

Considering Trends in Telemedicine Usage since 2020

Data Visualization Bootcamp
Group Project # 1

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Primary Dataset:

Medicare Telehealth Trends from the Centers for Medicare & Medicaid Services

Questions We Attempted to Answer:

1. What effect did the onset of the 2020 pandemic have on the usage of telemedicine and if there was an effect, have trends been sustained?
2. What was the breakdown in telemedicine usage by demographic factors?
3. Does telemedicine usage vary significantly by state?

Data Preparation and Analysis

```
# Importing Medicare data
medicare_data_df = pd.read_csv("Data\\Medicare_Telehealth_Trends_Q1_2023.csv")
medicare_data_df.head()
```

[3]

Python

	Year	quarter	Bene_Geo_Desc	Bene_Mdcd_Mdcr_Enrl_Stus	Bene_Race_Desc	Bene_Sex_Desc	Bene_Mdcr_Entlmt_Stus	Bene_Age_Desc	Bene_RUCA_Desc	Total_Bene_TH_Elig	Total_PartB_Enrl	Total_Bene_Telehealth	Pct_Telehealth
0	2023	1	Wyoming	Medicare Only	All	All	All	All	All	57582.0	87532.0	3976.0	0.0690
1	2023	1	Wyoming	Medicare & Medicaid	All	All	All	All	All	7781.0	10302.0	1373.0	0.1765
2	2023	1	Wyoming	All	Other/Unknown	All	All	All	All	NaN	NaN	NaN	NaN
3	2023	1	Wyoming	All	Non-Hispanic White	All	All	All	All	59795.0	89194.0	4813.0	0.0805
4	2023	1	Wyoming	All	Hispanic	All	All	All	All	2476.0	3786.0	213.0	0.0860

```
# Checking where NaN values come from
medicare_data_df.loc[medicare_data_df["Total_Bene_TH_Elig"].isna()].groupby(["Bene_Race_Desc", "Bene_RUCA_Desc"]).count()
```

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Python

			Year	quarter	Bene_Geo_Desc	Bene_Mdcd_Mdcr_Enrl_Stus	Bene_Sex_Desc	Bene_Mdcr_Entlmt_Stus	Bene_Age_Desc	Total_Bene_TH_Elig	Total_PartB_Enrl	Total_Bene_Telehealth	Pct_Telehealth
Bene_Race_Desc		Bene_RUCA_Desc											
All	All	All	16	16	16	16	16	16	16	0	0	0	0
		Rural	16	16	16	16	16	16	16	0	0	2	0
		Unknown	864	864	864	864	864	864	864	0	0	0	0
	American Indian/Alaska Native	All	8	8	8	8	8	8	8	0	0	1	0
Asian/Pacific Islander		Unknown	16	16	16	16	16	16	16	0	0	0	0
		Unknown	16	16	16	16	16	16	16	0	0	0	0
	Black/African American	Unknown	16	16	16	16	16	16	16	0	0	0	0
	Hispanic	Unknown	16	16	16	16	16	16	16	0	0	0	0
Non-Hispanic White		Unknown	16	16	16	16	16	16	16	0	0	0	0
		All	1008	1008	1008	1008	1008	1008	1008	0	0	0	0
		Rural	16	16	16	16	16	16	16	0	0	0	0
		Unknown	16	16	16	16	16	16	16	0	0	0	0
Other/Unknown		Urban	16	16	16	16	16	16	16	0	0	0	0

```
# Cleaning up columns
cleaned_data = medicare_data_df.rename(columns={"Bene_Geo_Desc": "State", "Bene_Mdcd_Mdcr_Enrl_Stus": "Medicare/Medicaid", "Bene_Race_Desc": "Race",
"Benef_Sex_Desc": "Sex", "Bene_Mdcr_Enrlmt_Stus": "Entitlement Status", "Bene_Age_Desc": "Age", "Bene_RUCA_Desc": "Locality", "Total_Bene_TH_Elig": "Total Telehealth-Eligible Users",
"Total_PartB_Enrl": "Part B Enrollment", "Total_Bene_Telehealth": "Telehealth Users", "Pct_Telehealth": "Percent of Telehealth Users"}).dropna().reset_index(drop=True)
cleaned_data.head()
```

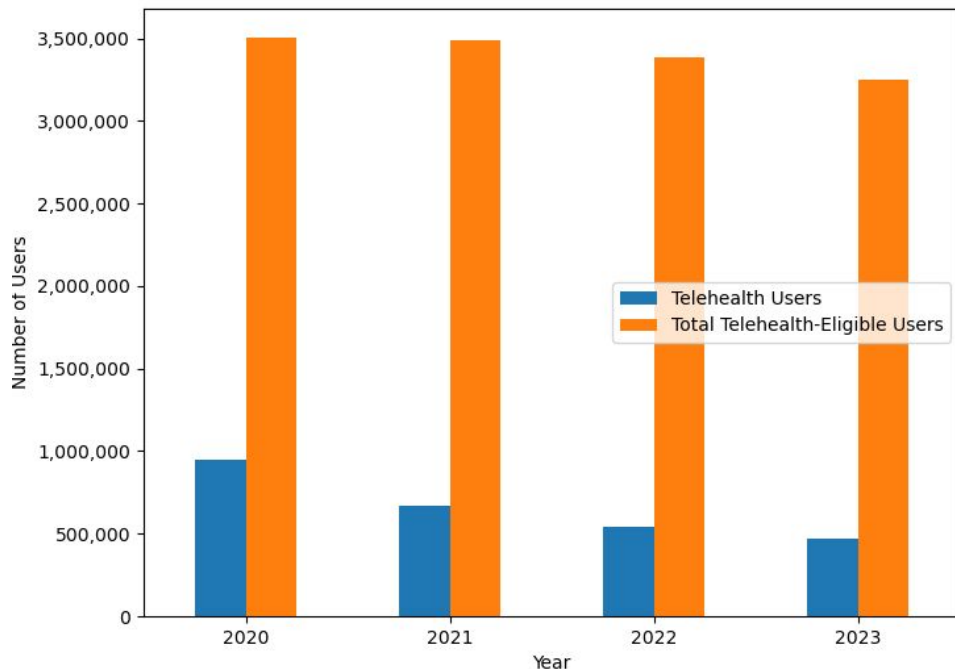
[5]

Python

	Year	quarter	State	Medicare/Medicaid	Race	Sex	Entitlement Status	Age	Locality	Total Telehealth-Eligible Users	Part B Enrollment	Telehealth Users	Percent of Telehealth Users
0	2023	1	Wyoming	Medicare Only	All	All	All	All	All	57582.0	87532.0	3976.0	0.0690
1	2023	1	Wvoming	Medicare & Medicaid	All	All	All	All	All	7781.0	10302.0	1373.0	0.1765

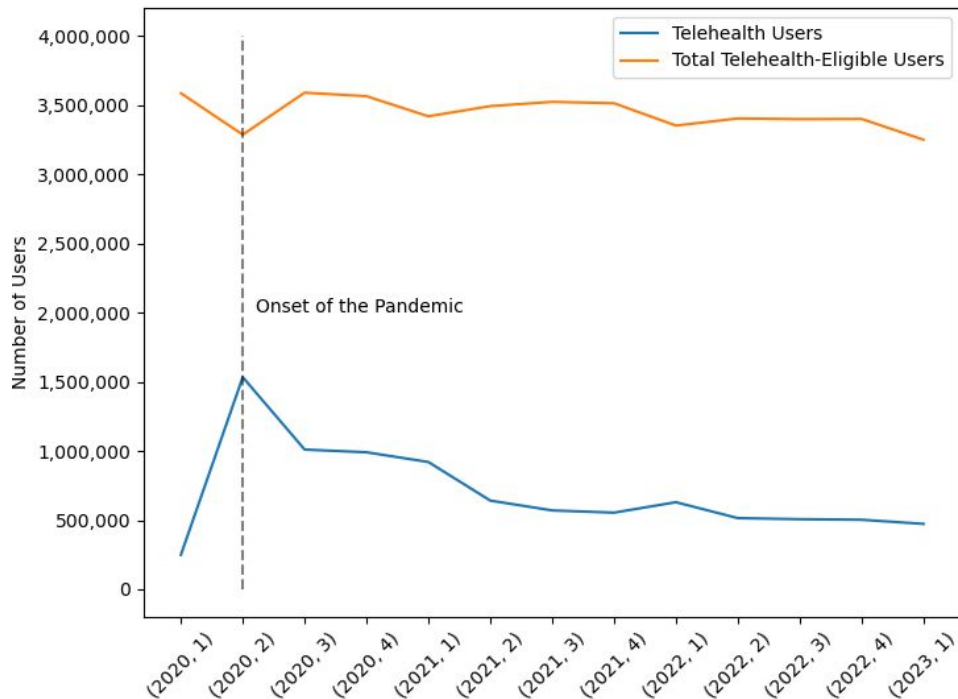
Question 1: What effect did the onset of the 2020 pandemic have on the usage of telemedicine and if there was an effect, have trends been sustained?

National Trends by Year



- Telemedicine use was highest in 2020, the year in which the COVID-19 pandemic began
- The number of telemedicine users has decreased in the years since 2020
- The total population of medicare beneficiaries using services which are eligible for telemedicine has decreased as well, but not as significantly as the number of users accessing telemedicine services
- This data is grouped by year, though we know the pandemic began partway through 2020, so we must consider the data more specifically

National Trends by Year and by Quarter



- The largest increase in use of telemedicine by user was in the second quarter of 2020, after the pandemic began
- Usage of telemedicine has decreased since 2020, but is higher in the first quarter of 2023 than in the first quarter of 2020
- The number of telemedicine users has not equaled the number of users in the first quarter of 2020 since after the pandemic began, it has remained a greater number
- The number of users accessing services which are eligible for telemedicine has stayed more consistent than the number of users using telemedicine when we look at the data by quarter

Limitations to visualizations and analysis for Question 1:

What effect did the onset of the 2020 pandemic have on the usage of telemedicine and if there was an effect, have trends been sustained?

- “Total Telehealth-Eligible Users” represents the population of Medicare beneficiaries who received services eligible for telehealth from a list of covered services effective July 2022
- The services that were used prior to July 2022 may not have been eligible for telemedicine because they were not under the same criteria
- The Center for Medicare & Medicaid Services explained in the methodology of this study that “Prior to March 2020, Medicare paid for telemedicine services under limited circumstances, with these services variously restricted to rural or health professional shortage areas, established patients, or certain types of healthcare providers. In response to the COVID-19 public health emergency (PHE), telemedicine services have been expanded via emergency waiver authority, through rulemaking, and through Congressional action to increase access to care.”
- Expansion of coverage and access to telemedicine services came in response to the COVID-19 pandemic, so one cannot attribute the increase in demand/usage of services entirely to the advent of the pandemic

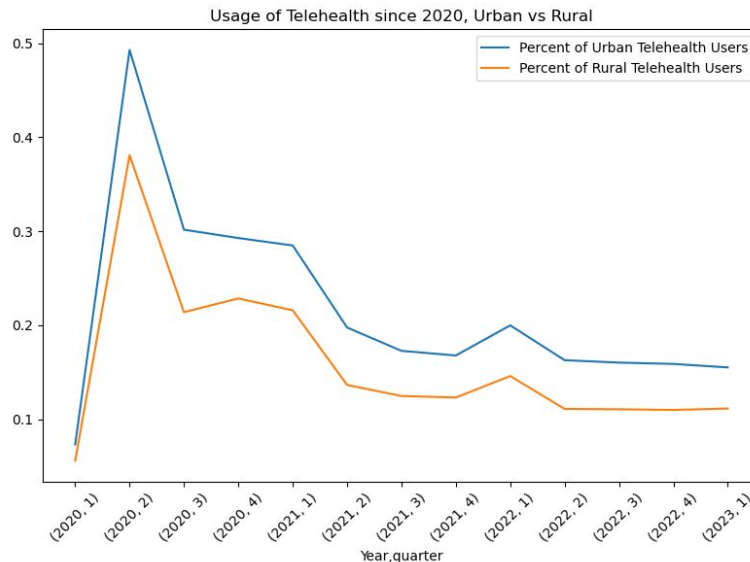
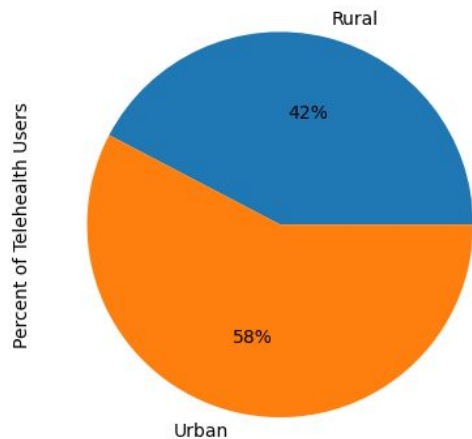
Question 1: What effect did the onset of the 2020 pandemic have on the usage of telemedicine and if there was an effect, have trends been sustained?

Analysis and Conclusion

- The effect was increased usage of telemedicine services by medicare beneficiaries
- The trend of increased usage has not continued, instead there has been a smaller number of telemedicine users each year since 2020
- The trend of higher usage since before the pandemic has remained, as the number of telemedicine users has stayed higher than the number of telemedicine users in the first quarter of 2020 in every quarter since

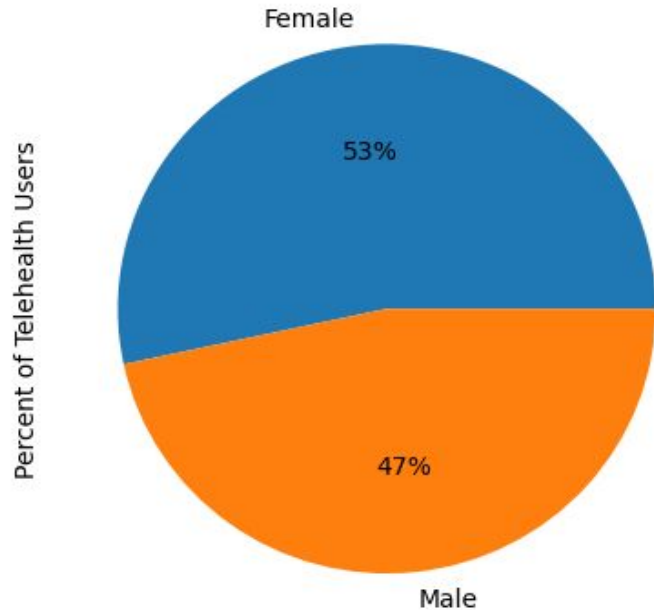
Question 2: What was the breakdown in telemedicine usage by demographic factors?

Demographic Data – Location



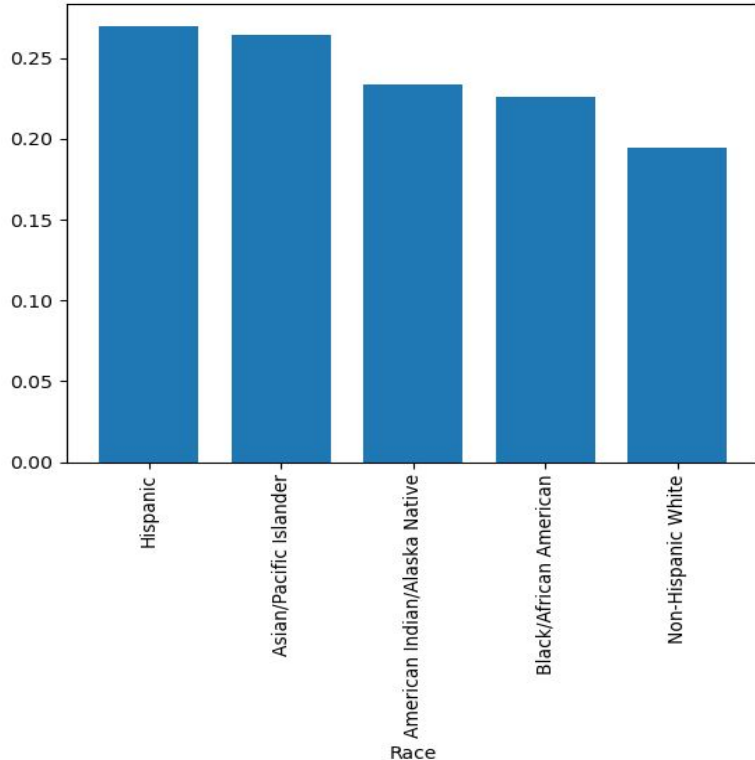
- Since the pandemic began, telemedicine is used at a much greater rate in urban areas compared to rural areas.
- This gap has shrunk consistently since the start of the pandemic, but has stayed above 4%.

Demographic Data – Sex



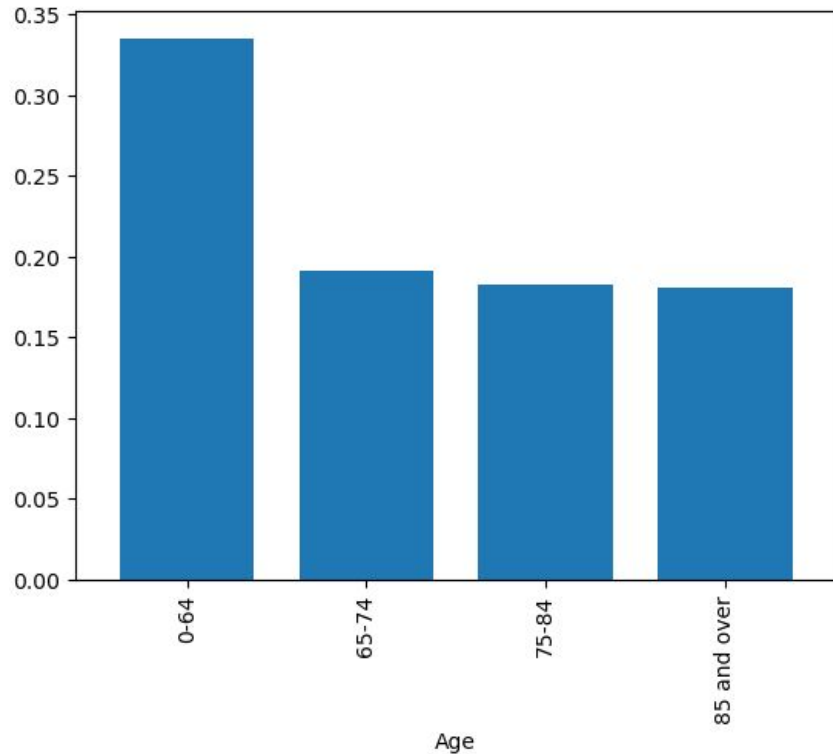
- Females use telemedicine slightly more often than males
- This gap has stayed consistent since data collection began

Demographic Data – Race



- Hispanic and Asian/Pacific Islander were the groups that used telemedicine the most.
- Non-Hispanic Whites used telemedicine the least since 2020

Demographic Data – Age



- Under age of 64 was the group with the most usage
- The three other groups saw no noticeable difference in usage

Question 2: What was the breakdown in telemedicine use by demographic factors?

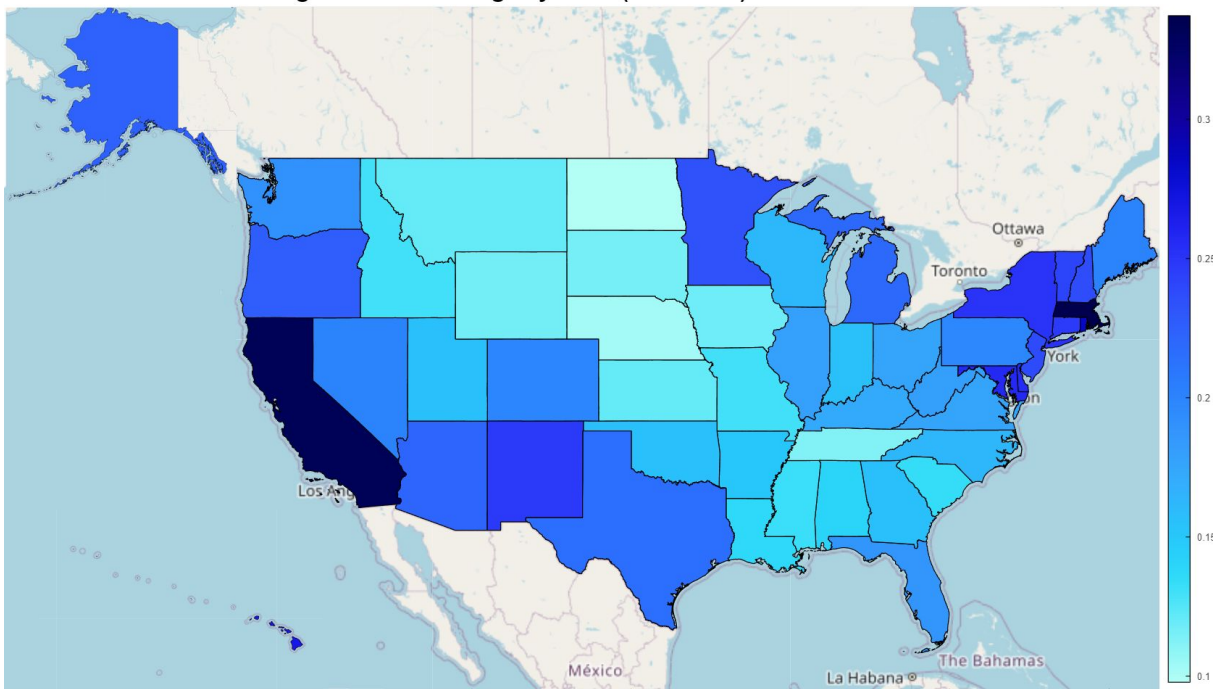
Analysis and Conclusion

- Looking at the demographic data, we can draw a few conclusions. It is clear the eligible users under 64 used telemedicine the most since 2020. When it comes to location of the eligible users, people in urban areas were more likely to use telemedicine than those in rural areas. As for sex, females used telemedicine more than males by 6%. Finally, when it comes to race, Hispanic people had the highest percentage of usage among eligible users.

Question 3: Does
telemedicine usage vary
significantly by state?

Mean Telehealth Usage by State (2020-2023)

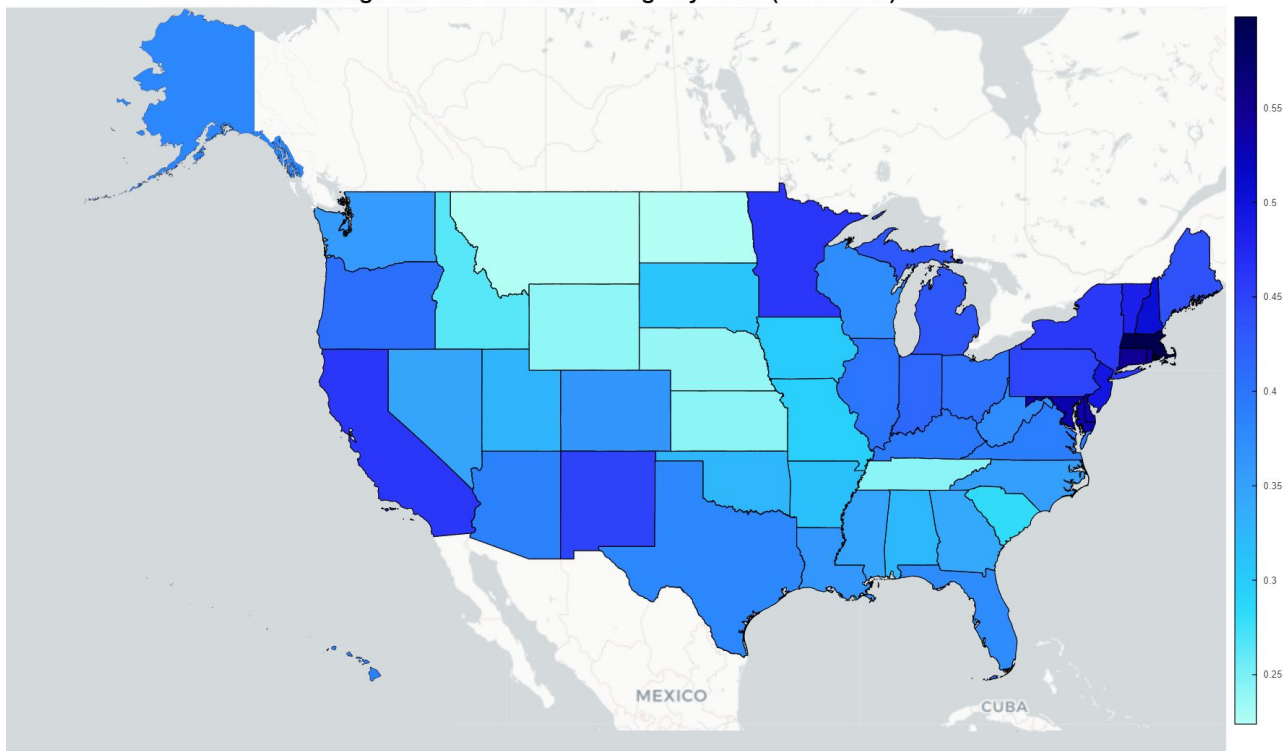
Average Telehealth Usage by State (2020-2023)



- California and Massachusetts are, on average, the largest users of Telehealth as a proportion of their population
- Results seem to be consistent with previous findings on rural vs urban areas

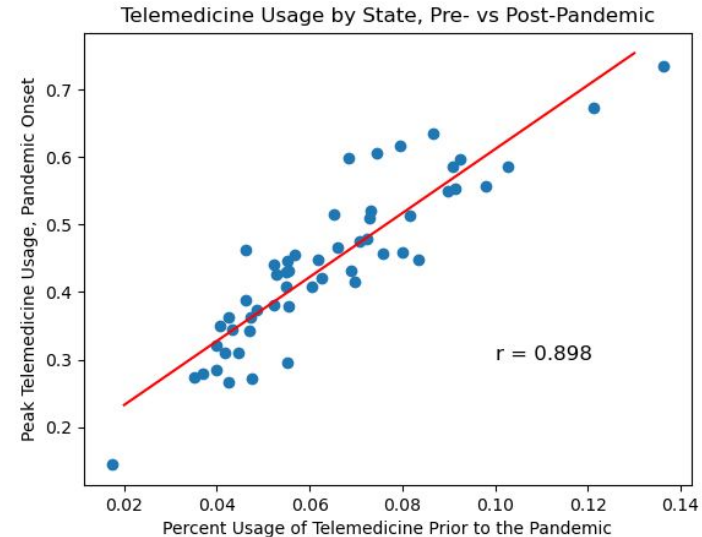
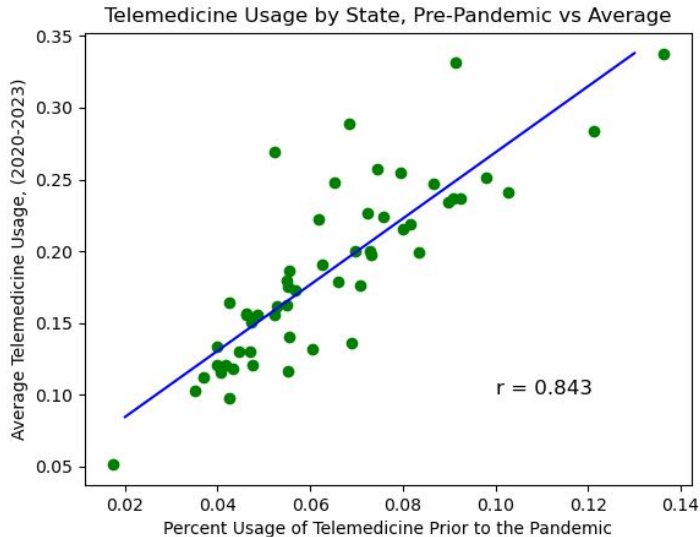
Change in Telehealth Usage by State (2020–2023)

Change in Peak Telehealth Usage by State (2020-2023)



- Trends seem largely similar to the previous graph, states with high average usages of telemedicine also experienced a large degree of change from Q1 2020 to Q2 2020

Scatter Plot: Pre- vs Post-Pandemic Usage



- While every state experienced an increase in usage, states which had higher usage rates of telemedicine prior to the pandemic (Q1 2020) had a higher peak usage directly after the pandemic (Q2 2020).
- States with higher telemedicine usage prior to the pandemic also had a higher average usage from 2020 to 2023.

Question 3: Does telemedicine use vary significantly by state?

Analysis and Conclusion

- There is a clear difference in telemedicine usage by state. Based on the map plots, the average ranges from 10% to 35% usage from 2020 to 2023, with states like California and Massachusetts at the top, and Montana and North Dakota at the bottom.
- These results seem to be very similar in the second map plot describing change in peak usage, with Massachusetts having the highest change in usage at 60%.
- Finally, pre-pandemic telehealth usage is correlated very tightly with average telehealth usage and peak telehealth usage, with R-squared values of 0.710 and 0.792, respectively.

Any questions?

