LETTER TO THE EDITOR

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 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 are applicable to results of the 2020 presidential election or "magically disappear" (https://twitter.com/realDonaldTrump/status/1324855496722026498) 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/11032020.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://electionproject.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 and present findings could be explained by the following. Conservatives and republicans may prefer individual responsibility to socioeconomic circumstances for health. They also may advocate that health is ultimately conditional on individuals attaining and retaining it in conformity with own resolutions irrespective of socioeconomic situations. Furthermore, as compared with liberals and democrats, conservatives and republicans may less search detailed health information and less get influenza vaccination.

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) 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,
| State         | Population | COVID-19 (Nov. 3, 2020) | 2020 Presidential election (Nov. 8, 2020) | Vote          | State Winner |
|---------------|------------|-------------------------|------------------------------------------|---------------|--------------|
|               | 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) |                   |
| Alabama       | 4,864,680  | 195,929                 | 4028 | >98         | 2,309,900 | 13.00          | 843,473 | 1,434,159 | 0.588 | Trump             |
| Alaska        | 738,516    | 17,448                  | 2363 | Nov. 4, 2020 | 172,031  | 43.66          | 56,849  | 108,231 | 0.525 | [Trump]          |
| Arizona       | 6,946,685  | 249,818                 | 3596 | Nov. 7, 2020 | 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 | 12,570,927 | 70.66          | 8,180,018 | 4,152,425 | 1.970 | Biden             |
| Colorado      | 5,531,141  | 114,709                 | 2074 | Nov. 6, 2020 | 3,173,127 | 86.28          | 1,753,416 | 1,335,253 | 1.313 | Biden             |
| Connecticut   | 3,581,504  | 74,843                  | 2090 | Nov. 7, 2020 | 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 | 684,488 | 17,524                  | 2560 | Nov. 5, 2020 | 279,152  | 57.29          | 258,561 | 14,449   | 17.895 | Biden             |
| Florida       | 20,598,139 | 816,700                 | 3965 | Nov. 4, 2020 | 11,031,440 | 42.81          | 5,269,926 | 5,646,949 | 0.933 | Biden             |
| 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 | Biden             |
| 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 | Unavailable | 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             |
| State        | Population | COVID-19 (Nov. 3, 2020) | 2020 Presidential election (Nov. 8, 2020) | Vote | State Winner |
|--------------|------------|-------------------------|------------------------------------------|------|--------------|
|              | Cumulative confirmed case (N) | Incidence (per 0.1-million population) | Updated | Reported (%) | Total reported (N) | Mail ballot (%) |
| 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 | 0.488 | Trump       |
| New York     | 19,618,453 | 51,668                  | 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 | 90  | 5,701,651 | 52.06 | 2,576,590 | 3,038,247 | 0.848 | Trump       |
| Ohio         | 11,641,879 | 226,138                | 1942 | Nov. 4, 2020 | 96  | 1,560,699 | 17.89 | 503,890  | 1,020,280 | 0.494 | Biden       |
| Oklahoma     | 3,918,137  | 126,526                 | 3229 | Nov. 6, 2020 | >98 | 3,005,201 | 30.41 | 300,325  | 197,421  | 1.521 | Biden       |
| 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 | Biden       |
| 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.
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

### TABLE 2

| 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* | -1.311      | -1.868 | -0.754 | <.001* |
| Mail ballot (%)                               | -0.008      | -0.014 | -0.002 | .014   | 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* | 0.109       | -0.026 | 0.244  | .114   |
| 65 years and over (%)                        | -0.116      | -0.193 | -0.039 | .003*  | 0.081       | -0.054 | 0.216  | .241   |
| Black/African American (%)                   | 0.018       | 0.003  | 0.033 | .222   | 0.027       | 0.005  | 0.049  | .018*  |
| Hispanic/Latino (%)                          | 0.007       | -0.008 | 0.021 | .351   | 0.020       | 0.002  | 0.038  | .026*  |
| 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*  | -0.051      | -0.414 | 0.312  | .782   |
| Bachelor’s degree or higher (%)              | -0.037      | -0.064 | -0.009 | .014*  | -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*  | 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*  |
| 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*  | -0.048      | -0.107 | 0.010  | .103   |
| Poverty people (%)                           | 0.052       | 0.004  | 0.100 | .033*  | 0.028       | -0.103 | 0.159  | .675   |

Abbreviations: LLCI, lower limit of 95% confidence interval; ULCI, upper limit of 95% confidence interval.

aStatistically significant.

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.

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REFERENCES
1. Takagi H. Presidential vote 2016 and coronavirus disease 2019 epidemic. J Med Virol. 2020. https://doi.org/10.1002/jmv.26620
2. Lundell H, Niederdeppe J, Clarke C. Public views about health causation, attributions of responsibility, and inequality. J Health Commun. 2013;18:1116-1130.
3. Kannan VD, Veazie PJ. Political orientation, political environment, and health behaviors in the United States. Prev Med. 2018;114:95-101.