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Association of political partisanship and COVID-19 case rates at the county level in Georgia during the Delta surge of 2021

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Abstract

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By Aaron Holton

Background
Regional responses to the SARS-CoV-2 pandemic in the United States have been highly politicized in terms of both policy and individual behaviors. Rates of SARS-CoV-2 infections in Georgia have varied at the county level throughout the pandemic. The aim of this study was to assess the association between county-wide political leanings and county level COVID-19 case rates in Georgia during the delta surge of 2021.

Methods
County level COVID-19 case data were collected from the Georgia Department of Public Health (GDPH). The delta surge was inclusive of cases with a positive test between July 1 and November 1, 2021. The total percentage of all county residents who voted republican in the 2020 presidential election was obtained from the Georgia Secretary of State website. The counties were then divided into political tertiles to create the exposure variable. County case rates were modeled using a Poisson regression. Each county's total population was used as the offset in the Poisson model. Race, education, and population density were controlled for in the model.

Results
Among the 158 counties analyzed, the cumulative incidence of COVID-19 during the delta wave ranged from 1.2% – 6.4% with a median of 3.3% (IQR 2.6 - 4.1). As the percent of a county that voted republican increased, the risk of COVID-19 also increased by as much as two times.

Conclusion
The percentage of county residents who voted republican in the 2020 presidential election was positively associated with increasing county rates of COVID-19 during the delta surge of 2021 in Georgia. This association was statistically significant when comparing the most republican counties to the least republican counties.

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Introduction

On March 25, 2021, all Georgians over the age of 16 years became eligible to receive Pfizer's COVID-19 vaccine, while those 18 years and older were eligible to receive the Moderna or Johnson & Johnson vaccine. This marked a major milestone for the state in its year long fight against the pandemic. As cases continued to decline following a deadly winter surge that killed approximately 9000 Georgians, there was growing optimism that widespread vaccine availability would be the panacea that the state, and the world, had been waiting on. It was generally well recognized that not all Georgians would be interested in taking the vaccine, and some of the hesitancies had their roots in political ideology. Theoretically, if enough people were to get inoculated with vaccines with 95% efficacy against symptomatic infection in clinical trials, then a combination of vaccine-induced and infection-induced immunity might be able to provide sufficient population immunity to significantly decouple hospitalizations and deaths from cases. What was not accounted for was the potential emergence of a new variant. On May 11, 2021, the World Health Organization (WHO) designated the B.1.617.2 lineage of the SARS2-CoV virus as a variant of concern[1]. The delta variant, as it was named, had come to the attention of the world after sweeping through India in April and May, and was associated with a higher rate of transmission than the original SARS-CoV2 ancestral strain[2]. After approximately three months of low COVID-19 case rates and widespread access to effective vaccines, the July 2021 rise of the delta variant in Georgia resulted in case rates, hospitalizations, and deaths on par with the winter surge of 2020-21[3]. With a statewide vaccination rate of about 40%, a fourth wave for the state was, in retrospect, an inevitability. Risk factors for county-wide case rates such as vaccination, socioeconomic status (SES), education, population density, and race/ethnicity have been well documented. Some studies have also examined political partisanship as another potentially significant risk factor for COVID-19 case rates[4].

The political determinants of health have been well described elsewhere[5]. But in the age of COVID-19, a meaningful distinction may be drawn between policy and political partisanship. Politics may contribute to structural disparities that affect the health of communities, whereas individual levels of partisanship in the United States are often wed to sets of beliefs that have become central to an intransigent identity, and in turn, have an outsized influence on individual behavior. While there is certainly some mixing of effects among policy and ideology, it is argued here that in the United States, political partisanship may be considered a social determinant of health. A regretful byproduct of what many refer to as the "politicization of the virus" has been widely divergent attitudes and behaviors surrounding COVID-19. Whereas democratic voters often overestimate the threat of the virus, republican voters own the alternate perception, and these bifurcated views have led to differing behaviors[6,7,8]. While unfortunate, this schism may have created a useful variable that could more accurately quantify a slippery confounder of many COVID-19 county level studies: human behavior. Attempts at human behavior quantification during the pandemic have often involved mobile phone use, survey data, or online restaurant reservations, all of which are prone to selection and/or information bias [9]. In contrast, the 2020 election featured turnout rates not seen since 1980, due to hotly contested presidential and senate races and expansions of early voting access, drop boxes, and mail-in voting. In this study we examine the association between political partisanship and COVID-19 case rates at the county level in Georgia.

Methods

Data Collection

Georgia county level COVID-19 case data was collected via the Georgia Department of Public Health website[10]. County cases with a symptom onset date between July 1, 2021, and November 1, 2021 were considered part of the delta wave. The total population of each of the 159 counties in Georgia was obtained from GeorgiaData[11.] The outcome of interest, cumulative incidence, was defined as the number of cases in each county during the wave divided by the county's total population. In order to exclude persons not eligible to be infected, cases with a test date between April 1, and 2021 and June 30, 2021 were collected and subtracted from the total population of each county. This is in line with CDC recommendations that persons recovered from COVID-19 not get retested for 90 days, as reinfection during that timeframe is rare. The resulting adjusted cumulative incidence for each county during the delta wave was used as the dependent variable for analysis. The exposure of interest was the percent of total residents in each county who voted for the republican candidate in the 2020 presidential election, which was acquired from the Georgia Secretary of State website[12]. This number was divided by each county's total population to create the exposure of interest. Population density, race, and education were considered covariates for this study. All three were collected from GeorgiaData[11]. Population density (the average number of individuals per square mile of land area) data were available from 2010. In the absence of individual level race/ethnicity data, county level percentage of Black residents was used as the race covariate. Across ages and socioeconomic ranges, Black Americans display the strongest association of any racial or ethnic group with the exposure of interest. For the education covariate, the percentage of county residents with a bachelor's degree was used. Although not included in the model, vaccination was seen as a behavior possibly influenced by political ideology. One and two dose vaccination levels in each county at the beginning and end of each wave was collected via the GDPH website. Chatahoochee county was deemed an outlier and removed from the analysis. Home to Fort Benning, this county has been a

consistent outlier for COVID-19 case rates throughout the pandemic. As military personnel are frequently moved on and off base, cases are not reflective of the community at large. The uncertainty surrounding this county's contribution to both the exposure and outcome necessitated exclusion from this analysis. Institutional review board approval and informed consent were not necessary for this cross-sectional study because all data were deidentified and publicly available.

Statistical Analysis

Data were collected and analyzed using the R software (version 4.0.3). A Poisson regression was used to model cumulative incidence rates. The continuous exposure variable (percentage of residents who voted republican in 2020) was categorized into tertiles in order to capture three distinct types of counties in Georgia: least republican (5.41%-26.30%), most heterogeneous (26.3% - 33.22%), and most republican (33.23-53.04%). Percent of Black residents, population density, and percent of residents with a bachelor's degree were controlled for in the analysis. The *a priori* covariates thought to interact with the exposure were race and education. Likelihood ratio tests revealed race to be a statistically significant interaction term. The first tertile of the exposure variable was the reference level, and incidence rate ratios were obtained comparing adjusted cumulative incidences in the second and third tertiles to the first. Underdispersion in the Poisson model was adjusted for using a scaled parameter.

Results

County level demographics by political tertile are represented in Table 1. While interpretating data in this study, it is important to keep in mind the deferential interpretations between individual and county level data. Political tertile 1, due to the inclusion of the most populated counties in Georgia, has three times the total individual population as political tertile 2 or 3. Still, each county is considered as one observation regardless of total population. The racial composition of each tertile is of note, as tertile 3 contained counties that were significantly more White, and less Black. This is consistent with the voting patterns of Black Americans, which skewed heavily democratic in the 2020 election regardless of age or any other covariate[13]. Tertile 3 also contained a larger percentage of households making more than $100,000 US per Year compared to tertile 1, which has been associated with an increased likelihood of being able to work from home to reduce exposure to COVID-19[14]. The cumulative incidence rates during the delta wave for each Georgia county are shown in Figure 1. An upward trend in cumulative incidence was observed as counties voted more republican, even in the absence of adjustment for population density. Table 2 features the vaccination rates and incidence rate ratios of each political tertile. The overall mean percentage of fully vaccinated residents per county at the outset of the delta wave was 31.1 %, with little variation by political tertile. Tertiles 1 and 3, the least and most republican counties, had a higher degree of intra-tertile variance than political tertile 2. However, compared to counties in the first tertile, counties in the second tertile had a COVID-19 incidence rate ratio of 1.53 (95% Confidence Interval (CI) 0.87, 2.70). The corresponding incidence rate ratio for counties in the third tertile was 2.12 (95% CI 1.28, 3.52). Figure 2 presents the percent change in fully vaccinated residents throughout the delta wave. Despite the increase in cases and hospitalizations, the counties with the most republican voters were the least likely to get vaccinated during the wave. The most politically heterogeneous counties (political tertile 2 and the upper half of political tertile 1) made the most gains in percentage fully vaccinated. Figure 3 shows the county level rates of fully vaccinated residents at the start of the delta wave.

Discussion

Approximately 7445 Georgians died between July 15 and December 1, 2021 as a result of infection with the delta variant of COVID-19. Although the COVID-19 vaccines have worked well in preventing hospitalization and death[15], vaccination rates in Georgia were in the bottom 10 of all U.S. states as the delta wave progressed[16] . Even as the new variant spread and cases rose, there was heterogeneity among the counties in terms of increasing percentage of the population fully vaccinated due to the emerging threat. The counties in the upper part of the "least republican" tertile and those in the middle tertile had the highest gains in vaccination status during the delta wave. At the same time, the counties in the third tertile, which represented the *most* republican counties, saw the least number of gains in vaccination status during the delta wave. The assumption that the counties with the lowest percent of republican voters had a higher baseline of fully vaccinated residents at the start of the wave, and thus less headroom to contend with, is only partly true. While it is true that the counties least likely to vote republican had, on average, higher rates of vaccination at the start of the delta wave, no county was above 60% vaccinated. At the start of the wave, the county with the highest percentage of vaccinated residents in Georgia was Clay County, which had 54.8% of its residents vaccinated. Clearly, there remained room for improvement despite Clay County's frontrunner status. And of the five counties with the highest fully vaccinated percentage of residents on July 1, four of them were counties won by former President Donald Trump; all 5 resided in the second tertile. Vaccination uptake has had some correlation with voting habits in some regions of the United States[17]. Georgia counties won by President Joe Biden (N=30) had an average rate of full vaccination of 35.6% (sd 6.7) on July 1, while counties won by President Donald Trump (N=128) averaged a 30.0% vaccination rate (sd 6.5,p value <0.001). However, categorizing the counties by tertiles eliminated this gap. This is an important distinction, as vaccination alone cannot be used to explain the differing COVID-19 case rates in this analysis. Regardless of the method of analysis, the difference in vaccination rates between counties won by President Biden compared to counties won

by President Trump were unremarkable, and the absolute rates of vaccination throughout the state were not nearly high enough to stymie the oncoming wave of cases. Additionally, the counties that ranked in the bottom 10% of fully vaccinated residents at the beginning of the delta wave did not correlate with the counties with the highest cumulative incidence during the delta wave. In the absence of a notable correlation between political tertile and vaccination rates in the state of Georgia, we must look to other factors to help explain higher rates of COVID-19 in counties with higher percentages of republican voters.

Behaviors typically associated with a reduction in individual risk of COVID-19 infection include vaccination, hand hygiene, frequent testing, physical distancing, and the use of high-quality respirators in crowded indoor environments. One mitigation effort alone might not be sufficient to explain county level case rate variances, but a culturally entrenched disbelief that some or all of these measures are effective or necessary could produce a notable gap between case rates, including the higher case rates in the most republican counties in Georgia. The politicization of COVID-19 has been an issue that has plagued the United States' COVID-19 response since the early days of the pandemic. The reflexive polarization between democratic and republican voters augments their differences over time, further entrenching behavior patterns into their respective cultures. Total compliance with, or defiance of, recommended public health guidelines were sometimes explicit political statements rather than behaviors commensurate with individual risk.

To apply the findings of this county level study to individuals would constitute a classic ecological fallacy. These results describe an outcome related to patterns of cultural behaviors, of which political partisanship has managed to carve out a considerable amount of influence. This study has several limitations. Although the number of susceptible persons in each county was estimated by subtracting recent cases from the pool of susceptibles, the timing of vaccination doses was not considered, leading to uncertainty regarding the true number of persons susceptible to a breakthrough case. Additionally, case detection relies on testing. Testing propensity may vary by political ideology, potentially creating an unmeasured confounder. There may be information bias surrounding vaccine uptake, as many metro

Atlanta residents traveled to rural counties to receive their shots during the early days of the vaccine rollout, thus overestimating vaccine uptake in more republican, and less populated counties, and underestimating uptake in the denser, less republican counties.

There exists a growing body of evidence that indicates counties with a higher share of republican voters in the 2020 election were subsequently associated with higher COVID-19 case rates [18,19]. This relationship holds in the presence of widespread vaccine availability. That political partisanship was more strongly associated with COVID-19 case rates then vaccine coverage may call for its implementation in future studies as an important confounder to adjust for in county and district level analyses. As the United States continues to become more divided along party lines, political partisanship should be taken seriously as a social determinant of health. A collective effort to turn down partisan rhetoric is needed to insulate our scientific processes from cultural confirmation bias and to engender trust from the public. The recognition of political partisanship as a social determinant of health should spark a sense of duty among health officials to discontinue their own contributions to an increasingly polarized response to public health guidance.

Table 1.

Georgia County Level Demographics by 2020 Election Results

	Tertiles of Percentage of County Residents Voting Republican‡			
	First (N=52) 5.41%-26.30%	Second (N=53) 26.31% – 33.22%	Third (N=53) 33.23% - 53.04%	Georgia Total
Total Population	6,415,098	2,103,235	2,088,183	10,617,423†
Race				
Black	45.3% (13.8)	28.0% (11.3)	13.1% (9.7)	32.6%
White	50.2% (13.4)	68.4% (10.8)	83.2% (9.6)	60.2%
Asian	1.9% (2.2)	1.1% (1.0)	1.4% (2.1)	4.7%
Other	2.6% (1.2)	2.5% (0.8)	2.3% (0.1)	2.5%
Ethnicity				
Hispanic	8.0% (7.0)	7.5% (6.2)	5.3% (3.3)	9.9%
Non-Hispanic	92.0% (7.0)	92.5% (6.2)	94.7% (3.3)	90.1%
Age				
<18	21.7% (3.8)	23.0% (2.5)	21.9% (3.1)	23.6%
18-64	61.6% (4.2)	58.9% (2.1)	58.8% (2.8)	62.1%
65+	16.7% (4.8)	18.2% (3.2)	19.3% (5.1)	14.3%
Education				
With Bachelor's Degree	18.6% (10.5)	15.9% (6.9)	19.8% (9.2)	30.7%
Without HS Diploma	19.3% (6.5)	19.2% (5.7)	16.0% (4.5)	13.3%
Household SES				
Earning >$100,000	15.8% (7.5)	16.2% (7.2)	21.4%(9.1)	26.5%
Below Poverty Level	17.5% (5.4)	16.5% (5.2)	11.3%(4.2)	11.3%

† Tertile populations do not sum to the Georgia total due to the exclusion of Chatahoochee county
‡ Mean percentages and (standard deviations) are reported throughout Table 1.

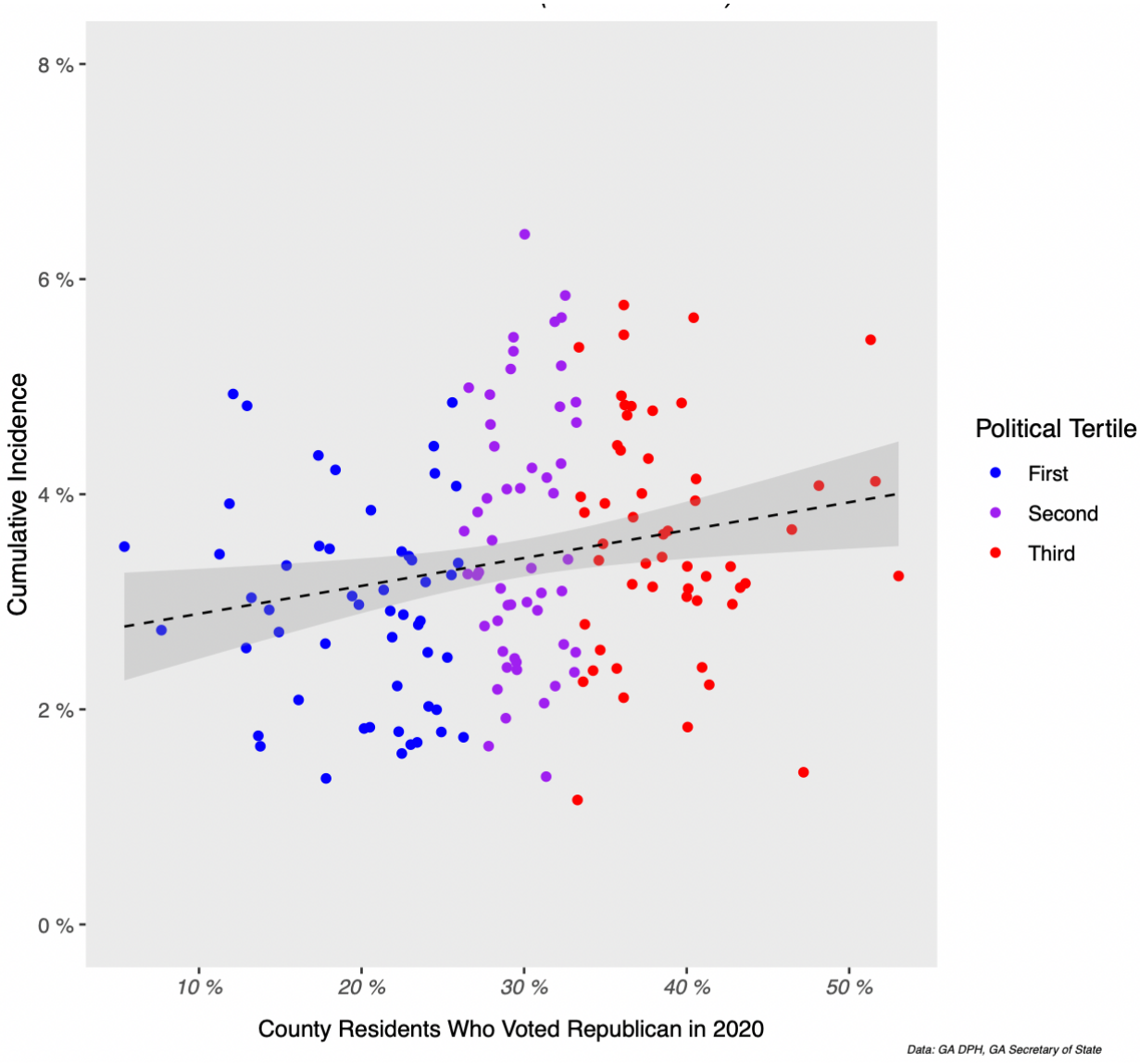

Figure 1. Georgia County level cumulative incidence rates by political tertile

Table 2.

Comparison of COVID-19 Cases and Vaccination Rates in Georgia Counties During the Delta Wave of 2021

Percent Voting Republican	Vaccination Rate†	Incidence Rate Ratio	95% CI
Counties by Political Tertile			
First Tertile (N=52)	31.46% (7.90)	Reference	Reference
Second Tertile (N=53)	30.21% (5.33)	1.53	(0.87, 2.70)
Third Tertile (N=53)	31.61% (7.11)	2.12	(1.28, 3.52)

† Percentage of County Residents Fully Vaccinated on 7.1.21

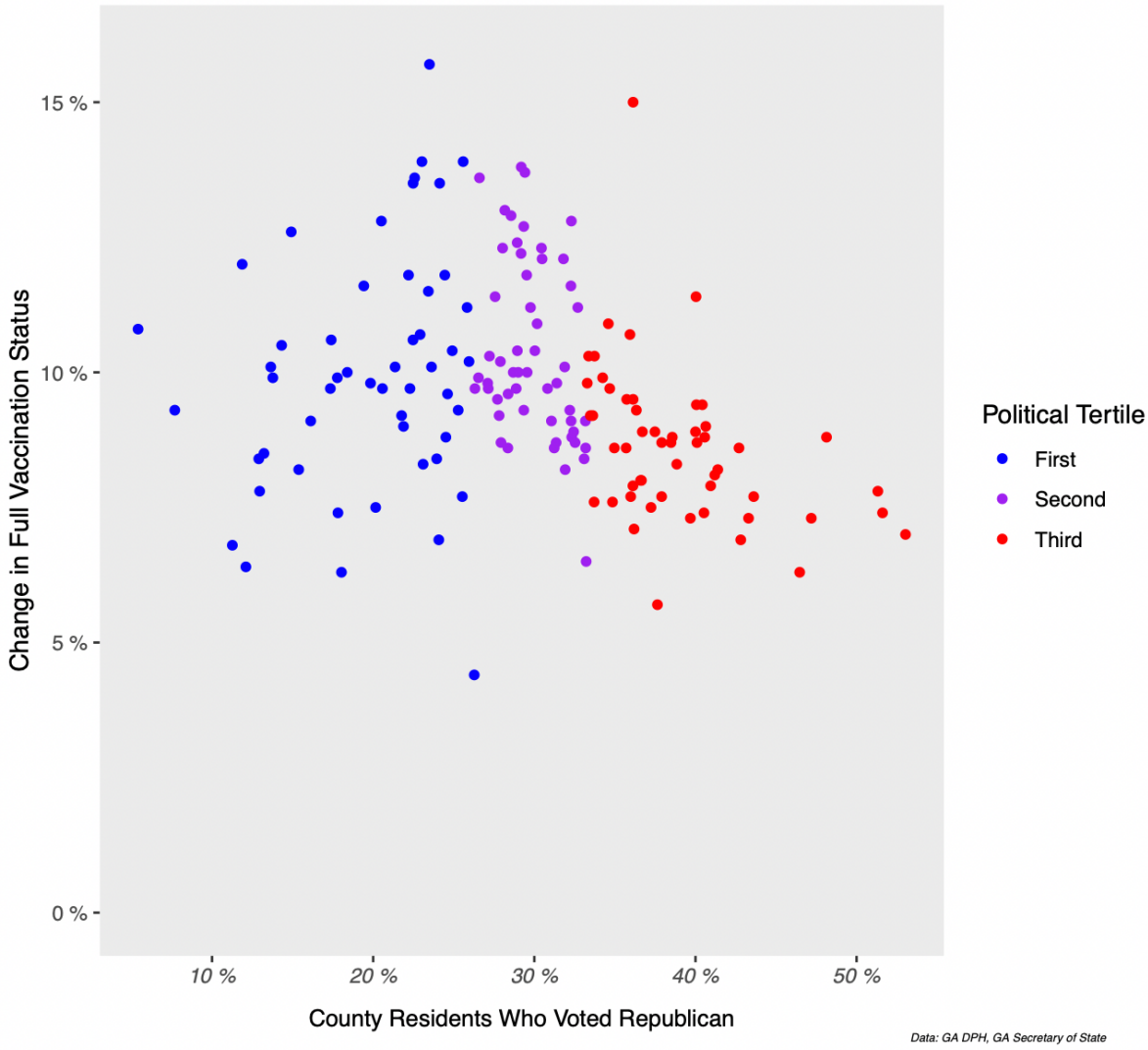

Figure 2. County level percent change in fully vaccinated residents by political tertile

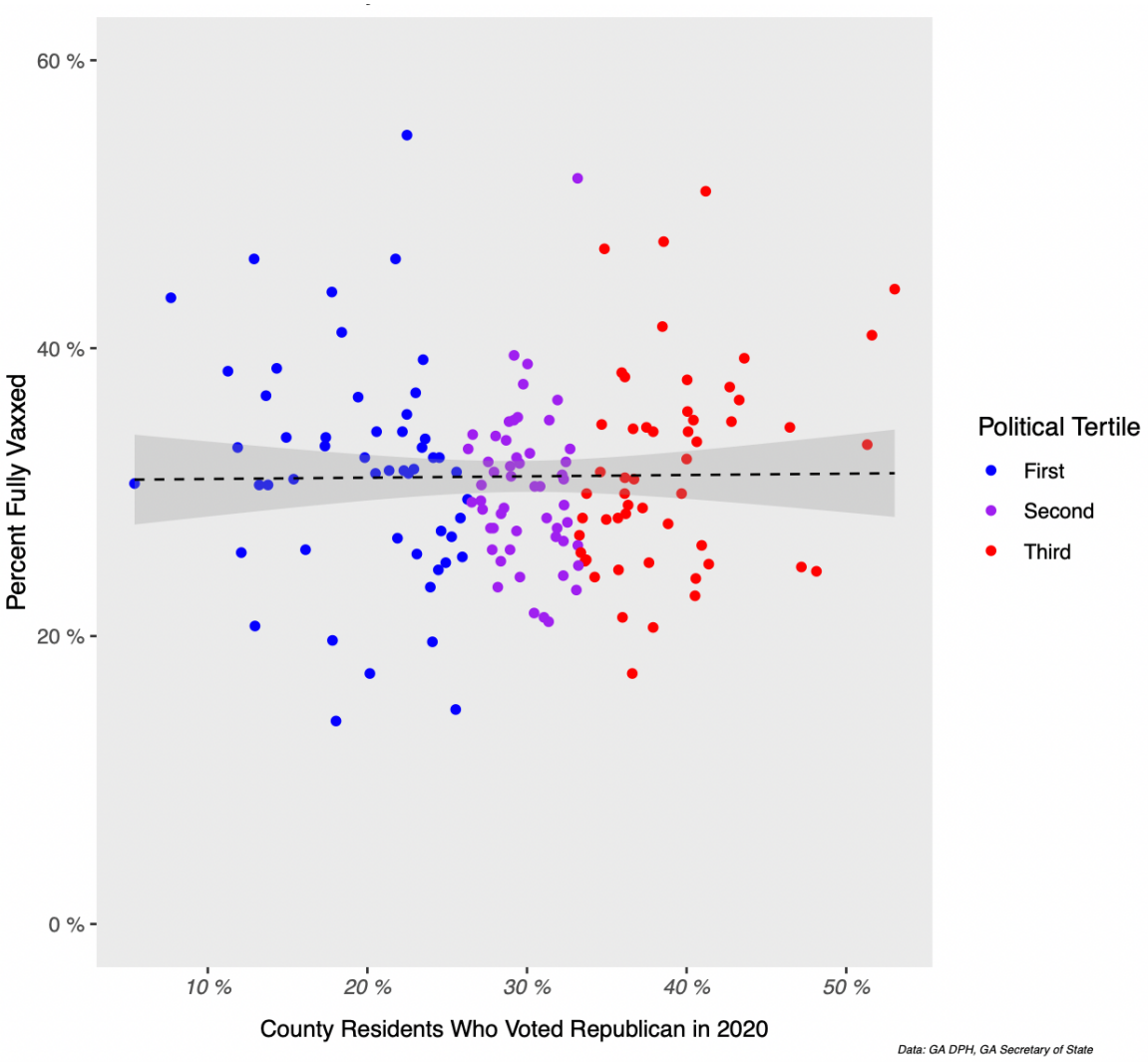

Figure 3. Percent of fully vaccinated residents by county and political tertile at the beginning of the delta wave (7.1.21)

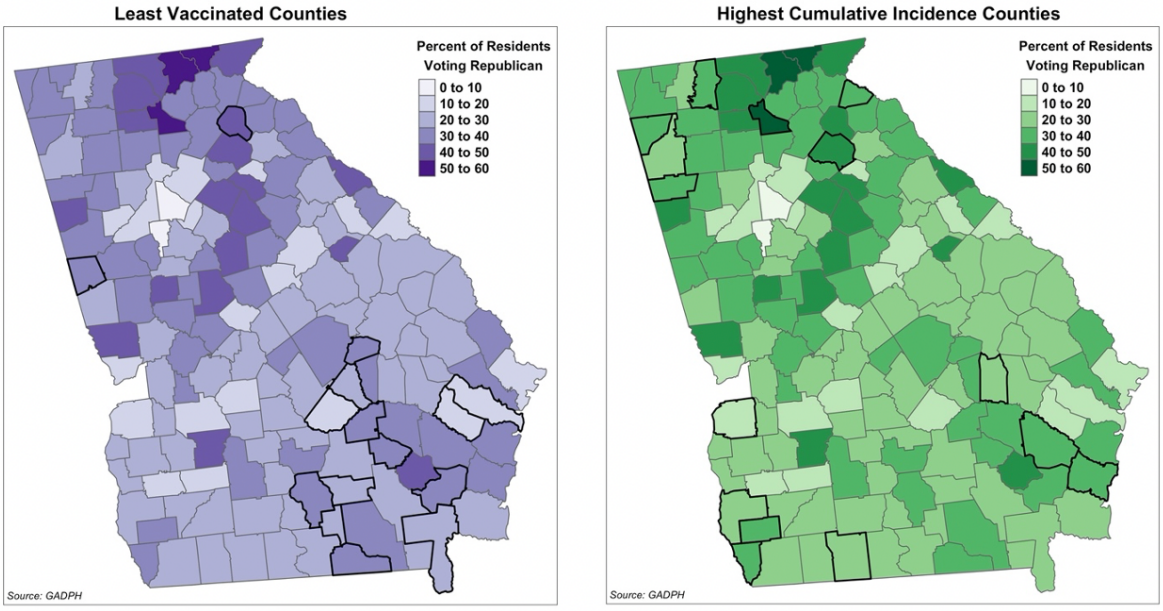

Figure 4a and 4b. Exposure map with least vaccinated counties (a) and highest cumulative incident counties (b) highlighted.

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