Measuring Partisian Effect on Covid Vaccination Rates

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The COVID-19 pandemic was one of the most influential moments in modern history. Taking the lives of over one million Americans, it changed how we lived for years and will have an impact on how we live for the rest of our lives. When vaccines became available in 2020, the message was simple: get the shot, protect yourself, but more importantly, protect others. Yet this was not simple, as vaccination became one of the most politically divisive issues ever seen. Whether someone got vaccinated or not depended not just on their underlying health status, nor their access to healthcare, but on their political identity.

This study examines whether voting patterns predict COVID-19 vaccination rates. Through analyzing counties across the continental United States, a relationship between partisanship and vaccination rates was made evident. While surveys had shown that Republicans and Democrats had different attitudes about vaccines, it was interesting to see how this played out geographically. These seemingly individual opinions quickly created stark differences in vaccination rates at the community and ultimately the State level. Counties with higher Democrat vote percentages had drastically higher vaccination rates, and vice versa. Political geography has become a powerful predictor of public health outcomes, which raises serious questions regarding partisan polarization affecting our ability to respond to public health crises effectively.

Political polarization in the United States has intensified over the past several decades, shifting further away from the legislature, into areas traditionally deemed immune to politics. Personal health, which has long been understood as personal decisions guided by medical professionals, has recently been parlayed with partisan identity. The Covid-19 pandemic brought this thinking to new extremes, as vaccinations quickly became one of the most politically polarized health behaviors in modern history. Understanding why political affiliation shapes health decisions requires analysis of the mechanisms through which partisan identity influences individuals behavior.From my analysis, I aimed to prove my hypothesis

that Political Party preference in 2020 had a strong impact on someone's consent to getting the COVID-19 vaccine.

Past research on vaccination acceptance and reluctance has shown that political partisanship is a strong determining factor in the public's attitudes towards the COVID-19 vaccine. A study conducted by Jian Cao, Christina Ramirez, and Michael Alvarez found that partisanship, trust in institutions, and social characteristics were strong predictors of vaccine hesitancy, with Republicans typically showing high rates of hesitancy compared to Democrats. (Cao, Ramirez, & Alvarez, 2022) Their analysis, conducted before the wide availability of the vaccine, demonstrated that these partisan differences were around before clinical trial data. This is interpreted as the root cause being underlying political beliefs, rather than evidence-based risk assessment. Along these lines, Jones and McDermott analyzed vaccination behavior post vaccine release to the public. In their findings, they highlighted that even after accounting for several possible external factors, Republicans were still significantly less likely to be vaccinated.

There are a few possible answers for this partisan divide. Jones and McDermott identified both direct and indirect effects of partisanship on vaccine hesitancy. Party identification seems to have a direct effect on health behaviors, while partisanship indirectly influences vaccination beliefs through its effect on COVID-19, conspiracy theories, and trust in government, science, and medical institutions. Dolman and colleagues demonstrated that the context of political polarization itself amplifies these partisan divides. Among individuals perceiving high levels of political polarization, Republicans exhibited 90% lower odds of vaccination intent compared to Democrats. Their research showed that high social trust, which normally would be a positive factor for vaccination, had a drastically lower correlation to the intent to get vaccinated in highly polarized environments. This demonstrates that political polarization doesn't just correlate with health behaviors but actually undermines traditional public health protective factors.

Cross-national research reveals that political influences on vaccine hesitancy extend beyond American partisan divisions. Stoeckel et al. examined vaccine hesitancy from a different standpoint. Rather than look directly at these issues in the United States, they chose to look at them across the E.U. In their research, they found associations with anti-elite worldviews and authoritarian ideologies rather than traditional left or right political mapping. Vaccine hesitancy has ties to broader world views to do with authority, and social hierarchies, instead of misinformation about efficacy or safety. This conceptualization labels vaccine hesitancy as political and correlates it to how individuals understand their relationship to governing institutions and expert authority.

There is a general understanding in the literature that political factors significantly influence Covid-19 vaccination decisions, despite counterarguments of other factors holding more weight. Some hone in on the power political leaders hold over their followers, dictating what is and is not socially acceptable, which we have seen reach new extremes in recent years. Others focus on individuals trust in institutions, arguing that partisan differences in trust in government, science and medical professionals will drive diverging behaviors. There is another highlight being flashed on the role of partisan media that exposes Republicans and Democrats to drastically differing information. These explanations are not mutually exclusive, and the answer lies somewhere in a combination of all 3, and probably many more. What the evidence does do, is suggest that partisanship shapes health behavior through multiple reinforcing pathways.

Building on this literature, I theorize that partisan voting patterns, particularly at the county level, serve as a proxy for the broader political and socio-economic environment which shapes vaccination decisions. Republican dominant counties would have more residents frequently tuning in to Republican elite messaging, social networks and echo-chambers of Covid-19 skepticism,and federal distrust. The inverse can be said for Democrat dominant counties. These should show greater alignment with medical expert guidance, a much higher Covid-19 risk perception and stronger trust in our institutions. The temporal factor must also
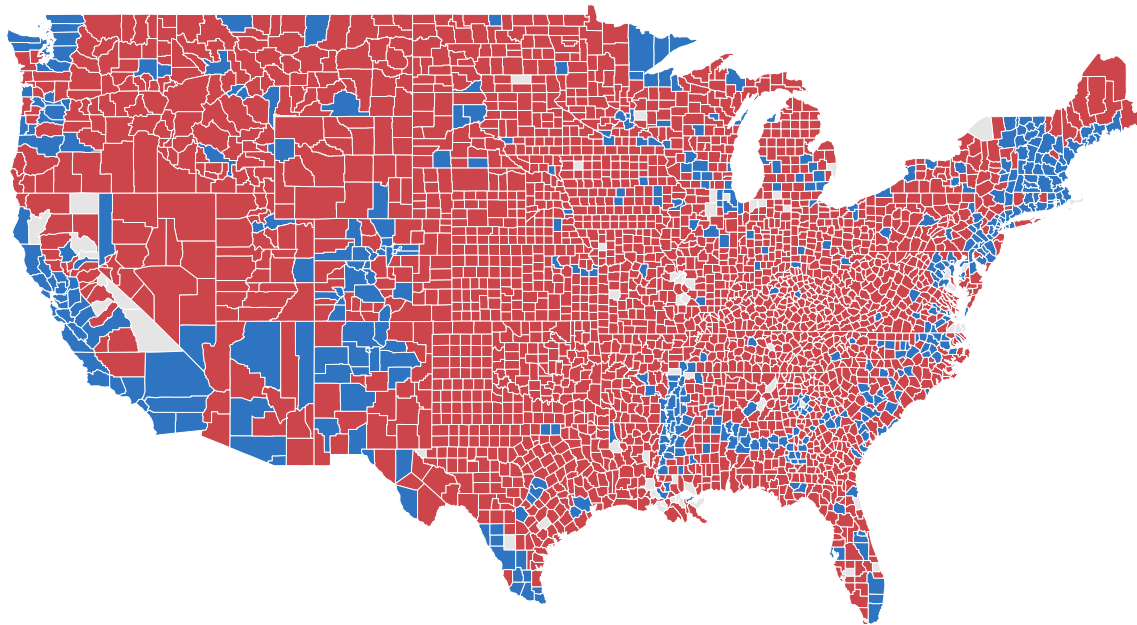
be accounted for, as the pandemic continued and partisan divisions deepened, I expect the relationship between voting patterns and vaccination rates to have strengthened between 2020 and 2024, reflecting the increasing politicization of public health.

```r
map_2020 <- ggplot(map_with_data,
                 aes(x = long, y = lat, group = group, fill = winner_2020)) +
  geom_polygon(color = "white", size = 0.05) +
  scale_fill_manual(
    values = c("DEMOCRAT" = "#2E74C0", "REPUBLICAN" = "#CB454A"),
    na.value = "gray90",
    name = "Winner"
  ) +
  coord_fixed(1.3) +
  theme_void(base_size = 12) +
  labs(title = "2020 Presidential Election Results",
       subtitle = "County-level winners") +
  theme(
    plot.title = element_text(hjust = 0.5, face = "bold", size = 14),
    plot.subtitle = element_text(hjust = 0.5, size = 11, color = "gray40"),
    legend.position = "bottom",
    legend.title = element_text(face = "bold")
  )

print(map_2020)
```

2020 Presidential Election Results

County–level winners
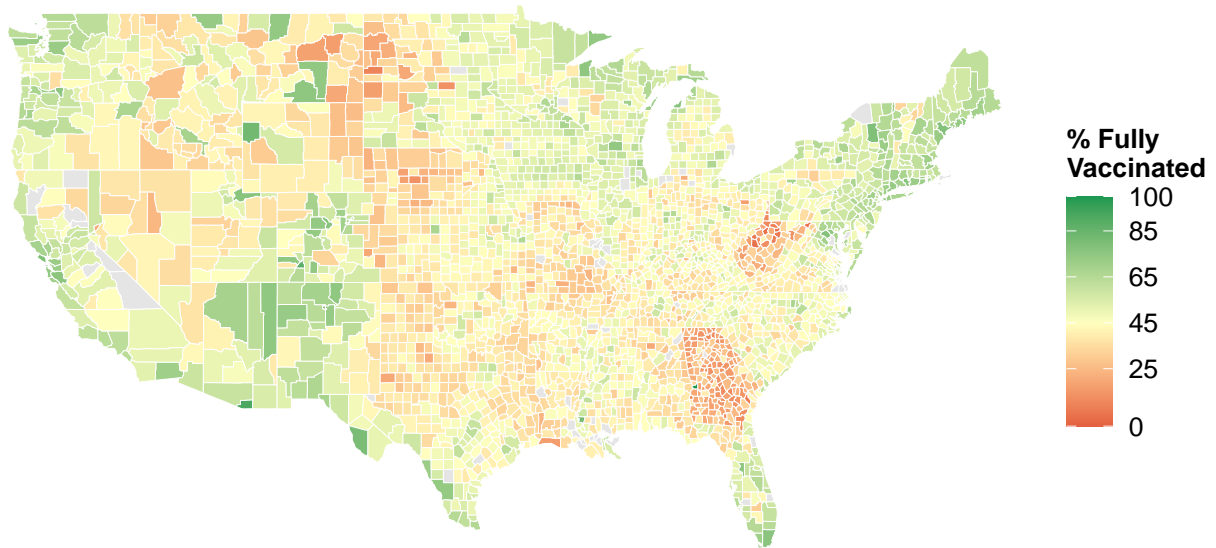

Winner DEMOCRAT REPUBLICAN NA

```
map_vaccination <- ggplot(map_with_data,
                          aes(x = long, y = lat, group = group,
                              fill = Series_Complete_Pop_Pct)) +
  geom_polygon(color = "white", size = 0.05) +
  scale_fill_gradient2(
    low = "#d73027",
    mid = "#ffffbf",
    high = "#1a9850",
    midpoint = 45,
    na.value = "gray90",
    name = "% Fully\nVaccinated",
    limits = c(0, 100),
    breaks = c(0, 25, 45, 65, 85, 100)
  ) +
  coord_fixed(1.3) +
  theme_void(base_size = 12) +
  labs(title = "COVID-19 Vaccination Rates by County") +
  theme(
    plot.title = element_text(hjust = 0.5, face = "bold", size = 14),
    legend.position = "right",
    legend.title = element_text(face = "bold", size = 10)
```

```
    )

print(map_vaccination)
```

COVID−19 Vaccination Rates by County

The first two maps go hand in hand, the first being a map of the continental United States showing which counties voted blue vs red in the 2020 election. The second map is a gradient demonstration of the % of counties that were populated. From green to a darker orange, counties were shown having total COVID-19 vaccination rates as of November 10, 2021. This date was chosen because it provided enough time for the vaccination mandate to be rolled out, as well as some buffer time to give enough people time to make their appointments and get the shot. These two maps together provide clarity into the relationship between a counties dominant political party and their willingness or refusal to get the covid shot.

```
hist_vax <- ggplot(merged_clean,
                aes(x = Series_Complete_Pop_Pct, fill = winner_2020)) +
```

```r
    geom_histogram(alpha = 0.6, bins = 40, position = "identity") +


    geom_vline(data = merged_clean %>%
                 group_by(winner_2020) %>%
                 summarise(mean_vax = mean(Series_Complete_Pop_Pct)),
               aes(xintercept = mean_vax, color = winner_2020),
               linetype = "dashed", linewidth = 1) +

  scale_fill_manual(
    values = c("DEMOCRAT" = "#2E74C0", "REPUBLICAN" = "#CB454A"),
    labels = c("Democratic Counties", "Republican Counties"),
    name = "2020 Winner"
  ) +
  scale_color_manual(
    values = c("DEMOCRAT" = "#2E74C0", "REPUBLICAN" = "#CB454A"),
    guide = "none"
  ) +


    labs(
    title = "Distribution of County Vaccination Rates",
    x = "Population Fully Vaccinated (%, November 2021)",
    y = "Number of Counties"
  ) +


    theme_minimal(base_size = 12) +
    theme(
    plot.title = element_text(face = "bold", size = 14, hjust = 0.5),
    plot.subtitle = element_text(size = 11, hjust = 0.5, color = "gray40"),
    legend.position = "bottom",
    legend.title = element_text(face = "bold")
  )

print(hist_vax)
```
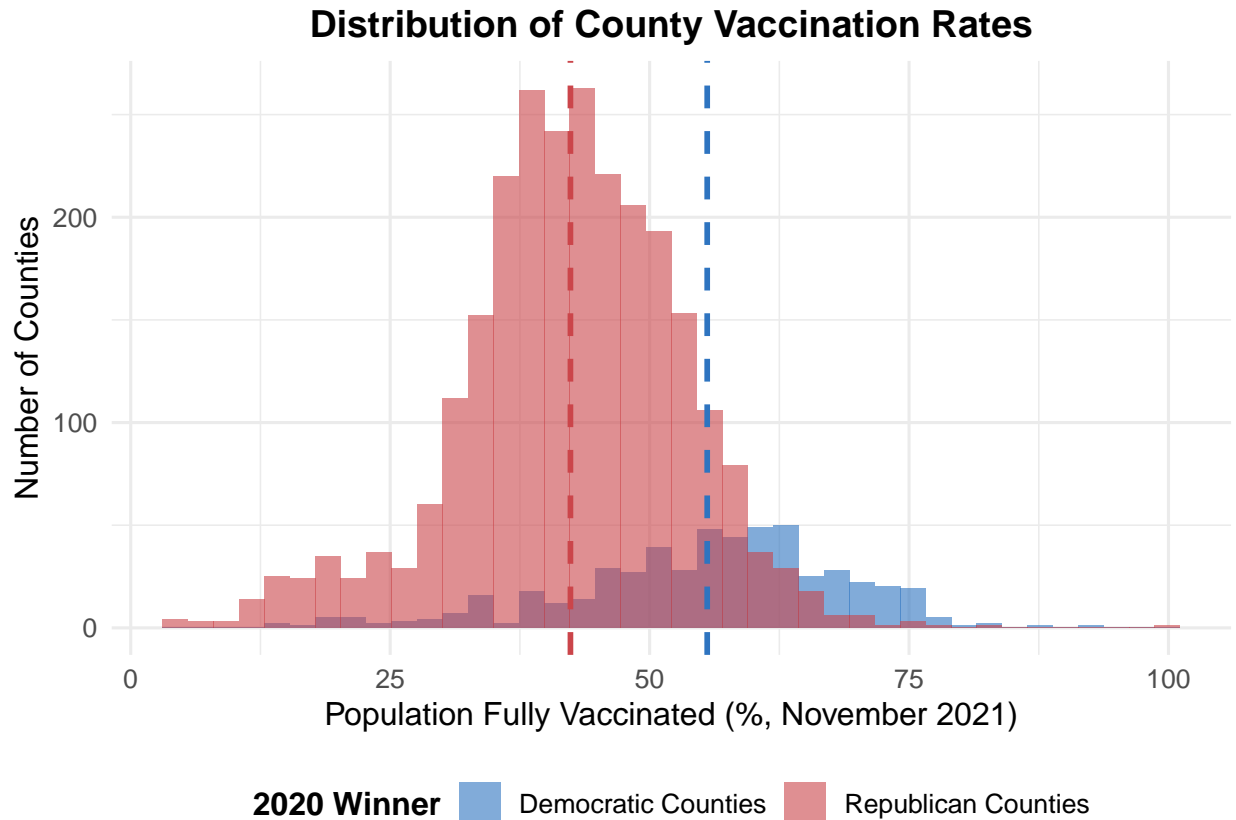
Distribution of County Vaccination Rates

The final visualization, a histogram with median lines of vaccination rates compared to the total number of counties that voted for a political party. This was particularly interesting given how many more counties vote red than blue. This is partially due to the relationship that Republican candidates have with rural counties, but it also is very efficient in explicitly showing the gap in vaccination rates between democratic and republican counties.

This project set out to test whether political party preference in 2020 had a strong impact on COVID-19 vaccination decisions. The data strongly support this hypothesis, counties with higher republican votes in the 2020 presidential election show substantially lower COVID-19 vaccination rates. This is one of the strongest relationships in the entire dataset. Political identity became a powerful predictor of whether people in a county got vaccinated or not.

The findings align with previous research conducted on this topic. As the literature demonstrates, party affiliation influences vaccination decisions both directly and indirectly. These

individual medical decisions add up into explicit geographic patterns where politics and public health have become tangled.

The possible effects of this are deeply concerning. When a Public health crisis emerges, it requires collective action and compliance with what the experts are saying. If partisan identity becomes the driving factor for medical decisions, then the public health institutions become redundant. The pandemic showed that at the moment, the United States places political polarization over life and death medical decisions. This raises complex questions about how the future will pan out in the event of another crisis.

This study confirms what many already suspected, partisan polarization has breached public health. The decision to get vaccinated against COVID-19 was deeply shaped by political identity. Understanding this is the first step in combating it, as we desperately search for new strategies that will overcome political divides in future crises.

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