

Factors Influencing Telehealth Utilization: Evidence from California

Emily Schultz

University of California, Berkeley

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Abstract

This paper studies the various characteristics that affect a person's likelihood of accessing and utilizing telehealth services in California. This question is particularly relevant given that telehealth has become one of the main ways people communicate with their healthcare providers during the Covid-19 pandemic. I utilize the California Health Interview Survey to conduct my analysis. First, I looked at how utilization and accessibility vary across different insurance coverages. Through my analysis, there are clearly lower usage rates among those with Medi-Cal. Therefore, I narrowed my population to those under the age of 65 with Medi-Cal and analyzed usage rates across different racial and ethnic groups. There are disparities in usage between different racial groups, so I included metrics such as mental health, speaking other languages, and being born in another country to try to explain these disparities. I then found similar patterns of usage for different racial groups among those with employment-based insurance, indicating that the source of disparity between different racial and ethnic groups is not associated with insurance, and rather some other variable worth further exploration.

I. Introduction

During the COVID-19 pandemic, telehealth, “the use of electronic information and communication technologies to provide and support health care when distance separates the participants,” has become increasingly important in the U.S. and likely worldwide (Telemedicine: A Guide to Assessing Telecommunications in Health Care 1996). In the last week of March 2020 alone there was an 154% increase in telehealth visits compared to the same period in 2019. The majority of these telemedicine encounters were people inquiring about coronavirus symptoms, meaning that the usage of telehealth likely reduced exposure to the virus, especially for medical professionals (Koonin, et al. 2020). In summary, people’s ability to access healthcare remotely during this pandemic has allowed some people to stay healthy and reduced the potential exchange of the virus in the medical setting, making telemedicine an incredibly relevant topic to study at this time. The pandemic also inspires one to question how have these events differentially affected people based on their insurance status, access to technology, or other characteristics?

The term “telemedicine” covers a large array of ways that doctors can interact with technology to help patients. In this paper, I will be focused on the commonly known form of telemedicine which is doctor’s visits that are conducted through video conference or telephone call. However, the usage of telemedicine also has broader implications for the medical field such as telesurgery, which allows a doctor to perform surgery from a distant site through robots. Over the past 30 years, usage of telehealth has become more commonplace partly because it provides a convenient way for people to engage with their health. This is especially relevant to the elderly and those that live in rural counties, where access to medicine may be limited due to distance or immobility. It is important to understand the factors that contribute to increased or decreased telehealth access and how telehealth usage can be expanded to populations where it would create

the most impact because as technology improves telehealth will continue to become one of the most important forms of healthcare.

I seek to understand how a person's insurance provider affects their usage of telehealth services. In order to increase telehealth utilization, healthcare providers must provide telehealth as an option to their patients, which is only likely if providers can expect to be reimbursed for those services. California was one of the first states to pass telehealth parity legislation to address a rise in the use of technology in medicine. The Telemedicine Development Act of 1996 prohibited health plans, specifically Medi-Cal (California's Medicaid plan), from requiring an in-person visit if the service could be provided virtually, subject to reimbursement policies that were developed by the Medi-Cal program. The California Department of Health Care Services mandated that for those with Medi-Cal, reimbursement rates for telehealth would be equivalent to those of a face-to-face visit. In 2011, the Telehealth Advancement Act was passed, which additionally mandated that private payers reimburse healthcare providers for telehealth services. Employment-based insurance coverage is private insurance that employees receive from their employer, so mandates for private insurance also apply to employment-based insurance. Based on this legislation, I hypothesize that those with private insurance and employment-based insurance will have a higher utilization of telemedicine when compared to those with Medi-Cal because legislation was passed more recently regarding those on private insurance when compared to legislation for those on Medi-Cal.

In California, legislation has not been passed directly addressing Medicare recipients because it is a national program. But an analysis of telemedicine usage among Medicare beneficiaries would be especially interesting because the elderly are one of the populations that stands to benefit the most from the relative ease of telehealth, and the majority of the elderly are covered by Medicare. In 2020, as part of the Coronavirus Preparedness and Response Supplemental

Appropriations Act, the Centers for Medicare and Medicaid Services increased accessibility to and the types of telehealth services available to Medicare users (Sodhi 2021). Previous to this act, the Balanced Budget Act of 1997 established that healthcare providers were only paid for telehealth services if a patient lived in a rural area and had to travel to get medical services. I will be analyzing utilization of telehealth in California before covered telehealth services had been expanded for Medicare users. For this reason, I hypothesize that telehealth usage will be more likely for Medicare users when compared to the uninsured, but due to policy differences, it will likely be less when compared to those with Medi-Cal, private insurance, or employment-based coverage, holding other things such as demographics as equal as possible.

I also intend to investigate the reasoning for why certain insurance types may have a decreased usage when compared to other insurance types. The first variable that I consider as a source of differences in usage is race. Certain racial groups may be more or less likely to utilize telehealth for a variety of reasons associated with characteristics that are correlated with race. These include language barriers, being born in a different country from the United States, and prevalence toward certain socioeconomic statuses, which in turn we expect to be associated with the likelihood of physical or mental health problems. Telehealth is often utilized by mental health practitioners due to its ease and similarity to in-person sessions, so if a racial group is more likely to have mental health problems than they also may be more likely to utilize telehealth.

In the past people have researched many aspects of telehealth. One article researched how health insurance mandates for telemedicine affected health outcomes and utilization (Grecu and Sharma 2019). Another article conducted a cost-benefit analysis for telehealth and determined its effectiveness at lowering per-capita Medicare reimbursement (Chakrabarti 2019). Others have written about patient's satisfaction with telehealth services (Martinez et al., 2018). Overall,

studies have examined the possible improvements that telehealth offers but have not charted and analyzed the actual usage of telehealth on a statewide level.

To answer my research question, which is how telehealth usage varies depending on different insurance coverage plans, I will utilize the California Health Interview Survey. This survey interviews over 20,000 Californians annually and asks many demographic and health related questions. One of the questions that the California Health Interview Survey asks is whether a person has received care from a health provider through video/phone in the past 12 months. This is my main outcome variable. The survey also asks what a person's current health coverage source is, which is my first independent variable. In my model I will also include control variables for age, gender, race, income, education, and county of residence. I utilize an OLS regression to determine how the likelihood of utilizing telehealth differs for each insurance type when compared to the uninsured. I run a pooled linear regression on the data for the years 2015, 2016, 2017, and 2018, including time fixed effects to control for any common influences of technological change over this period. In addition, I look at the level of telehealth utilization within each insurance type and compare which insurance types have the largest utilization rates. I then condensed my population into Medi-Cal recipients under the age of 65 and investigated how race, being born in another country, language barriers, and differences in mental health may have contributed to differences in the level of telehealth usage.

The remainder of this paper will follow this outline. Section II will discuss previous literature that has been published on the topics of how insurance type affects general health utilization and telehealth utilization. Section III describes the empirical model and data that I utilized to answer my question. Section IV provides empirical results and explains the robustness checks that I performed. Section V will provide a summary of my conclusions, limitations of my model, and possible future topics of study.

I. Literature Review

Several researchers have analyzed telehealth utilization in the past, focusing on the effects of telehealth parity legislation. Researchers analyzed how the adoption of telehealth parity legislation affected the utilization of telehealth services (Valenta, et al. 2019). The researchers determined how the frequency of telehealth private insurance claims varied between states with and without telehealth parity laws and examined how the frequencies changed over six time periods from 2010-2015. Valenta, et al. (2019) determined that the utilization of telehealth is increasing over time. However, the overall utilization of telehealth during these years was still limited when compared to all outpatient visits. Other researchers looked into how telehealth insurance mandates affected healthcare costs (private health insurance premiums), healthcare utilization (hospital and primary care usage), and patient outcomes (self-reported health status) (Grecu and Sharma 2019). Grecu and Sharma (2019) found that the adoption of telehealth insurance mandates led to a sustained increase in private insurance enrollment, leading to a decrease in healthcare costs per person. They found further evidence of increased primary care utilization, decreased hospital utilization, and improved self-reported health outcomes, which could indicate cost efficiency.

My paper differs from these researchers' because they only analyzed telehealth utilization by private insurance users from the perspective of immediately before and after private insurance parity legislation. I intend to analyze the long-term effects of parity telehealth legislation on telehealth utilization by Medi-Cal, Medicare, and private insurance users. California adopted Medi-Cal telehealth coverage legislation in 1996 and 2011, before my dataset starts, so this legislation will not have a large impact on my analysis and instead I will compare usage rates between Medi-Cal and private insurance coverages in the pooled panel data, which is like comparing steady states. Coverage for telehealth services for Medicare users

was not expanded until March 2020, during the coronavirus pandemic, so I expect to find lower telehealth usage levels in this group.

Researchers have also explored how general health care utilization varies between different insurance coverages. Several researchers analyzed the effect of not having health insurance on healthcare utilization (Anderson, Dobkin and Gross 2012). They compared the health care consumption of teenagers who are under the age of nineteen and were still considered a dependent of their parents by private insurers at that time to the health care consumption of those who are just older than nineteen. Anderson, Dobkin, and Gross (2012) found that insurance coverage is correlated with higher utilization of healthcare and higher healthcare costs. In contrast, Dafny and Gruber (2005) analyzed how expansions in Medicaid for low-income children effected child hospitalizations. The researchers tracked child hospitalizations when Medicaid expansions first occurred in 1983 up until 1996 and found how the rates of hospitalizations related to the probability that a child is eligible for Medicaid. Dafny and Gruber (2005) discovered that a 10% increase in Medicaid eligibility was associated with an 8.4% increase in child hospitalizations. The expansion of Medicaid led to an increase in healthcare access and utilization, reducing the increase of avoidable hospitalizations and increasing unavoidable hospitalizations.

The research by Anderson, Dobkin, and Gross (2012) is different from my research because they consider the differences in healthcare utilization between private insurance users and non-insurance users. The research by Dafny and Gruber (2005) differs from mine because it concentrated on the effects of Medicaid expansion on healthcare utilization. I will be comparing one element of healthcare utilization, specifically telehealth, between private insurance users, non-insurance users, Medicare, and Medi-Cal users. Also, both of these articles analyzed children, while I will be focused on adults and the elderly.

In conclusion, there is no research specifically addressing how telehealth utilization varies according to private, Medi-Cal, and Medicare insurance in California. Most research that has been done on this topic focuses on how telehealth utilization varies for the privately insured according to state parity legislation or how healthcare utilization generally is affected by insurance coverage. All previous research has been done on a nationwide or multi-state scale, and I will be addressing this topic in California only. My research will create an understanding of who has been able to utilize telehealth services and whether California legislation aimed at expanding telehealth services has been successful. It will also depict how telehealth services were utilized prior to the coronavirus pandemic, and it may provide insights into how or why telehealth utilization changed in reaction to the coronavirus pandemic.

II. Empirical Model and Data

2.1 Data and Variables. To answer my research questions, I am utilizing the California Health Interview Survey, which is a repeated cross section of Californian residents (California Health Interview Survey 2015, 2016, 2017, 2018). This is both a web and telephone survey, and about 20,000 people have been surveyed annually since 2001. The survey employs an address-based sampling frame to ensure that it is representative of California's population. The sample sizes of my data set are as follows: in the year 2015 the sample size is 21,034 adults, in the year 2016 the sample size is 21,055 adults, in the year 2017 the sample size is 21,253 adults, and in 2018 the sample size is 21,177 adults.

In my first regression, my outcome variable is "Received care from health provider through video/phone in the past 12 months", which represents someone's usage of telehealth. This is a dichotomous variable with one indicating yes and zero indicating no. My main predictor variable is insurance type, which can take these values: uninsured, Medicare & Medicaid, Medicare & others, Medicare only, Medicaid, employment-based, privately

purchased, and other public. In my regression, I include a dummy variable for each insurance type. I include several control variables in my regressions. The control variable age takes on different values for each 4-year increment of increase and the control variable gender is a dummy variable with one indicating male and zero indicating female. The control variable education is measured in years. The control variable race is based on the Office of Management and Budget's classification of race and ethnicity and it takes on the values Hispanic, non-Hispanic white, African American, American Indian/Alaskan Native, Asian only, and other/two or more races. In my regression, I include a dummy variable for each race to account for differences between each race. The control variable for income is a measure of a household's total annual income before taxes, in increments of \$10,000 up to income over \$180,000. The last control variable I include is whether a person lives in a metropolitan (urban) county, which has a value of one, or a non-metropolitan (rural) county, which has a value of zero.

After my initial analysis I decided to limit the population to just those with Medi-Cal under the age of 65. Then, to further explore the nature of differences in usage across race and ethnicity, I included variables for whether a person speaks Spanish, a different language, or is foreign born. All of these variables are dummy variables taking on a value of 1 if the person speaks Spanish, a different language, or was born in another country.

Finally, in order to explore the role of mental health treatment in telemedicine, I also included a regression with the Kessler Index as the main outcome variable and then included the variable as a regressor in the regression with telehealth utilization as the main outcome variable. The Kessler Index variable is a measure of psychological distress and can take on any valuable of 10 to 50. A value of 13 is described as "serious mental illness" therefore I created a dummy variable taking on a value of 1 if the person has an index of 13 or greater and 0 if the person has an index below 13.

A summary of my first outcome variable, utilization of telehealth, is described in Table 1, which can be found in the Appendix. This summary data is on the entire population in the sample. The percentages below each value represent the percentage of the total population that utilized telehealth. In 2015 and 2016 around 10% of the population report utilizing telehealth and there is a slight increase in 2017 and 2018. Table 2, which can also be found in the Appendix, is a summary of my main predictor variable, insurance type. This summary data is also on the entire population in the sample. The percentages below each value represent the percentage of the total population with each insurance type. The percentages of people with each insurance type are about the same across every year, with the highest percentage, 33%, being on employment-based insurance and the lowest percentage, 1%, on “Other Public” insurance. For my control variables, the average age is 53 years old in each year and the average income is in the range from \$70,000-\$79,999. As to be expected, the majority of individuals in my data set live in metropolitan counties and about 50% of the individuals in the data set are white. In addition, about 45% are male and 55% female.

2.2 Empirical Model. I utilize standard linear regression techniques to obtain estimates for how the likelihood of utilizing telehealth, my endogenous variable, trends across insurance type. In addition, I assume that this survey is a representative sample because this survey was conducted through the telephone or web. My econometric model is:

$$Telehealth_{it} = \alpha + \beta_1 Insurance\ Type + \beta_2 X + u_{it}$$

where $Telehealth_{it}$ is a dummy variable indicating whether or not a person has accessed telehealth in the past year, X includes control variables, such as income, age, gender, race, education, and urban or rural residence and u_{it} is the error term corresponding to all other determinants of y_{it} , modeled using standard techniques that produce robustness to certain kinds of heteroskedasticity. To avoid multicollinearity, the uninsured and white non-Hispanics are dropped from the

regression. Therefore, I evaluate the relationship between all insurance types (Medicare & Medicaid, Medicare & others, Medicare only, Medicaid, employment-based, privately purchased, other public) and the likelihood that each insurance type would utilize telehealth in comparison to the uninsured. I run a pooled regression for the years 2015, 2016, 2017, and 2018 and include time fixed effects. I was unable to include individual fixed effects because the data set does not follow individuals over time. The model for the second regression is:

$$y_{it} = \alpha + \beta_1 RacialGroup + \beta_2 X + u_{it}$$

where y_{it} is a dummy variable indicating whether or not a person has accessed telehealth in the past year, X includes control variables, such as income, age, gender, education, and urban or rural residence and u_{it} is the error term corresponding to all other determinants of y_{it} . In this regression, I chose to only analyze those with Medi-Cal under the age of 65 because that group had the lowest utilization rates in my first regression. The third regression follows the same format as regression two but includes the control dummy variables for if a person speaks Spanish, a different language, or is foreign born. Regression four has a slightly different model because the main outcome variable is the dummy variable for the Kessler Index, which takes a value of 1 if it is greater than 13. The rest of the model is the same as regression two. The fifth and sixth regressions follow the same format but the fifth regression includes the Kessler index control variable. Regression seven limits the population to those with employment-based insurance for purposes of comparison.

In my regressions I chose to conduct an ordinary least squares model instead of a probit or logit model. In this case, this is acceptable because telehealth usage, my dependent variable, was on average not close to 0 or 1. In addition, I checked discrete choice models and found similar results.

III. Results

I present the regression results below. Each regression is presented in a table with the dependent variable as well as all control variables included.

Regression on Insurance Type. Table 3 provides the regression results from all of the years with the white non-Hispanic group as the default. The main outcome variable in this regression is utilization of telehealth and the sample in the whole population from 2015-2018.

When compared to the uninsured, the highest utilization is among those with Medicare and Medi-Cal, at 7.4% and the lowest utilization is among those with only Medi-Cal at about 2.9%. Those with Medicare and other insurance and employment-based insurance have about the same likelihood of utilization at around 6% more likely than the uninsured. People with private insurance were about 3% more likely than the uninsured, people with other public insurance were about 4.2% more likely than the uninsured, and people with Medicare alone were about 5.3% more likely than the uninsured to use telehealth. All of these figures are significant at the 1% level, so insurance coverage does have an impact on telehealth usage.

Other results provide further insights. For every \$10,000 increase in a person's income, they are .06% more likely to utilize telehealth. If a person is male, they are 2.1% less likely to utilize telehealth and if a person lives in a metropolitan area, they are 4.3% more likely to use telehealth. These results show that Hispanics are 2.9% less likely,

Table 3

VARIABLES	(1) Telehealth
Medicare & Medi-Cal	0.0737*** (0.00513)
Medicare & Others	0.0585*** (0.00460)
Medicare Only	0.0529*** (0.00664)
Medi-Cal	0.0294*** (0.00344)
Employment-Based	0.0617*** (0.00369)
Privately Purchased	0.0302*** (0.00509)
Other Public	0.0423*** (0.0102)
Age	-0.000384*** (8.47e-05)
Male	-0.0216*** (0.00211)
Education	0.00448*** (0.000403)
Income	0.000670** (0.000273)
Urban vs. Rural	0.0426*** (0.00342)
Hispanic	-0.0289*** (0.00294)
African American	0.0156*** (0.00561)
American Indian	-0.0119 (0.0104)
Asian	-0.0319*** (0.00323)
Other/Two or more races	0.000413 (0.00709)
2016	-0.00425 (0.00331)
2017	-0.00425 (0.00331)
2018	-0.00425 (0.00331)
Constant	-0.00882 (0.00834)
Observations	84,220
R-squared	0.014

African Americans are 1.5% more likely, and Asians are 3.2% less likely to utilize telehealth than white non-Hispanics. All of these results are significant at the 1% level; therefore, race does seem to have an impact on telehealth utilization.

Medi-Cal Recipients Under 65. Table 4 provides the regression results of all Medi-Cal recipients under the age of 65, which was the group with the lowest utilization in regression 1. The main outcome variable in this regression is utilization of

telehealth and the sample is only Medi-Cal recipients under the age of 65.

When compared to white non-Hispanics with Medi-Cal, Hispanics and Asians are about 3.5% less likely to utilize telehealth. In contrast, African Americans with Medi-Cal are 0.8% more likely than white non-Hispanics to utilize telehealth. The results for Hispanics and Asians are significant at the 1% level, but the results for African Americans are not significant. Therefore, race does impact telehealth usage among those with Medi-Cal for Hispanics and Asians, but it is not a large contributor to telehealth usage variance for African Americans with Medi-Cal. Living in a metropolitan city does slightly

increase the likelihood of using telehealth by 2.4% and being male slightly decreases the chances of utilizing telehealth by 1.6%. In addition, as education level increases there is a 0.5% higher chance of a person utilizing telehealth. All of these coefficients are significant at the 1% level.

Including Other Languages and Foreign Birth. Table 5 explores some of the reasons why Asians and Hispanics may have lower usage rates when compared to white non-Hispanics. Some factors that may contribute to the decrease in usage among these racial and ethnic groups may be

Table 4

VARIABLES	(1) Telehealth
Age	0.000247 (0.000156)
Male	-0.0155*** (0.00439)
Education	0.00542*** (0.000849)
Income	-9.41e-05 (0.000881)
Urban vs. Rural	0.0241*** (0.00840)
Hispanic	-0.0352*** (0.00609)
African American	0.00802 (0.0106)
American Indian	0.00354 (0.0226)
Asian	-0.0380*** (0.00796)
Other/Two or more races	0.0161 (0.0155)
2016	0.000232 (0.00640)
2017	0.000232 (0.00640)
2018	0.000232 (0.00640)
Constant	0.000773 (0.0161)
Observations	14,620
R-squared	0.012

whether a person is born in the US and whether English is their first language. To measure this, I included a dummy variable for if a person speaks Spanish in the home, a different language, or are foreign born. The main outcome variable in this regression is utilization of telehealth and the sample is Medi-Cal recipients under the age of 65.

Based on these results, speaking another language does have a negative effect on usage of telehealth; people are 3.8% less likely to utilize telehealth if they speak a different language. This coefficient is significant at the 1% level, so speaking a different language does have a significant effect on whether a person utilizes telehealth. Specifically, if a person speaks Spanish, they are 1.28% less likely to utilize telehealth, but this coefficient is not significant, so speaking Spanish does not have a significant effect on whether a person utilizes telehealth. Being foreign born makes a person 1.4% less likely to use telehealth, this

coefficient is not significant at the 1% or 5% level, therefore it does not have a significant effect on utilization of telehealth. While some of these variables may not be significant, the fact that they are all negative does partially explain why certain races and ethnicities may not be as likely to utilize telehealth as white Non-Hispanics. Including these variables in the regression also alters the coefficients for racial groups. Hispanics are 2.4% less likely to utilize telehealth and Asians are 1.5% less likely to utilize telehealth than white non-Hispanics. This is a slight decrease in the likelihood when compared to the previous regression, meaning that including the variables for

Table 5

VARIABLES	(1) Telehealth
Age	0.000479*** (0.000171)
Male	-0.0174*** (0.00441)
Education	0.00388*** (0.000945)
Income	-9.39e-05 (0.000880)
Urban vs. Rural	0.0258*** (0.00841)
Hispanic	-0.0240*** (0.00692)
African American	0.00764 (0.0106)
American Indian	0.00198 (0.0225)
Asian	-0.0152 (0.0109)
Other/Two or more races	0.0171 (0.0155)
Spanish	-0.0128 (0.00873)
Other Language	-0.0384*** (0.0128)
Foreign Born	-0.0143* (0.00773)
2016	0.000231 (0.00640)
2017	0.000231 (0.00640)
2018	0.000231 (0.00640)
Constant	0.0112 (0.0163)
Observations	14,620
R-squared	0.013

languages and being born in another country did affect the likelihood of these racial and ethnic groups utilizing telehealth. But for Hispanics, it represents a decrease of less than 2 standard errors in the point estimate of the coefficient, which remains significant at the 1% level. For Asians, the coefficient falls by more than half and become insignificant at the 10% level. These patterns imply that Asian American Medi-Cal beneficiaries probably use telemedicine less because of language difficulties, while Hispanic beneficiaries use it less for other reasons.

Mental Health as the Dependent Variable. One main use of telehealth is for mental health services; therefore, it may be expected that those with

worse mental health may use more telehealth services. The Kessler Screening Scale is utilized to analyze mental health and a level of 13 is identified as the meaningful level for needing mental health services. In this regression, the dependent variable is the Kessler Screening Scale metric, and the independent variables are racial and ethnic groups. Therefore, this regression evaluates the likelihood that a person in each racial and ethnic group would seek out mental health services. The main outcome variable in this regression is whether a person’s Kessler Index is greater than 13 and therefore significant and the sample is Medi-Cal recipients under the age of 65.

When compared to white non-Hispanics, Hispanics were 5.2% less likely to have a mental health level of 13 or above, they were also 3.5% less likely to utilize telehealth.

African Americans were 0.9% less likely to have a meaningful level of mental health. but they

Table 6

VARIABLES	(1) Kessler Index >13
Age	0.00144*** (0.000188)
Male	-0.00603 (0.00490)
Education	-0.00808*** (0.00103)
Income	-0.00429*** (0.000969)
Urban vs. Rural	0.0175* (0.0102)
Hispanic	-0.0524*** (0.00740)
African American	-0.00935 (0.0114)
American Indian	0.00165 (0.0273)
Asian	-0.0651*** (0.00976)
Other/Two or more races	-0.0200 (0.0152)
Spanish	-0.0530*** (0.00877)
Other Language	-0.0480*** (0.0119)
Foreign Born	-0.00922 (0.00727)
2016	0.0106 (0.00712)
2017	0.0106 (0.00712)
2018	0.0106 (0.00712)
Constant	0.169*** (0.0200)
Observations	14,576
R-squared	0.027

were 0.8% more likely to use telehealth. This indicates the African American’s need for mental health services are not indicative of African American’s telehealth utilization. Finally, Asians are 6.5% less likely to have a need for mental health services and they are 3.8% less likely to utilize telehealth than white non-Hispanics. The results for both Hispanics and Asians indicate that mental health services may be a main motivation for accessing telehealth and partially explain the reduced usage rates in these racial groups. The coefficients for Asians and Hispanics were significant at the 5% level, meaning that for these groups, race did have a significant impact on mental health, but the coefficient for African Americans is not significant, meaning that being African American does not significantly affect whether a person may need mental health services compared to non-Hispanic whites.

Including Mental Health Index. With the Kessler metric included in the regression, we can look at how the utilization of telehealth differs across different races while controlling for mental health. Table 7 shows the results of this regression. The main outcome variable in this regression is utilization of telehealth and the sample is Medi-Cal recipients under the age of 65.

The coefficient for Hispanics and Asians is negative, Hispanics are 1.96% less likely to utilize telehealth and Asians are 1.42% less likely to utilize telehealth when compared to white non-Hispanics. This is a slight decrease in the difference in usage between these groups and white non-Hispanics, which can be contributed to the inclusion of language variables, the foreign-born variable, and the Kessler index variable. The coefficient for Hispanics is significant, but the coefficient for Asians is not. For

VARIABLES	(1) Telehealth
Age	0.000384** (0.000188)
Education	0.00456*** (0.000949)
Income	0.000323 (0.000881)
Urban vs. Rural	0.0240*** (0.00842)
Hispanic	-0.0196*** (0.00694)
African American	0.00811 (0.0105)
American Indian	0.00141 (0.0225)
Asian	-0.0142 (0.0107)
Other/Two or more races	0.0106 (0.0151)
Spanish	-0.00987 (0.00870)
Other Language	-0.0317** (0.0126)
Foreign Born	-0.0121 (0.00768)
2016	-0.000797 (0.00636)
2017	-0.000797 (0.00636)
2018	-0.000797 (0.00636)
Kessler K6	0.0870*** (0.0105)
Constant	-0.00352 (0.0163)
Observations	14,576
R-squared	0.022

Hispanics, race does have a significant effect on telehealth utilization. African Americans are 0.8% more likely to use telehealth than white non-Hispanics, which is a slight decrease from previous regressions and can be attributed to the control variables included. The coefficient for African Americans is not significant.

Employment-Based Insurance. In order to compare the results of utilization across different races for those with Medi-Cal, I conducted a regression that looks at utilization across different races for those with employment-based insurance. The main outcome variable in this regression is utilization of telehealth and the sample is people with employment-based insurance.

Compared to white non-Hispanics, Hispanics with employment-based insurance are 2.3% less likely to utilize telehealth, this is very similar to the results from Hispanics with Medi-Cal who were about 2.4% less likely to use telehealth. This coefficient is significant at the 1% level, meaning that race does have a significant impact for Hispanics on telehealth utilization among those with employment-based insurance.

Also, there is similar utilization between Hispanics with Medi-Cal and employment-based insurance. Asians with employment-

based insurance are about 2% less likely to utilize telehealth, which is slightly more than Asians with Medi-Cal who are 1.5% less likely to utilize telehealth. This coefficient is significant at the 1% level. African Americans with employment-based insurance are 1.4% more likely to use telehealth services than white non-Hispanics, which is higher than African Americans with Medi-Cal, who are only 0.2% more likely to utilize telehealth than white non-Hispanics. This coefficient

Table 8

VARIABLES	(1) Telehealth
Age	-0.000690*** (0.000162)
Male	-0.0549*** (0.00410)
Education	0.000428 (0.000862)
Income	0.00124** (0.000485)
Urban vs. Rural	0.0598*** (0.00755)
Hispanic	-0.0237*** (0.00596)
African American	0.0136 (0.0111)
American Indian	0.0321 (0.0256)
Asian	-0.0200*** (0.00669)
Other/Two or more races	-0.0197 (0.0124)
Spanish	-0.0279*** (0.00978)
Other Language	-0.0742*** (0.0128)
Foreign Born	-0.0142** (0.00571)
2016	-0.0120 (0.00734)
2017	-0.0120 (0.00734)
2018	-0.0120 (0.00734)
Kessler K6	0.175*** (0.0209)
Constant	0.126*** (0.0165)
Observations	25,276
R-squared	0.019

is not significant at the 1% level, so other factors besides race may be contributing to this group's higher utilization rates.

IV. Conclusions

5.1 Summary of Results. In conclusion, employment-based insurance users and Medicare users had the highest usage levels across insurance types and had the highest increased likelihood of using telehealth when compared to the uninsured. Employment-based insurance is a form of private insurance, so these results make sense in the context of the Telehealth Advancement Act, which was passed in 2011 and mandated that private insurance coverages reimburse for telehealth services. However, this legislation did not have the same effect on private insurance users. The high level of usage among those with Medicare is surprising considering that reimbursement for telehealth services was not expanded until 2020. However, as I discussed earlier, the elderly are one of the populations where telehealth can provide the largest benefits because of its convenience. The elderly usually require more visits to the doctor's office and are more likely to have difficulty getting to the doctor's office. Health care practitioners are aware of these difficulties and it is possible that they offer telehealth services to the elderly more because it provides an easier option for them to access health care.

According to my regression results, the Telemedicine Development Act of 1996, which expanded telehealth services to Medi-Cal users, did increase telehealth usage for Medi-Cal users when compared to the uninsured, but it was not as successful when compared to other insurance coverages. I investigated why Medi-Cal users may be less likely to utilize telehealth by limiting the population to only those under age 65 with Medi-Cal and running a regression across different races and discovered that the majority of this decreased usage was among Hispanics and Asians. I considered possible reasons for decreased usage among these groups including speaking a different language, being born in another country, and mental health differences.

When all of these variables were included in the regression, I found that they partially explained the decreased usage among Asians and Hispanics. I found that speaking another language does decrease the likelihood that someone will utilize telehealth and likely deters Asians and Hispanics from using telehealth. In addition, I found that Hispanics and Asians were much less likely to have a significant mental health index on the Kessler scale, meaning that they were much less likely to require mental health services, which is often one of the main reasons people access telehealth.

For comparison reasons, I also limited my population to only those with employment-based insurance and looked for any differences in utilization among different races. I found a similar trend to those with Medi-Cal under the age of 65, Asians and Hispanics have a decreased likelihood of using telehealth and African Americans have an increased likelihood of using telehealth when compared to white non-Hispanics. This proves that differences among usage rates in different racial groups transcend insurance type.

5.2 Limitations of my Model. Unfortunately, my model had very low R squared values in every year's regression. Therefore, insurance type and race does not explain most of the variation in telehealth usage across the population. It is possible that there are other unobservable variables that influence healthcare providers on their decision to provide telehealth to their patients or that influence people on their insurance coverage choice, which could bias my results. For insurance coverage, this issue could be solved with an instrumental variable that is correlated with insurance coverage but is not correlated with unobservable factors. Also, due to a lack of data, I was only able to evaluate the results of telehealth usage many years after legislation had been passed. If data was available prior to the years when legislation passed regarding insurance coverages and telehealth, then I could perform a difference-in-differences estimation, which may better estimate the immediate impacts of this legislation.

5.3 Topics of Future Study. The finding that insurance coverage does not explain most of the

variation in telehealth is interesting because it presents an opportunity to discover where the variance in telehealth usage stems from and how the government could create policy to increase telehealth usage. In addition, the discovery that certain racial groups, specifically Asians and Hispanics, have decreased usage levels provides an opportunity to remove these group's barriers to using telehealth and discover ways to increase their usage. The finding that those living in metropolitan areas utilize more telehealth is also an interesting considering that telehealth utilization likely benefits those living in rural counties more. Future research into why metropolitan counties have higher telehealth utilization rates may provide an understanding for how rural residents can gain more access. In the future, an analysis of how telehealth usage varies according to insurance type in 2020 could provide interesting insights on the impacts of the virus, which made using telehealth very attractive.

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VI. Appendix

Year	2015	2016	2017	2018
Utilized Telehealth	2,181 (10%)	2,161 (10%)	2,669 (12%)	2,736 (13%)

Table 1

Year	2015	2016	2017	2018
Uninsured	1,473 (7%)	1,307 (6%)	1,242 (6%)	1,267 (6%)
Medicare & Medi-Cal	1,768 (8%)	1,907 (9%)	1,816 (9%)	2,094 (10%)
Medicare & Others	5,409 (26%)	5,325 (25%)	5,508 (26%)	5,516 (26%)
Medicare Only	568 (3%)	790 (4%)	882 (4%)	863 (4%)
Medicaid	3,399 (16%)	3,720 (18%)	2,954 (14%)	3,098 (15%)
Employment-Based	6,856 (33%)	6,574 (31%)	7,226 (34%)	6,934 (33%)
Privately Purchased	1,305 (6%)	1,204 (6%)	1,247 (6%)	1,153 (5%)
Other Public	256 (1%)	228 (1%)	278 (1%)	252 (1%)

Table 2

