

Racial Concentration and Dynamics of COVID-19 Vaccination

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Race and COVID-19 vaccination: two patterns

Lower among
racialized minorities

Lower among areas
with high proportions
of racialized
communities

Why **RACE** has been a consistent predictor of COVID-19 vaccination rates?

Vaccine hesitancy ←-----low trust

Other factors leading to high hesitancy

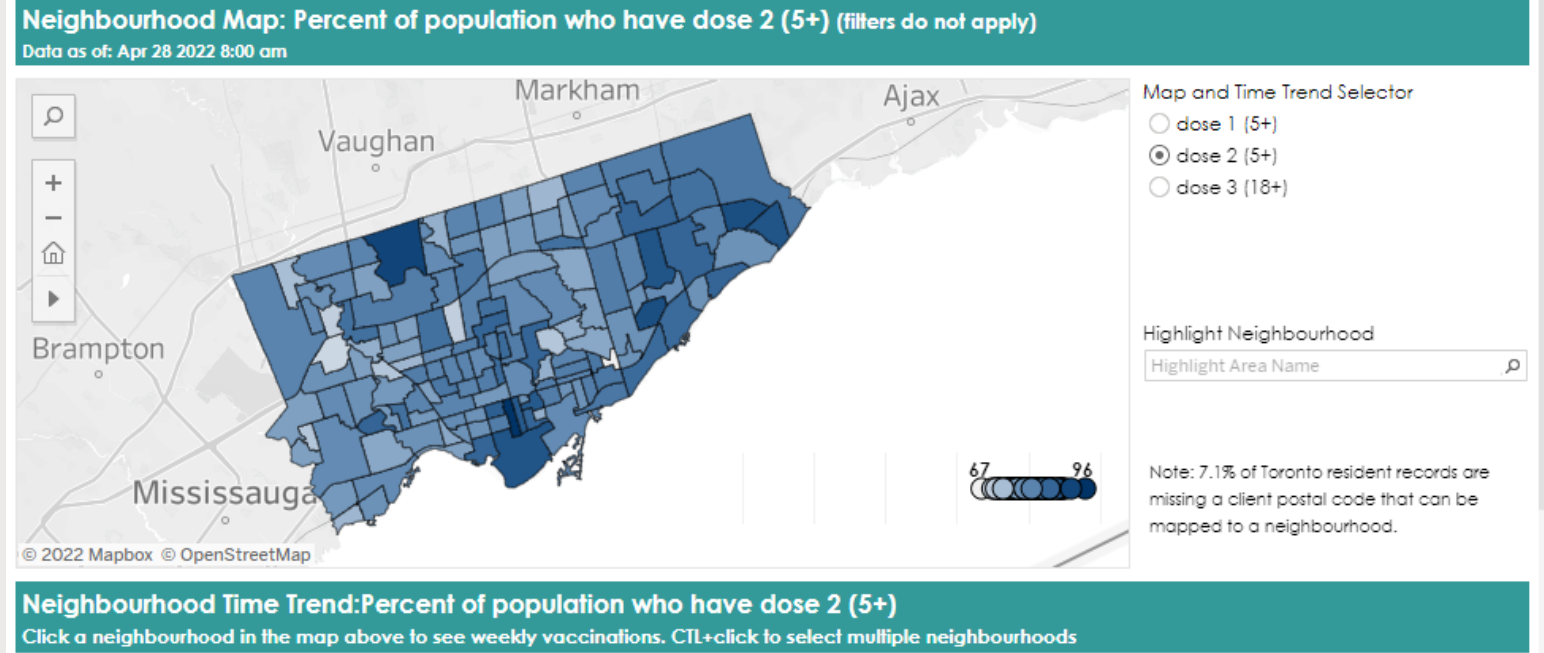
- Higher vulnerability to myths and misinformation
- Greater perceived barriers to obtaining COVID-19 vaccines
- Higher concern about cost and safety issues

A critical perspective: Vaccine hesitancy should not be taken as the main explanation

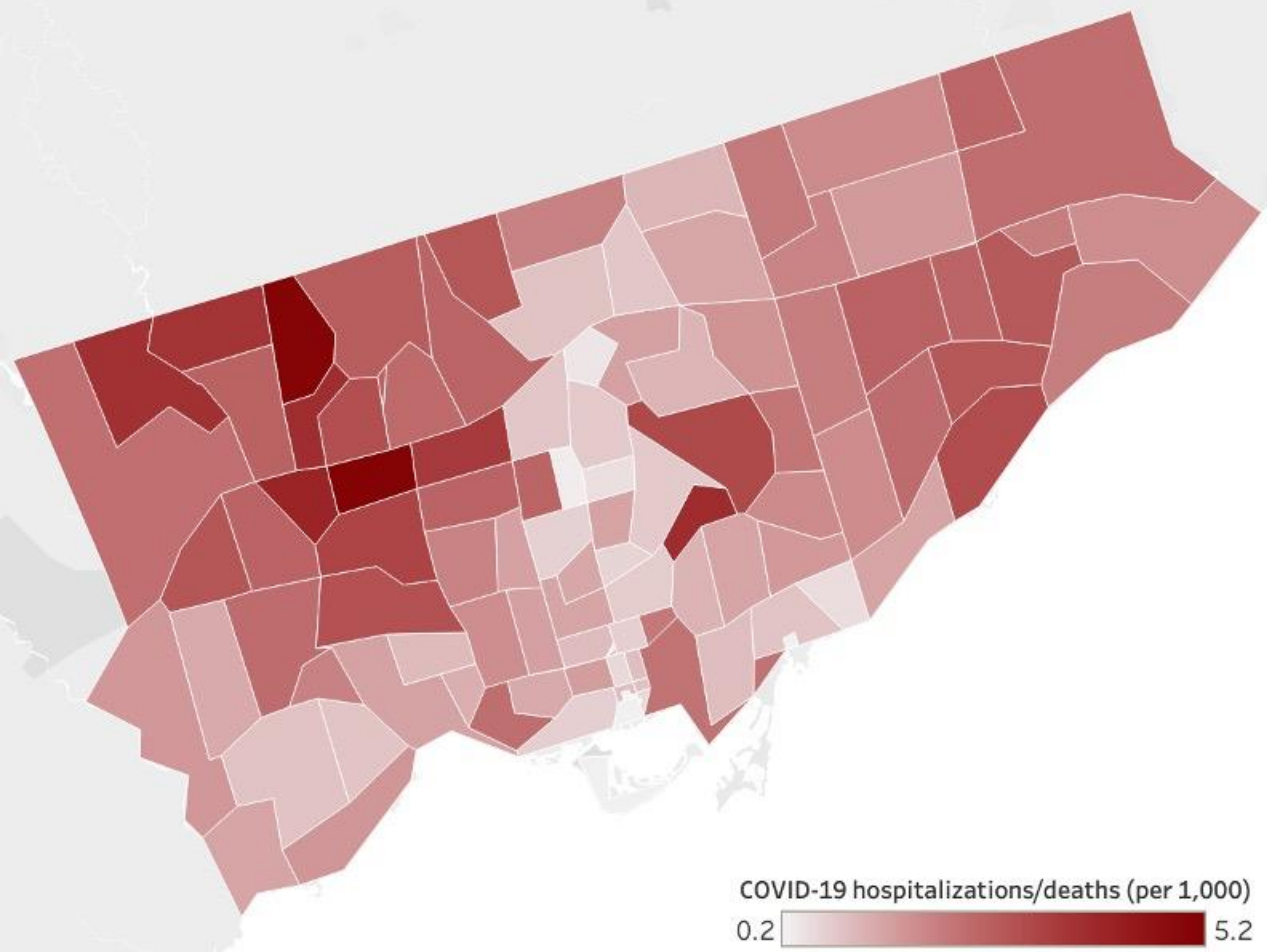
- Overlooks the need for public health systems to become more trustworthy and accessible as well as the structural barriers/racism that underlie the race effect.
- Vaccine acceptancy is not always lower among racialized groups.
 - I. Asians are the group most willing to get the COVID-19 vaccine
 - II. Blacks have also become more willing to get vaccinated over time.

This research

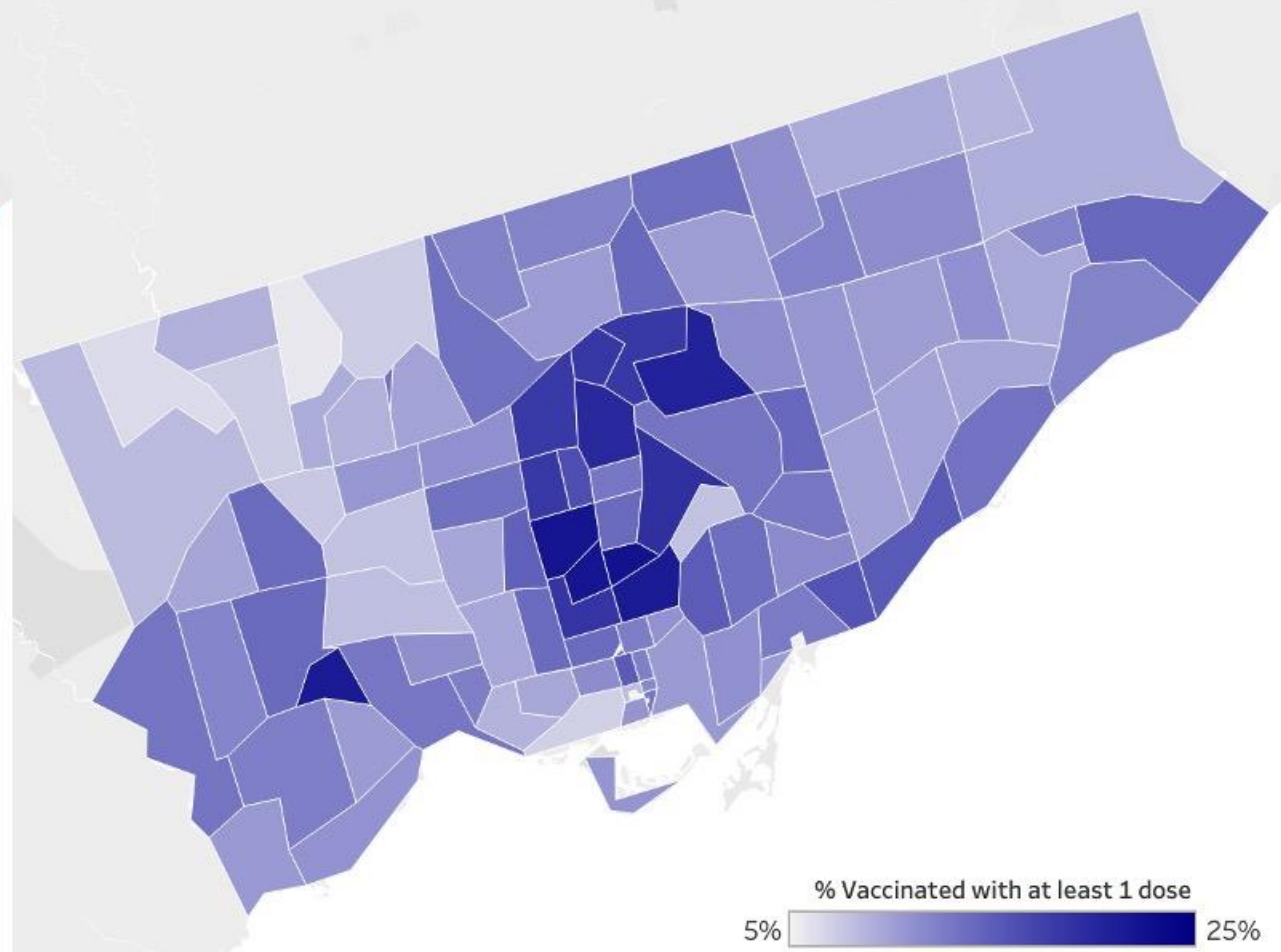
Moving beyond individual factors (vaccine hesitancy)



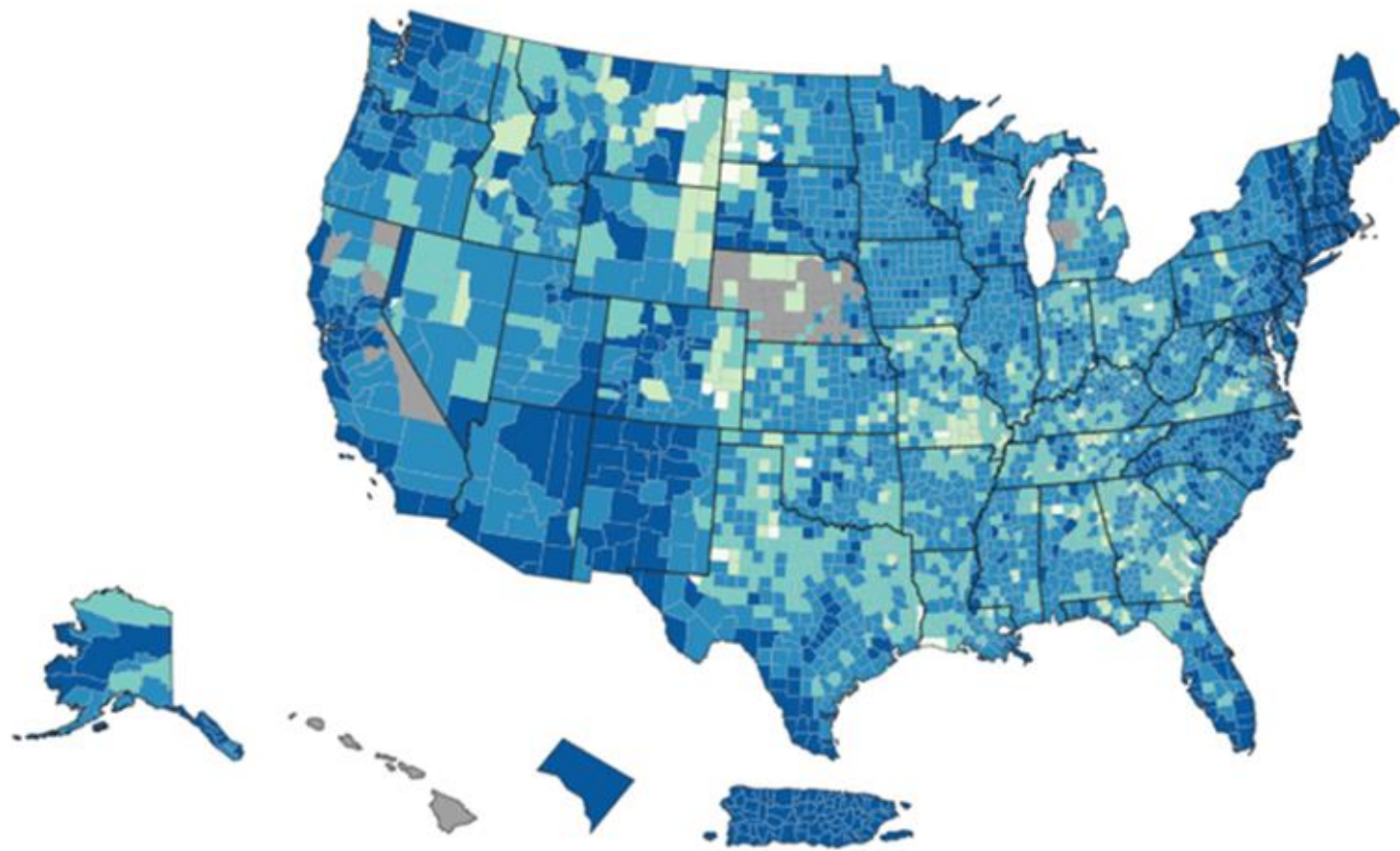
COVID-19 HOSPITALIZATIONS AND DEATHS



COVID-19 VACCINATIONS



% of total population with at least one dose of All Counties in US



Khanijahani and Tomassoni (2022:368) emphasize that “the spatialized nature of structural and environmental racism and socioeconomic disadvantage, along with the infectious nature of COVID-19, calls for attention beyond the individual characteristics.”

Racial concentration as a predictor

Highlights the role of structural dynamics

Helps defuse the “victim-blaming” narratives about why racial and ethnic groups are hardest hit by COVID-19

Two mechanisms

Racial concentration is associated with the concentrations of social vulnerabilities.

Racial concentration is associated with concentrations of differential political dynamics.

Two contributions

Racialized groups cannot be simply reduced to one minority group (e.g., minority concentration)

- Concentrations of Asians, Blacks, Hispanics, and Whites

Time matters

- From the early rollout to the time when vaccines became widely available

Key argument

Racially specific mechanisms- **differential concentrations of social vulnerability and political ideology by race-** are likely to create diverse associations between racial concentration and COVID-19 vaccination not only across racial groups but also within racial groups over time.

Data

CDC: County-level COVID-19 vaccination rates; COVID-19 Hesitancy Data

The Census Bureau's 2019 American Community Survey (ACS): Racial concentrations (e.g., Asian concentration is measured by the percent of the county population that is non-Hispanic Asian)

Social vulnerability indicators including median household income, unemployment rate, level of education are from the U.S. Congress Joint Economic Committee's Social Capital Project. 2018 as well as two other indicators, resources constrained health system index and healthcare accessibility barriers index that are from the COVID-19 Vaccine Coverage Index launched by Surgo Ventures in February 2021.

Political ideology: political party affiliation (percent of Republicans) and the differences between Republican votes and Democratic votes during the 2020 election in each county.

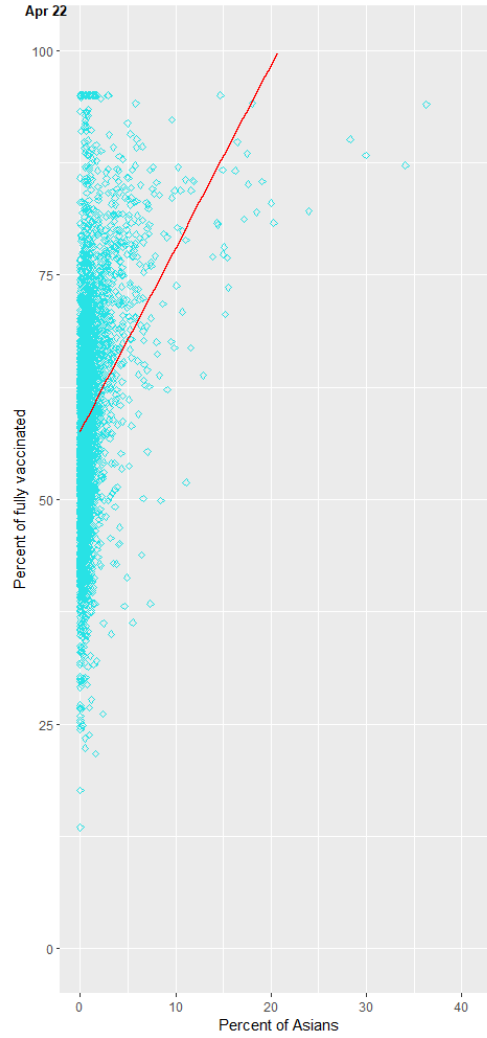
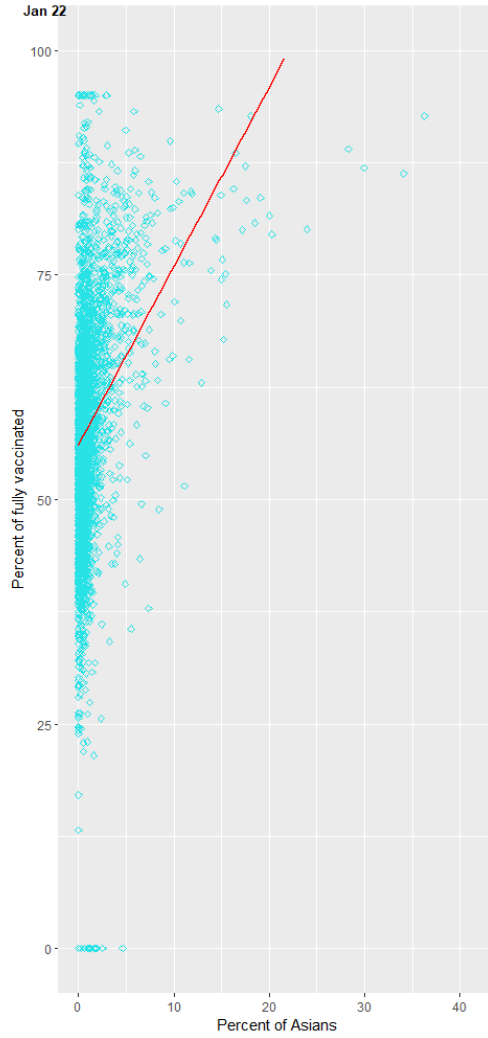
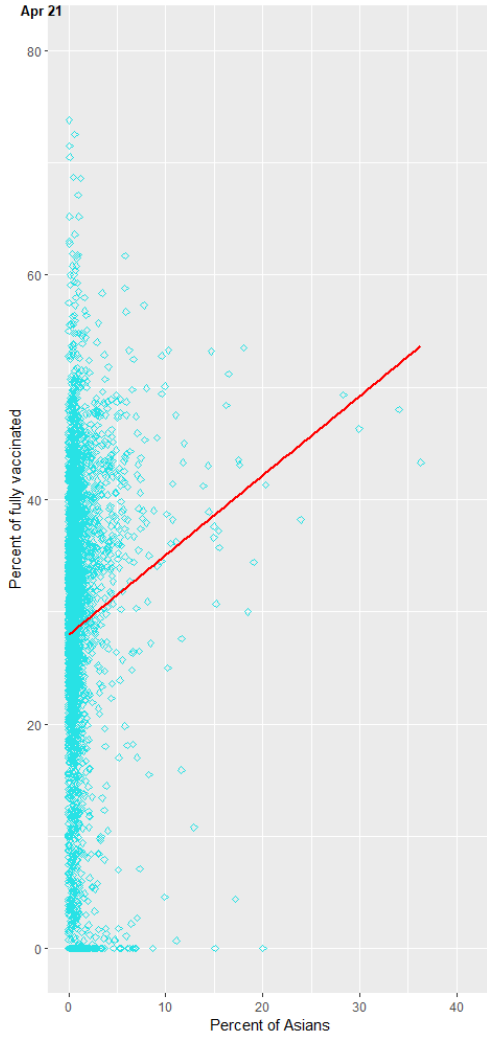
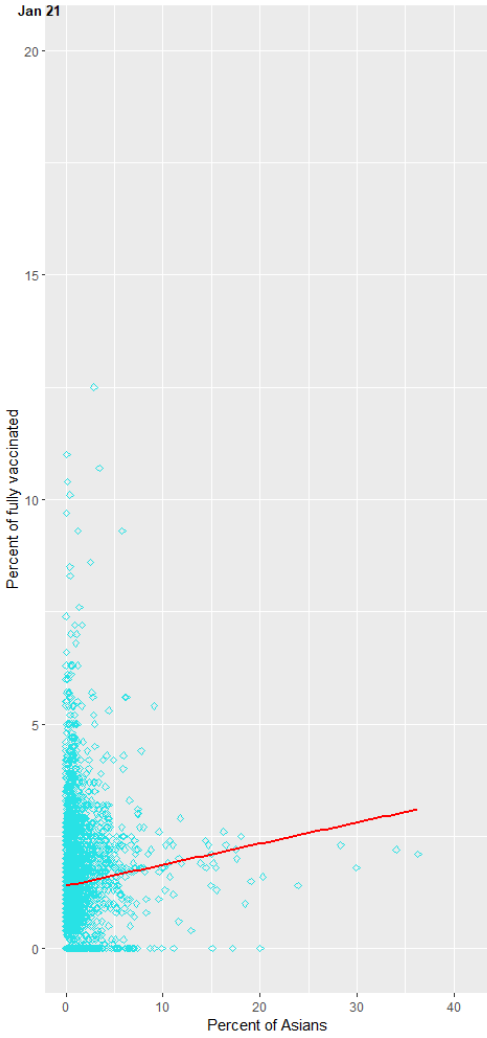
Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Vaccination</i>					
Fully vaccinated as of January 2021	3,097	1.5	1.4	0.0	25.4
Fully vaccinated as of April 2021	3,097	28.9	14.3	0.0	99.9
Fully vaccinated as of January 2022	3,097	58.6	13.1	0.0	95.0
Fully vaccinated as of April 2022	3,089	60.2	12.5	13.5	95.0
<i>Racial concentration</i>					
Percent Asians	3,104	1.3	2.6	0.0	41.7
Percent of Blacks	3,104	9.0	14.5	0.0	87.2
Percent of Hispanics	3,104	9.4	13.8	0.0	99.2
Percent of Whites	3,104	76.6	19.8	0.7	100.0
<i>Social vulnerability</i>					
Median household income (in 10k)	3,104	4.8	1.2	1.9	12.6
Unemployment rate	3,104	4.0	1.6	0.0	18.8
Percent of adults with BA	3,104	20.8	9.1	3.0	80.2
Resource constrained health system	3,104	0.5	0.3	0.0	1.0
Healthcare accessibility barriers	3,104	0.5	0.3	0.0	1.0
Social vulnerability PCF index	3,104	0.0	1.0	-4.7	2.9
<i>Political ideology</i>					
Percent of GOP	3,104	0.7	0.2	0.1	1.0
GOP/DEM votes difference (10k)	3,104	-0.2	5.4	-188.3	11.9
Political conservatism index	3,104	0.0	1.0	-22.6	-1.6
<i>Controls</i>					
COVID-19 vaccine hesitancy	3,104	8.6	3.2	1.9	18.2
COVID-19 cases, as of July 2021 (1k)	3,104	10.6	37.7	0.0	1282.4
Total population (10k)	3,104	10.0	31.9	0.0	1005.7
Percent of rural population	3,104	58.5	31.4	0.0	100.0

Empirical Findings (1)

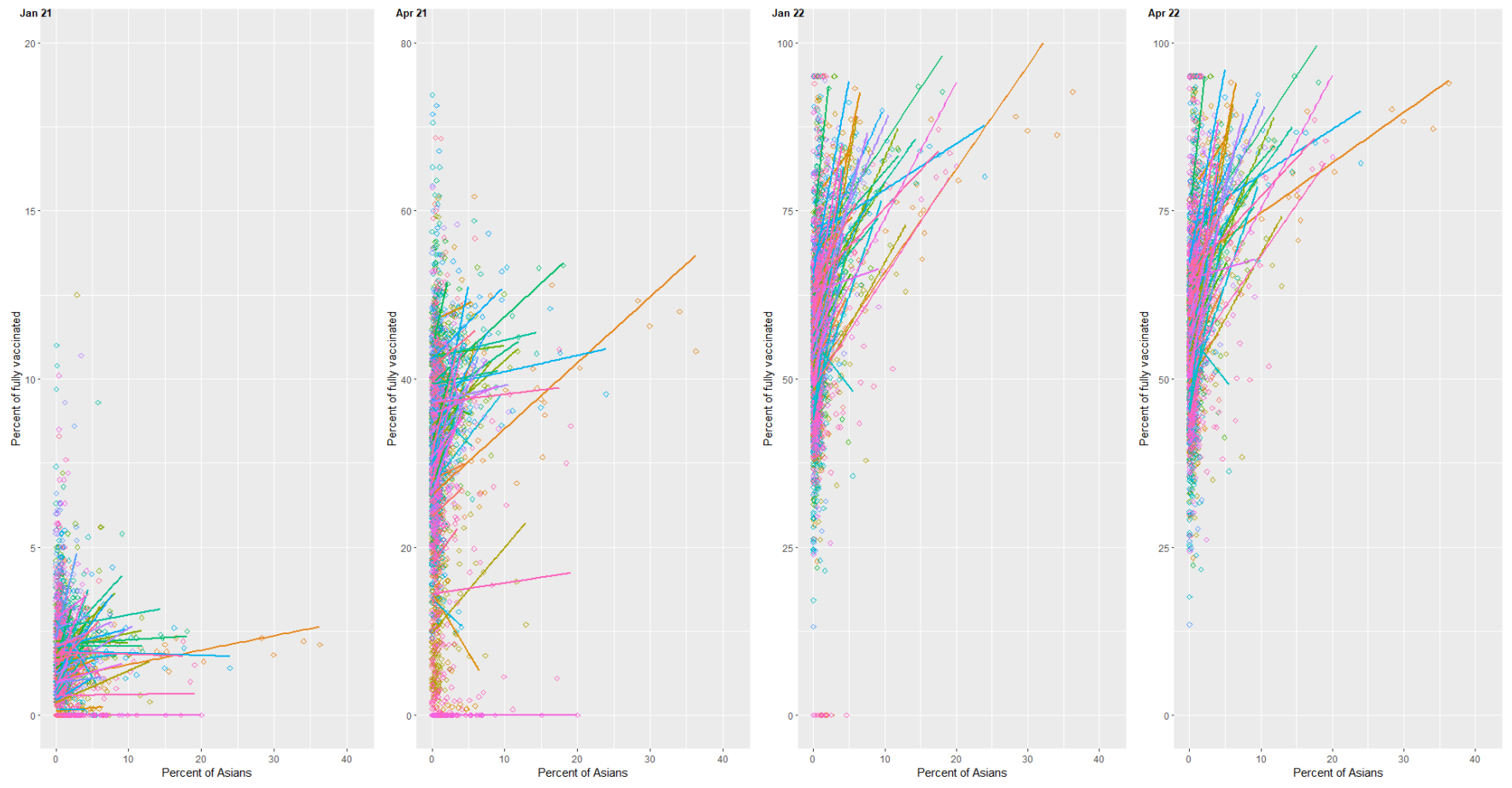
- Differential associations between concentrations of diverse racial groups and vaccination rates.



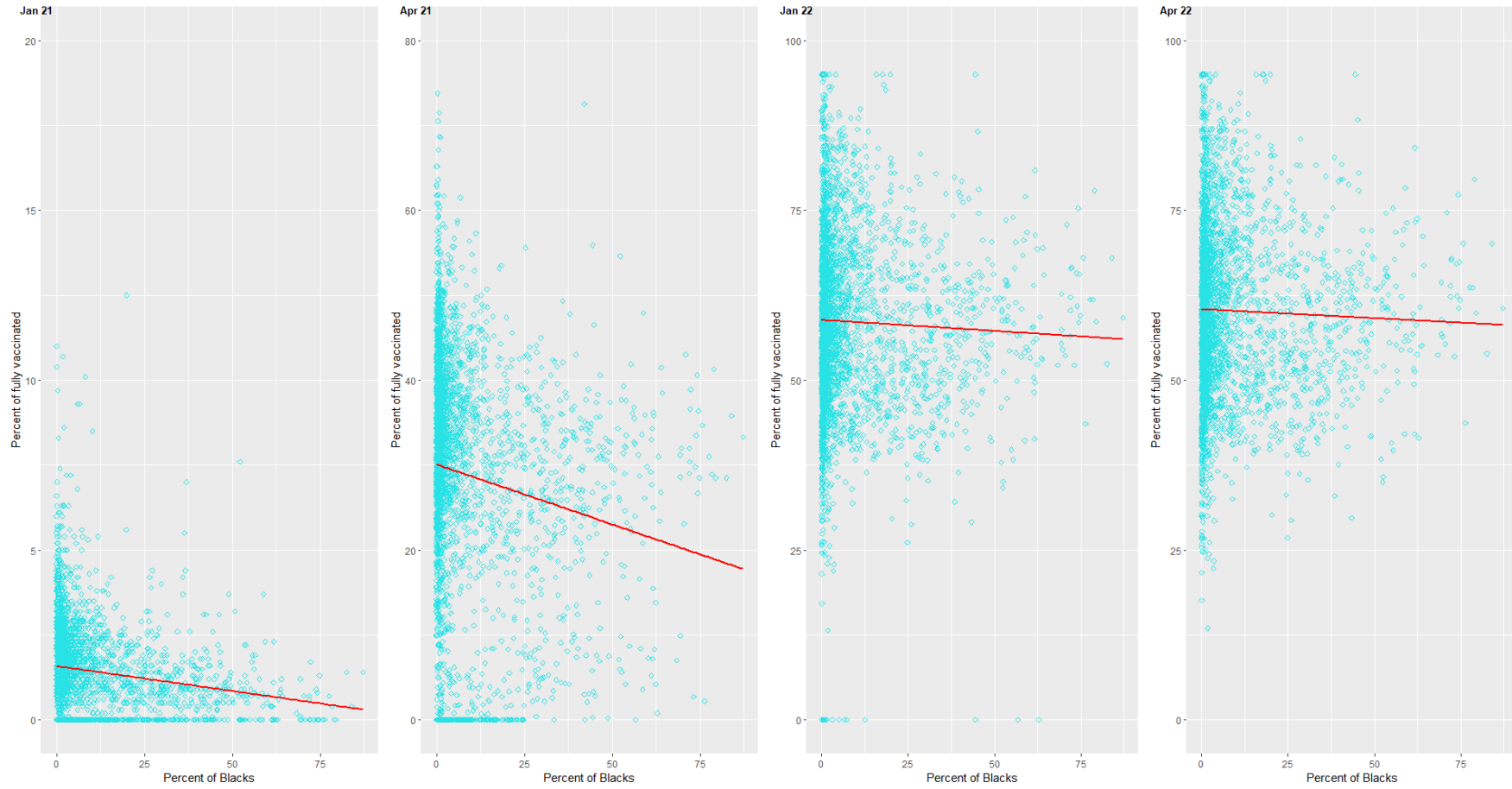
Asian: overall



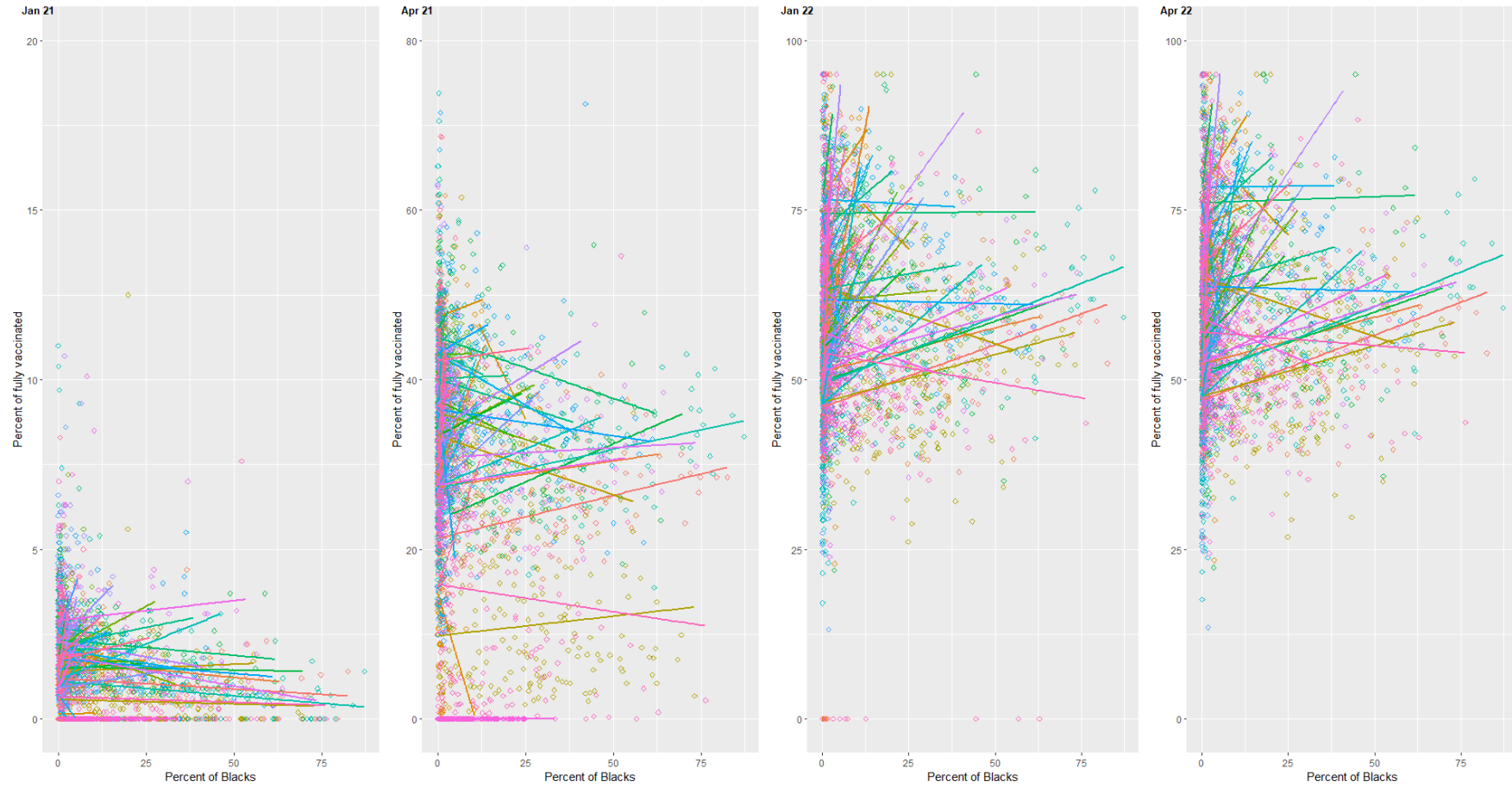
Asian: by state



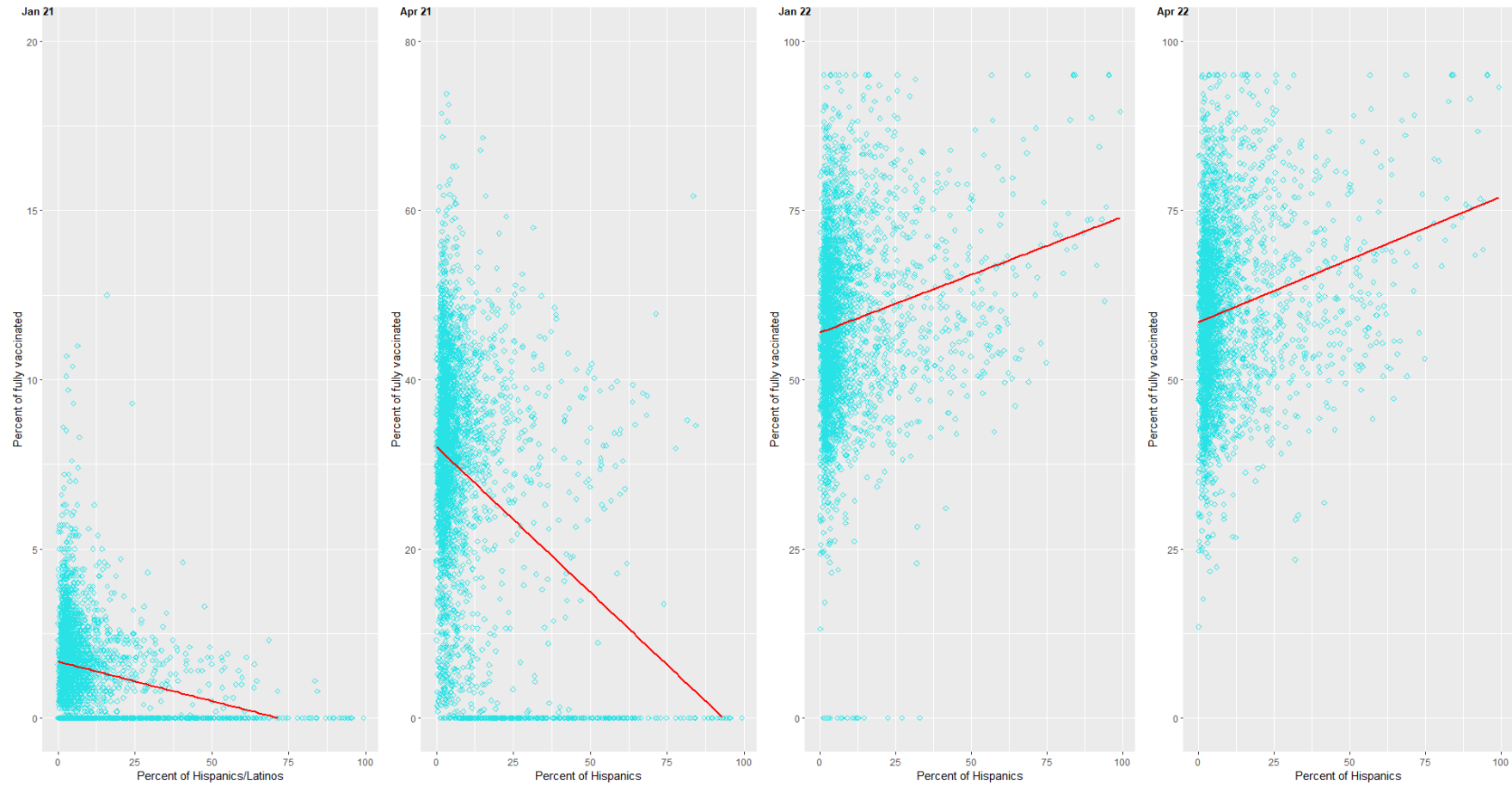
Black: overall



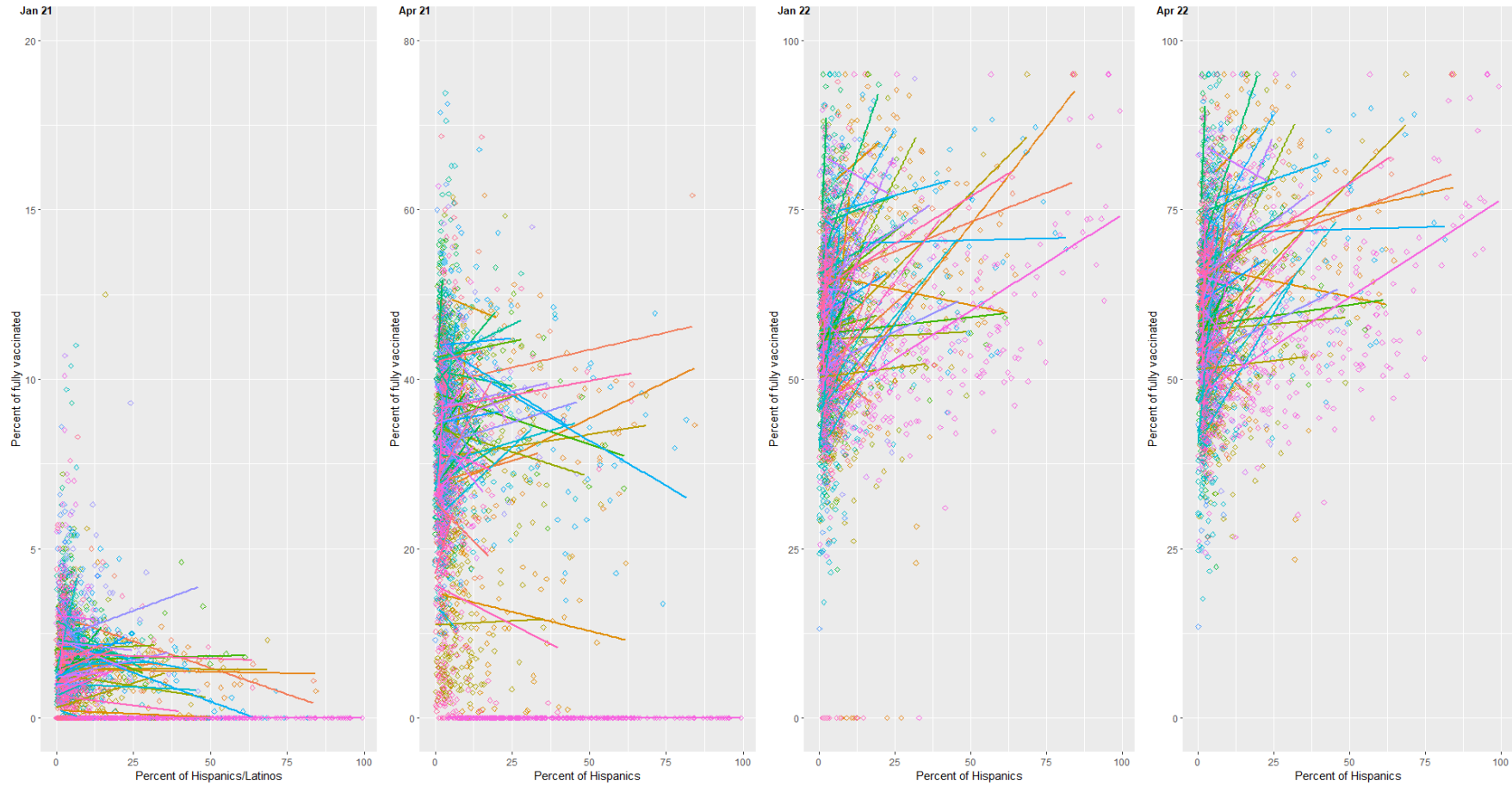
Black: by state



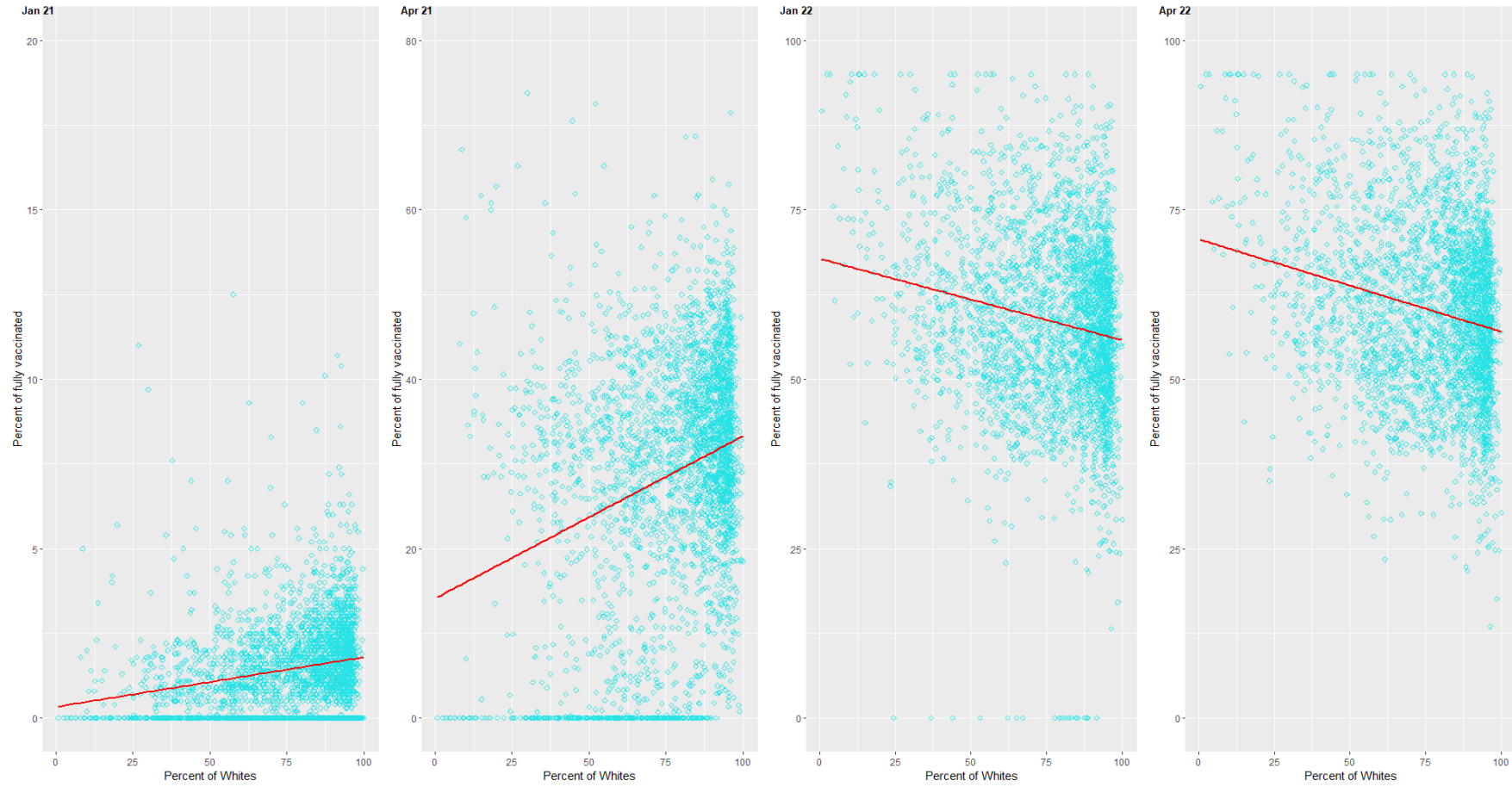
Hispanic: overall



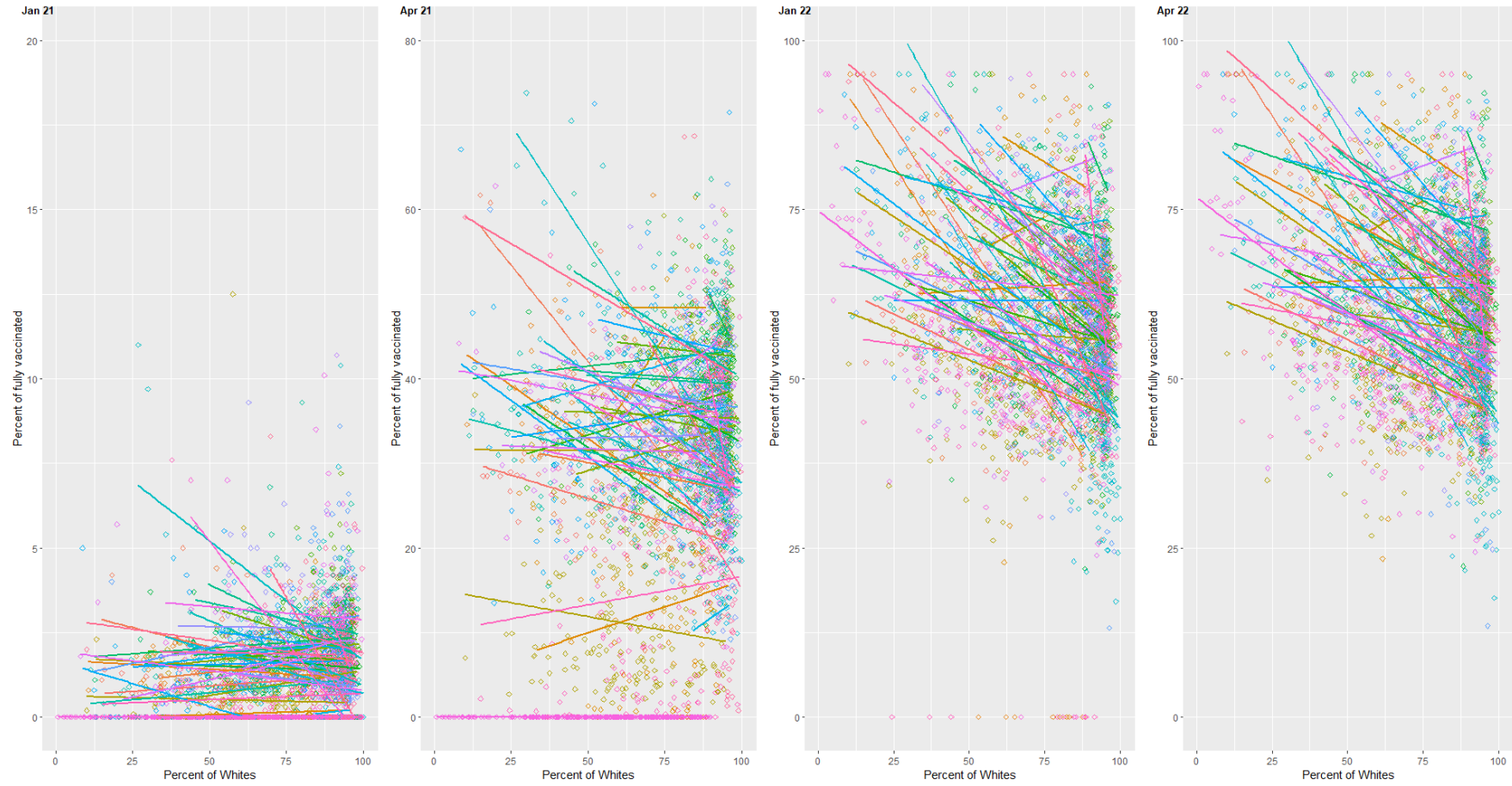
Hispanic : by state



White: overall



White: by state

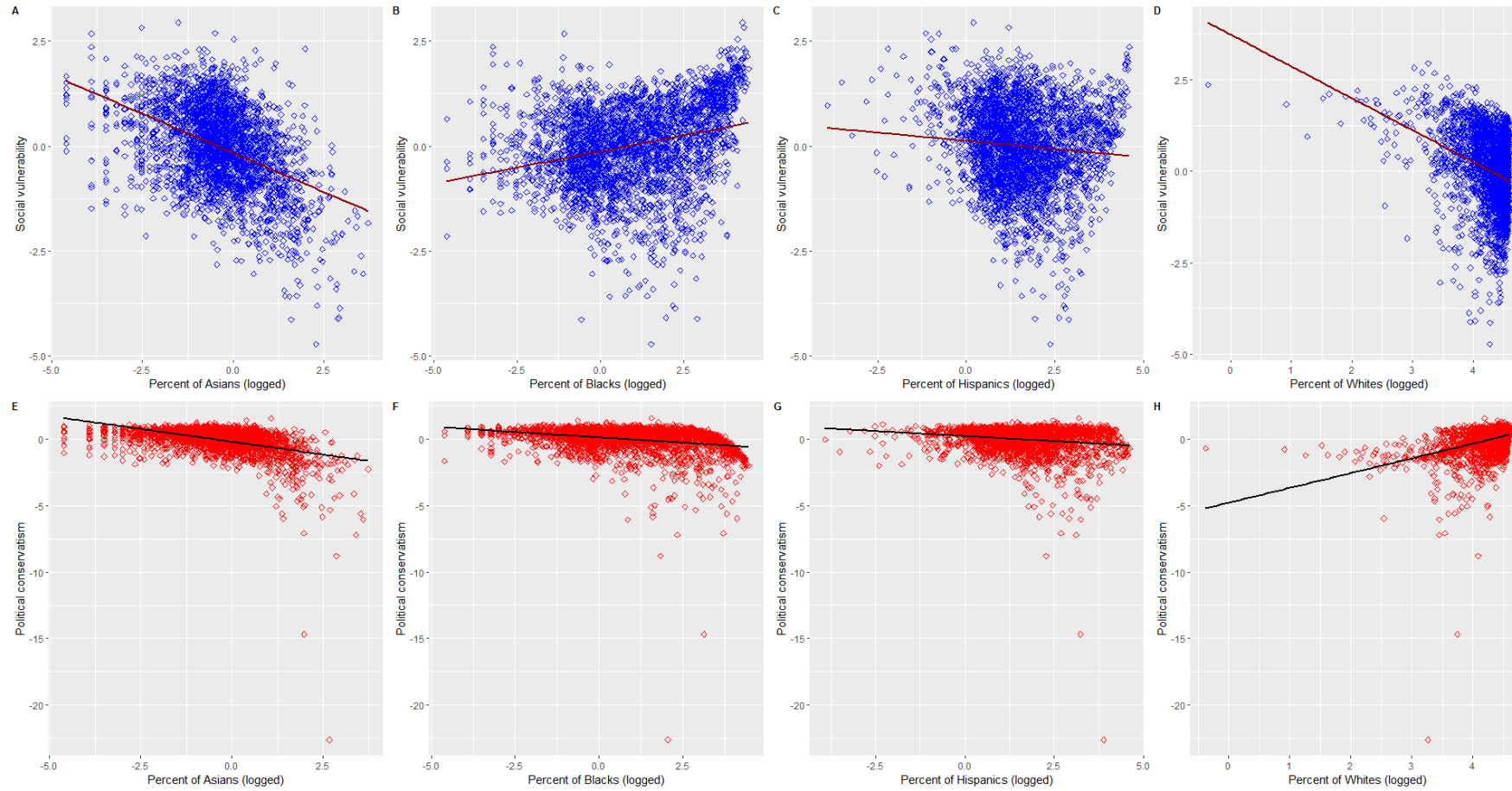




Empirical Findings (2)

- Concentrations of different racial groups mean concentrations of differential vulnerabilities and political dynamics

Figure 2. Scatterplots between social vulnerability, political conservatism, and concentrations of Asians, Blacks, Hispanics, and Whites



Empirical Findings (3)

- Model (1) base
- Model (2) social vulnerability
- Model (3) political ideology
- Model (4) full



April 2021

<i>Predictors</i>	Asian				Black				Hispanic				White			
	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)
(Intercept)	44.71 ***	39.34 ***	42.73 ***	34.97 ***	45.92 ***	38.14 ***	42.86 ***	35.12 ***	46.89 ***	39.86 ***	44.51 ***	35.41 ***	48.98 ***	43.31 ***	40.32 ***	36.11 ***
Racial concentration																
Percent of x population	0.25 **	0.07	0.11	-0.16	0.02	0.06 ***	-0.09 ***	-0.05 **	-0.04 *	-0.01	-0.06 ***	-0.02	-0.04 ***	-0.10 ***	0.03 **	-0.03 *
Mechanisms																
Social vulnerability PCF index		-1.72 ***		-2.38 ***		-2.08 ***		-2.08 ***		-1.74 ***		-2.19 ***		-2.74 ***		-2.48 ***
Political ideology PCF index			-2.64 ***	-3.21 ***			-3.52 ***	-3.53 ***			-2.78 ***	-3.15 ***			-3.13 ***	-2.81 ***
Controls																
COVID-19 vaccine hesitancy	-1.46 ***	-0.85 ***	-1.24 ***	-0.37 *	-1.56 ***	-0.78 ***	-1.13 ***	-0.35 *	-1.60 ***	-0.88 ***	-1.34 ***	-0.41 *	-1.57 ***	-0.53 **	-1.22 ***	-0.32
COVID-19 cases, as of July 2021 (1k)	-0.04	-0.03	0	0.01	-0.06 **	-0.03	0	0.03	-0.05 **	-0.04 *	0.01	0.03	-0.06 ***	-0.03 *	0	0.02
Total population (10k)	0.04	0.04	-0.05	-0.07 **	0.07 ***	0.04 *	-0.06 **	-0.09 ***	0.06 **	0.05 *	-0.05 *	-0.08 ***	0.07 ***	0.04	-0.05 *	-0.07 **
Percent of rural population	-0.02 **	-0.01 *	-0.01	0	-0.02 ***	-0.01	-0.01 *	0	-0.02 ***	-0.01 *	-0.01 **	0	-0.01 **	0.01	-0.01 *	0.01
Random Effects																
σ^2	57.28	56.33	55.05	53.23	57.37	56.03	54.52	53.15	57.28	56.34	54.8	53.25	57.07	54.93	54.95	53.22
τ_{00}	109.23 _{state}	91.84 _{state}	106.68 _{state}	86.05 _{state}	112.59 _{state}	91.84 _{state}	102.47 _{state}	85.06 _{state}	111.25 _{state}	92.04 _{state}	107.08 _{state}	85.92 _{state}	114.92 _{state}	91.04 _{state}	104.94 _{state}	86.20 _{state}
N	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}	49 _{state}
Observations	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097	3097
Marginal R ² /Conditional R ²	0.138 / 0.703	0.103 / 0.659	0.139 / 0.707	0.108 / 0.659	0.144 / 0.711	0.094 / 0.657	0.150 / 0.705	0.115 / 0.660	0.148 / 0.711	0.106 / 0.660	0.149 / 0.712	0.110 / 0.660	0.145 / 0.716	0.089 / 0.657	0.143 / 0.705	0.102 / 0.657

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

April 2022

<i>Predictors</i>	Asian				Black				Hispanic				White			
	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)	Model (1)	Model (2)	Model (3)	Model (4)
(Intercept)	86.69 ***	80.74 ***	82.81 ***	73.54 ***	89.62 ***	79.24 ***	83.53 ***	73.97 ***	86.58 ***	75.59 ***	82.08 ***	68.55 ***	103.46 ***	94.38 ***	90.84 ***	84.58 ***
Racial concentration																
Percent of x population	0.59 ***	0.39 ***	0.31 **	-0.05	0.07 ***	0.13 ***	-0.13 ***	-0.07 ***	0.15 ***	0.19 ***	0.11 ***	0.16 ***	-0.18 ***	-0.28 ***	-0.07 ***	-0.18 ***
Mechanisms																
Social vulnerability PCF index		-1.94 ***		-3.11 ***		-2.85 ***		-2.81 ***		-2.83 ***		-3.58 ***		-4.84 ***		-4.47 ***
Political ideology PCF index			-5.30 ***	-6.02 ***			-6.59 ***	-6.58 ***			-5.23 ***	-5.80 ***			-4.45 ***	-3.86 ***
Controls																
COVID-19 vaccine hesitancy	-2.38 ***	-1.71 ***	-1.95 ***	-0.91 ***	-2.69 ***	-1.66 ***	-1.82 ***	-0.88 ***	-2.46 ***	-1.36 ***	-1.96 ***	-0.61 ***	-2.77 ***	-1.06 ***	-2.22 ***	-0.76 ***
COVID-19 cases, as of July 2021 (1k)	-0.01	-0.01	0.07 **	0.08 ***	-0.05 *	-0.02	0.06 **	0.09 ***	-0.08 ***	-0.07 **	0.02	0.06 **	-0.06 **	-0.02	0.03	0.05 **
Total population (10k)	0.03	0.03	-0.16 ***	-0.18 ***	0.09 ***	0.05	-0.16 ***	-0.20 ***	0.13 ***	0.10 ***	-0.10 ***	-0.15 ***	0.09 ***	0.03	-0.09 **	-0.12 ***
Percent of rural population	-0.09 ***	-0.09 ***	-0.08 ***	-0.06 ***	-0.10 ***	-0.08 ***	-0.08 ***	-0.07 ***	-0.09 ***	-0.08 ***	-0.07 ***	-0.05 ***	-0.07 ***	-0.04 ***	-0.07 ***	-0.04 ***
Random Effects																
σ^2	86.97	86	78.04	75.02	87.08	84.79	77.16	74.73	86.04	83.63	77.35	73.07	81.54	74.66	77.41	71.52
τ_{00}	59.45 state	41.91 state	49.88 state	30.33 state	69.06 state	42.11 state	46.00 state	29.47 state	63.83 state	37.96 state	50.87 state	27.58 state	76.94 state	39.54 state	58.27 state	32.08 state
N	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state	49 state
Observations	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089	3089
Marginal R ² / Conditional R ²	0.394 / 0.640	0.368 / 0.575	0.426 / 0.650	0.410 / 0.580	0.400 / 0.665	0.355 / 0.569	0.441 / 0.650	0.420 / 0.584	0.412 / 0.662	0.378 / 0.572	0.434 / 0.658	0.417 / 0.577	0.429 / 0.706	0.397 / 0.606	0.434 / 0.677	0.414 / 0.595

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Racial concentration	Mechanisms	Time	
		Apr-21	Apr-22
Asian	Model (1): base	0.25 **	0.59 ***
	Model (2): social vulnerability	0.07	0.39 ***
	Model (3): political ideology	0.11	0.31 **
	Model (4): full	-0.16	-0.05
Black	Model (1): base	0.02	0.07 ***
	Model (2): social vulnerability	0.06 ***	0.13 ***
	Model (3): political ideology	-0.09 ***	-0.13 ***
	Model (4): full	-0.05 **	-0.07 ***
Hispanic	Model (1): base	-0.04 *	0.15 ***
	Model (2): social vulnerability	-0.01	0.19 ***
	Model (3): political ideology	-0.06 ***	0.11 ***
	Model (4): full	-0.02	0.16 ***
White	Model (1): base	-0.04 ***	-0.18 ***
	Model (2): social vulnerability	-0.10 ***	-0.28 ***
	Model (3): political ideology	0.03 **	-0.07 ***
	Model (4): full	-0.03 *	-0.18 ***

Four takeaways

Concentrations of Asians, Blacks, Hispanics, and Whites are associated with COVID-19 vaccination differently.

The association between racial concentration and COVID-19 vaccination also change within racial groups from early vaccine rollout to the time after vaccines became widely available

Rather vaccine hesitancy, social vulnerability and political ideology are the underlying factors for the association between racial concentration and COVID-19 vaccination.

Differential concentrations of social vulnerability and political ideology by race create the racially specific and time varying patterns