. As of September 30, 2019, Arizona had 37 Medically Underserved Areas and 194 primary medical care, 187 dental, and 189 Mental Health Professional Shortage Areas.[64]

During the study period, 471,972 telehealth encounters were billed to Medicaid between March 2020 and September 2020. AHCCCS covers all significant telehealth services[65], including asynchronous, telephonic (audio-only), and interactive audio and video. It also covers telehealth for remote monitoring and dentistry. Patients can receive services at their home, even prior to the relaxation of site of services restrictions during the COVD-19 pandemic and are not required to visit an originating site if services are provided through a telehealth modality to their residence. For in-person visits, AHCCCS beneficiaries can receive services at a network of 154 Federally Qualified Health Centers (FQHCs), over 26 Rural Health Clinics (RHCs), or one of 127 hospitals across the State.[66]

For this study, we assumed that in the absence of telehealth, AHCCCS beneficiaries would visit either an FQHC or RHC. Many patients, especially those outside Maricopa and Pima counties, usually rely on these facilities for primary or mental health care.[67] FHQCs and RHCs provide telehealth services to those who cannot attend in-person, and reimbursement for telehealth during COVID-19 was identical to the prospective payment rate for an in-person encounter.

**Exhibit 13: Utilization of Telehealth Services in Arizona**




While telehealth encounters were provided to residents throughout the State, a significant number of encounters occurred in Gila, Apache, and La Paz counties, all of which are designated as non-metropolitan by the United States Census Bureau and the United States Department of Agriculture. In addition, each county has numerous Health Professional Shortage Areas in primary care, dentistry, and mental health care.[68] As such, the use of FQHCs or RHCs has become increasingly important in providing clinical care services. A further

examination of the map shows that a large majority of the telehealth cases occurred in counties outside Maricopa and Pima, where access to specialty providers is limited.

**Exhibit 14: Telehealth Services Utilization in Arizona by Age**

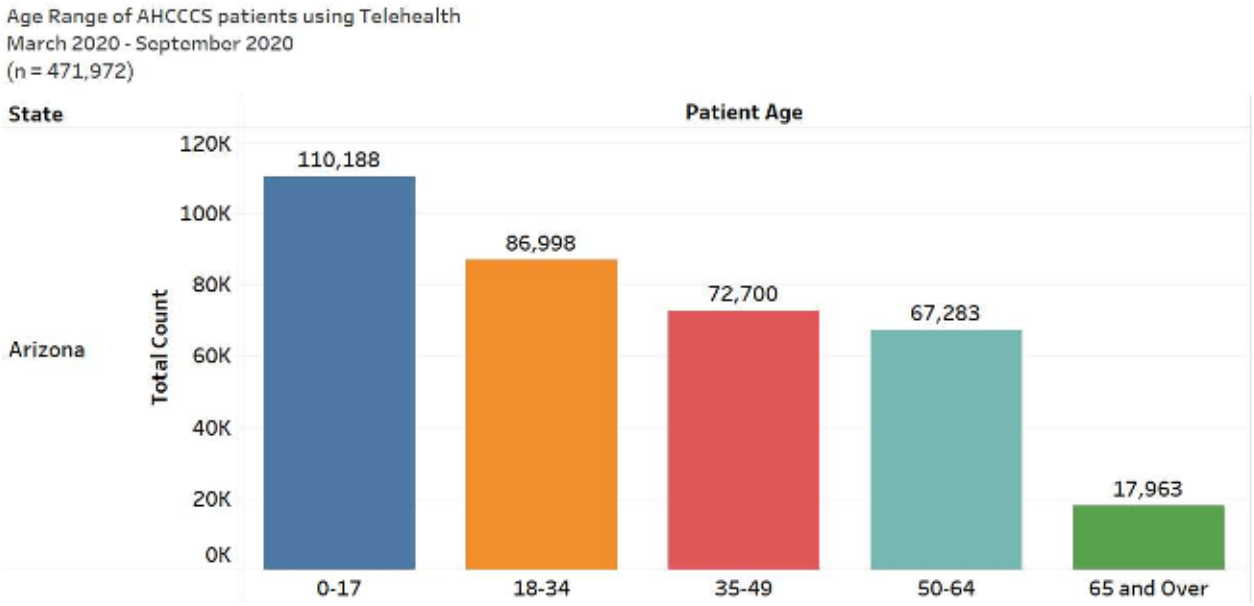
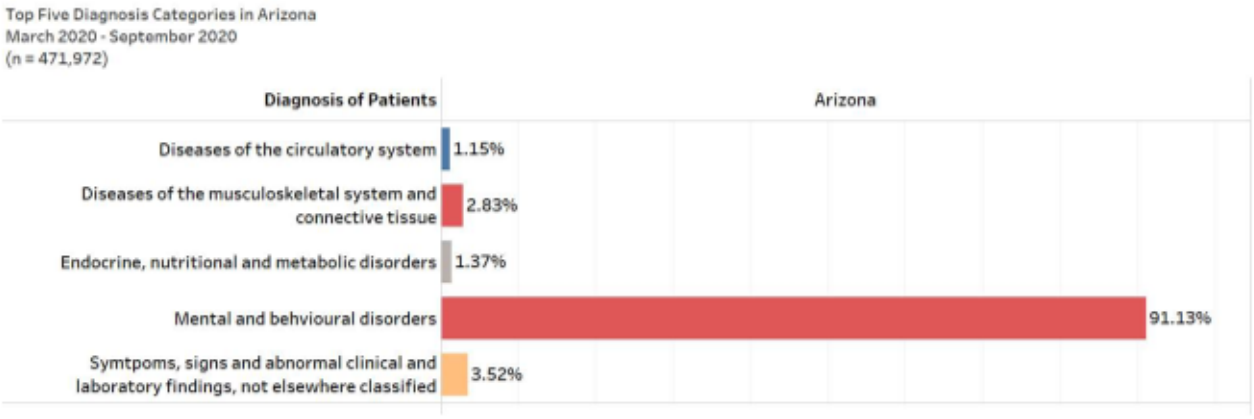



Exhibit 13 displays the telehealth service utilization by AHCCCS recipients across the State. The rapid increase from March to April is consistent with trends across the country.

In Exhibit 14, the majority of telehealth services were provided to children followed by young adults under age 35.

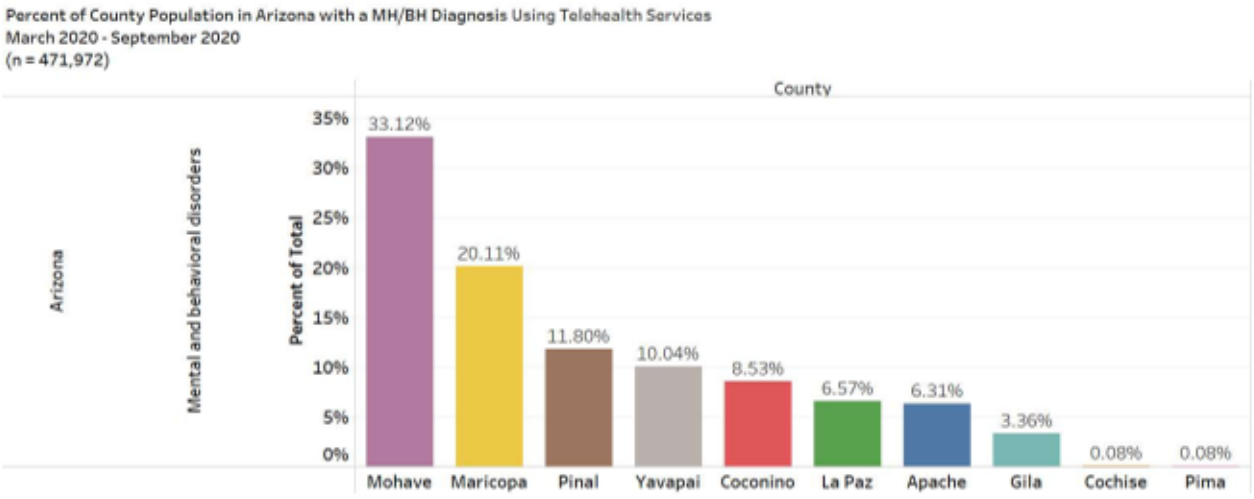
Medicaid is the single largest payer for behavioral health services in the United States, with nearly 20 percent of Medicaid enrollees diagnosed with a behavioral health condition.[69] Medicaid spending for individuals with a behavioral health condition is more than four times higher than expenditures for individuals with Medicaid that do not have a behavioral health diagnosis.[70] Several studies found that over 80 percent of the increased costs for people with comorbid mental and physical health conditions were associated with physical health expenditures.[71] Within the study period over 91% of telehealth encounters for AHCCCS recipients (approximately 433,6000) were provided to patients diagnosed with mental and behavioral health disorders. Exhibit 15 indicates that no other diagnosis within this population was as prevalent confirming the that the availability of behavioral health professionals was critical in meeting the health care needs of patients enrolled in AHCCCS.

**Exhibit 15: Top Five Diagnosis Categories Among Recipients of Telehealth Services in Arizona**



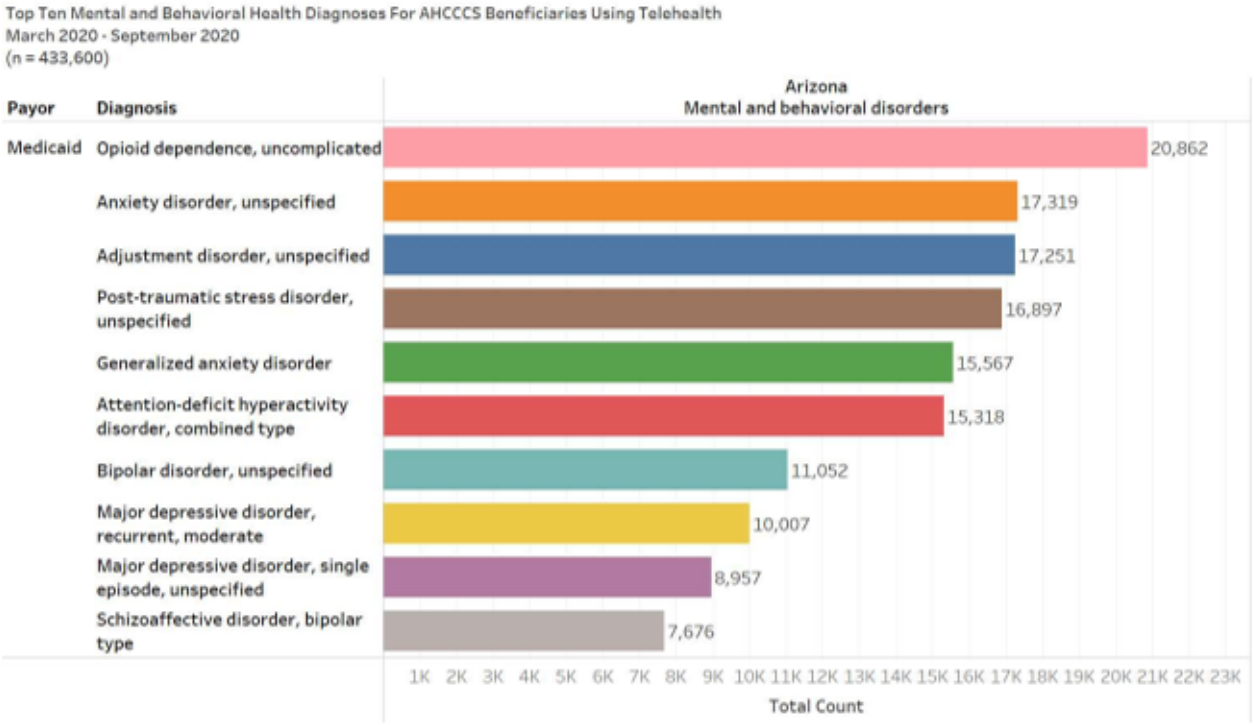

Within the data set, all Medicaid telehealth encounters with Arizona patients residing in non-metropolitan included a high volume of patients with a diagnosis of behavioral or mental health, as shown in Exhibit 16.

**Exhibit 16: Percent of Telehealth Encounters for Patients with a Behavioral or Mental Health Diagnosis, by Arizona County**



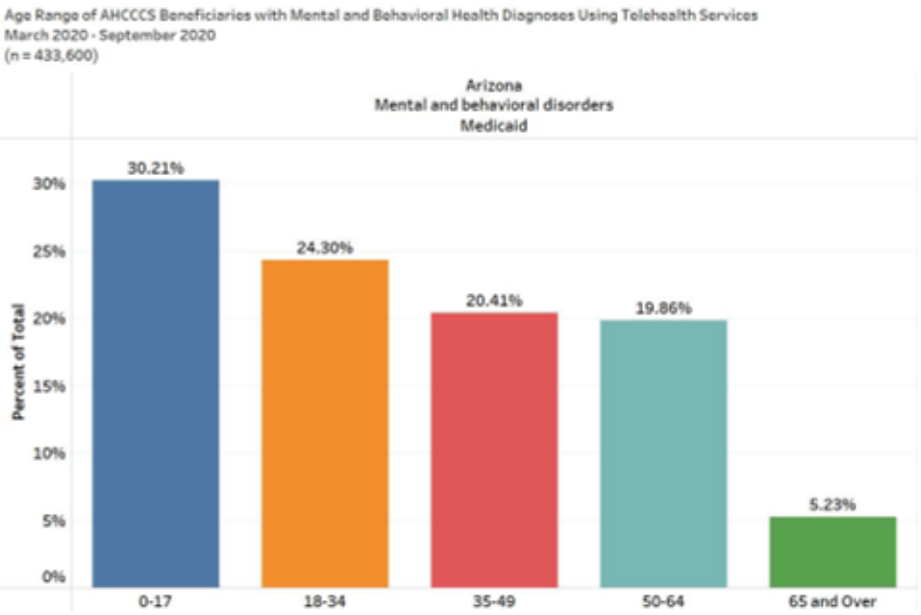

Each of these counties contain designated HPSAs with a documented shortage of mental health providers. In Mohave County, there are eight designated HPSAs, with four in geographic regions (Colorado City, Golden Valley, Hualapai Tribe, and Kingman) and five with FQHCs that are the primary provider for mental health services.[72] The frequency of these conditions ranges from substance use disorders to generalized anxiety disorder, and major depressive disorder. In 2015, nearly 1.8 million inpatient stays in Arizona were primarily for mental health or substance use disorders (6.7 of all admissions). The most common mental health diagnosis was mood disorder followed by alcohol-related disorder.[73] As Exhibit 17 shows, mental and behavioral disorders' top ten specific diagnoses within Arizona were related to mood disorders or substance abuse.

**Exhibit 17: Top Ten Behavioral and Mental Health Diagnoses for AHCCCS Beneficiaries Using Telehealth Services**



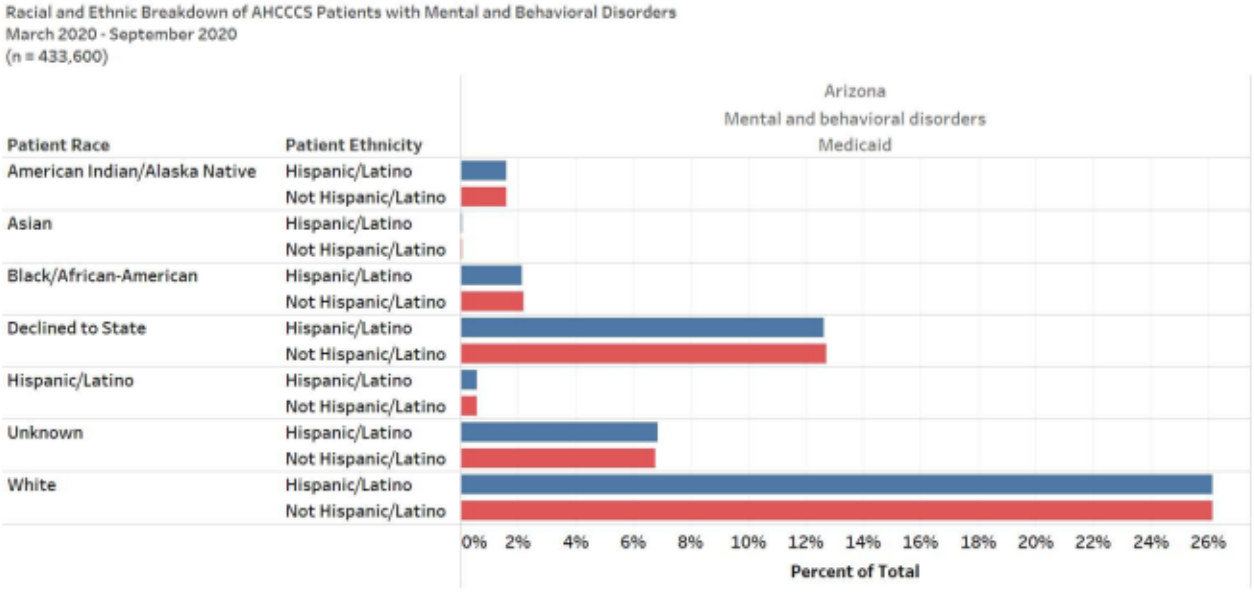

The age range for these diagnoses skewed heavily towards children, adolescents, and young adults, as shown in Exhibit 18.

**Exhibit 18: Age Range of AHCCS Beneficiaries with a Behavioral or Mental Health Diagnosis That Received Telehealth Services**



The racial and ethnic breakdown of AHCCCS beneficiaries in Exhibit 19 shows that a majority of those initiating telehealth encounters were White and Non-Hispanic/Latino

**Exhibit 19: Race and Ethnic Breakdown of AHCCS Beneficiaries with a Behavioral or Mental Health Diagnosis That Received Telehealth Services**




## Cost Analysis - Medicaid

We took a sample of ten Arizona counties and assigned five each to FQHCs and RHCS as we assumed these are the locations that the Medicaid beneficiaries would have gone for in-person care if telehealth was not available. Facilities were identified through a review of community health centers and rural clinics listed on the websites of the Arizona Alliance for Community Health Centers[74] and the University of Arizona Center for Rural Health.[75] Based on location of the FQHC or RHC, we predicted where patients in each county were likely to seek in-person care. We then took the total number of patients (433,600) and identified from our data the percentage of patients within each county that had a telehealth encounter during our study period (i.e., Maricopa County had 20% of patients) We then calculated the number of patients per county from that percentage and divided by the number of sites to derive the total patients per location, as shown in Table 5.

**Table 5: Total Number of Patients Per Location (AHCCCS)**

| Facility | Name of County | Number of Patients | Percent within County | Number of Patients | Number of Locations | Total Patients Per Location |
|---|---|---|---|---|---|---|
| ***Federally Qualified Health Centers*** | | | | | | |
| **Clinica Adelante, Inc** | Maricopa | 433,600 | 20% | 87,196.96 | 50 | 1,743.94 |
| **Canyonlands Health Center** | Gila | 433,600 | 1% | 3,468.80 | 3 | 1,156.27 |
| **El Rio Health Center** | Pinal | 433,600 | 12% | 51,164.80 | 30 | 1,705.49 |

| Facility | Name of County | Number of Patients | Percent within County | Number of Patients | Number of Locations | Total Patients Per Location |
|---|---|---|---|---|---|---|
| **Tuba City Regional Health Care** | Coconino | 433,600 | 9% | 36,986.08 | 8 | 4,623.26 |
| **North Country Health Care** | Mohave | 433,600 | 33% | 143,608.32 | 4 | 35,902.08 |
| ***Rural Health Clinics*** | | | | | | |
| **Sage Outpatient Clinic** | Apache | 433,600 | 6% | 27,360.16 | 3 | 9,120.05 |
| **Community Hospital Clinic** | Yavapai | 433,600 | 10% | 43,533.44 | 5 | 8,706.69 |
| **La Paz Medical Services** | La Paz | 433,600 | 7% | 28,487.52 | 1 | 28,487.52 |
| **Tonto Basin Clinic** | Gila | 433,600 | 3% | 14,568.96 | 3 | 4,856.32 |
| **Superior Clinic** | Pinal | 433,600 | 12% | 51,164.80 | 30 | 1,705.49 |

We assumed a 10% reduction in hospitalizations (as described earlier) realized as the result of access to a licensed and qualified clinician via telehealth. In calculating avoided hospitalizations, we assumed a one-day hospital admission. The average cost nationally for an inpatient admission is $2,607 per day[76]. The analysis in Table 6 quantifies the total savings generated as a result of reduced hospitalizations.

**Table 6: Cost Categories for Reduced Hospitalizations**

| Cost Categories | Amount |
|---|---|
| **Number of Mental and Behavioral Health Patients (March 2020 – September 2020)** | 433,600.00 |
| **Reduced Hospitalizations (10%)** | 43,360.00 |
| **Average Cost of One-Day Hospital Stay** | $2,607.00 |
| ***Total Savings for Reduced Hospitalizations*** | **$113,039,520.00** |

To calculate provider costs, we assumed that 15 psychiatrists, 15 licensed clinical social workers, and 15 nurse practitioners were needed to address the volume of patients with a behavioral or mental health disorder that accessed telehealth care. This was based on the overall provider-to-patient ratio from analysis developed by the University of Wisconsin Population Health Institute[77]. Table 7 displays the salaries for each provider category.

**Table 7: Cost Categories for Provider Salaries**

| Category | Salary |
|---|---|
| **Psychiatrist** | $231,890.00 |
| **Licensed Clinical Social Worker** | $71,664.00 |
| **Nurse Practitioner** | $139,371.00 |

We adjusted the salary to account for the seven-month study period (58% of a full annual salary) and multiplied this rate by the number of providers to calculate a subtotal. Table 8 presents the total salaries across all clinicians after considering fringe benefits (calculated as 30% of the seven-month estimated salary).

**Table 8: Salaries and Fringe Benefit Calculations for Providers**

| Cost Category | Amount |
|---|---|
| **Psychiatrist Salaries** | $2,017,433.00 |
| **Licensed Clinical Social Workers** | $623,476.80 |
| **Nurse Practitioners** | $139,371.00 |
| ***Subtotal Personnel Costs*** | **$3,853,447.50** |
| **Fringe Benefits (30%)** | $1,156,034.25 |
| ***Total Personnel Costs*** | **$5,009,481.75** |

Broadband costs (Table 9) were calculated based on the charges assessed by Cox- $29.99 per month for each telehealth recipient to ensure adequate bandwidth to accommodate a telehealth video visit and a blanket charge of $50.00 per month for each telehealth provider per site. We discounted that amount by 10% to consider that some patients accessed telehealth through for audio-only visits as our analysis shows. We then multiplied the figure by seven to account for the total charges across the seven-month study period.

**Table 9: Cost Categories for Broadband**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$29.99/month** | $13,003,664.00[6] |
| **Broadband for physicians @$50.00/month** | $2,250.00 |
| ***Subtotal Amount*** | $13,005,914.00 |
| **Adjustment for Audio-Only (10%)** | $1,300,591.40 |
| ***Subtotal Amount*** | $11,705,322.60 |
| ***Total Broadband Costs (x7)*** | **$81,937,258.20** |

To calculate the costs of telehealth maintenance, we used the $20,000 annual depreciation amount. As shown in Table 10, we multiplied these costs by the number of FQHCs and RHCs and adjusted by 58% to reflect the seven-month study period.

[6] This amount was calculated using 433,600 patients

**Table 10: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 154 |
| ***Total Maintenance Costs*** | $3,080,000.000 |
| ***Total Maintenance for Study Period*** | $1,786,400.00 |

To calculate the savings associated with avoided travel time, we identified the FQHC or RHC that was in the same county as an AHCCCS beneficiary. We calculated the fastest driving route possible using Google Maps and used $.68 per mile as the standard rate. To ascertain the total distance traveled, we chose a random address within the city or county in which the FHQC or RHC is located. We multiplied this by the number of telehealth encounters originating from each county, assuming that if telehealth were not available, that the patient would go to the nearest FQHC or RHC for care. Using Google Maps, we identified the time needed to travel to an in-person location and used that as the basis for patient productivity (lost time due to travel) and used mileage to determine the cost and amount of carbon dioxide and nitrous oxide emissions. Since many of the patients with behavioral and mental health diagnoses that received telehealth services during this time period were children, adolescents, and young adults, we calculated lost wages based on the maximum income threshold for an individual (rather than a family of four) to qualify for Medicaid in Arizona. The calculated values are shown in Table 11

**Table 11: Cost Saving Categories and Amounts for AHCCCS**

| Cost Category | Amount |
|---|---|
| **Travel Costs (FQHCs)** | $11,793,394.00 |
| **Wages Lost (FQHCs)** | $2,581,250.22 |
| **Travel Costs (RHCs)** | $15,046,068.87 |
| **Wages Lost (RHCs)** | $4,478,713.17 |
| **Cost of Emissions (FHQCs and RHCs)** | $133,005,707.42 |

The net savings related to mental and behavioral health from March 2020 through September 2020 for AHCCCS is shown in Table 12

**Table 12: Total Net Savings for AHCCS – Mental and Behavioral Health.**

| *Arizona Health Care Cost Containment System (AHCCCS)*<br>*Mental and Behavioral Health* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $113,039,520.00 |
| **Reduced patient travel** | $26,839,462.93 |
| **Lost wages** | $7,059,963.59 |
| **Reduced vehicle emissions** | $133,005,707.72 |

| | |
|---|---|
| **Total Savings** | **$279,944,654.04** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $5,009,481.75 |
| **Broadband costs** | $81,937,258.20 |
| **Maintenance costs** | $1,706,400.00 |
| **Total Costs** | **$88,713,139.95** |
| | |
| **Net Savings** | **$191,211,514.09** |

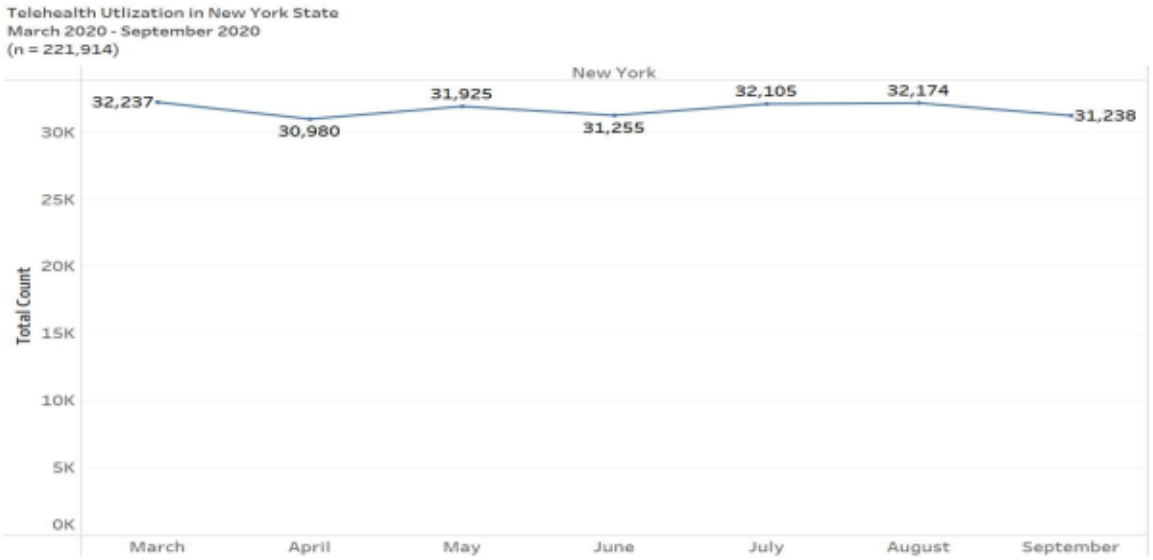
## New York

As of 2018, New York had 3,674,851 Medicare beneficiaries, which comprise 19% of the total population and in which 542 out of 1,000 beneficiaries used outpatient services. [78] Based on 2019 data, Medicare spends a total of $25,323,305.476[79] annually on health care. In April of 2020, over 56.5% of Medicare beneficiaries were using telehealth services, one of the highest uptakes within the United States.[80] In 2019, Medicaid enrollment exceeded 7.4 million in Fiscal Year 2018-19, increasing by 62,825 recipients, or 1.0 percent, compared to the prior year[81]. Amendments to the New York Insurance and Public Health Laws required that services covered under a comprehensive health insurance policy or contract be fully reimbursed when the service is delivered via telehealth, including audio-only for New York Medicaid Managed Care plans.[82] Total federal and State spending on Medicaid equaled $62.86 billion in 2016.[83]

Over 220,000 New York-based telehealth encounters were collected during the study period for this analysis. The encounters mainly occurred in one of the five boroughs of New York City and both Nassau and Suffolk Counties in Long Island, New York. Northwell Health provided care to a significant majority of these patients in 2020. Northwell Health is a non-profit integrated healthcare network and is New York State's largest healthcare provider and private employer. Northwell has two flagship hospitals: North Shore University Hospital and Long Island Jewish Medical Center.[84]

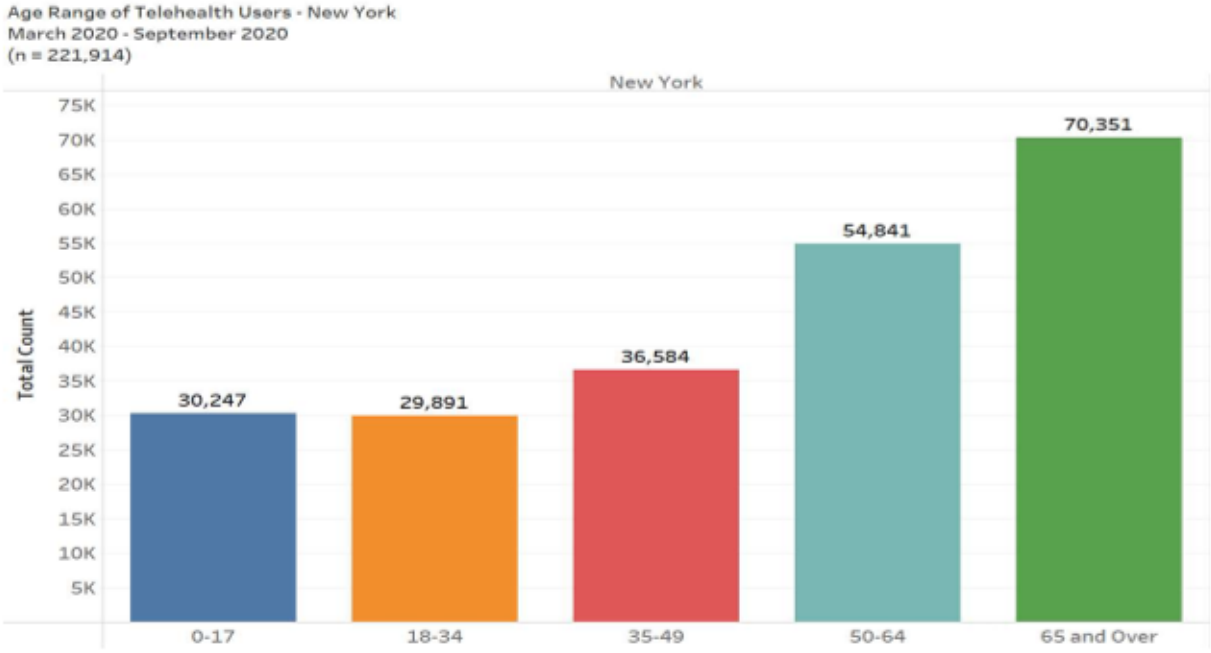
As can be seen in Exhibit 20, utilization of telehealth was consistent throughout the study period. Unlike other telehealth programs, the overall utilization rate did not drop significantly in September. The telehealth service volume continues to be higher than historical telehealth usage at any time for systems such as Northwell Health.

**Exhibit 20: Utilization of Telehealth Services in New York City and Long Island**



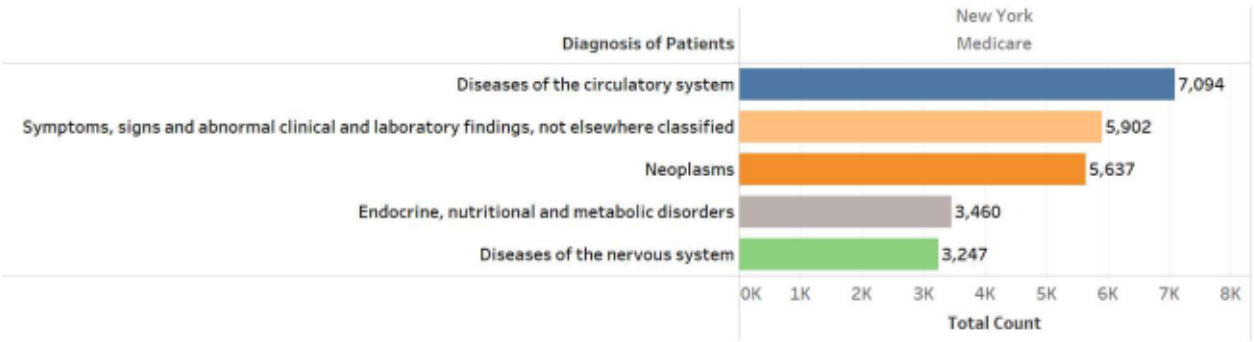

The age range for those patients using telehealth skewed towards the elderly, specifically age 50 and older, as shown in Exhibit 21.

**Exhibit 21: Telehealth Services Utilization in by Age in New York City and Long Island, New York**



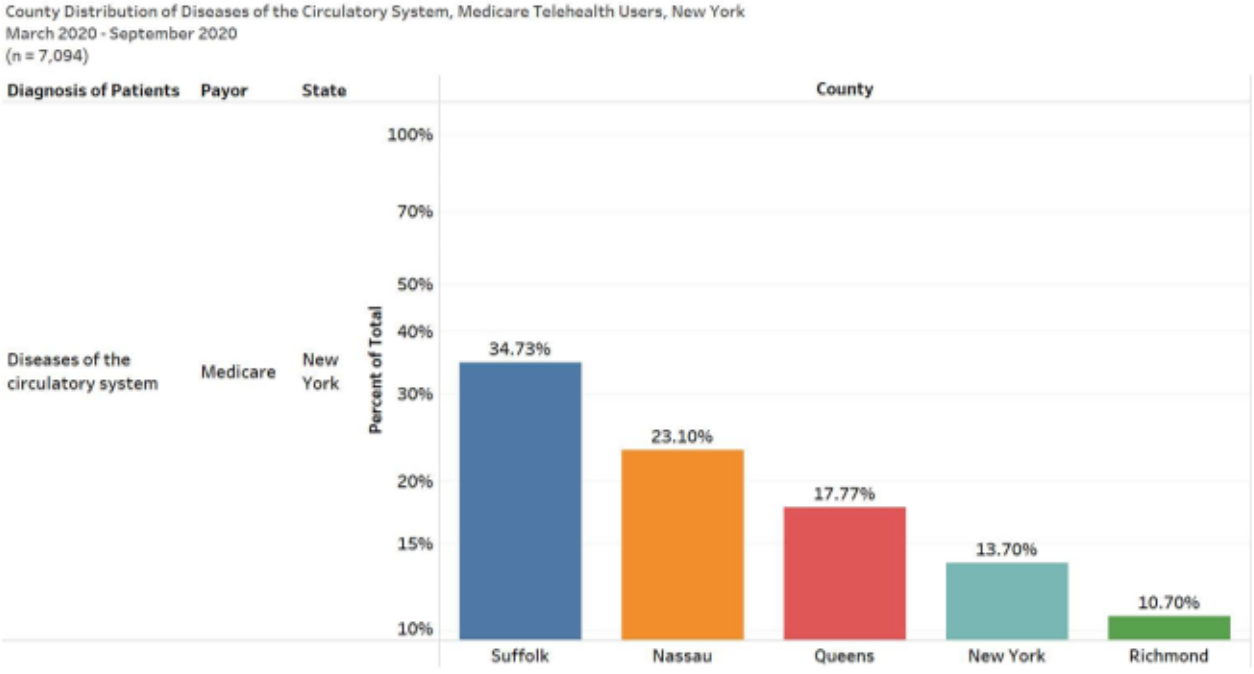

Within the Medicare population in New York, the most frequent diagnosis category among those using telehealth were diseases of the circulatory system, which affected over 7,000 individuals within New York City and Long Island, as shown in Exhibit 22.

**Exhibit 22: Top Diagnosis Categories Among Recipients of Telehealth Services in New York City and Long Island**



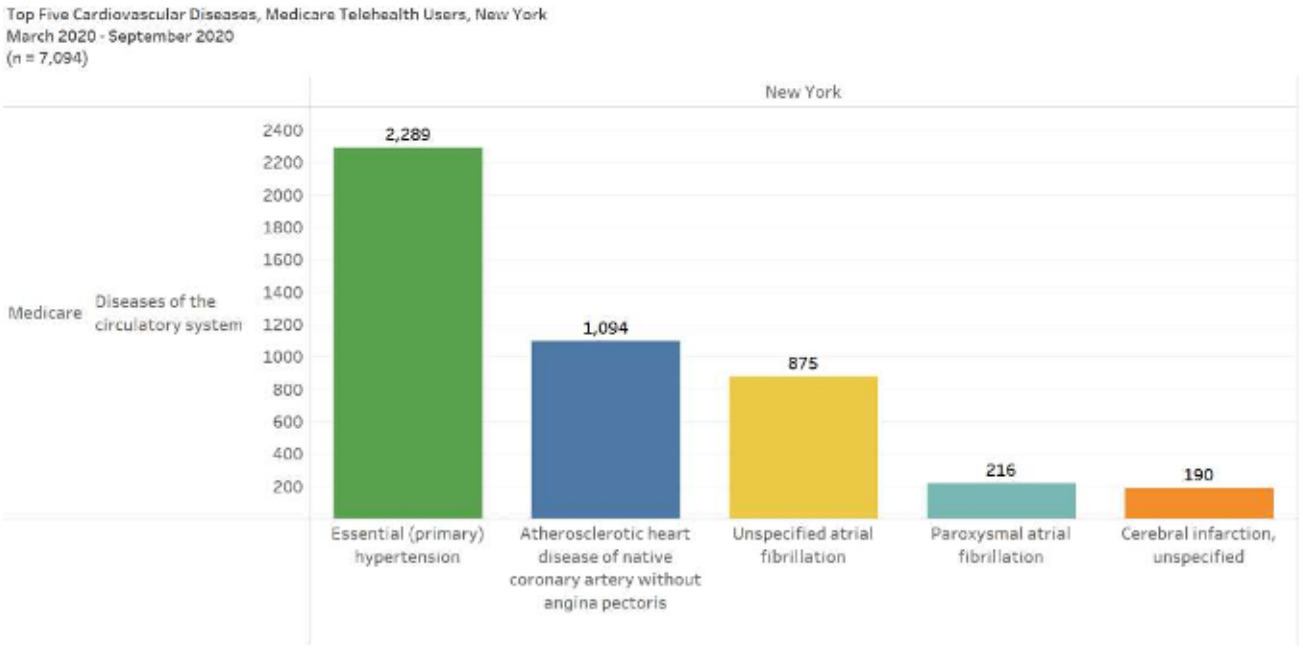

In Exhibit 23, the county locations where the most frequent circulatory disease was Suffolk and Nassau in Long Island and boroughs within New York City. None of the identified counties are listed as HPSA, and there is an abundance of cardiologists in each area.

**Exhibit 23: Percent of Telehealth Encounters for Patients with Circulatory Disease, by County**



As shown in Exhibit 24, the most frequent cardiovascular condition among patients receiving telehealth services was hypertension, followed by congestive heart failure and atrial fibrillation. A 2014 study conducted by the Centers for Disease Control and Prevention (CDC) used data from the National Hospital Discharge Survey and the costs associated with hypertension for community hospitals across the United States. They examined changes in hypertension-associated hospitalizations and expenses over time for patients 25 years of age and above. The analysis showed that the proportion of hospitalizations associated with a primary or secondary diagnosis of hypertension increased from 1.9% to 5.4% over twenty years.[85]

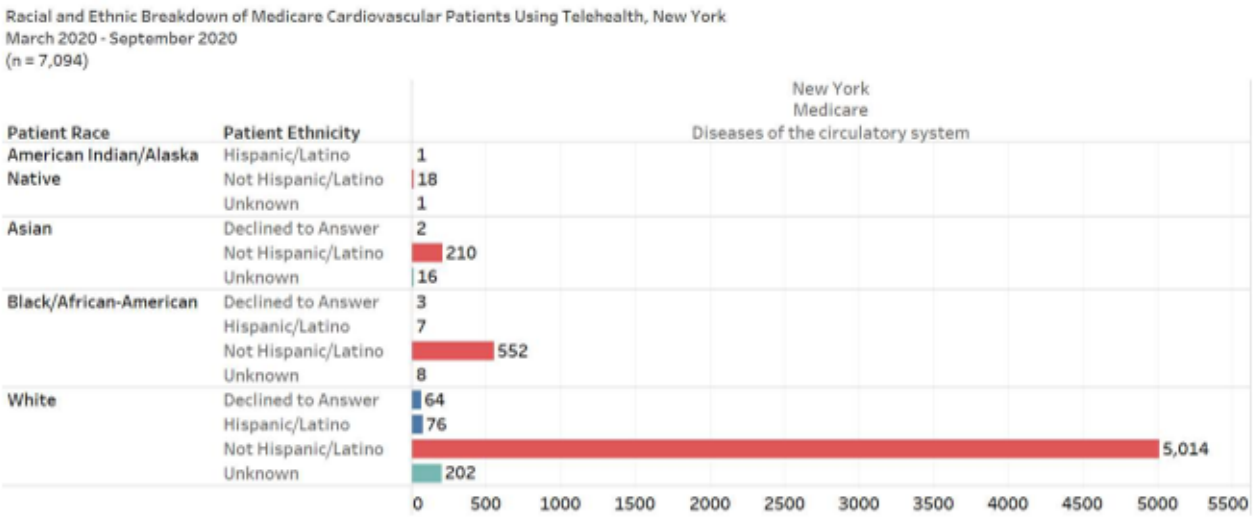
**Exhibit 24: Most Prevalent Conditions Among Patients with Cardiovascular Disease who Received Telehealth Services in New York City and Long Island**




Furthermore, telehealth is an effective strategy to reduce all-cause hospital readmissions among heart failure patients. Using modalities such as remote monitoring and videoconferencing, researchers calculated a reduction of 14 percentage points (19.3% to 5.2%) within three years, potentially saving millions of dollars.[86]

Exhibit 25 shows the racial and ethnic categories of Medicare patients with cardiovascular disease seeking treatment during the study period.

**Exhibit 25: Race and Ethnic Breakdown of Medicare Beneficiaries with a Cardiovascular Disease Diagnosis That Received Telehealth Services in New York City and Long Island**




The most significant number of patients were White/Not-Hispanic, followed by Black/African-American, and Asian.

## Cost Analysis - Medicare

In Table 13, we took the five counties with the highest rate of Medicare beneficiaries with cardiovascular disease, determined the percentage of those patients within each county, and multiplied by the number of available providers. Given the high volume of cardiologists, we set a maximum limit of 300.

**Table 13: Total Number of Patients Per Provider (New York City and Long Island)**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **Suffolk** | 7,094.00 | 35% | 2,463.75 | 300 | 8.21 |
| **Nassau** | 7,094.00 | 23% | 1,638.71 | 300 | 5.46 |
| **Queens** | 7,094.00 | 18% | 1,260.60 | 300 | 4.20 |
| **New York** | 7,094.00 | 14% | 971.88 | 300 | 3.24 |
| **Richmond** | 7,094.00 | 11% | 759.06 | 300 | 2.53 |

Research indicates that the average hospitalization cost for patients with a form of cardiovascular disease is $6,600[87]. In Table 14, we show the cost savings in reduced hospitalizations

**Table 14: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Cardiovascular Patients** | 7,094 |
| **Reduced hospitalization (10%)** | 709.40 |
| **Average Cost of Hospital Stay** | $6,600. |
| ***Cost of Total Hospitalizations*** | **$4,682,040.00** |

The median salary for a cardiologist in New York that accepts Medicare is $350,000. The wages for nurses fluctuate, so we set a maximum threshold of $90,000 for nurses and physician assistances. Table 15 shows the estimated personnel costs for 25 cardiologist and 25 nurses or physician assistants.

**Table 15: Cost Categories for Provider Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Cardiologist Salaries** | $5,075,000.00 |
| **Nurses/Physician Assistants** | $1,305,000.00 |
| ***Subtotal Personnel Costs*** | **$6,380,000.00** |
| **Fringe Benefits (30%)** | $1,914,000.00 |
| ***Total Personnel Costs*** | **$8,294,000.00** |

As shown in Table 16, we used a maximum rate of $50.00 per month to determine broadband costs. Provider rates were set at $100.00 per month given the location in which services are provided.

**Table 16: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$50.00/month** | $354,000.00 |
| **Broadband for physicians @$100.00/month** | $10,000.00 |
| ***Subtotal Amount*** | $364,700.00 |
| **Adjustment for Audio-Only (10%)** | $36,470.00 |
| ***Subtotal Amount*** | $328,230.00 |
| ***Total Broadband Costs (x7)*** | **$2,297,610.00** |

Table 17 shows the estimated maintenance costs for each site included within the study.

**Table 17: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 100 |
| ***Total Maintenance Costs*** | $2,000,000.00 |
| ***Total Maintenance for Study Period*** | $1,160,000.00 |

Table 18 provides the estimated travel time from a patient's residence to the nearest cardiologist using Google Maps. We assumed that Medicare beneficiaries are retired and, therefore, would not have to take leave from work. We also assumed they would use a personal vehicle for travel (for those traveling more than 3 miles to a cardiologist).

**Table 18: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $304.82 |
| **Cost of Emissions** | $138,950.61 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicare cardiovascular patients in New York City and Long Island are shown in Table 19.

**Table 19: Net Telehealth Savings for New York City and Long Island Medicare Beneficiaries**

| *New York Medicare Beneficiaries*<br>*Diseases of the Circulatory System* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $4,682.040.00 |
| **Reduced patient travel** | $304.82 |
| **Reduced vehicle emissions** | $138,950.81 |
| **Total Savings** | **$4,821,295.43** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $8,294,000.00 |
| **Broadband costs** | $2,297,610.00 |
| **Maintenance costs** | $1,160,000.00 |
| **Total Costs** | **$11,751,610.00** |
| | |
| **Net Savings** | **($6,930,314.57)** |

In this analysis, telehealth did not provide net cost savings. This is attributable to the high volume of cardiologists located within a close geographic proximity to Medicare beneficiaries. Prior to the pandemic, the distance between a provider and patient was not a major barrier to care, which minimizes the overall cost-benefit of telehealth. However, this should not be misinterpreted as an indication that telehealth does not add value for cardiovascular disease care in a major metropolitan area like New York City. As presented earlier, there is substantial evidence that telehealth can be an effective tool to reduce unnecessarily hospitalization and support improved disease management for patients with cardiovascular disease. Among patients with barriers to receiving seeking in-person care such as individuals with limited mobility or those with caregiving responsibilities, access to telehealth is remains an important resource for disease management regardless of geographic distance from a specialist.

## Medicaid

The most frequent diagnosis within the New York Medicaid population that used telehealth was neoplasms, with prostate, breast, and blood cancer being the most frequent diagnoses. The availability of oncologists that accept Medicaid within the counties with the highest proportion of beneficiaries was sparse. Given this limited number, a Medicaid patient with a diagnosis of a neoplasm that did not have access to telehealth would be required to travel significant distances to receive specialized care. A research study conducted in 2021 identified disparities specific to oncological care in access for patients with Medicaid, with substantial differences within and between hospitals with regards to accepting Medicaid rates differing substantially.[88]

In Exhibit 26, the top five diagnosis categories for Medicaid patients using telehealth are shown.

**Exhibit 26: Top Five Diagnosis Categories Among Medicaid Recipients of Telehealth Services in New York**

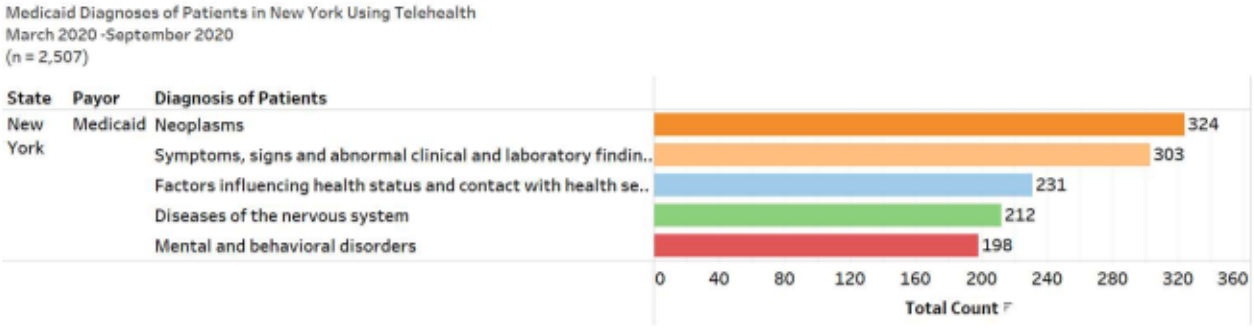



Exhibit 26 shows the top five neoplasm diagnoses for those Medicaid beneficiaries using telehealth.

**Exhibit 26: Volume of Telehealth Encounters for Medicaid Patients with a Neoplasm Diagnosis in New York**

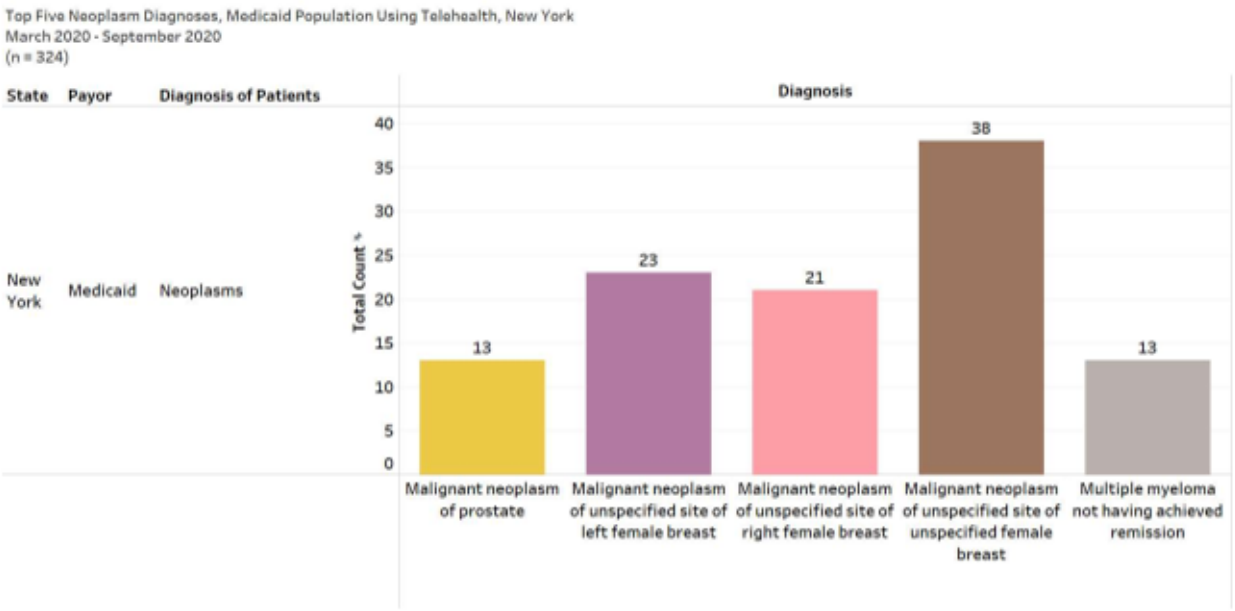
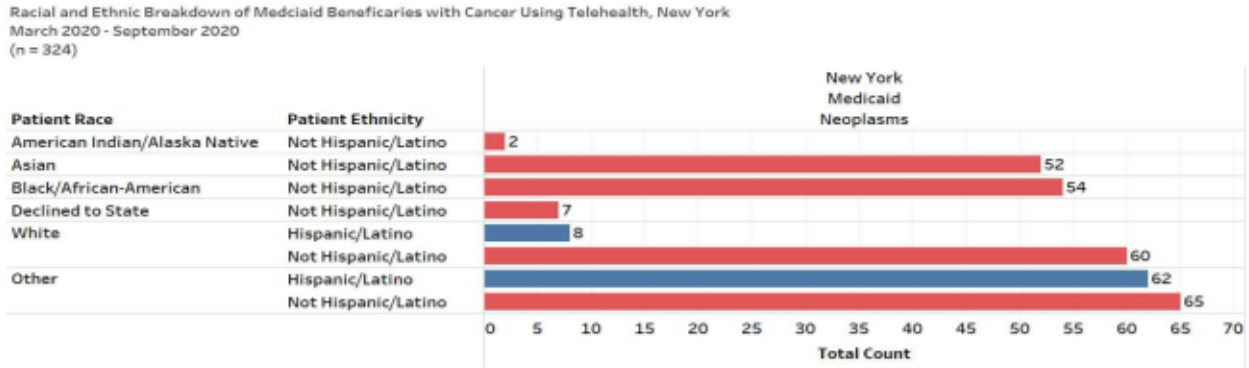


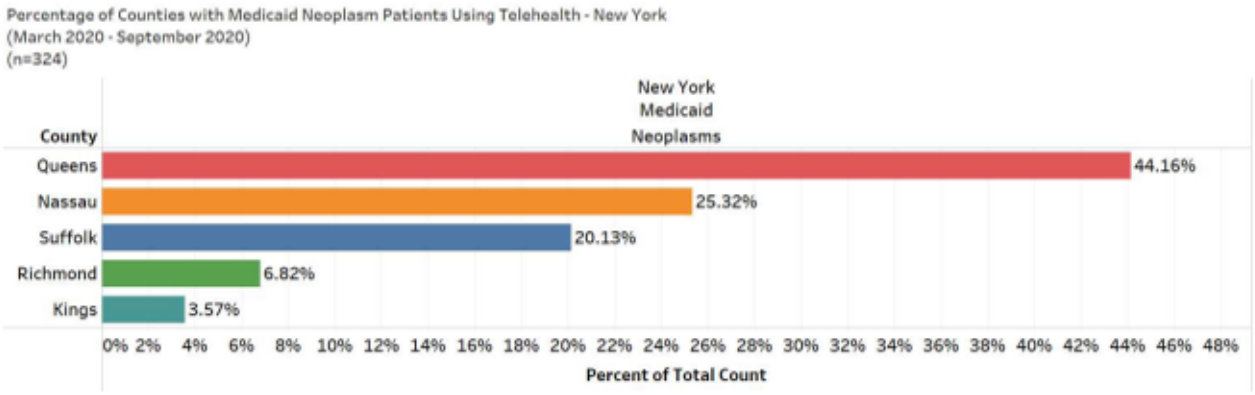

Exhibit 27 shows the racial and ethnic breakdown of Medicaid beneficiaries with cancer using telehealth.

**Exhibit 27: Race and Ethnic Breakdown of Medicaid Beneficiaries with a Neoplasm Diagnosis That Received Telehealth Services in New York**



Among Medicaid patients in New York with a neoplasm diagnosis that used telehealth, Asian and Black/African-Americans were more likely to have a diagnosis of cancer. The percentage of beneficiaries by county is shown in Exhibit 28.

**Exhibit 28: Percent of Telehealth Encounters for Medicaid Patients with a Neoplasm Diagnosis, by County in New York City and Long Island**




## Cost Analysis - Medicaid

In Table 20, we identified the five counties with the highest rate of telehealth encounters for Medicaid beneficiaries with neoplasms, calculated the percentage of patients within each county, and divided by the number of available providers.

**Table 20: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **Queens** | 324 | 42% | 136.02 | 6 | 22.67 |
| **Nassau** | 324 | 24% | 77.99 | 6 | 13.00 |
| **Suffolk** | 324 | 19% | 62.01 | 6 | 10.34 |
| **Richmond** | 324 | 6% | 21.00 | 6 | 3.50 |
| **Kings** | 324 | 3% | 11.02 | 6 | 1.84 |

According to the literature, the average hospitalization cost for a patient with cancer is $22,100[89]. In Table 21, we show the estimated cost savings in reduced hospitalizations.

**Table 21: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Cardiovascular Patients** | 324 |
| **Reduced hospitalization (10%)** | 16.2 |
| **Average Cost of Hospital Stay** | $21,100 |
| ***Cost of Total Hospitalizations*** | **$358,020.00** |

The median salary for an oncologist in New York that accepts Medicaid is $377,300. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 22 shows the estimated personnel costs for five oncologists and five nurses or physician assistants.

**Table 22: Cost Categories for Provider Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Oncologist Salaries** | $1,094,393.20 |
| **Nurses/Physician Assistants** | $270,775.90 |
| ***Subtotal Personnel Costs*** | **$1,365,169.20** |
| **Fringe Benefits (30%)** | $409,550.76 |
| ***Total Personnel Costs*** | **$1,774,719.96** |

In 2020, New York State included within their budget a subsidy for broadband services that started at $15 per month. We used this figure in Table 23 to calculate broadband costs.

**Table 23: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$15/month** | $4,860.00 |
| **Broadband for 5 physicians and 5 nurses/PAs@$100.00/month** | $1,000.000 |
| ***Subtotal Amount*** | $5,860.00 |
| **Adjustment for Audio-Only (10%)** | N/A[7] |
| ***Subtotal Amount*** | $5,860.00 |
| ***Total Broadband Costs (x7)*** | **$41,020.00** |

Table 24 shows the estimated maintenance costs for each site included within the study.

**Table 24: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 2 |
| ***Total Maintenance Costs*** | $10,000 |
| ***Total Maintenance for Study Period*** | $5,800.00 |

In Table 26 we calculated the travel distance and time from a patient's residence to the nearest oncologist using Google Maps. We examined the travel time and calculated the costs for both a personal vehicle and public transportation. The hourly Medicaid wage for a family of four is $19.05 per hour.

[7] Because the patient cohort was small (324 patients) we opted to not take out the 10% for audio-only as the number of patients would have been too small to make a difference in cost.

**Table 26: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs (Car)** | $13.057.44 |
| **Travel Costs (Public Transportation)** | $1,412.13 |
| **Lost Wages (Car)** | $11,186.94 |
| **Lost Wages (Public Transportation)** | $20,463.40 |
| **Cost of Emissions** | $135,022.98 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicaid cancer patients in New York are shown in Table 27.

**Table 27: Net Telehealth Savings for New York Medicaid Beneficiaries**

| *New York Medicaid Beneficiaries*<br>*Neoplasms* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $358,020.00 |
| **Reduced patient travel (Car)** | $13,057.44 |
| **Reduced patient travel (Public Transportation)** | $1,412.13 |
| **Lost wages (Car)** | $11,186.94 |
| **Lost wages (Public Transportation)** | $20,463.40 |
| **Reduced vehicle emissions** | $135,022.98 |
| **Total Savings (Car)** | **$517,287.36** |
| **Total Savings (Public Transportation)** | **$379,895.52** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $1,774,719.06 |
| **Broadband costs** | $41,020.00 |
| **Maintenance costs** | $5,800,00 |
| **Total Costs** | **$11,751,610.00** |
| | |
| **Net Savings (Car)** | **($1,304,252.60)** |
| **Net Savings (Public Transportation)** | **($1,441,644.44)** |

Within the Medicaid population, the use of telehealth did not provide net cost savings, but this is primarily attributable to the low patient volume (n = 324) of patients with Medicaid and a cancer diagnosis that used telehealth during the study period. Telehealth has been promoted as a very effective tool to support cancer care.[90] If the data had included a larger patient cohort, we are confident that the cost benefits of telehealth for oncology care in New York City and Long Island would be clearly illustrated.

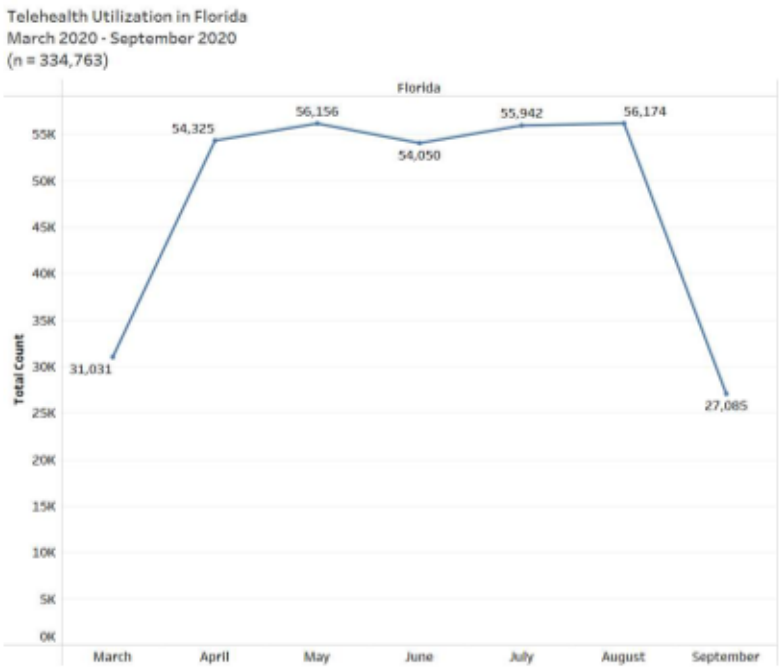
## Florida

As of October 2020, Medicare enrollment within the State of Florida was at 4.6 million, which is 21 percent of the State's population.[91] Medicare spending within the State is $28,599,166,489, which averages $11,646.00 per enrollee.[92] More than 77% of Medicare beneficiaries use Medicare Advantage to pay for telehealth services.[93] About 3.7 million people in Florida are eligible for Medicaid and about 219,000 Florida children were enrolled in the Children's Health Insurance Program (CHIP) as of June 2020.[94] Total Federal and State spending on Medicaid equaled $21.8 billion in 2016, approximately $5,090 per enrollee.[95]

Baptist Health South Florida was the most significant contributor of Florida data for this study, providing data on over 360,000 telehealth encounters during the study period. Baptist Health South Florida, currently has over 41 locations with 292 physicians covering 53 specialty areas of medicine.[96] Miami Cancer Institute is part of the Baptist Health network as well as the Memorial Sloan Kettering Cancer Alliance[97] and is a next-generation, leading cancer center known for its clinical care and research.[98]

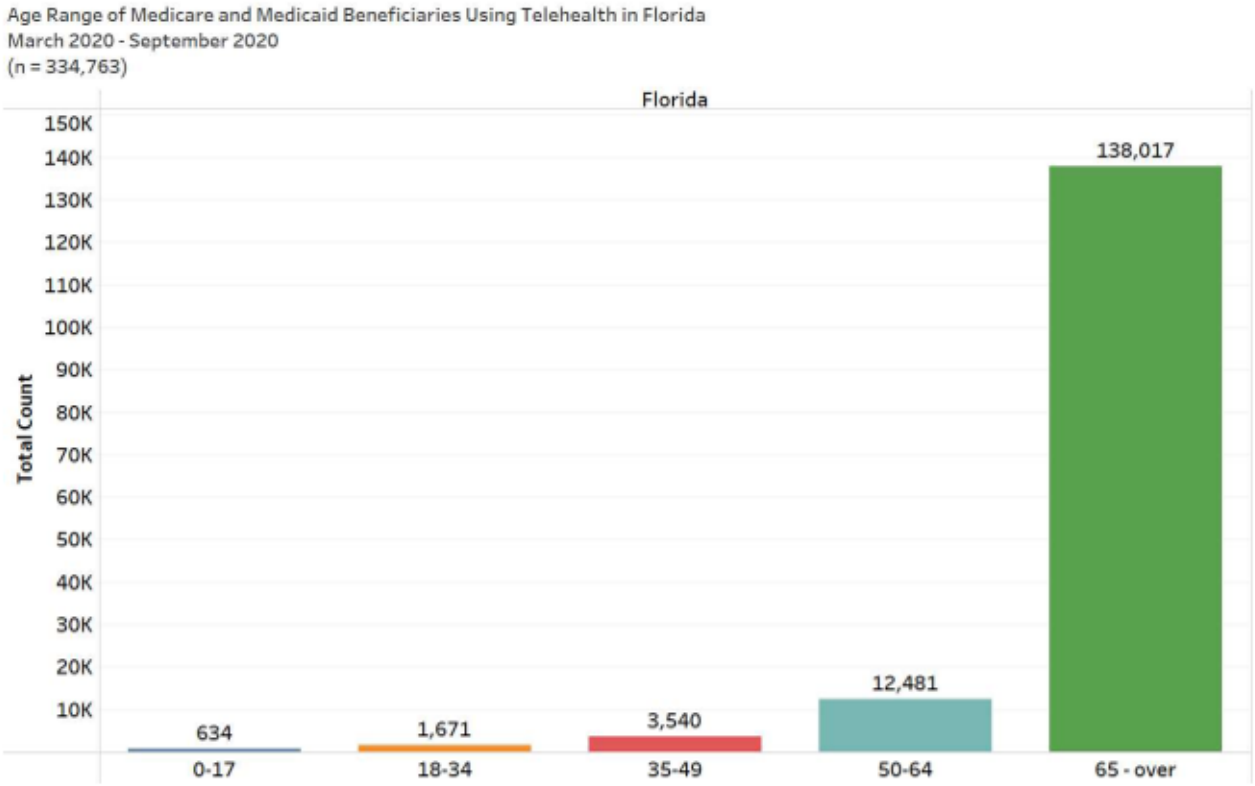
As illustrated in Exhibit 29, the utilization for telehealth in Florida increased significantly from March to April and remained consistent throughout the summer, with a decrease in September.

**Exhibit 29: Utilization of Telehealth Services in Florida**



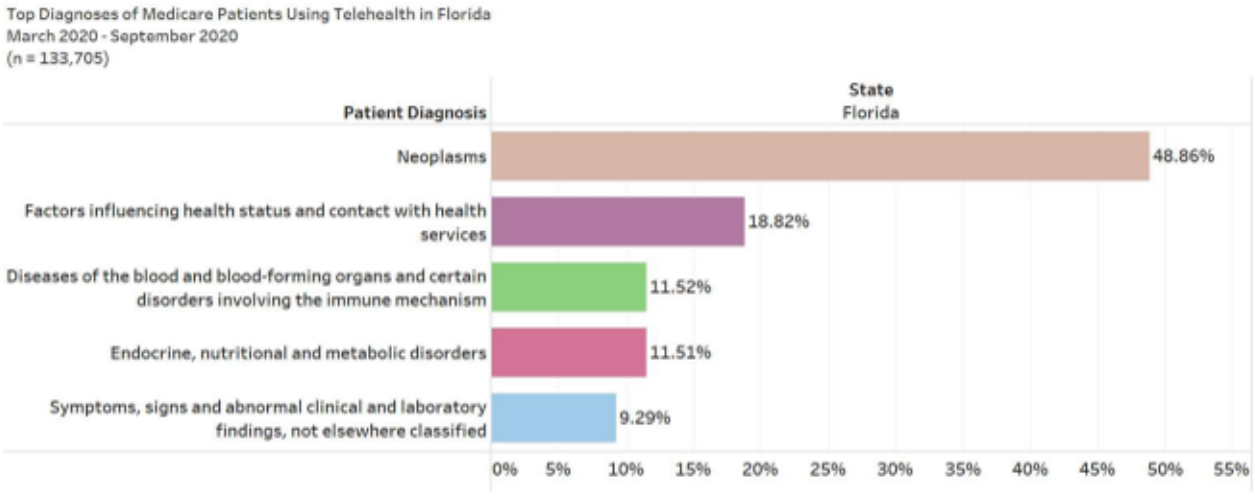

The age range for Medicare and Medicaid beneficiaries within Florida skewed heavily towards the 65 and over range, which is not surprising, given the demographics of the State in 2020. Exhibit 30 shows the breakdown of varying age categories, with individuals aged 65 and over representing more than ten times the number of beneficiaries in the nearest category (aged 50-64).

**Exhibit 30: Telehealth Services Utilization in Florida by Age**



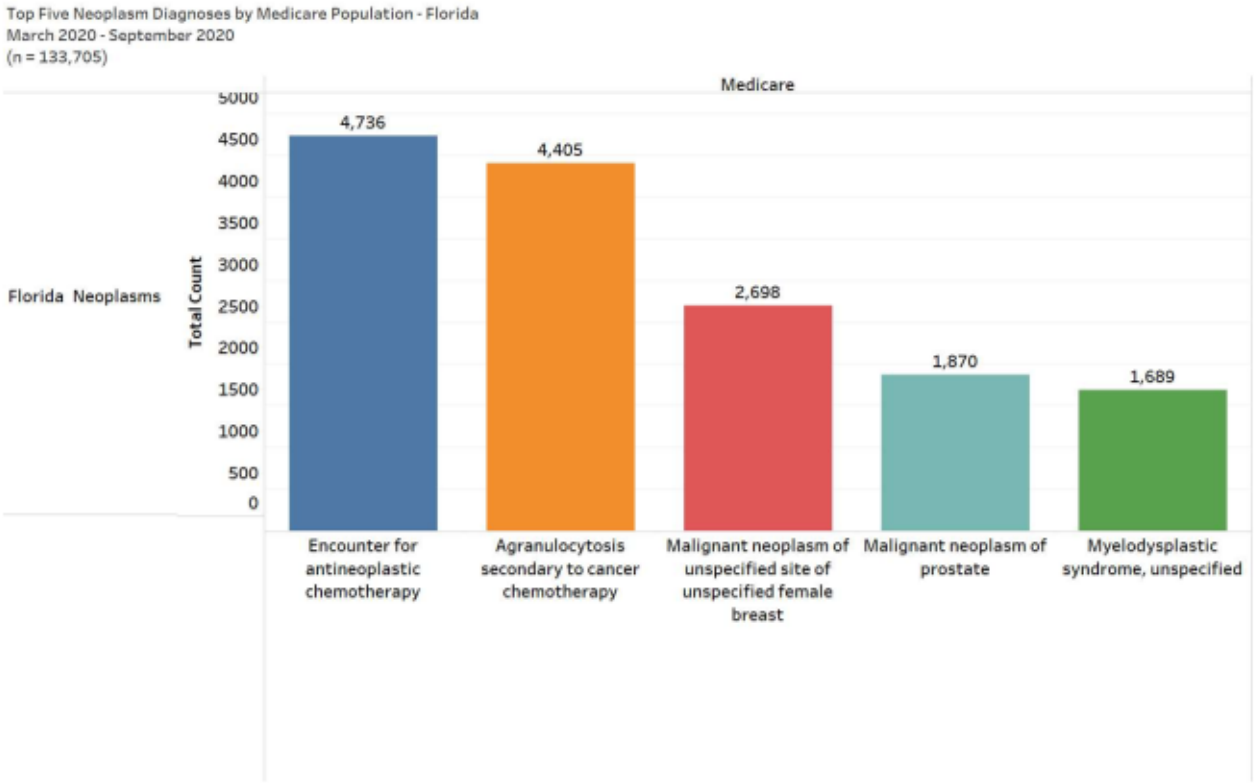

The leading diagnosis category for Medicare and Medicaid patients receiving telehealth in Florida was neoplasms, which surpassed any other clinical condition regardless of age group. In Exhibit 31, the degree to which this diagnosis is present amount the Medicare population is displayed.

**Exhibit 31: Top Five Diagnosis Categories Among Medicare Recipients of Telehealth Services in Florida**




Within this clinical category, the top five diagnoses for the Medicare population using telehealth included chemotherapy, breast cancer, and prostate cancer, among others, as illustrated in Exhibit 32

**Exhibit 32: Top Neoplasm Diagnoses Among Medicare Recipients of Telehealth Services in Florida**




As seen in Exhibit 33, patients residing in several counties outside of the Miami-Dade area received telehealth services from oncologists, nurses, physician assistants, and other staff. This information is significant because Miami Cancer Institute, part of Baptist Health South Florida, is the only provider approved to deliver care either through telehealth or in-person to the Medicare population within the study. For some patients, this can result in significant costs and time associated with traveling to receive in-person care.

**Exhibit 33: Percent of Telehealth Encounters for Patients with a Neoplasm Diagnosis, by County in Florida**

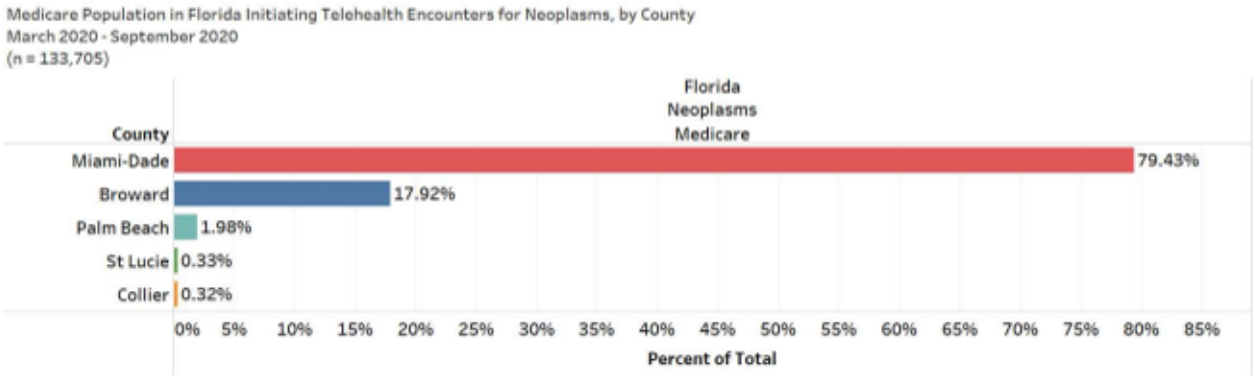
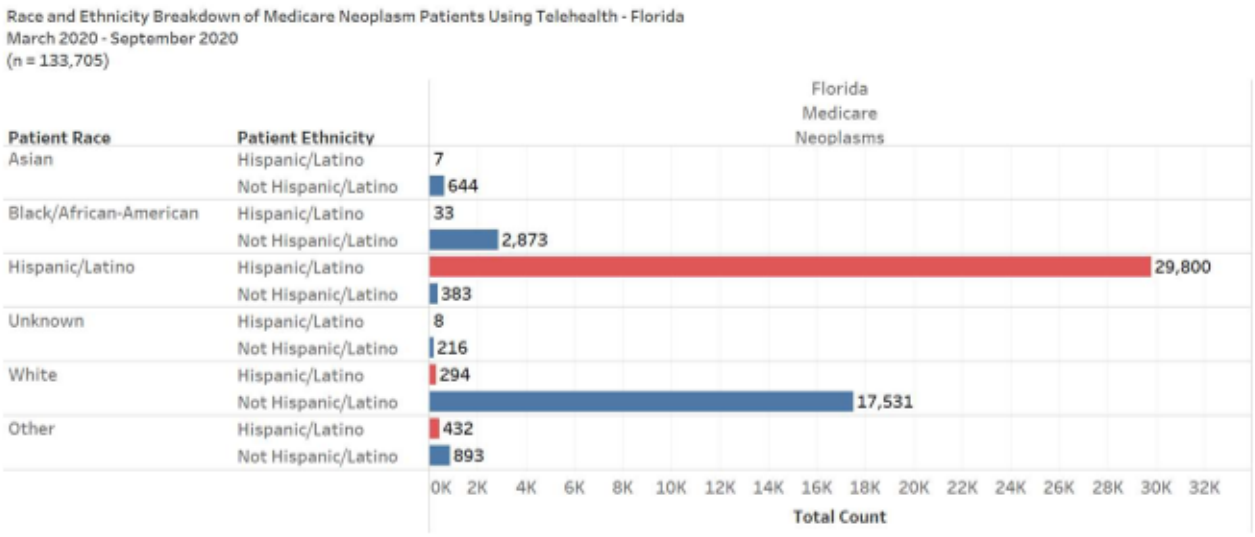



Exhibit 34 details the racial and ethnic breakdown of Medicare patients with a neoplasm diagnosis using telehealth during the study period. This chart demonstrates the large proportion of Hispanics/Latinos with neoplasms seeking telehealth care during the study period.

**Exhibit 34: Race and Ethnic Breakdown of Medicare Beneficiaries with a Neoplasm Diagnosis That Received Telehealth Services in Florida**




## Cost Analysis - Medicare

Similar to the other States, we identified the five counties with the highest rate of telehealth encounters for Medicare beneficiaries with neoplasms, calculated the percentage of patients within each county, and multiplied by the number of available providers. In this instance, there was only a single provider – Miami Cancer Institute, part of Baptist Health South Florida, where we received data and where care would have been provided in-person in telehealth was not available. As one of the only specialty hospitals able to provide oncologic care through telehealth, Miami Cancer Institute provides an excellent opportunity to assess the cost benefit of telehealth. Our analysis is shown in Table 28

**Table 28: Total Patients Per Center**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Center |
|---|---|---|---|---|---|
| **Miami-Dade** | 15,398.00 | 79% | 12,230.63 | 135 | 90.60 |
| **Broward** | 15,398.00 | 18% | 2,759.32 | 135 | 20.44 |
| **Palm Beach** | 15,398.00 | 2% | 304.88 | 135 | 2.26 |
| **St. Lucie** | 15,398.00 | 0% | 50.81 | 135 | 0.38 |
| **Collier** | 15,398.00 | 0% | 49.27 | 135 | 0.36 |

In Table 29, we show the cost savings in reduced hospitalizations using $22,100 as the average cost of a hospitalization for cancer.

**Table 29: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Neoplasm Patients** | 15,398.00 |
| **Reduced hospitalization (10%)** | 1,539.80 |

| | |
|---|---|
| **Average Cost of Hospital Stay** | $21,100 |
| ***Cost of Total Hospitalizations*** | **$32,489,780.00** |

The median salary for an oncologist in Florida that accepts Medicare is $305,387.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 30 shows the estimated personnel costs for 25 cardiologist and 25 nurses or physician assistants.

**Table 30: Cost Categories for Provider Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Oncologist Salaries** | $4,428,111.50 |
| **Nurses/Physician Assistants** | $1,305,000.000 |
| ***Subtotal Personnel Costs*** | **$5,731,111,50** |
| **Fringe Benefits (30%)** | $1,719,933,45 |
| ***Total Personnel Costs*** | **$7,453,044.95** |

Broadband costs were calculated based on the prices set by AT&T, the primary carrier in the area, which charges $35.00 a month. We continued to use $50 per month for providers, as shown in Table 31

**Table 31: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$35/month** | $538,930.00 |
| **Broadband for 25 physicians/25 nurses or PAs @$50/month** | $6,750.00 |
| ***Subtotal Amount*** | $545,680.00 |
| **Adjustment for Audio-Only (10%)** | $54,568.00 |
| ***Subtotal Amount*** | $491,112.00 |
| ***Total Broadband Costs (x7)*** | **$3,437,784.00** |

Table 32 shows the estimated maintenance costs for each site included in the study.

**Table 32: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 1 |
| ***Total Maintenance Costs*** | $20,000 |
| ***Total Maintenance for Study Period*** | $11,600.00 |

In Table 33 we calculated the travel distance and time from a patient's residence to Miami Cancer Institute, part of Baptist Health South Florida, using Google Maps. We calculated travel costs based on use of a personal vehicle and assumed that the beneficiaries were retired.

**Table 33: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs (Car)** | $11,556,910.21 |
| **Cost of Emissions** | $7,405,570.44 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicare cancer patients in Florida are shown in Table 34

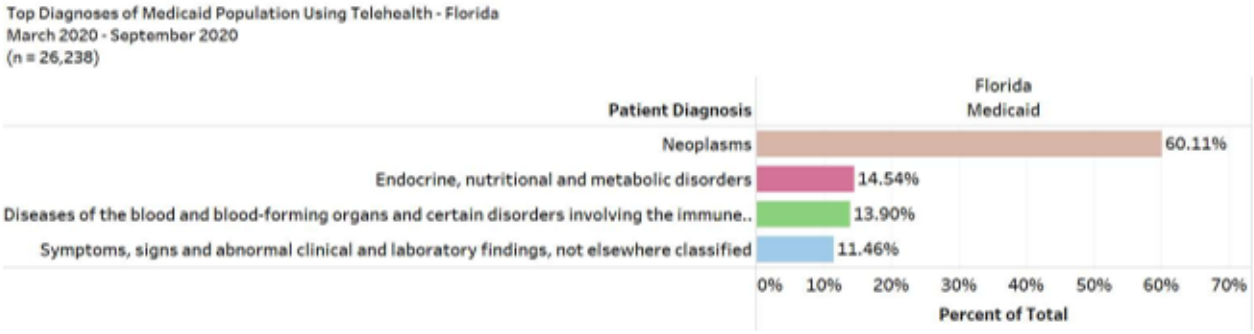
**Table 34: Net Telehealth Savings for Florida Medicare Beneficiaries**

| *Florida Medicare Beneficiaries Neoplasms* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $32,489,780.00 |
| **Reduced patient travel** | $13,745.57 |
| **Reduced vehicle emissions** | $11,556,910.21 |
| **Total Savings** | **$44,060,444.68** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $7,453,044.95 |
| **Broadband costs** | $3,437,784.00 |
| **Maintenance costs** | $11,600.00 |
| **Total Costs** | **$10,902,428.95** |
| | |
| **Net Savings** | **$33,158,015.73** |

## Medicaid

The most frequent diagnosis within the Medicaid population using telehealth services was also neoplasms, as shown in Exhibit 35.

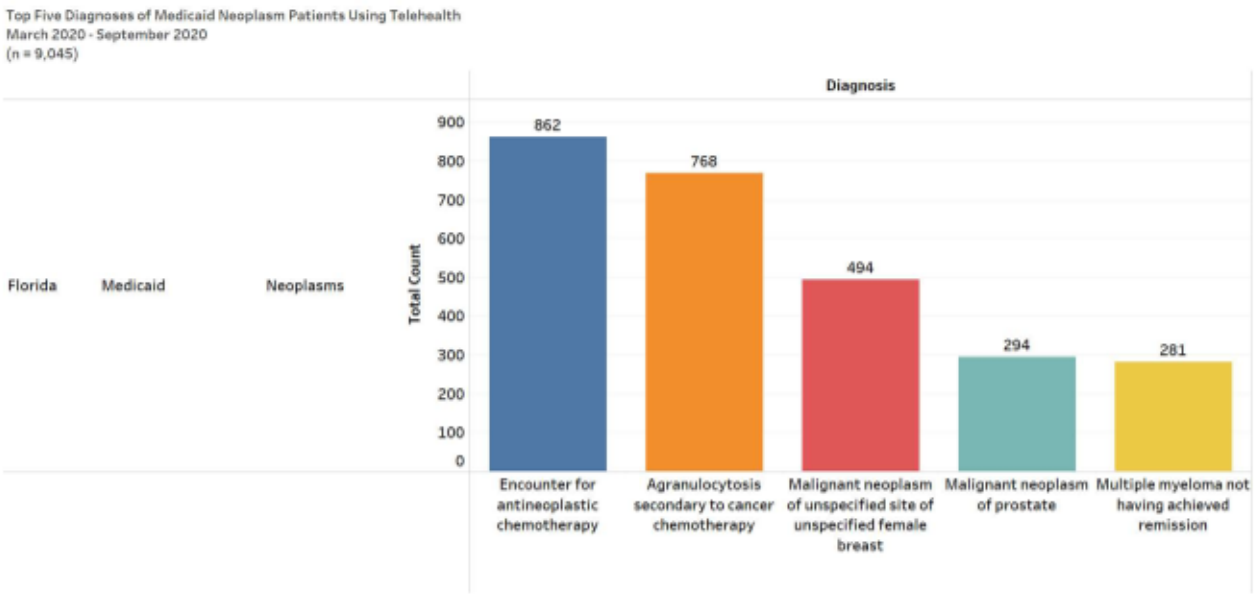
**Exhibit 35: Top Diagnosis Categories Among Medicaid Recipients of Telehealth Services in Florida**




The top five diagnoses among patients with neoplasms using telehealth were very similar to the Medicare population; chemotherapy, breast and prostate cancer were the most frequent diagnoses, as

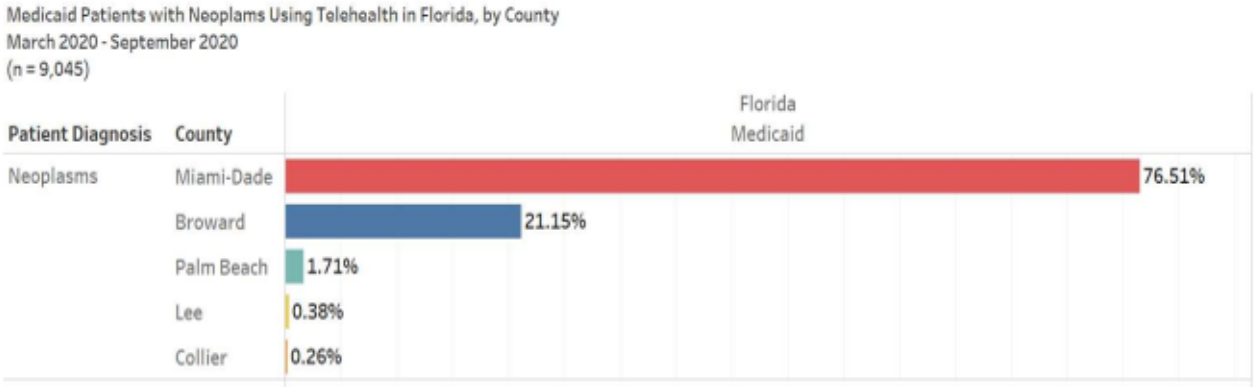
shown in Exhibit 36. In contrast to Medicare beneficiaries, Medicaid beneficiaries receiving telehealth services were more likely to have a diagnosis of blood cancer.

**Exhibit 36: Top Diagnosis Categories Among Medicaid Recipients with Neoplasms Receiving Telehealth Services in Florida**




In Exhibit 37, the counties with a high percent of Medicaid patient with neoplasms using telehealth were the same as those with high populations of Medicare patients with neoplasms, with the substitution of Lee County instead of St. Lucie.

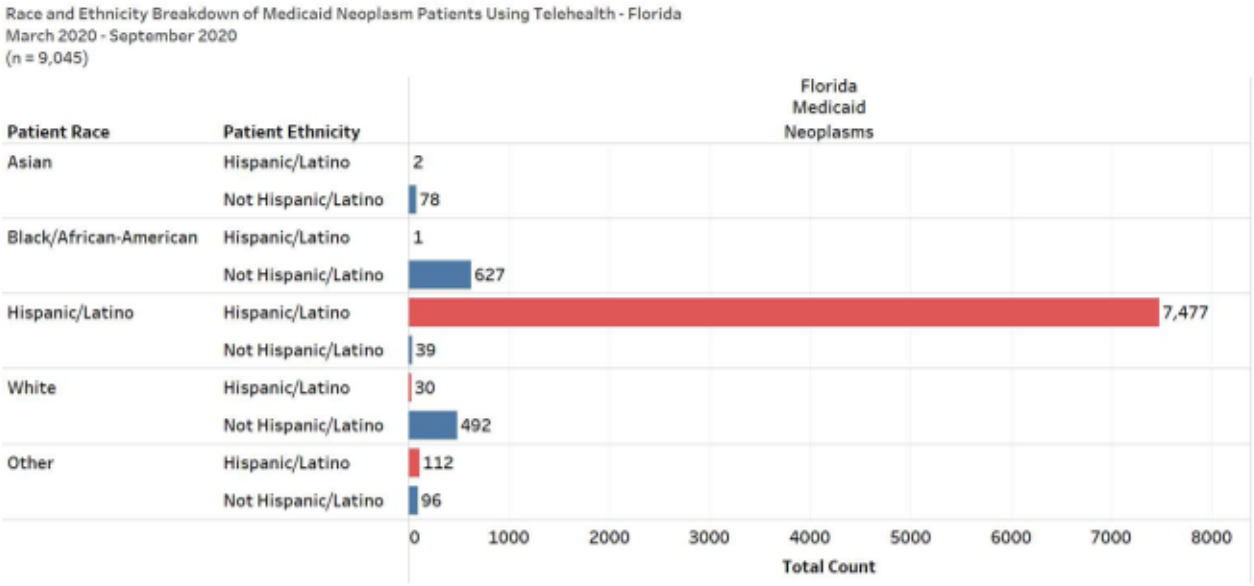
**Exhibit 37: Percent of Telehealth Encounters for Medicaid Patients with a Neoplasm Diagnosis, by County in Florida**




The race and ethnic breakdown of Medicaid patients with a neoplasm diagnosis that used telehealth was identical to Medicare patients with a neoplasm in that Hispanic/Latinos were the most frequent users of telehealth. However, in contrast to the Medicare patient group, among Medicaid patients,

Black/African-Americans with neoplasms used telehealth more frequently than Whites, as shown in Exhibit 38.

**Exhibit 38: Race and Ethnic Breakdown of Medicaid Beneficiaries with a Neoplasm Diagnosis That Received Telehealth Services in Florida**




## Cost Analysis - Medicaid

Our analysis of the total patients per provider is shown in Table 35.

**Table 35: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **Miami-Dade** | 8,998.00 | 77% | 6,884.37 | 135 | 51.00 |
| **Broward** | 8,998.00 | 21% | 1,903.08 | 135 | 14.10 |
| **Palm Beach** | 8,998.00 | 2% | 153.87 | 135 | 1.14 |
| **Lee** | 8,998.00 | 0% | 34.19 | 135 | 0.25 |
| **Collier** | 8,998.00 | 0% | 26.09 | 135 | 0.19 |

In Table 36, we show the cost savings as a result of reduced hospitalizations using $22,100 as the average cost per hospitalization.

**Table 36: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 8,998.00 |
| **Reduced hospitalization (10%)** | 899.80 |
| **Average Cost of Hospital Stay** | $21,100 |
| ***Cost of Total Hospitalizations*** | **$18,985,780.00** |

The median salary for an oncologist in Florida that accepts Medicare is $305,387.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 37 provides the estimated personnel costs for 25 oncologists and 25 nurses or physician assistants.

**Table 37: Cost Categories for Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Oncologist Salaries** | $4,428,111.50 |
| **Nurses/Physician Assistants** | $1,305,000.000 |
| ***Subtotal Personnel Costs*** | **$5,731,111,50** |
| **Fringe Benefits (30%)** | $1,719,933,45 |
| ***Total Personnel Costs*** | **$7,453,044.95** |

For broadband costs, we used AT&T as the primary provider. AT&T charged $35.00 a month during this time period. We continued to use $50 per month as the cost of broadband for providers

**Table 38: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$35/month** | $538,930.00 |
| **Broadband for 25 physicians/25 nurses or PAs @$50.00/month** | $6,750.00 |
| ***Subtotal Amount*** | $545,680.00 |
| **Adjustment for Audio-Only (10%)** | $54,568.00 |
| ***Subtotal Amount*** | $491,112.00 |
| ***Total Broadband Costs (x7)*** | **$3,437,784.00** |

Table 39 shows the estimated maintenance costs for each site included within the study.

**Table 39: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 1 |
| ***Total Maintenance Costs*** | $20,000 |
| ***Total Maintenance for Study Period*** | $11,600.00 |

In Table 40 we calculated the travel distance and time from a patient's residence to the Miami Cancer Institute using Google Maps. We estimated the travel time for an individual traveling via personal vehicle and using public transportation. The average Medicaid wage for a family of four was $18.36 per hour.

**Table 40: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs (Car)** | $10,736.00 |

| Cost Category | Amount |
|---|---|
| **Travel Costs (Public Transportation)** | $35,922.30 |
| **Lost Wages (Car)** | $5,677.83 |
| **Lost Wages (Public Transportation)** | $41,670,02.00 |
| **Cost of Emissions (Car)** | $7,391,663.85 |
| **Cost of Emissions (Public Transportation)[8]** | $8,589,719.07 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicaid cancer patients in Florida are shown in Table 41.

**Table 41: Net Telehealth Savings for Florida Medicaid Beneficiaries**

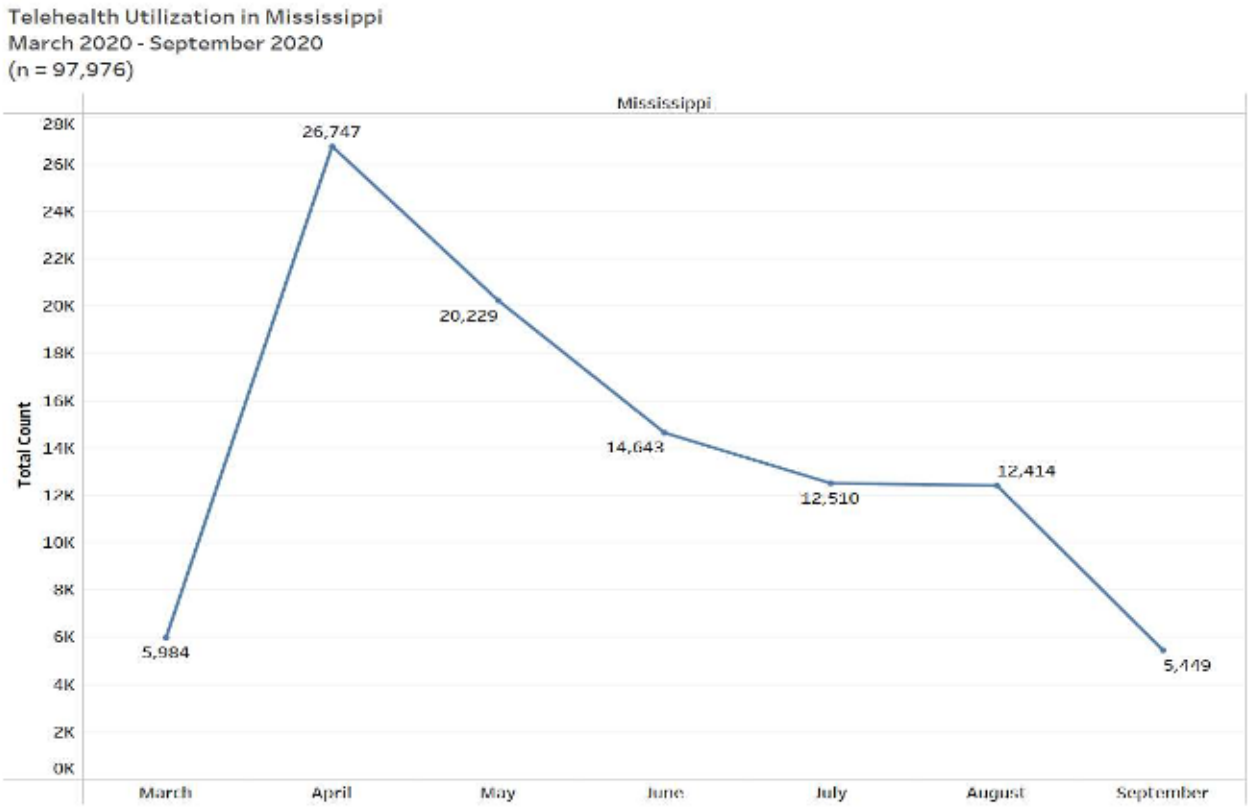
| *Florida Medicaid Beneficiaries*<br>*Neoplasms* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $18,985,780.00 |
| **Reduced patient travel (Car)** | $10,736.00 |
| **Reduced patient travel (Public Transportation)** | $35,922.30 |
| **Lost wages (Car)** | $5,677.83 |
| **Lost wages (Public Transportation)** | $41,670,02.00 |
| **Reduced vehicle emissions (Car)** | $7,391,663.85 |
| **Reduced vehicle emissions (Public Transportation)** | $8,589,719.07 |
| **Total Savings (Car)** | **$26,393,857.74** |
| **Total Savings (Public Transportation)** | **$27,653,161.08** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $7,453,044.95 |
| **Broadband costs** | $3,437,784.00 |
| **Maintenance costs** | $11,600.00 |
| **Total Costs** | **$10,902,428.95** |
| | |
| **Net Savings (Car)** | **$15,491,428.79** |
| **Net Savings (Public Transportation)** | **$16,752,732.13** |

[8] Public buses in Florida used diesel fuel, which at the time of this report was $3.26 per gallon. Per the EPA, the use of diesel fuel increases carbon dioxide and nitrous oxide emissions by 13%, which was added to the total amount.

## Mississippi

The telehealth utilization rate for Mississippi during the study period, as seen in Exhibit 39, was different than other States. There was a significant increase from March to April, and then a precipitous decrease over the next few months with volume of encounters in September closely aligning with the rate of telehealth use in March.

**Exhibit 39: Utilization of Telehealth Services in Mississippi**



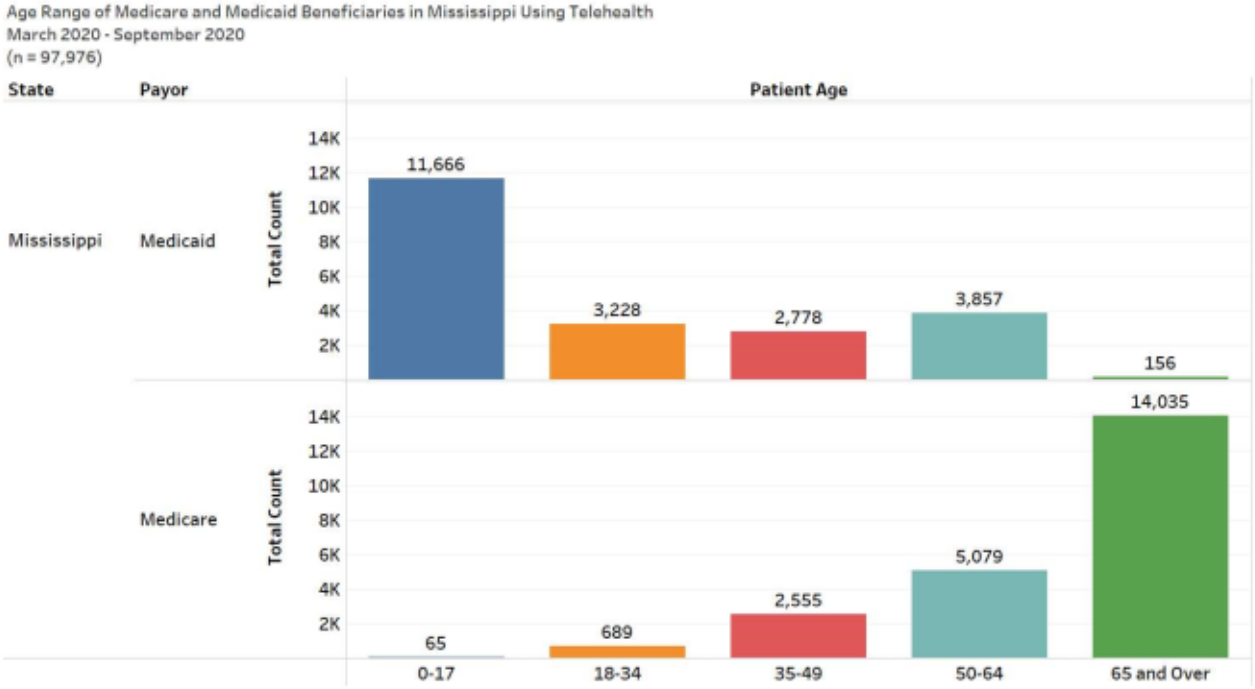

As of September 2020, there were 609,420 people with Medicare in Mississippi.[99] Medicare covers over twenty percent of the population in Mississippi with an annual budget of $5,280,832,700 spent, or $11,016 per beneficiary.[100]As of 2019, over 2.9 million individuals were covered by Medicaid in Mississippi, with 39% considered low-income (<200% FPL).[101] Medicaid spent over $6.5 billion in Mississippi in 2019, with most of those funds going to managed care or long-term care.[102]

The University of Mississippi Medical Center (UMMC) offers telehealth to rural and urban residents to expand access and eliminate barriers to healthcare. In 2003, they began offering specialty care through telehealth to expand services to rural hospitals and clinics across the State.[103] Over 190,000 individuals used telehealth during the study period, with over half using either Medicare or Medicaid as their primary insurance.

Exhibit 40 show the age breakdown for those with Medicare and Medicaid using telehealth. The preponderance of beneficiaries on Medicaid were children and adolescents between zero and 17, while the Medicare population was primarily 65 and over. Many Medicare beneficiaries were not 65 or over,

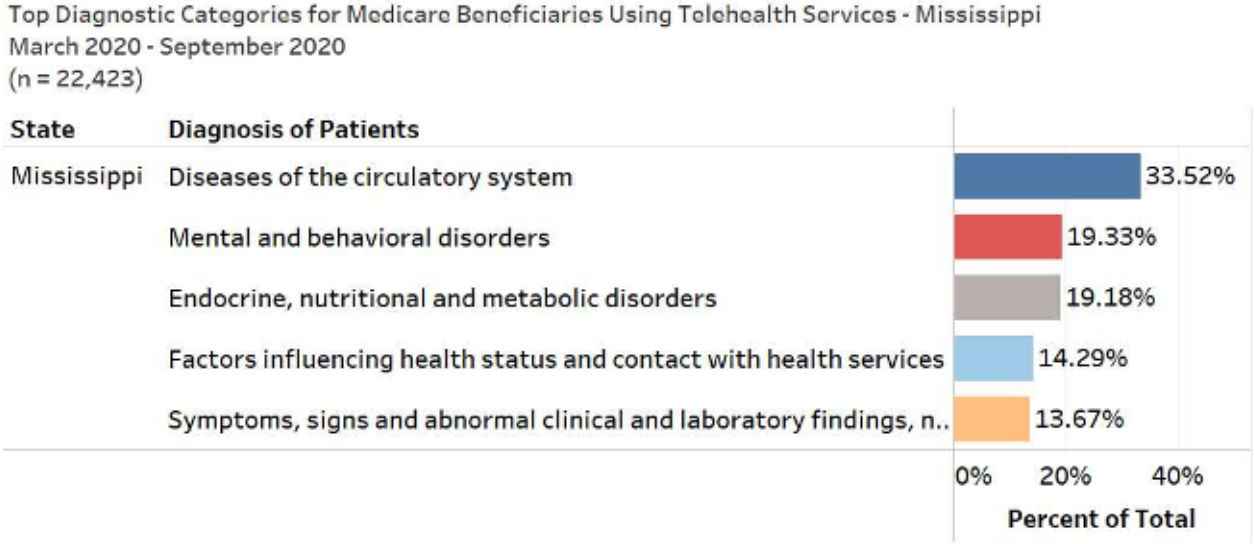
indicating they had a disability and were receiving Social Supplemental Income (SSI) from Social Security or qualified for Medicare because of a disability and were paying for coverage.

**Exhibit 40: Age Range of Medicare and Medicaid Beneficiaries That Received Telehealth Services in Mississippi**



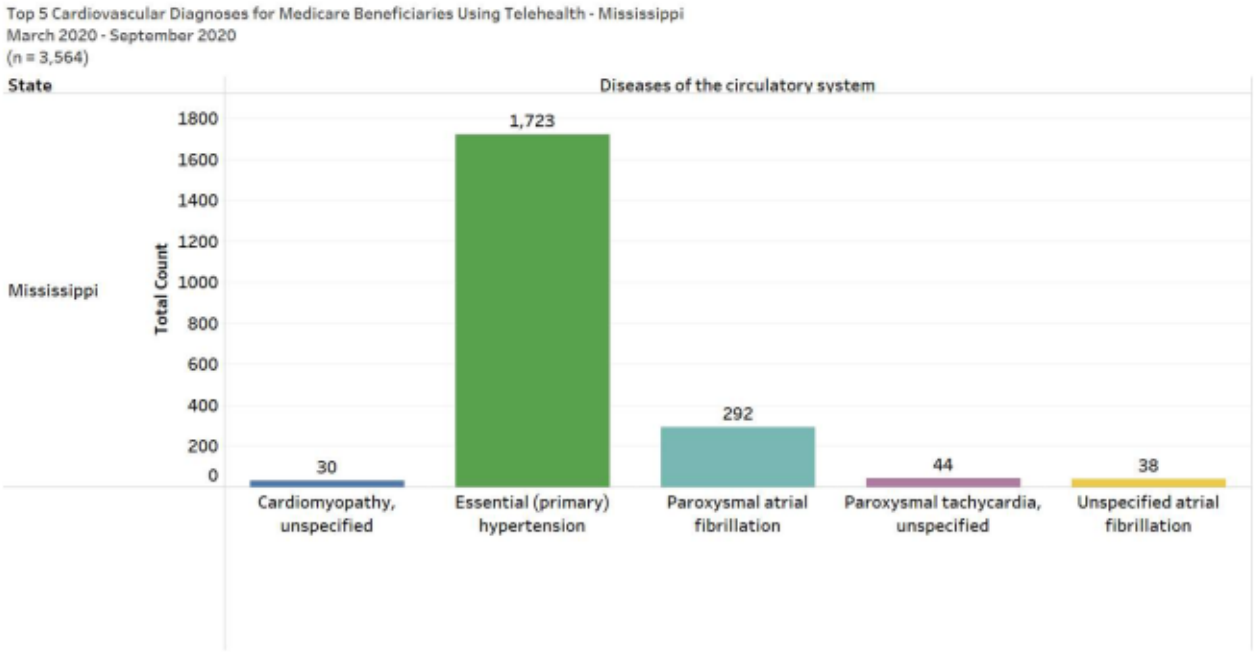

As shown in Exhibit 41, the most frequent diagnostic category for Medicaid patients in Mississippi who received telehealth care was circulatory disease followed by mental and behavioral disorders and endocrine, metabolic, and nutritional disorders, both exceeding 15% each.

**Exhibit 41: Top Five Diagnosis Categories Among Medicare Recipients of Telehealth Services in Mississippi**



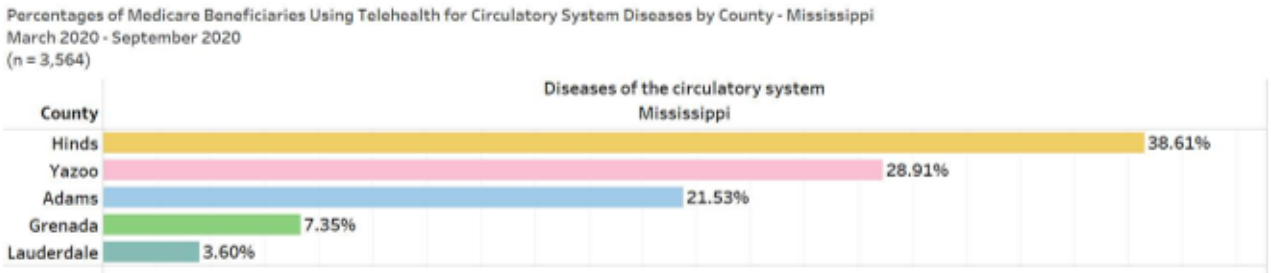
As shown in Exhibit 42, hypertension followed by atrial fibrillation were the most frequent diagnosis among Medicare beneficiaries with a diagnosis of circulatory disease that used telehealth.

**Exhibit 42: Top Five Diagnoses Among Medicare Recipients of Telehealth Services with Circulatory Disease in Mississippi**




In Exhibit 43, the counties with the highest percentage of Medicare patients with cardiovascular disease using telehealth included Hinds, Yazoo, and Adams counties.

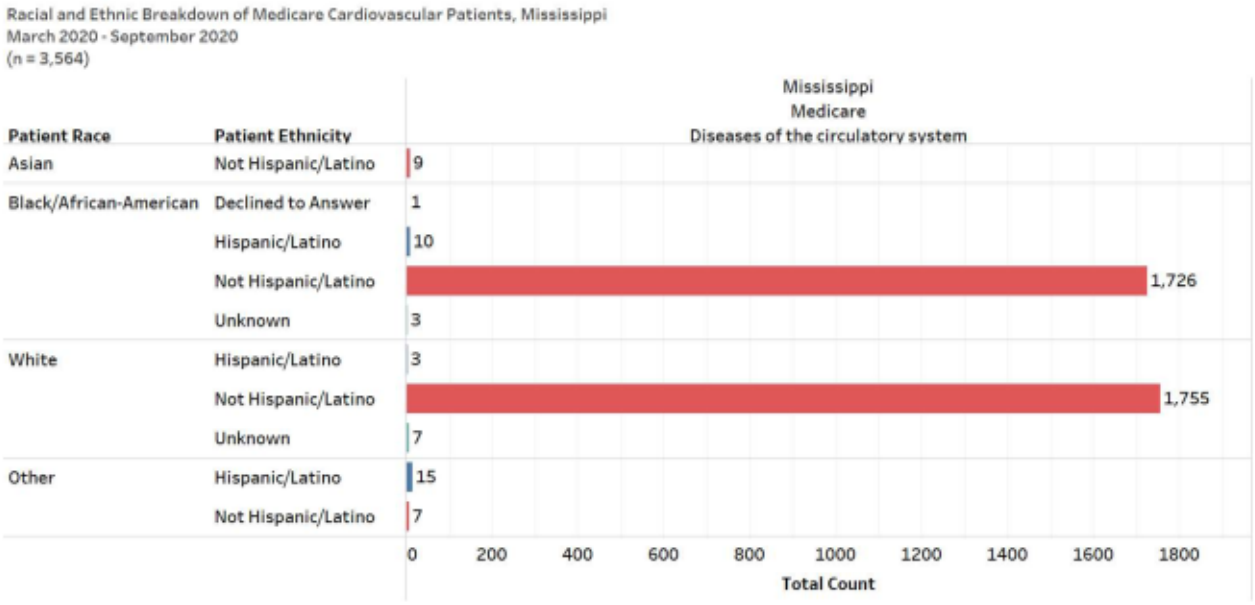
**Exhibit 43: Percent of Telehealth Encounters for Medicare Patients with a Circulatory Disease, by County in Mississippi**




Yazoo county currently has a population of just over 26,000; over 50% of Yazoo residents are Black/African-American.[104] It is designated as an HPSA for primary and mental health care and has one critical access hospital that offers cardiology clinics. Grenada county has a population of just under 21,000 with a high percent of White residents, and no FQHCs or RHCs within their limits. There is only one specialty clinic for cardiology, which is located directly in Grenada, MS.

The racial and ethnic breakdown of Medicare beneficiaries with cardiovascular disease is shown in Exhibit 44 and shows almost an equal distribution of patients between White and Black/African-American.

**Exhibit 44: Race and Ethnic Breakdown of Medicare Beneficiaries with a Circulatory Disease That Received Telehealth Services in Mississippi**




## Cost Analysis - Medicare

Our analysis of the total patients per provider is shown in Table 42

**Table 42: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **Hinds** | 20,118.00 | 3% | 926.00 | 144 | 6 |
| **Yazoo** | 20,118.00 | 5% | 955.00 | 5 | 191 |
| **Adams** | 20,118.00 | 4% | 710.00 | 5 | 142 |
| **Lauderdale** | 20,118.00 | 1% | 123.00 | 17 | 7 |
| **Lincoln** | 20,118.00 | 1% | 102.00 | 3 | 34 |

In Table 43, we show the cost savings in reduced hospitalizations using $7,821 as the average cost per hospitalization.

**Table 43: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 20,118.00 |
| **Reduced hospitalization (10%)** | 201,180 |
| **Average Cost of Hospital Stay** | $7,821 |
| ***Cost of Total Hospitalizations*** | **$15,734,287.80** |

The median salary for a cardiologist in Mississippi that accepts Medicare is $350,000.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 44 reflects total personnel costs for 20 cardiologists and 20 nurses or physician assistants.

**Table 44: Cost Categories for Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Cardiologist Salaries** | $4,060,000.00 |
| **Nurses/Physician Assistants** | $1,044,000.00 |
| ***Subtotal Personnel Costs*** | **$5,104,000.00** |
| **Fringe Benefits (30%)** | $1,531,200.00 |
| ***Total Personnel Costs*** | **$6,635,200.00** |

For broadband costs, we used Spectrum as the primary provider which charges $44.99 a month; we continued to use $50 per month as the cost of broadband for providers.

**Table 45: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$49.99/month** | $905,108.82 |
| **Broadband for 20 physicians/ 20 nurses & PAs @$50.00/month** | $2,000.00 |
| ***Subtotal Amount*** | $907,108.82 |
| **Adjustment for Audio-Only (10%)** | $90,710.88 |
| ***Subtotal Amount*** | $816,397.94 |
| ***Total Broadband Costs (x7)*** | **$3,437,784.00** |

Table 46 shows the estimated maintenance costs for each site included within the study.

**Table 46: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 15 |
| ***Total Maintenance Costs*** | $300,000.00 |
| ***Total Maintenance for Study Period*** | $174,000.00 |

In table 47 we calculated the travel distance and time from a patient's residence to various Medicare providers using Google Maps. We assumed that Medicare beneficiaries are retired and, therefore, would not have to take leave from work. Given the lack of public transportation, we calculated costs based on transportation using a personal vehicle.

**Table 47: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $20,19.82 |
| **Cost of Emissions (Car)** | $257,987.28 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicare cardiovascular patients in Mississippi are shown in Table 48.

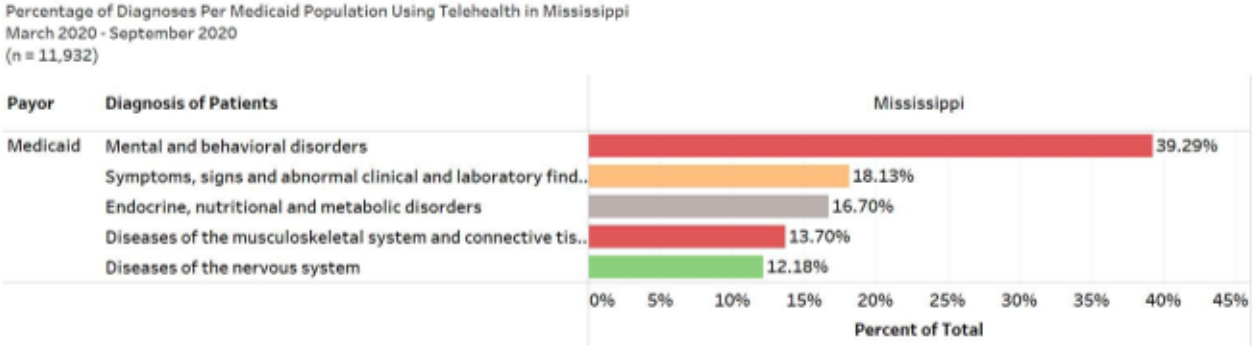
**Table 48: Net Telehealth Savings for Mississippi Medicare Beneficiaries**

| *Mississippi Medicare Beneficiaries*<br>*Diseases of the Circulatory System* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $15,734.287.00 |
| **Reduced patient travel** | $20,519.82 |
| **Reduced vehicle emissions** | $257,987.28 |
| **Total Savings** | **$16,012,794.90** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $6,635,200.00 |
| **Broadband costs** | $5,714,785.57 |
| **Maintenance costs** | $174,000.00 |
| **Total Costs** | **$12,523,985.57** |
| | |
| **Net Savings** | **$3,488,809.33** |

## Medicaid

Exhibit 45 shows the most frequent diagnostic categories for Medicaid beneficiaries in Mississippi that used telehealth during the study period.

**Exhibit 45: Top Five Diagnosis Categories Among Medicaid Recipients Using Telehealth Services in Mississippi**



Mental and behavioral disorders are consistently one of the top categories across numerous States, particularly among the Medicaid population. Additionally, symptoms, signs, and abnormal clinical findings provide a wide array of diagnoses, making it challenging to ascertain potential cost savings in areas such as reduced hospitalizations. Therefore, for this analysis, we focused on endocrine, nutritional, and metabolic disorders among Medicaid beneficiaries.

As Exhibit 46 shows, the most frequent diagnoses within this category were Type I and Type II diabetes among Medicaid beneficiaries using telehealth.

**Exhibit 46: Top Five Diagnosis Categories Among Medicaid Recipients with an Endocrine, Nutritional or Metabolic Disorder that Used Telehealth Services in Mississippi**

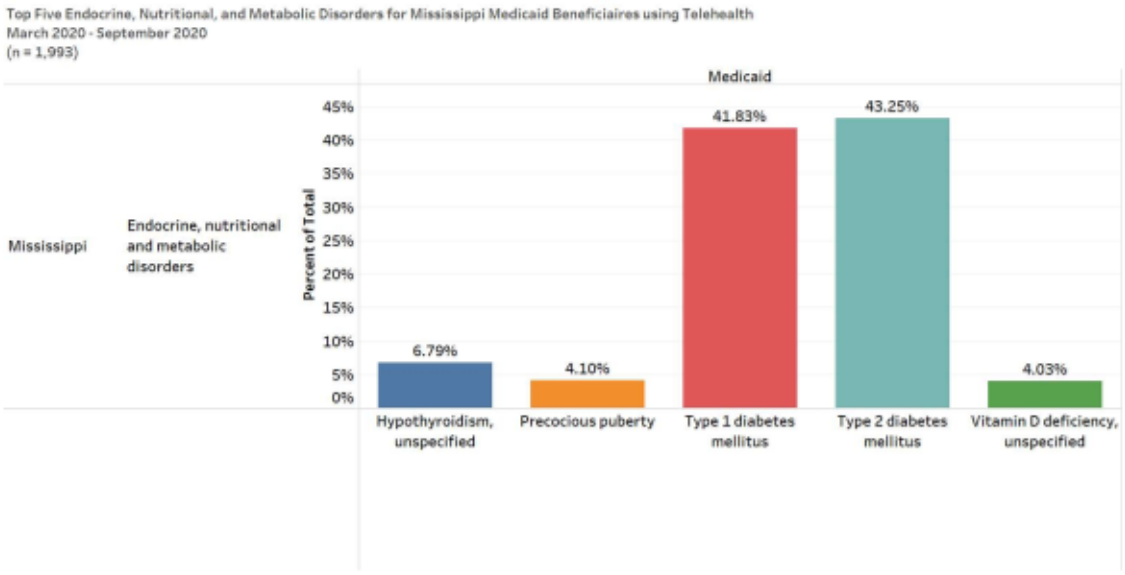
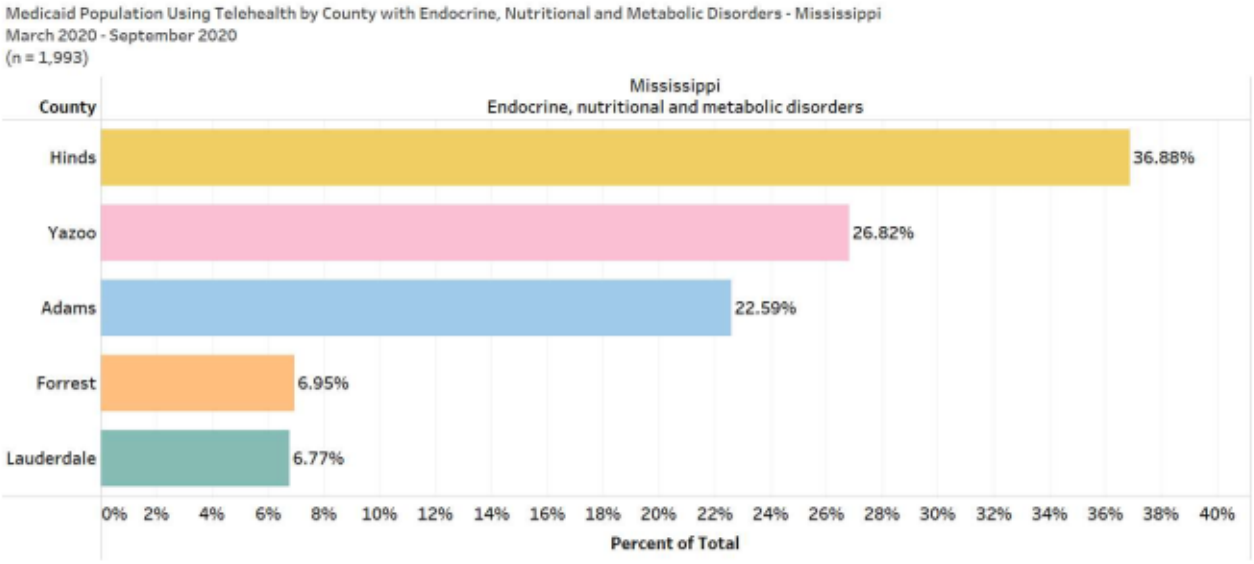


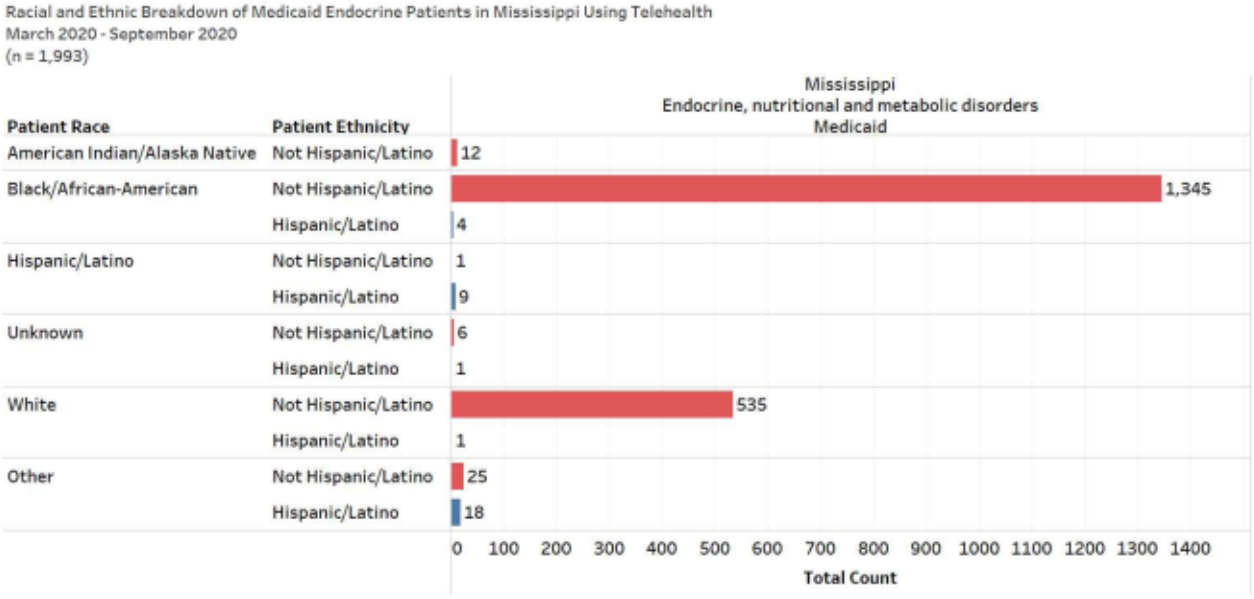

Exhibit 47 shows the county breakdown of Medicaid beneficiaries using telehealth for endocrine disorders.

**Exhibit 47: Percent of Telehealth Encounters for Medicaid Patients with an Endocrine, Nutritional or Metabolic Disorder, by County in Mississippi**




The racial and ethnic breakdown of Medicaid endocrine patients using telehealth in Mississippi is shown in Exhibit 48. The majority of patients were Black/African-American, followed by White patients.

**Exhibit 48: Race and Ethnic Breakdown of Medicaid Beneficiaries with an Endocrine Disorder That Received Telehealth Services in Mississippi**




## Cost Analysis - Medicaid

Our analysis of the total patients per provider is shown in Table 49

**Table 49: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **Hinds** | 1,993.00 | 31% | 611.65 | 17 | 35.98 |
| **Yazoo** | 1,993.00 | 22% | 444.84 | 1 | 444.84 |

| | | | | | |
|---|---|---|---|---|---|
| **Adams** | 1,993.00 | 19% | 374.68 | 7 | 53.53 |
| **Grenada** | 1,993.00 | 5% | 96.46 | 7 | 13.78 |
| **Lincoln** | 1,993.00 | 5% | 98.65 | 10 | 9.87 |

In Table 50, we show the cost savings in reduced hospitalizations using $6,600 as the average cost per hospitalization.

**Table 50: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 1993.00 |
| **Reduced hospitalization (10%)** | 193.30 |
| **Average Cost of Hospital Stay** | $6,600.00 |
| ***Cost of Total Hospitalizations*** | **$1,315,380.00** |

The median salary for an endocrinologist in Mississippi that accepts Medicaid is $201,574.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 51 shows the estimated personnel costs for ten endocrinologists and ten nurses or physician assistants.

**Table 51: Cost Categories for Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Endocrinologist Salaries** | $1,169,129.00 |
| **Nurses/Physician Assistants** | $522,000.00 |
| ***Subtotal Personnel Costs*** | **$1,691,129.30** |
| **Fringe Benefits (30%)** | $507,338.76 |
| ***Total Personnel Costs*** | **$2,198,467.76** |

For broadband costs, we used Spectrum as the primary provider; Spectrum charged $44.99 a month. We continued to use $50 per month to calculate the cost of broadband for providers.

**Table 52: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$49.99/month** | $89,665.07 |
| **Broadband for physicians @$50.00/month** | $2,100.00 |
| ***Subtotal Amount*** | $91.765.07 |
| **Adjustment for Audio-Only (10%)** | $9,176.51 |
| ***Subtotal Amount*** | $82,588.56 |
| ***Total Broadband Costs (x7)*** | **$578,119.34** |

Table 53 shows the estimated maintenance costs for each site included within the study.

**Table 53: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 10 |
| ***Total Maintenance Costs*** | $200,000.00 |
| ***Total Maintenance for Study Period*** | $116,000.00 |

Table 54 calculates the travel distance and time from a patient's residence (using a personal vehicle) to various Medicaid providers using Google Maps. The minimum Medicaid wage for a family of four was $3.58 per hour.

**Table 54: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $186,171.99 |
| **Lost Wages** | $18,828.58 |
| **Cost of Emissions (Car)** | $2,205,632.34 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicaid patients with an endocrine disorder in Mississippi are shown in Table 55.

**Table 55: Total Telehealth Net Savings for Mississippi Medicaid Beneficiaries**

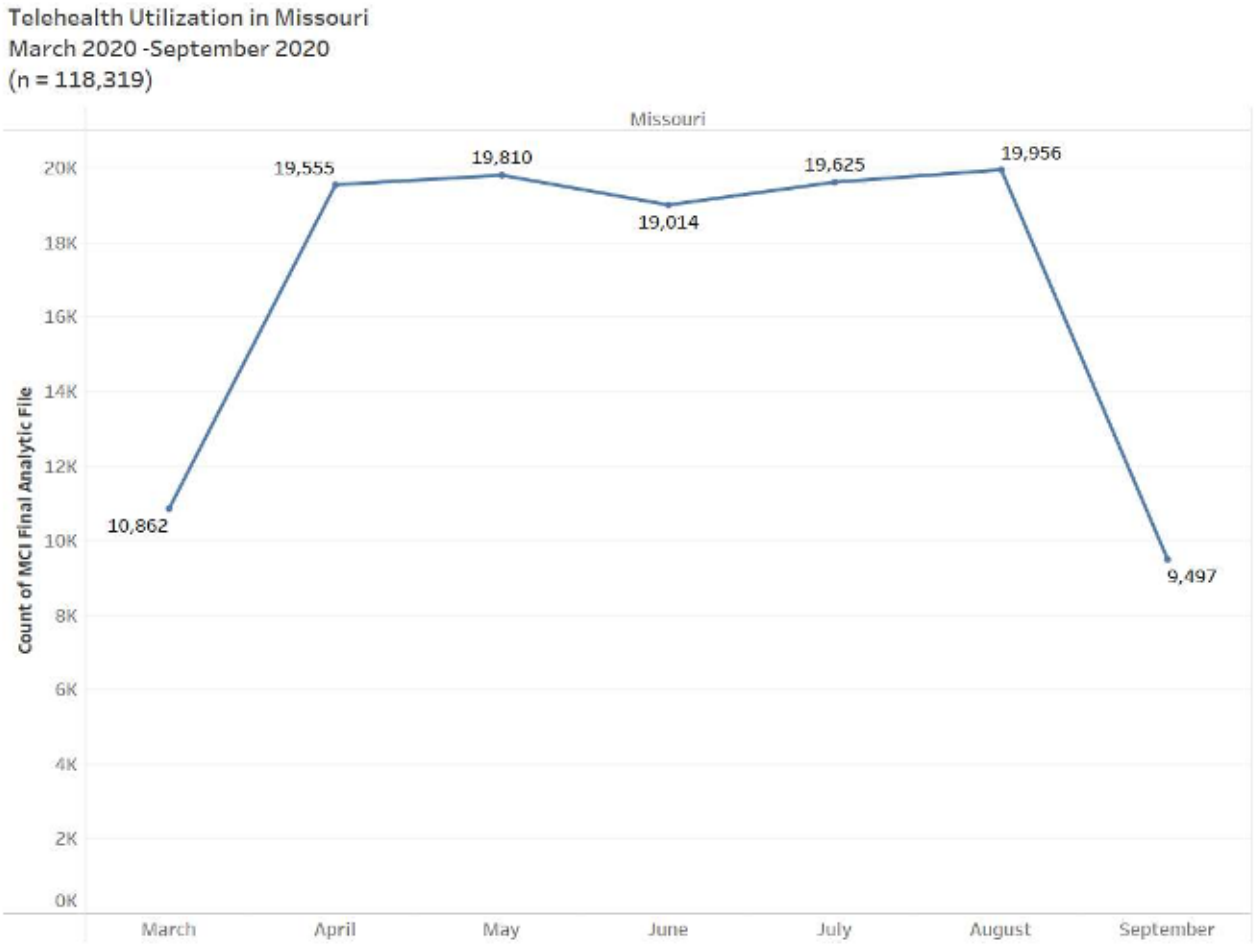
| ***Mississippi Medicaid Beneficiaries<br>Endocrine, Nutritional, and Metabolic Disorders*** | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $1,315,380.00 |
| **Reduced patient travel** | $186,171.99 |
| **Lost wages** | $18,826.58 |
| **Reduced vehicle emissions** | $2,209,692.34 |
| **Total Savings** | **$3,726,070.91** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $2,877,067.96 |
| **Broadband costs** | $578,119.34 |
| **Maintenance costs** | $116,000.00 |
| **Total Costs** | **$3,571,187.30** |
| | |
| **Net Savings** | **$154,881.61** |

## Missouri

The current Medicare population within Missouri is 1.2 million, with the average amount spent per enrollee on par with the national average.[105] Over 82 percent of Medicare beneficiaries in Missouri are 65 or over, and the other 18 percent qualify for Medicare due to an ongoing disability.[106] Additionally, 5.9 million individuals are on Medicaid in Missouri, with 29% of those individuals considered low-income (less than 200% FPL).[107]

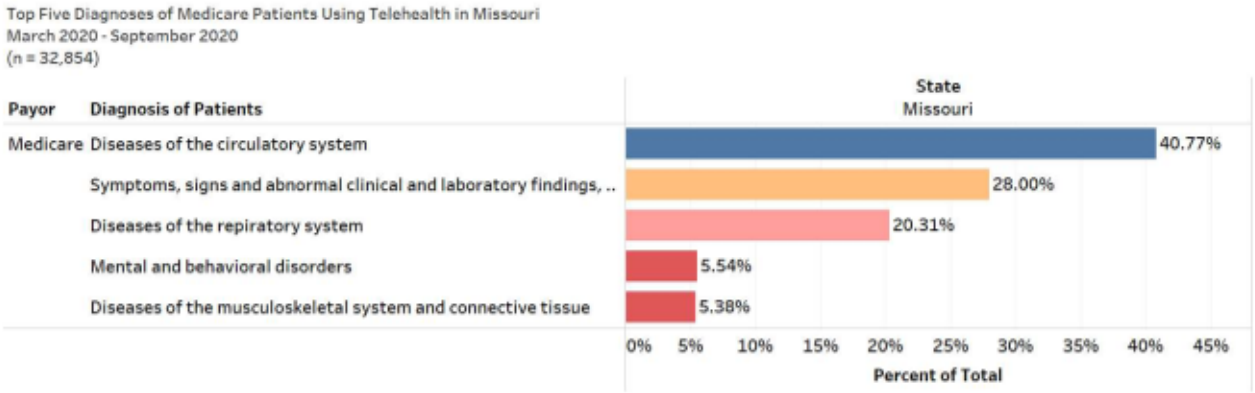
In Exhibit 49, the utilization rate for telehealth encounters in Missouri climbed from March to April and remains consistent until September, in which there was a decline in utilization back to a similar level to the rate in March 2020.

**Exhibit 49: Utilization of Telehealth Services in Missouri**




Among Medicare beneficiaries in Missouri using telehealth, the most common diagnostic category was diseases of the circulatory system. Patients with this diagnosis code accounted for over 40% of all Medicare reimbursed telehealth encounters during the study period, as shown in Exhibit 50.

**Exhibit 50: Top Five Diagnosis Categories Among Medicare Recipients of Telehealth Services in Missouri**




Within this diagnostic category, the most common diagnoses were congestive heart failure, coronary heart disease, and hypertension, as shown in Exhibit 51.

**Exhibit 51: Top Diagnoses Among Medicare Recipients with Circulatory Disease that Used Telehealth in Missouri**

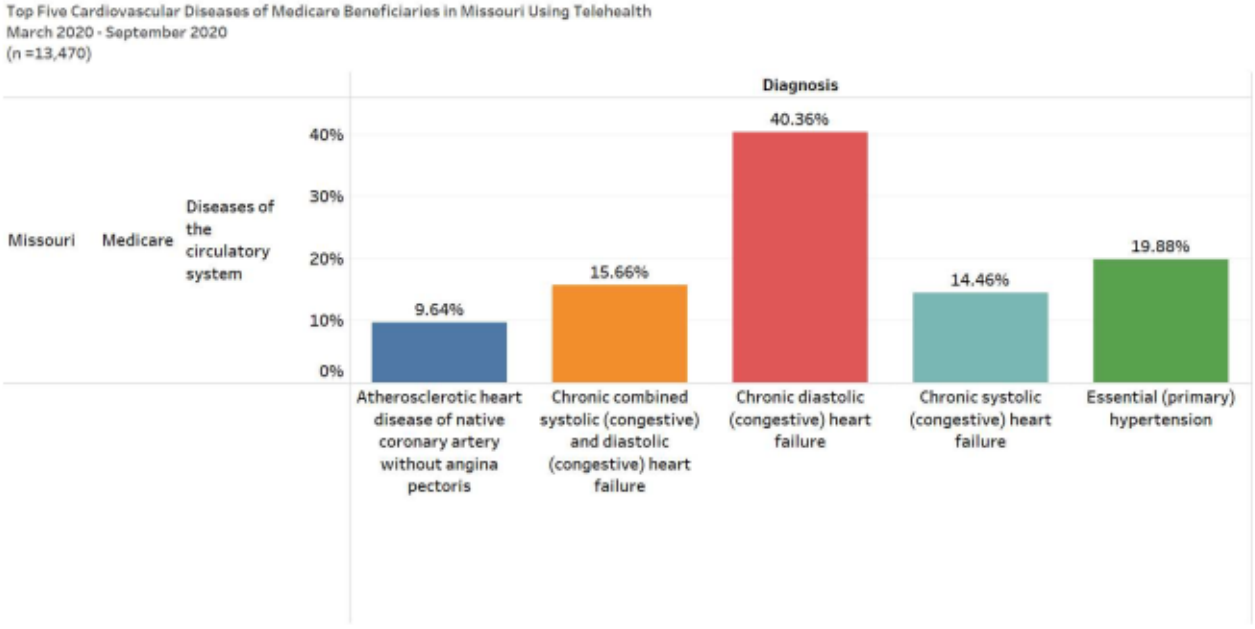
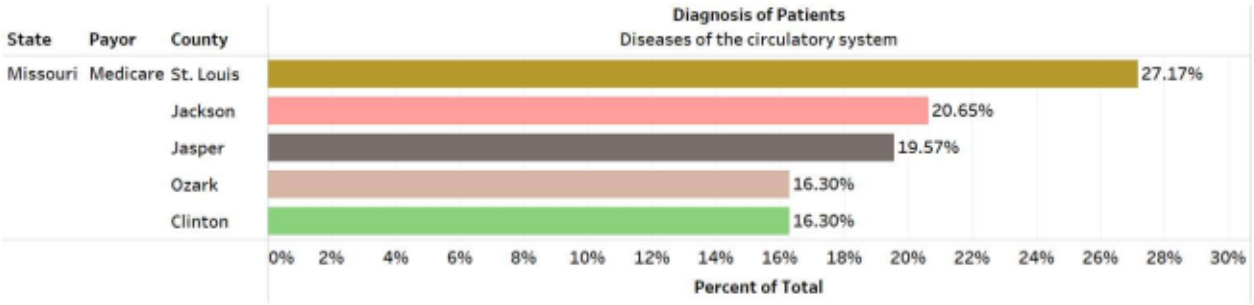



Exhibit 52 illustrates the breakdown of telehealth utilization across the top five counties in Missouri with the highest volume of Medicare cardiovascular patients using telehealth. Metro areas with a high population density, such as St. Louis and Jackson County, accounted for nearly 50% of encounters. Rural counties, such as Ozark and Clinton, has lower levels of use but still accounted for a substantial number of telehealth encounters by Medicare beneficiaries with a circulatory disease.

**Exhibit 52: Percent of Telehealth Encounters for Medicare Patients with a Circulatory Disease, by County in Missouri**




## Cost Analysis - Medicare

Our estimate of the total patients per provider is shown in Table 56

**Table 56: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **St. Louis** | 13,470.00 | 27% | 3,659.80 | 553 | 6.62 |
| **Jackson** | 13,470.00 | 21% | 2,778.86 | 692 | 4.02 |
| **Jasper** | 13,470.00 | 20% | 2,636.08 | 30 | 87.87 |
| **Ozark** | 13,470.00 | 16% | 2,195.61 | 16 | 137.23 |
| **Clinton** | 13,470.00 | 16% | 2,195.61 | 48 | 45.74 |

In Table 57, we show the cost savings in reduced hospitalizations using $6,600 as the average cost per hospitalization.

**Table 57: Cost Categories for Reduced Hospitalization**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 13,470.00 |
| **Reduced hospitalization (10%)** | 1,347.00 |
| **Average Cost of Hospital Stay** | $6,600.00 |
| ***Cost of Total Hospitalizations*** | **$8,890,200.00** |

The median salary for a cardiologist in Missouri that accepts Medicare is $382,700.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Tale 58 shows the estimated personnel costs for 20 cardiologists and 20 nurses or physician assistants.

**Table 58: Cost Categories for Reduced Hospitalization**

| Cost Category | Amount |
|---|---|
| **Cardiologist Salaries** | $4,433,320.00 |
| **Nurses/Physician Assistants** | $1,044,000.00 |
| ***Subtotal Personnel Costs*** | **$5,483,320.00** |
| **Fringe Benefits (30%)** | $1,646,996.00 |
| ***Total Personnel Costs*** | **$7,128,316.00** |

For broadband costs, we used Spectrum, which charged customers $29.99 a month, as the primary provider and continued to use $50 per month as the cost of broadband for providers.

**Table 59: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$49.99/month** | $403,844.41 |
| **Broadband for 20 physicians/20 nurses & PAs @$50.00/month** | $2,000.00 |
| ***Subtotal Amount*** | $405,844.11 |
| **Adjustment for Audio-Only (10%)** | $40,584.41 |
| ***Subtotal Amount*** | $365,259.70 |
| ***Total Broadband Costs (x7)*** | **$2, 556,817.50** |

Table 60 shows the estimated maintenance costs for each site included within the study.

**Table 60: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 22 |
| ***Total Maintenance Costs*** | $440,000.00 |
| ***Total Maintenance for Study Period*** | $255,200.00 |

In Table 61 we calculated the travel distance and time, using a personal vehicle, from a patient's residence to cardiologists who accepted Medicare using Google Maps. Given that our focus was on Medicare beneficiaries, we did not assume any lost wages due to missed work.

**Table 61: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $3,985.34 |
| **Cost of Emissions (Car)** | $522,205.87 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicare cardiovascular patients in Missouri are shown in Table 62.

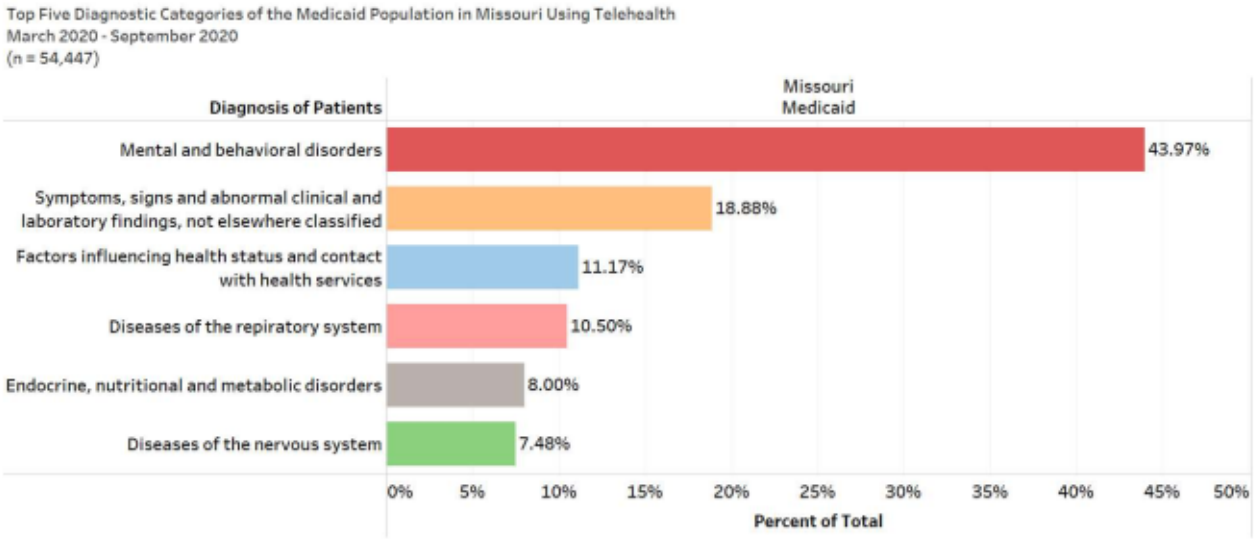
**Table 62: Net Telehealth Savings for Missouri Medicare Beneficiaries**

| *Missouri Medicare Beneficiaries*<br>*Diseases of the Circulatory System* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $8,976,102.00 |
| **Reduced patient travel** | $3,985.34 |
| **Reduced vehicle emissions** | $522,205.87 |
| **Total Savings** | **$9,510,293.41** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $7,128,316.00 |
| **Broadband costs** | $1,442,706.98 |
| **Maintenance costs** | $255,200.00 |
| **Total Costs** | **$8,826,222.08** |
| | |
| **Net Savings** | **$684,071.33** |

## Medicaid

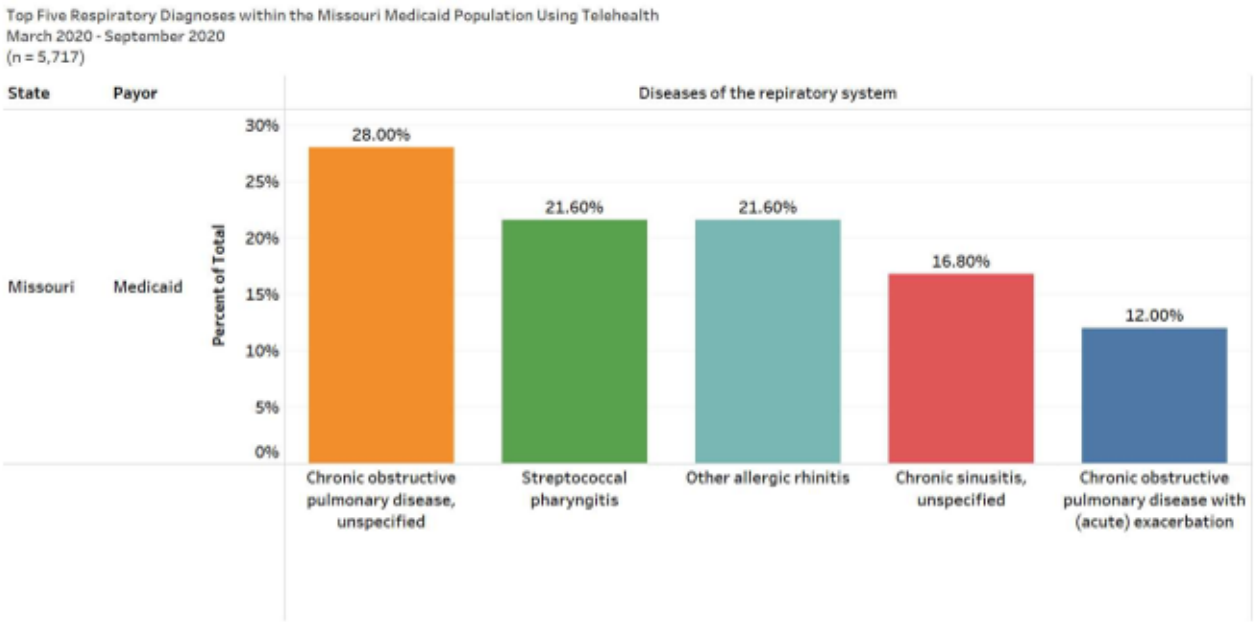
As shown in Exhibit 53, the most frequent diagnostic category among Medicaid recipients using telehealth in Missouri during the study period was behavioral and mental health which accounted for over 43% of all Medicaid patients that used telehealth.

**Exhibit 53: Top Five Diagnosis Categories Among Medicaid Recipients of Telehealth Services in Missouri**



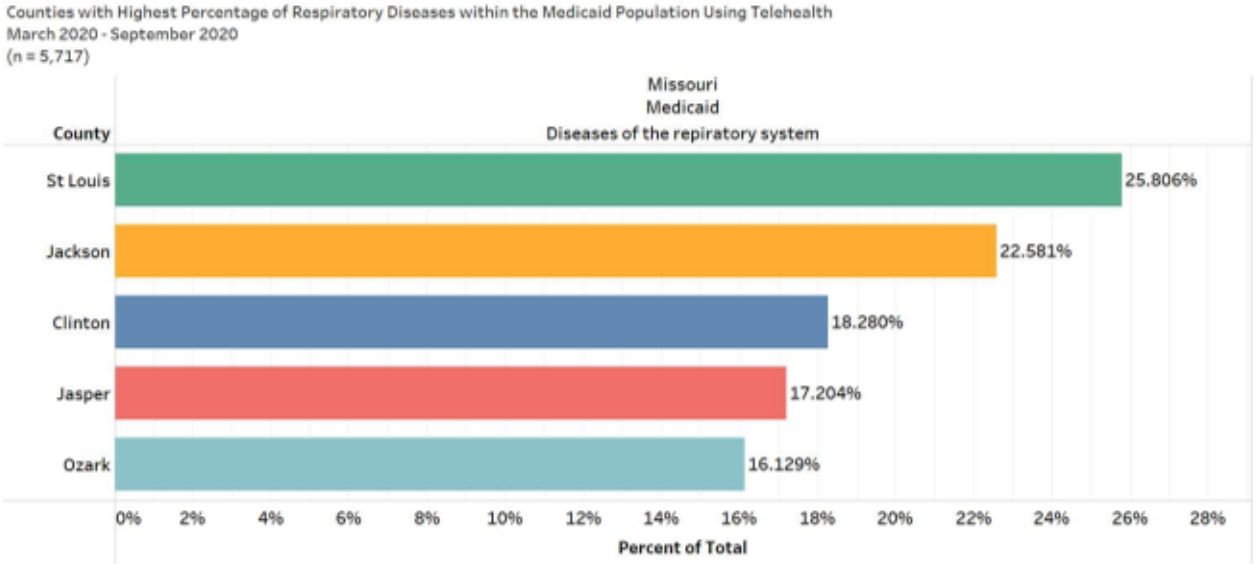

For this analysis, we focused on diseases of the respiratory system, given that this is the first time it has appeared as a top diagnosis category among Medicaid beneficiaries using telehealth. Exhibit 54 shows the specific diagnoses that affected Medicaid patients with respiratory disease that used telehealth.

**Exhibit 54: Top Five Diagnoses Among Medicaid Recipients of Telehealth Services with Respiratory Disease in Missouri**




Over 40% of Medicaid telehealth recipients with a respiratory disease had a diagnosis of chronic obstructive pulmonary disease (COPD). Telehealth services can increase rural residents' access to COPD care when they otherwise would experience barriers to accessing specialty respiratory care due to distance.[108] Many studies have shown the efficacy of telehealth on respiratory disease and telehealth's ability to customize interventions for patients, avoid unnecessary emergency room hospitalizations, and reduce general and specialist practitioner visits.[109] Exhibit 54 provides a list of the top five counties within Missouri in which Medicaid beneficiaries with respiratory disease were using telehealth services.

**Exhibit 54: Percent of Telehealth Encounters for Medicaid Patients with a Respiratory Disease, by County in Missouri**



Similar to the Medicare population, the most populous counties in the State accounted for the greatest percent of telehealth encounters.

## Cost Analysis - Medicaid

Our calculations to estimate the total patients per provider is shown in Table 63.

**Table 63: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **St. Louis** | 5,717.00 | 26% | 1,475.33 | 58 | 25.44 |
| **Jackson** | 5,717.00 | 23% | 1,290.96 | 49 | 26.35 |
| **Clinton** | 5,717.00 | 18% | 1,045.07 | 16 | 65.32 |
| **Jasper** | 5,717.00 | 17% | 983.55 | 47 | 20.93 |
| **Ozark** | 5,717.00 | 16% | 922.09 | 4 | 230.52 |

In Table 62, we show the cost savings in reduced hospitalizations using $7,821.00 as the average cost for a hospitalization.

**Table 62: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 5717.00 |
| **Reduced hospitalization (10%)** | 571.00 |
| **Average Cost of Hospital Stay** | $7,821.00 |
| ***Cost of Total Hospitalizations*** | **$4,471,265.70** |

The median salary for a pulmonologist in Missouri that accepts Medicaid is $201,584.00. We again set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 63 shows the estimated personnel costs for ten practitioners and ten nurses or physician assistants.

**Table 63: Cost Categories for Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Pulmonologists Salaries** | $1,169,187.20 |
| **Nurses/Physician Assistants** | $522,000.00 |
| ***Subtotal Personnel Costs*** | **$1,691,187.20** |
| **Fringe Benefits (30%)** | $507,356.16 |
| ***Total Personnel Costs*** | **$2,198,543.36** |

For broadband costs, we calculated costs using Spectrum which charged $44.99 a month and continued to use $50 per month for the cost of broadband for providers.

**Table 64: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$49.99/month** | $100,867.38 |
| **Broadband for 10 physicians/10 nurses & PAs @$50.00/month** | $1,000.00 |
| ***Subtotal Amount*** | $101,867.58 |
| **Adjustment for Audio-Only (10%)** | $10,186.76 |
| ***Subtotal Amount*** | $91,680.02 |
| ***Total Broadband Costs (x7)*** | **$2,198,543.36** |

Table 65 shows the estimated maintenance costs for each site included within the study.

**Table 65: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 22 |
| ***Total Maintenance Costs*** | $440,000.00 |
| ***Total Maintenance for Study Period*** | $641,765.75 |

In Table 66 we calculated the travel distance and time (using a personal vehicle) from a patient's residence to pulmonologists accepting Medicaid using Google Maps. The minimum Medicaid wage for a family of four was $19.05 per hour.

**Table 66: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $10,771.00 |
| **Lost Wages** | $3,401.86 |
| **Cost of Emissions (Car)** | $247,868.64 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicaid respiratory patients in Missouri are shown in Table 67.

**Table 67: Net Telehealth Savings for Missouri Medicaid Beneficiaries**

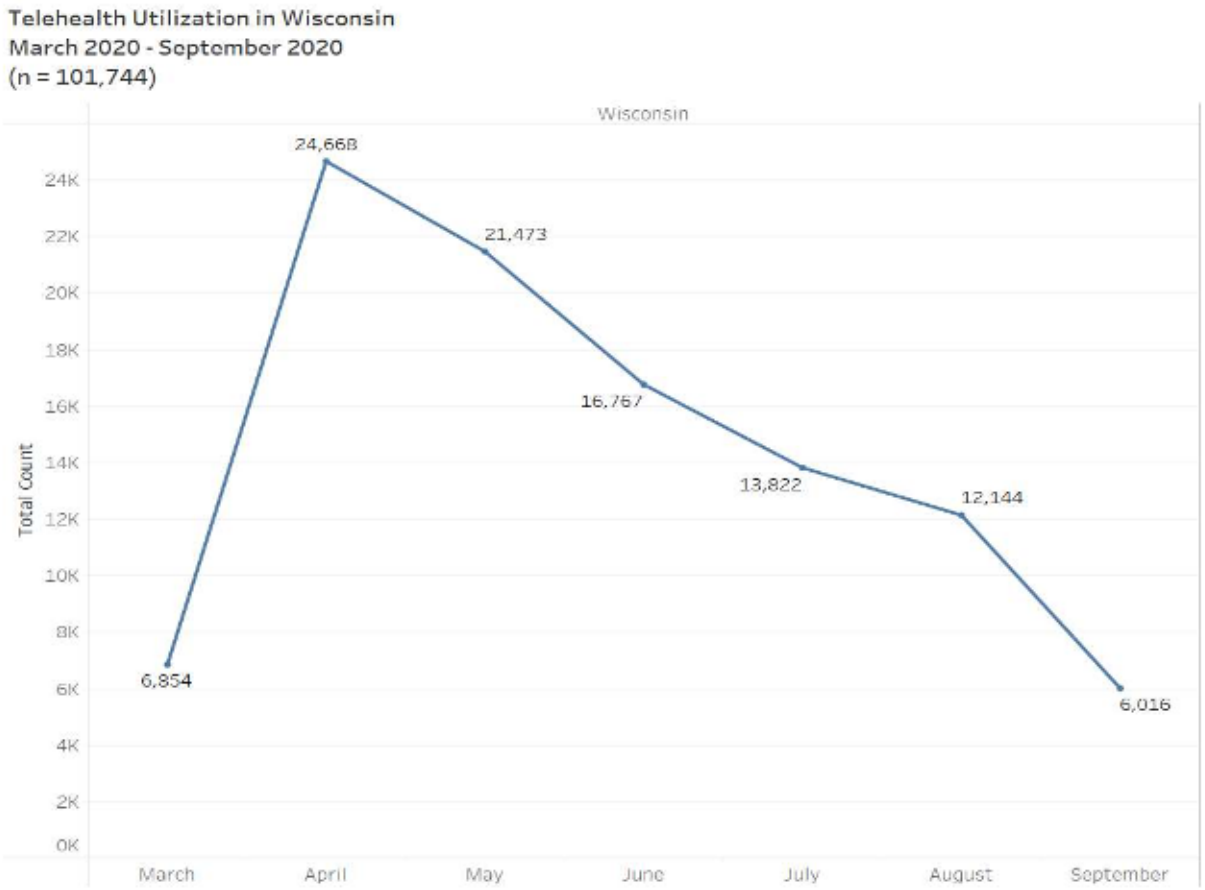
| ***Missouri Medicaid Beneficiaries<br>Diseases of the Respiratory System*** | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $4,471,265/70 |
| **Reduced patient travel** | $10,777.71 |
| **Lost wages** | $3,401.86 |
| **Reduced vehicle emissions** | $4,733,313.91 |

| | |
|---|---|
| **Total Savings** | **$3,726,070.91** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $2,198,543.36 |
| **Broadband costs** | $641,765.75 |
| **Maintenance costs** | $255,200.00 |
| **Total Costs** | **$3,095,509.11** |
| | |
| **Net Savings** | **$1,637.804.80** |

## Wisconsin

Wisconsin's Medicare population is currently 1.12 million, with a 13.9% increase in enrollment from 2014 to 2019.[110] Medicare spent $6,322,747,585 on beneficiaries in Wisconsin, or approximately $9,558 per enrollee.[111] Their Medicaid population is[112] 5.6 million, with 24% classified as low-income (<200% FPL). Gundersen Health System (Gundersen Health) is a non-profit health system based in La Crosse, Wisconsin, that has multi-specialty group medical practices, a teaching hospital, and regional community clinics, among other sites. Gundersen Health's flagship hospital, Gundersen Lutheran Medical Center, is located in La Crosse and is a teaching hospital with 325 beds and a Level II Trauma and Emergency Center.[113]

**Exhibit 55 Utilization of Telehealth Services in Wisconsin**




The utilization of telehealth services in Wisconsin increased rapidly from March to April. It steadily decreased over the remaining months until September, similar to March, as shown in Exhibit 55 above.

In Exhibit 56, the top five diagnoses categories are shown, with Mental and Behavioral Disorders ranking at the top. For this analysis, we focused on Endocrine, Nutritional, and Other Metabolic Disorders.

**Exhibit 56: Top Five Diagnosis Categories Among Medicare Recipients of Telehealth Services in Wisconsin**

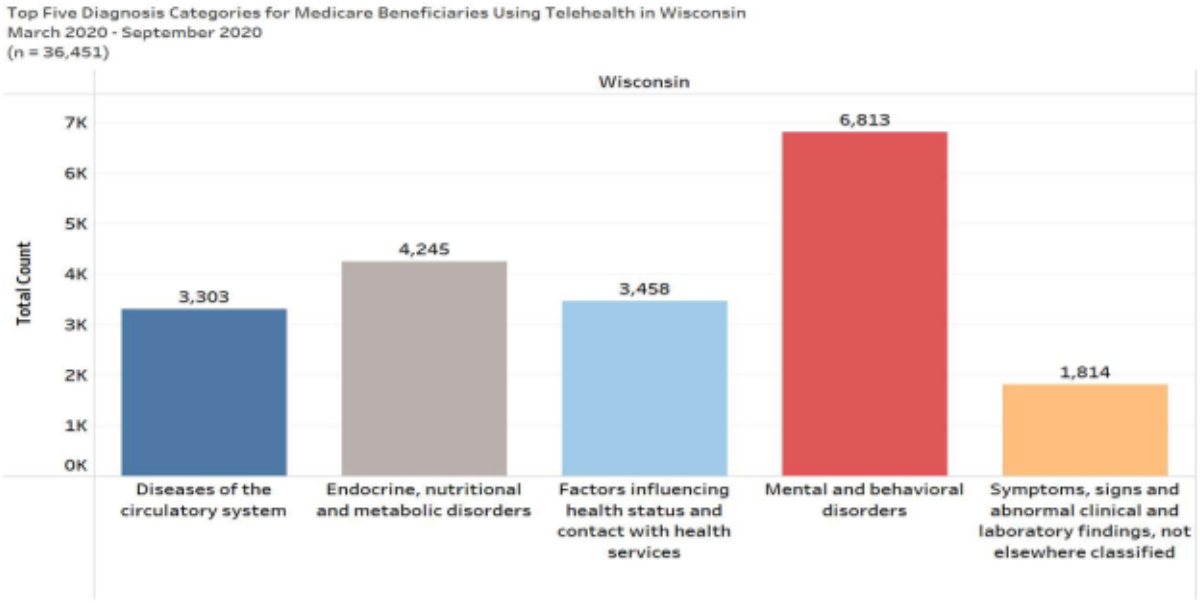
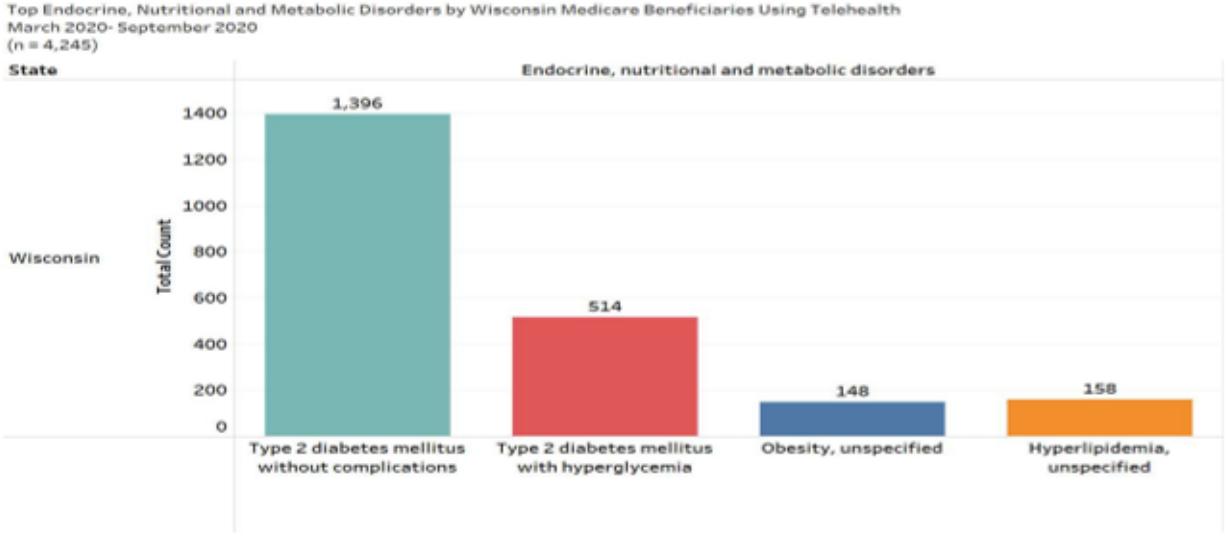


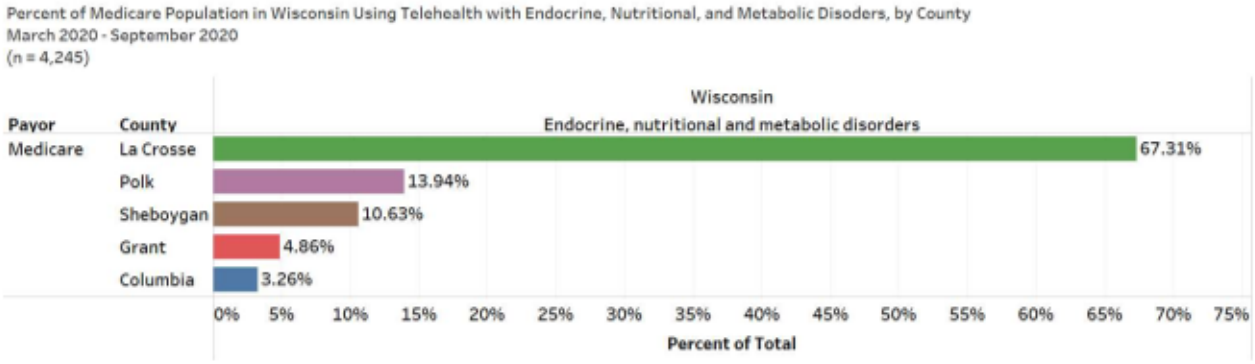

Exhibit 57 illustrates how Type II diabetes was the most frequently occurring diagnosis within this category during the study period.

**Exhibit 57: Top Five Diagnoses Among Medicare Recipients with an Endocrine Disorder that Use Telehealth Services in Wisconsin**




La Crosse County within Wisconsin contained almost two-thirds of the total volume of Medicare beneficiaries with an endocrine disorder that used telehealth during the study period. Similar to Missouri, the volume of telehealth services was lower in more rural counties, as shown in Exhibit 58.

**Exhibit 58: Percent of Telehealth Encounters for Patients with an Endocrine, Nutritional, or Metabolic Disorder, by County in Wisconsin**




## Cost-Analysis - Medicare

Our estimate of the total patients per provider is shown in Table 68.

**Table 68: Total Patients Per Provider**

| Name of County | Number of Patients | Percent within County | Number of Patients | Number of Providers | Total Patients Per Provider |
|---|---|---|---|---|---|
| **La Crosse** | 4,245.00 | 67% | 2,857.31 | 15 | 190 |
| **Polk** | 4,245.00 | 14% | 591.75 | 7 | 85 |
| **Sheboygan** | 4,245.00 | 11% | 451.24 | 7 | 64 |
| **Grant** | 4,245.00 | 5% | 206.31 | 5 | 41 |
| **Columbia** | 4,245.00 | 3% | 138.39 | 12 | 12 |

In Table 69, we show the cost savings in reduced hospitalizations using $6,600 as the average cost for a hospitalization.

**Table 69: Cost Categories for Reduced Hospitalizations**

| Cost Category | Amount |
|---|---|
| **Number of Patients** | 4,254.00 |
| **Reduced hospitalization (10%)** | 424.50 |
| **Average Cost of Hospital Stay** | $6,600.00 |
| ***Cost of Total Hospitalizations*** | **$2,801,700.00** |

The median salary for an endocrinologist in Wisconsin that accepts Medicare is $226,000.00. Again, we set a maximum threshold of $90,000 to calculate personnel costs for nurses and physician assistants. Table 70 shows the estimated personnel costs for five endocrinologists and five nurses or physician assistants.

**Table 70: Cost Categories for Salaries and Fringe Benefits**

| Cost Category | Amount |
|---|---|
| **Endocrinologist Salaries** | $655,400.00 |
| **Nurses/Physician Assistants** | $261,000.00 |
| ***Subtotal Personnel Costs*** | **$916,400.00** |
| **Fringe Benefits (30%)** | $274,900.00 |
| ***Total Personnel Costs*** | **$1,191,320.00** |

For broadband costs, we used Infinity as the primary provider. Infinity charged customers $39.99 a month and we continued to use $50 per month for broadband cost for providers.

**Table 71: Cost Categories for Broadband Access**

| Cost Category | Amount |
|---|---|
| **Broadband for individuals @$49.99/month** | $180,433.88 |
| **Broadband for 5 physicians/5 nurses & PAs @$50.00/month** | $2,800.00 |
| ***Subtotal Amount*** | $183,234.49 |
| **Adjustment for Audio-Only (10%)** | $18,323.49 |
| ***Subtotal Amount*** | $164,911.39 |
| ***Total Broadband Costs (x7)*** | **$1,154,379.73** |

Table 72 shows the estimated maintenance costs for each site included within the study.

**Table 72: Cost Categories for Telehealth Maintenance**

| Cost Category | Amount |
|---|---|
| **Maintenance (Per Site)** | $100,000 |
| **Depreciation** | $20,000 |
| **Number of Sites** | 18 |
| ***Total Maintenance Costs*** | $360,000.00 |
| ***Total Maintenance for Study Period*** | $208,000.00 |

Table 73 provides the estimated travel distance and time from a patient's residence to endocrinologists that accept Medicare using Google Maps. Given lack of public transportation, we calculated costs based on use of a personal vehicle.

**Table 73: Cost Categories for Net Savings**

| Cost Category | Amount |
|---|---|
| **Travel Costs** | $18,938.52 |
| **Cost of Emissions (Car)** | $179,130.68 |

The net savings for outpatient telehealth from March 2020 through September 2020 for Medicare endocrine patients in Wisconsin are shown in Table 74

**Table 74: Net Telehealth Savings for Wisconsin Medicare Beneficiaries**

| *Wisconsin Medicare Beneficiaries*<br>*Endocrine, Nutritional, and Metabolic Disorders* | |
|---|---|
| | |
| **Savings** | **Amount** |
| **Reduced hospitalizations** | $2,801,200.00 |
| **Reduced patient travel** | $18,932.82 |
| **Reduced vehicle emissions** | $179,130.68 |
| **Total Savings** | **$2,999,768.18** |
| | |
| **Costs** | **Amount** |
| **Personnel costs** | $1,191,320.00 |
| **Broadband costs** | $1,154,379.73 |
| **Maintenance costs** | $208,000.00 |
| **Total Costs** | **$2,554,499.73** |
| | |
| **Net Savings** | **$445,269.45** |

## Sensitivity Analysis

In addition to calculating cost-benefit for telehealth use by patients eligible for Medicare and Medicaid reimbursement across States and clinical conditions, we also performed a one-way sensitivity analysis. For the purposes of the analysis, we used telehealth utilization rates at 90%, 75%, and 50%. Initially, we assumed that all telehealth visits replaced all in-person encounters during the study period. Without the availability of telehealth, all encounters would have taken place in-person at the nearest health care facility. This model is potentially an overestimation of results as it is plausible that the patient may not have received care by a health care provider if these services were not available using telehealth. A specialist may have been unavailable at the time the patient needed treatment, or a patient may not have traveled for in-person consultations due to lack of reliable transportation, cost limitations, an inability to leave their job, or other reasons.[114] For that reason, the utilization rates assume an overall reduction in utilization. Instead of utilization being shown at 100% for telehealth, we used a 90%, 75%, or 50%.

For this analysis, we depict the cumulative and per-person cost savings across States and programs while aligning with a specific clinical category. We conducted a two-sample homoscedastic *t*-test to compare the means of the population accessing telehealth and hypothetical in-person care. The results showed a significant difference between the groups in terms of both mean time savings ($p$-value < 0.05) and mean cost savings ($p$-value = 0.05).

The sensitivity analysis results across clinical conditions, with replacement thresholds at 100%, 90%, 75%, and 50%, are listed in Table 75. This analysis depicts the cumulative time and per-person cost savings within each of these conditions. The findings suggest considerable cost and time savings, even if telehealth utilization drops to 50%.

**Table 75: Results of One-Way Sensitivity Analysis**

| State | Program | Total Savings | Travel Costs Saved | Per Person Savings |
|---|---|---|---|---|
| **Diseases of the Circulatory System** | | | | |
| **Missouri** | Medicare | $9,510,293.41 | $3,985.54 | $706.04 |
| | 90% | $8,559,264.07 | $3,586.99 | $635.43 |
| | 75% | $7,132,720.06 | $2,989.16 | $529.53 |
| | 50% | $4,755,146.71 | $1,992.77 | $353.02 |
| **Mississippi** | Medicare | $16,012,794.90 | $20,519.82 | $795.94 |
| | 90% | $14,411,515.41 | $18,467.83 | $716.35 |
| | 75% | $12,009,596.17 | $15,389.86 | $596.96 |
| | 50% | $8,006,397.45 | $10,259.91 | $397.97 |
| **New York** | Medicare | $4,821,295.43 | $304.82 | $679.63 |
| | 90% | $4,339,165.89 | $274.34 | $611.67 |
| | 75% | $3,615,971.58 | $228.62 | $509.72 |
| | 50% | $2,410,647.72 | $152.41 | $339.82 |
| **Endocrine, Nutritional and Other Metabolic Disorders** | | | | |
| **Wisconsin** | Medicare | $2,999,769.18 | $18,938.82 | $706.66 |
| | 90% | $2,699,792.26 | $17,044.93 | $635.99 |
| | 75% | $2,249,826.88 | $14,204.11 | $529.99 |
| | 50% | $1,499,884.59 | $9,469.41 | $353.33 |
| **Mississippi** | Medicaid | $3,726,070.91 | $186,171.99 | $1,869.58 |
| | 90% | $3,353,463.82 | $167,554.79 | $1,682.62 |
| | 75% | $2,794,553.18 | $139,628.99 | $1,402.18 |
| | 50% | $1,863,035.46 | $93,086.00 | $934.79 |
| **Neoplasms** | | | | |
| **Florida** | Medicare | $44,060,444.68 | $13,754.47 | $2,861.44 |
| | 90% | $39,654,400.21 | $12,379.02 | $2,575.30 |
| | 75% | $33,045,333.51 | $10,315.85 | $2,146.08 |
| | 50% | $22,030,222.34 | $6,877.23 | $1,430.72 |
| **Florida** | Medicaid*[9] | $26,393,857.74 | $10,736.56 | $2,933.30 |
| | 90% | $23,754,471.96 | $9,662.90 | $2,639.97 |
| | 75% | $19,795,393.30 | $8,052.42 | $2,199.98 |
| | 50% | $13,196,928.87 | $5,368.28 | $1,466.65 |
| **Florida** | Medicaid**[10] | $27,653,161.08 | $35,992.00 | $3,073.26 |
| | 90% | $24,887,844.98 | $32,392.80 | $2,765.93 |
| | 75% | $20,739,870.81 | $26,994.00 | $2,304.94 |
| | 50% | $13,826,580.54 | $17,996.00 | $1,536.63 |
| **New York** | Medicaid* | $517,287.36 | $13,057.44 | $57.49 |

[9] *This analysis assumes that the individual would use a personal vehicle for travel to the nearest health care facility with an oncologist that accepts Medicaid.

[10] **This analysis assumes that the individual would use public transportation for travel to the nearest health care facility with an oncologist that accepts Medicaid.

| State | Program | Total Savings | Travel Costs Saved | Per Person Savings |
|---|---|---|---|---|
| | 90% | $465,558.63 | $11,751.70 | $51.74 |
| | 75% | $387,965.52 | $9,793.08 | $43.12 |
| | 50% | $258,643.68 | $6,528.72 | $28.74 |
| **New York** | Medicaid** | $379,895.52 | $1,412.13 | $42.22 |
| | 90% | $341,905.97 | $1,270.91 | $38.00 |
| | 75% | $284,921.64 | $1,059.09 | $31.66 |
| | 50% | $189,947.76 | $706.06 | $21.11 |
| **Mental and Behavioral Health** | | | | |
| **Arizona** | Medicaid | $279,944,654.04 | $26,839,462.93 | $645.63 |
| | 90% | $251,950,188.63 | $24,155,516.64 | $581.07 |
| | 75% | $209,958,490.53 | $20,129,597.20 | $484.22 |
| | 50% | $139,972,327.02 | $13,419,731.46 | $322.81 |
| **Diseases of the Respiratory System** | | | | |
| **Missouri** | Medicaid | $4,733,313.91 | $10,777.71 | $827.94 |
| | 90% | $4,259,982.52 | $9,699.94 | $745.14 |
| | 75% | $3,549,985.43 | $8,083.28 | $620.95 |
| | 50% | $2,366,656.95 | $5,388.85 | $413.97 |

Overall, the highest cumulative cost savings were for the Medicaid program, specifically in the states of Mississippi, Florida, Arizona, and Missouri. This result is attributed to the limited availability of specialty providers that accept Medicaid and are geographically accessible to these patients. In situations where a patient must travel significant distances for care, either using a personal vehicles or public transportation, telehealth produces greater cost savings. Additionally, total cost savings is directly impacted by the volume of telehealth encounters.

The lowest observed costs savings were associated with telehealth services for Medicaid recipients living in New York City and Long Island. This result is attributable to the low sample size (n = 324) and high population density. Providers that accepted Medicaid were geographically close to beneficiaries, reducing the need to travel long distances and the subsequent impact on work. The overall net savings are assumed to be an underestimation, as this analysis looks at data from one specific program in a State. It is unlikely that only 324 Medicaid beneficiaries saw an oncologist during the study period, but it is difficult to ascertain the total amount without additional data. Therefore, this analysis depicts only a small fraction of the overall cost savings.

## Discussion

As shown in the analysis above, there was significant demand for telehealth services during the COVID-19 pandemic. With many health care facilities overwhelmed in screening and treating patients for COVID-19 and numerous outpatient facilities temporarily shut down, telehealth served as the primary method for delivering health care services. In states where a large proportion of residents have limited resources, multiple counties are rural, and there is an inadequate number of providers (defined as the number of providers per 100,000), access to health care services will continue to remain challenging even after the pandemic.

There is strong evidence indicating that the quality of care delivered by telehealth is equivalent, or better, to in-person care for a number of clinical conditions. A systematic review of studies published from 2008 to 2018 found that the use of video telehealth modalities was associated with fewer medication errors and a high accuracy of an initial diagnosis.[115] Additionally, in a recent study of patient satisfaction surveys in gastroenterology clinics during COVID-19, video visits were associated with a higher percentage of patients reporting that telehealth was as good as, or better than, a face-to-face visit.[116]

## Cost Savings

Some individuals have assumed that the utilization of telehealth will decrease as the volume of COVID-19 cases decrease and more individuals return to in-person visits. While the study data showed a decline in the volume of telehealth encounters, the overall utilization rate in September 2020 remained higher than at any point in 2019 and has stabilized and remains 38 times higher than pre-pandemic utilization levels.

The analysis shows that the use of telehealth can generate significant cost savings, particularly within the Medicaid program, to increase access to health care services for prevalent conditions where there is a shortage of providers within geographic proximity to the patient. Examples of conditions where telehealth can produce cost savings by improving access include mental and behavioral health, neoplasms, and cardiovascular disease. The greatest cost savings associated with the use of telehealth were realized in non-metropolitan counties with a low population density and a low provider-to-patient ratio (defined as the number of providers per 100,000 residents). The most significant cost savings were realized through preventing avoidable hospitalizations. Without detailed information on the severity of a patient's medical condition, we cautiously underestimated that timely access through telehealth reduced hospitalizations by 10%. Given the 2019 rates of hospitalizations from each of the counties we studied,[117] we contend that access to specialists via telehealth contributed to reduced hospitalizations at rates exceeding 10%.

Following reduced hospitalizations, the next largest cost driver was patient travel. Access to specialty providers, particularly psychiatrists, cardiologists, and oncologists, was limited among Medicaid beneficiaries. Analysis by the Medicaid and CHIP Payment Access Commission (MACPAC) found that psychiatrists and other specialists accept Medicaid at rates far lower than for Medicare or private insurance.[118] Many of those who accepted Medicaid did not have offices located within a reasonable distance from patients, requiring patients to make a significant investment in time to travel to the provider's office using either a personal vehicle or public transportation (when available as an option). The more prevalent the condition, the more patients had to travel, and more vehicle emissions were released, adversely impacting the environment and increasing total costs to patients based on the amount of gas needed for a round-trip in-person visit.

The only cases where the use of telehealth did not produce significant cost savings were situations where patients resided in metropolitan areas with a high volume of specialty providers. For example, in New York, the most common clinical condition among Medicare beneficiaries was cardiovascular disease. A large percent of Medicare beneficiaries who used telehealth resided in one of the five boroughs of New York City or Long Island. Access to a cardiologist did not pose a barrier, as most patients resided within a few miles from the provider's office and could easily get there by car or public transportation. In these circumstances, *the use of telehealth did generate cost savings*; however,

because savings associated with transportation were not realized, the use of telehealth to increase access to cardiovascular care in New York City had low overall utility relative to cost-benefit.

It should be noted that the costs that are used to calculate the net savings for telehealth are independent of the payer. These are fixed costs, including provider salaries and fringe benefits, maintenance, and monthly broadband costs. The net savings per beneficiary is applicable independent of the fixed costs. The sensitivity analysis shows that even as the utilization rate declines, there are still savings to the program. These savings are independent of access to specialty providers and potential care coordination from various telehealth modalities.

## The Future Role of Telehealth in Health Care Delivery

The pandemic provided a unique opportunity to demonstrate the value of telehealth as an alternative to in-person care. Even though overall utilization has decreased as provider offices have re-opened, telehealth continues to be a widely accepted method for receiving health care. Research suggest that more than two thirds of services previously only provided in person could be delivered virtually.[3]

There is extensive evidence that chronic diseases, such as diabetes, cardiovascular disease, and COPD, all highlighted in this study, can be effectively managed through a combination of telehealth and in-person care. Specifically, telehealth can be used for medication reconciliation either over the phone or on video. Both the patient and informal caregivers (such as family members) can be present during the calls and participate in the visits, increasing health literacy for the family.[119] It also provides a means to initiate necessary visits without travel, provide focused and frequent patient education when needed, and facilitate shared decision-making between the patient, family members, and the provider.

Hypertension is one of the most frequent diagnoses in our study population, prevalent within both the Medicaid and Medicare populations. Studies show that frequent self-monitoring improves both blood pressure measurements and medication adherence.[120] When coupled with telemonitoring, patients who take their blood pressure have statistically significant improvement in their hypertension.[121] Studies show that patients who are most successful at lowering their blood pressure engage in both self-monitoring as well as frequent interactions with providers, either through telehealth or in-person. Another study demonstrated that patients who regularly interact with providers and pharmacists for medication titration and receive regular education and lifestyle management (specifically through telehealth) achieve statistically significant blood pressure reduction at one year using home monitoring.[122]

Several telehealth program directors and providers affiliated with the organizations providing data for this study stated that the rate of missed appointments significantly dropped when patients could use telehealth within their homes. Last year, a survey with both a primary and specialty care clinic recorded missed appointments and compared them with an analogous cohort of in-person visits. The no-show rate of telehealth visits during the COVID-19 pandemic was 7.5% (14/186), lower than both the no-show rate of 36.1% for in-office visits (56/155) ($p < 0.0001$) and a pre-pandemic in-office no-show rate of 29.8% (129/433) ($p < 0.0001$).[123] Another study conducted by The Ohio State University Wexler Medical Center showed that using telehealth without geographic and site-of-service restrictions decreased the number of missed appointments. Before the pandemic, the overall no-show rate for in-person visits was 9% and 12.2% for Medicaid patients. To date, the overall no-show rate for telehealth visits is 5.8% and 9.6% among Medicaid patients.[124]

A survey of primary care clinicians conducted by the Larry Green Primary Care Center found that over 95% continue to use telehealth to provide important services, particularly chronic disease management and behavioral health, and two-thirds plan to continue to use telehealth to meet the needs of their patient population.[125] A patient survey conducted in 2021 found that nearly 88% of respondents would like to continue to use telehealth for non-urgent consultants after COVID-19 has passed.[126] Given these sentiments, it is likely that telehealth will continue to play a role in health care delivery moving forward.

Telehealth cannot completely replace in-person care; however, there is increased acknowledgement that many services can be performed virtually without compromising health care quality. As such, effective patient management includes a combination of in-person and virtual care such that telehealth will substitute for some in-person visits, empowering providers to employ a hybrid approach to appropriately meet the needs of each patient. For example, the appropriate management of patients with chronic conditions such as hyperlipidemia, heart failure, diabetes, and atrial fibrillation requires consistent and frequent interaction between patients, providers, nurse case managers, and other specialty staff. Telehealth improves accessibility by removing the barriers that time, transportation, and mobility issues can present to a patient. Telehealth can also increase patient engagement by reducing missed ("no show") appointments, especially for visits that are important in preventing adverse events such as follow-up visits to discuss lab results and appointments to discuss medication management.

## Limitations

There are some limitations that might affect the generalizability of these findings. First of all, the data was collected from six health systems and one Medicaid program. While services were provided to patients across the U.S., encounters were over-represented within the states where the health systems and Medicaid agencies were located. This finding likely impacted the high volume of Medicaid claims and patient demographics, including an oversampling of patients residing in rural areas.

The data we collected were from limited data sets. As such, they did not contain any identifiable information on patients. It was, therefore, difficult to know if a patient had used multiple telehealth visits for a specific condition. It is possible that, based on the patient's health status, that many individuals may have need to contact a provider several time. However, since we were unable to ascertain the percentage of repeat visits and using a broad assumption may have significant underestimated the overall utilization, we opted to assume each encounter in our data set represented one unique visit. Additionally, the three-digit zip code could have represented another county besides the one we designated. Yet, the lack of identifiable information, such as an address, made that assumption difficult. Therefore, we used the most frequent county within that three-digit number to designate a county for our analysis.

The amount we assumed for maintenance may be an underestimate as well, and it only factors in the cost of the telehealth platform. To truly identify maintenance and facility costs, we would need to gather information from each program that submitted data on other costs, such as their mortgage/rent payment, utility costs, furniture costs, and others. It is unlikely those costs would have been revealed for publication in a report, and it would have taken a significant amount of time to know the depreciated value of each of those assets. To simply the analysis and focus only on the costs and benefits of telehealth, we only factored in the cost of telehealth platform.

The data set represents encounter data from the pandemic (March) to the subsequent six months (September 2020). As such, it is difficult to estimate changes in telehealth utilization from pre-pandemic levels or ongoing telehealth utilization through the fall of 2020 and into 2021. Given that national data (CDC, CMS) showed exponential growth in telehealth use, we anticipate that encounters from our data sources were similarly a fraction of total encounters in the late winter and early spring of 2020. Likewise, we are unable to track telehealth utilization through the duration of 2020 and into 2021. However, commercial data (McKinsey) found sustained telehealth utilization levels comparable to service volume in fall 2020. Further, the COVID-19 pandemic caused an unprecedented change in daily life. The rapid adoption of telehealth exposed opportunities and challenges which are likely to impact the future use of telehealth and affect both provider and patient preferences for in-person care once COVID-19 rates drop.

The data reflects telehealth encounters at a single point in time. As such, we are unable to determine the distribution of telehealth utilization at the patient level. The data may represent a large volume of visits from some patient groups, affecting patient demographics, diagnoses, and geographic variation. Without longitudinal or claims data, we cannot analyze patients' subsequent use of non-telehealth services, including in-person ambulatory care (e.g., physician office, urgent care, pharmacy-based clinic) or emergency care visits and hospitalizations.

Additionally, the use of telehealth to potentially reduce racial and ethnic disparities in care is a critical issue to consider. However, the data received for this project were telehealth encounters, or individuals that actively sought care from March through September 2020. The data does not provide any information on those individuals who did not seek care. It also does not provide the outcomes for those patients using telehealth services. It is difficult to correlate specific socioeconomic factors to outcomes that occurred as the result of a telehealth intervention. We are unable to tell the underlying influence of race, economic status, education level, or other social determinants of health on telehealth outcomes. As a result, we removed this part of our analysis from the study.

## Conclusion

The analyses described in this report provide the most comprehensive understanding of telehealth utilization during the first six months of the pandemic. Representing all payer groups and derived from 1.4 million encounters with a demographic distribution is comparable to the U.S. population, the data provides valuable insights that have not been available to date. This paper provides a first level of analysis by:

- Characterizing the demographics of patients that received telehealth services;
- Delineating the services provided via telehealth by location and patient population;
- Calculating the individual components that account for costs and savings related to telehealth utilization; and
- Quantifying the cost benefit of telehealth based on specific disease condition, location, and patient population.

This study was conducted to support pending legislation regarding the future of waivers enacted during the COVID-19 pandemic to ensure continued access to health care. It is the authors' hope that the findings prove useful in informing deliberations by Congress and the Congressional Budget Office, the Department of Health and Human Services, Military Health Administration, Veterans Health

Administration, and commercial payers with regards to telehealth legislation, reimbursement, and other policies that will determine the future role of telehealth as a modality to deliver health care services in the United States.

# Endnotes

[1] https://www.countyhealthrankings.org/explore-health-rankings/measures-data-sources/county-health-rankings-model/health-factors/clinical-care/quality-of-care/preventable-hospital-stays

[2] Health and Human Services, What is Telehealth? How is telehealth different from telemedicine. www.healthit.gov Accessed Jul 28, 2021

[3] Bestsenny O, Gilbert G, Harris A, Rost J. Telehealth: A quarter-trillion-dollar post- COVID-19 reality? McKinsey & Company. July 9, 2021. Available at: Telehealth: A post-COVID-19 reality? | McKinsey Accessed 8/30/2021

[4] Verna S, Early impact of CMS expansion of Medicare telehealth during COVID-19. *Health Affairs Blog*, July 15, 2020. Available at: Early Impact Of CMS Expansion Of Medicare Telehealth During COVID-19 | Health Affairs Accessed 8/30/2021

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