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A red mirage—Did the association of the 2016 presidential election results with the COVID-19 epidemic magically disappear in 2020?

To the Editor,

The author's previous study[1] for US states indicated that the vote ratio (defined as the votes for Ms. Hillary Clinton divided by those for Mr. Donald Trump) in the 2016 presidential election were independently and negatively associated with the coronavirus disease 2019 (COVID-19) incidence (calculated as the cumulative number of cases until September 30, 2020 divided by the population), which suggests that the support to Clinton may be negatively (conversely, the support to Trump may be positively) associated with the COVID-19 epidemic. The author herein investigated whether the interesting associations[1] are applicable to results of the 2020 presidential election or "magically disappear" (https://twitter.com/realDonaldTrump/status/1324004491612618752) like a "red mirage" (https://www.axios.com/bloomberg-group-trump-election-night-scenarios-a554e8f5-9702-437e-ae75-d2be478d42bb.html).

For each US state, the cumulative number of confirmed COVID-19 cases on November 3, 2020 (the day of the 2020 presidential election) was procurable on "Johns Hopkins Coronavirus Resource Center" (https://github.com/CSSEGISandData/COVID-19/blob/master/csse_covid_19_data/csse_covid_19_daily_reports_us/11-03-2020.csv). The number of votes in the 2020 presidential election were extracted from "The New York Times" (https://www.nytimes.com/interactive/2020/11/03/us/elections/results-president.html) on November 8, 2020 (5 days after the day of the 2020 presidential election). The number of returned mail ballots until November 3 was retrieved from "2020 General Election Early Vote Statistics" (https://electproject.github.io/Early-Vote-2020G/index.html). Demographic and socioeconomic characteristics in 2018 were available on "American Community Survey, 2014–2018 ACS 5-Year Data Profile" (https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/). The COVID-19 incidence was calculated as the cumulative number of cases divided by the population. The vote ratio was defined as the votes for Mr. Joseph Biden divided by those for President Trump (<1 denotes that Trump won in the state). The univariable and multivariable random-effects inverse-variance (of the COVID-19 incidence) weighted regression (meta-regression where each state is likened to a study in meta-analysis) was performed using OpenMetaAnalyst (http://www.cebm.brown.edu/openmeta/index.html). The vote ratio and demographic/socioeconomic characteristics were entered into the regression as covariates for the logarithmic-transformed COVID-19 incidence.

Extracted data were listed in Table 1. The vote ratio in District of Columbia was 17.895 despite 0.380 (Wyoming)–2.045 (Vermont) in the other states. Hence, we decided to exclude it (occupying merely 0.21% of the total population and 0.19% of the cumulative COVID-19 cases in the entire US) as an outlier. The univariable regression demonstrated that the vote ratio (for Biden vs. Trump) was significantly and negatively associated with the COVID-19 incidence (coefficient, −0.640; p < .001; Table 2; Figure 1), which would indicate that the COVID-19 incidence decreases as the vote for Biden increases (conversely, the COVID-19 incidence increases as the vote for Trump increases). The multivariable regression also demonstrated independent (of other covariates including mail ballot [%]), significant, and negative association of the vote ratio (−1.311; p < .001; Table 2) with the COVID-19 incidence.

The present study indicated that the support to Trump in the 2020 presidential election was independently and positively associated with the COVID-19 epidemic. Namely, in the 2020 presidential election, the association of the support to Trump in the 2016 presidential election with the COVID-19 epidemic did not "miraculously disappear" (https://twitter.com/realDonaldTrump/status/1324855496722026498) like a red mirage. The previous[1] and present findings could be explained by the following. Conservatives and republicans may prefer individual responsibility to socioeconomic circumstances for health.[2] They also may advocate that health is ultimately conditional on individuals attaining and retaining it in conformity with own resolutions irrespective of socioeconomic situations.[2] Furthermore, as compared with liberals and democrats, conservatives and republicans may less search detailed health information and less get influenza vaccination.[3]

The cumulative number of COVID-19 cases in the entire US used for the analysis was dramatically increased by 30% from 7.2 million (on September 30 in the previous study[1]) to 9.3 million (on November 3 in the present study) during merely one month. During this one-month period, the COVID-19 incidence in states with more support to Trump (less support to Clinton in 2016 or Biden in 2020) may have been more increased than that in states with less support to Trump (more support to Clinton or Biden). Indeed, the COVID-19 incidence in Montana (vote ratio for Clinton versus Trump in 2016, 0.64; that for Biden versus Trump in 2020, 0.71) and Wyoming (vote ratio in 2016, 0.32; that in 2020, 0.38) was increased respectively by 2.69 (from 1255 to 3375 cases per 0.1-million population) and 2.46 (from 1022 to 2513 cases per 0.1-million population) folds. Whereas that in California (vote ratio in 2016, 1.95; that in 2020, 1.97) and New York (vote ratio in 2016,

TABLE 1 Extracted data

| State | Population | COVID-19 (Nov. 3, 2020) | | 2020 Presidential election (Nov. 8, 2020) | | | | Vote | | | |
		Cumulative confirmed case (N)	Incidence (per 0.1-million population)	Updated	Reported (%)	Total reported (N)	Mail ballot (%)	Joseph Biden (N)	Donald Trump (N)	Ratio (Biden vs. Trump)	Sate Winner
Alabama	4,864,680	195,929	4028	Nov. 6, 2020	>98	2,309,900	13.00	843,473	1,434,159	0.588	Trump
Alaska	738,516	17,448	2363	Nov. 4, 2020	56	172,031	43.66	56,849	108,231	0.525	[Trump]
Arizona	6,946,685	249,818	3596	Nov. 7, 2020	97	3,295,325	73.00	1,631,195	1,612,585	1.012	[Biden]
Arkansas	2,990,671	114,519	3829	Nov. 7, 2020	>98	1,216,818	9.72	420,985	761,251	0.553	Trump
California	39,148,760	945,401	2415	Nov. 5, 2020	77	12,570,927	70.66	8,180,018	4,152,425	1.970	Biden
Colorado	5,531,141	114,709	2074	Nov. 6, 2020	95	3,173,127	86.28	1,753,416	1,335,253	1.313	Biden
Connecticut	3,581,504	74,843	2090	Nov. 7, 2020	97	1,786,555	34.87	1,059,250	699,079	1.515	Biden
Delaware	949,495	25,426	2678	Nov. 5, 2020	>98	502,384	29.45	295,413	199,857	1.478	Biden
District of Columbia	684,498	17,524	2560	Nov. 5, 2020	80	279,152	57.29	258,561	14,449	17.895	Biden
Florida	20,598,139	816,700	3965	Nov. 4, 2020	96	11,031,440	42.81	5,269,926	5,646,949	0.933	Trump
Georgia	10,297,484	364,589	3541	Nov. 7, 2020	>98	4,981,074	26.44	2,463,889	2,454,729	1.004	[Biden]
Hawaii	1,422,029	15,318	1077	Nov. 4, 2020	>98	573,854	84.27	365,802	196,602	1.861	Biden
Idaho	1,687,809	67,024	3971	Nov. 6, 2020	>98	867,971	46.34	286,991	554,019	0.518	Trump
Illinois	12,821,497	436,265	3403	Nov. 6, 2020	89	5,454,018	29.62	3,016,834	2,330,734	1.294	Biden
Indiana	6,637,426	188,066	2833	Nov. 6, 2020	>98	3,031,629	16.70	1,239,529	1,727,085	0.718	Trump
Iowa	3,132,499	134,326	4288	Nov. 7, 2020	92	1,686,491	59.05	757,699	896,102	0.846	Trump
Kansas	2,908,776	86,290	2967	Nov. 5, 2020	>98	1,320,528	31.63	542,646	748,608	0.725	Trump
Kentucky	4,440,204	111,379	2508	Nov. 7, 2020	98	2,157,710	26.93	777,813	1,342,474	0.579	Trump
Louisiana	4,663,616	184,769	3962	Nov. 7, 2020	>98	2,147,395	7.42	855,630	1,255,528	0.681	Trump
Maine	1,332,813	6925	520	Nov. 6, 2020	91	783,776	63.58	419,309	340,512	1.231	Biden
Maryland	6,003,435	147,766	2461	Nov. 4, 2020	70	2,165,706	44.88	1,367,129	759,962	1.799	Biden
Massachusetts	6,830,193	161,585	2366	Nov. 7, 2020	92	3,443,426	39.56	2,247,362	1,117,629	2.011	Biden
Michigan	9,957,488	207,763	2087	Nov. 6, 2020	>98	5,530,390	51.34	2,794,853	2,646,956	1.056	Biden
Minnesota	5,527,358	157,096	2842	Nov. 7, 2020	96	3,271,288	Unavialable	1,717,991	1,485,677	1.156	Biden
Mississippi	2,988,762	121,509	4066	Nov. 6, 2020	86	1,148,432	18.15	447,162	683,527	0.654	Trump
Missouri	6,090,062	193,441	3176	Nov. 6, 2020	>98	3,010,315	27.50	1,242,851	1,711,848	0.726	Trump

TABLE 1 (Continued)

| State | Population | COVID-19 (Nov. 3, 2020) | | 2020 Presidential election (Nov. 8, 2020) | | | | Vote | | | |
		Cumulative confirmed case (N)	Incidence (per 0.1-million population)	Updated	Reported (%)	Total reported (N)	Mail ballot (%)	Joseph Biden (N)	Donald Trump (N)	Ratio (Biden vs. Trump)	Sate Winner
Montana	1,041,732	35,159	3375	Nov. 5, 2020	>98	602,777	87.36	243,714	341,763	0.713	Trump
Nebraska	1,904,760	74,060	3888	Nov. 6, 2020	>98	940,208	50.82	367,930	550,231	0.669	Trump
Nevada	2,922,849	103,025	3525	Nov. 7, 2020	95	1,295,764	41.24	647,474	619,944	1.044	Biden
New Hampshire	1,343,622	11,448	852	Nov. 6, 2020	>98	803,195	22.57	422,284	365,248	1.156	Biden
New Jersey	8,881,845	242,825	2734	Nov. 7, 2020	80	3,583,436	83.33	2,093,262	1,438,777	1.455	Biden
New Mexico	2,092,434	49,240	2353	Nov. 7, 2020	>98	919,261	34.69	498,022	400,920	1.242	Biden
New York	19,618,453	513,689	2618	Nov. 6, 2020	84	7,264,757	18.19	4,235,992	2,934,143	1.444	Biden
North Carolina	10,155,624	280,377	2761	Nov. 7, 2020	98	5,464,084	17.69	2,733,681	2,658,274	1.028	[Biden]
North Dakota	752,201	47,187	6273	Nov. 4, 2020	91	361,279	48.14	114,687	234,962	0.488	Trump
Ohio	11,641,879	226,138	1942	Nov. 4, 2020	90	5,701,651	52.06	2,576,590	3,038,247	0.848	Trump
Oklahoma	3,918,137	126,526	3229	Nov. 6, 2020	96	1,560,699	17.89	503,890	1,020,280	0.494	Trump
Oregon	4,081,943	46,460	1138	Nov. 7, 2020	97	2,334,762	91.40	1,318,475	942,737	1.399	Biden
Pennsylvania	12,791,181	220,074	1721	Nov. 7, 2020	98	6,749,175	37.94	3,350,534	3,313,236	1.011	Biden
Rhode Island	1,056,611	34,543	3269	Nov. 6, 2020	97	505,201	30.41	300,325	197,421	1.521	Biden
South Carolina	4,955,925	179,952	3631	Nov. 7, 2020	>98	2,515,926	52.11	1,092,518	1,386,207	0.788	Trump
South Dakota	864,289	48,854	5653	Nov. 6, 2020	>98	422,678	28.15	150,475	261,108	0.576	Trump
Tennessee	6,651,089	266,357	4005	Nov. 4, 2020	>98	3,049,471	6.90	1,139,364	1,849,791	0.616	Trump
Texas	27,885,195	950,302	3408	Nov. 7, 2020	97	11,259,148	8.63	5,216,321	5,872,348	0.888	Trump
Utah	3,045,350	119,375	3920	Nov. 6, 2020	88	1,193,845	75.58	444,531	701,078	0.634	Trump
Vermont	624,977	2237	358	Nov. 5, 2020	95	350,178	69.44	227,231	111,131	2.045	Biden
Virginia	8,413,774	184,679	2195	Nov. 7, 2020	>98	4,412,267	21.61	2,384,014	1,958,619	1.217	Biden
Washington	7,294,336	110,011	1508	Nov. 7, 2020	96	3,917,784	87.65	2,303,430	1,514,563	1.521	Biden
West Virginia	1,829,054	25,596	1399	Nov. 7, 2020	>98	864,488	17.14	259,193	589,848	0.439	Trump
Wisconsin	5,778,394	238,066	4120	Nov. 6, 2020	>98	3,297,473	38.67	1,630,569	1,610,030	1.013	Biden
Wyoming	581,836	14,621	2513	Nov. 5, 2020	>98	276,528	Unavialable	73,445	193,454	0.380	Trump

Abbreviation: COVID-19, coronavirus disease 2019.

TABLE 2 Results of inverse-variance weighted regression

Covariate	Univariable				Multivariable			
	Coefficient	LLCI	ULCI	p Value	Coefficient	LLCI	ULCI	p Value
2020 Presidential election								
Vote ratio (Biden vs. Trump)	−0.640	−0.927	−0.352	<.001[a]	−1.311	−1.868	−0.754	<.001[a]
Mail ballot (%)	−0.008	−0.014	−0.002	.014[a]	0.001	−0.006	0.007	.839
Demographic characteristics								
Sex ratio (male/100 females)	0.014	−0.034	0.061	.576	−0.002	−0.147	0.144	.984
Under 18 years (%)	0.161	0.099	0.223	<.001[a]	0.109	−0.026	0.244	.114
65 years and over (%)	−0.116	−0.193	−0.039	.003[a]	0.081	−0.054	0.216	.241
Black/African American (%)	0.018	0.003	0.033	.022	0.027	0.005	0.049	.018[a]
Hispanic/Latino (%)	0.007	−0.008	0.021	.351	0.020	0.002	0.038	.026[a]
Social characteristics								
Never married, male (%)	0.017	−0.041	0.075	.563	0.075	−0.247	0.398	.647
Divorced, male (%)	−0.051	−0.151	0.048	.314	0.090	−0.311	0.490	.661
Never married, female (%)	0.015	−0.037	0.068	.562	0.037	−0.275	0.349	.815
Divorced, female (%)	−0.105	−0.209	−0.209	.049[a]	−0.051	−0.414	0.312	.782
Bachelor's degree or higher (%)	−0.037	−0.064	−0.009	.014[a]	−0.003	−0.061	0.055	.914
Computer user (%)	−0.041	−0.092	0.01	.117	0.021	−0.130	0.172	.781
Internet user (%)	−0.039	−0.073	−0.005	.024[a]	0.004	−0.097	0.104	.945
Economic characteristics								
Civilian unemployment (%)	0.023	−0.105	0.151	.727	−0.186	−0.355	−0.017	.031[a]
Median household income (thousand dollars)	−0.012	−0.026	0.003	.110	−0.013	−0.080	0.054	.708
Mean household income (thousand dollars)	−0.008	−0.019	0.003	.168	0.024	−0.029	0.077	.374
No health insurance (%)	0.072	0.027	0.117	.002[a]	−0.048	−0.107	0.010	.103
Poverty people (%)	0.052	0.004	0.100	.033[a]	0.028	−0.103	0.159	.675

Abbreviations: LLCI, lower limit of 95% confidence interval; ULCI, upper limit of 95% confidence interval.
[a]Statistically significant.

1.62; that in 2020, 1.44) was merely increased respectively by 1.15 (from 2092 to 2415 cases per 0.1-million population) and 1.12 (from 2338 to 2618 cases per 0.1-million population) folds. During 4 years from 2016 to 2020, the support to Trump in states with high COVID-19 incidence may have been increased, or that in states with low COVID-19 incidence may have been decreased. For example, the support to Trump was increased, namely the vote ratio for Clinton in 2016 or Biden in 2020 versus Trump was decreased from 0.98 (in 2016) to 0.93 (in 2020) in Florida (3965 cases per 0.1-million population) and from 0.69 to 0.65 in Mississippi (4066 cases per 0.1-

million population). Furthermore, the support to Trump was decreased, namely the vote ratio was increased from 1.87 to 2.04 in Vermont (358 cases per 0.1-million population) and from 1.07 to 1.23 in Maine (520 cases per 0.1-million population). Provisional (on November 8), not final, results of the 2020 presidential election, however, might bias the present findings.

In conclusion, the support to Trump in the 2020 presidential election was associated with the COVID-19 epidemic. Namely, the association of the support to Trump in the 2016 presidential election with the COVID-19 epidemic did not disappear in 2020. Further

FIGURE 1 Inverse-variance weighted regression of logarithmic-transformed coronavirus disease 2019 (COVID-19) incidence (y-axis) on vote ratio for Biden versus Trump (x-axis). Each circle represents a state with area proportional to inverse of variance of the COVID-19 incidence
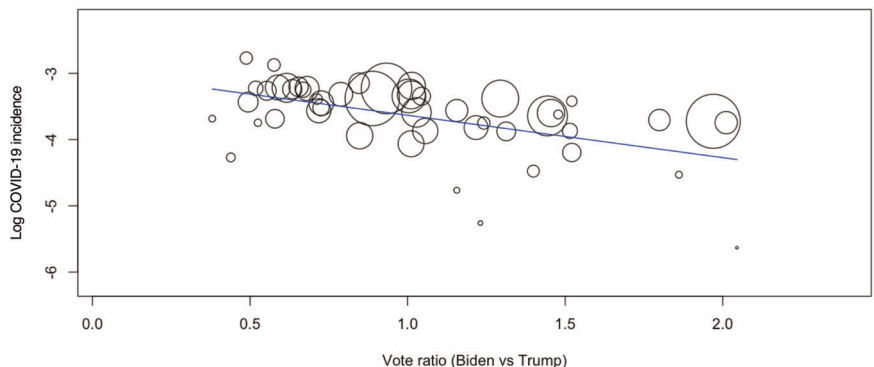
investigation for the association of political orientation with COVID-19, however, should be required.

Hisato Takagi MD, PhD

Department of Clinical Research, Shizuoka Medical Center, Shizuoka, Japan

Correspondence

Hisato Takagi, MD, PhD, Department of Clinical Research, Shizuoka Medical Center, 762-1 Nagasawa, Shimizu-cho, Sunto-gun, Shizuoka 411-8611, Japan.

Email: kfgth973@ybb.ne.jp

ORCID

Hisato Takagi http://orcid.org/0000-0002-5594-8072

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