

Letters

RESEARCH LETTER

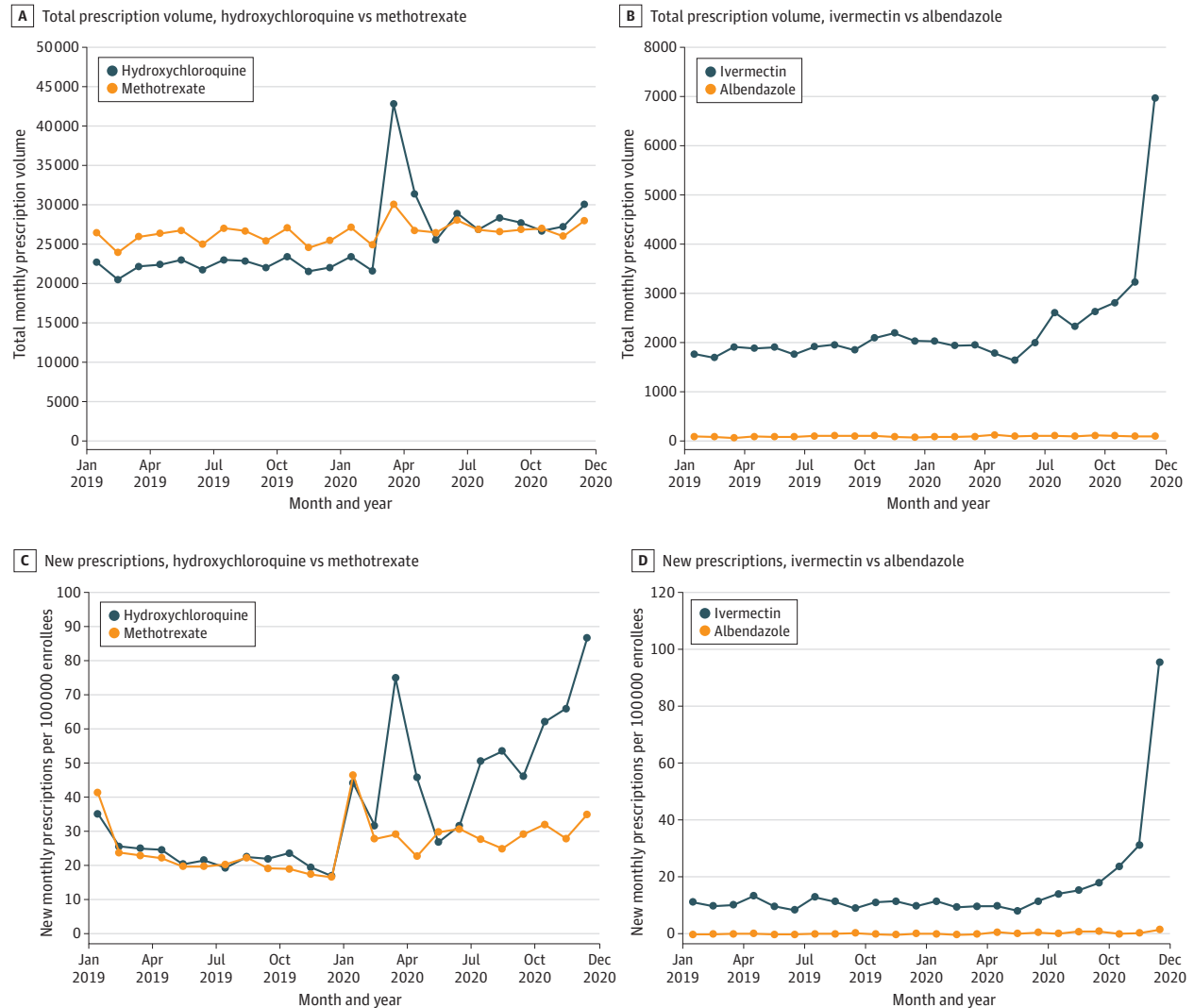
Association of County-Level Prescriptions for Hydroxychloroquine and Ivermectin With County-Level Political Voting Patterns in the 2020 US Presidential Election

Public opinion about the COVID-19 pandemic in the US is deeply divided by political affiliation,¹ including beliefs about the value of ineffective^{2,3} COVID-19 treatments such as hydroxychloroquine sulfate, an antimalarial drug, and ivermectin, an anti-parasitic drug. There is increased prescribing⁴ of these treat-

ments despite evidence against their effectiveness. We hypothesized that the county-level volume of prescriptions for hydroxychloroquine and ivermectin—but not other, similar medications—would be associated with county-level political voting patterns in the 2020 US presidential election.

Methods | In this cross-sectional study, we used deidentified medical claims for all outpatient visits by adults aged 18 years or older in counties with 50 or more enrollees from January 2019 through December 2020 included in the OptumLabs Data Warehouse, which includes medical claims for commercial and

Figure 1. Monthly Patterns in Total Volume and New Prescriptions per 100 000 Enrollees for Proposed COVID-19 Therapies and Control Medications From 2019 to 2020



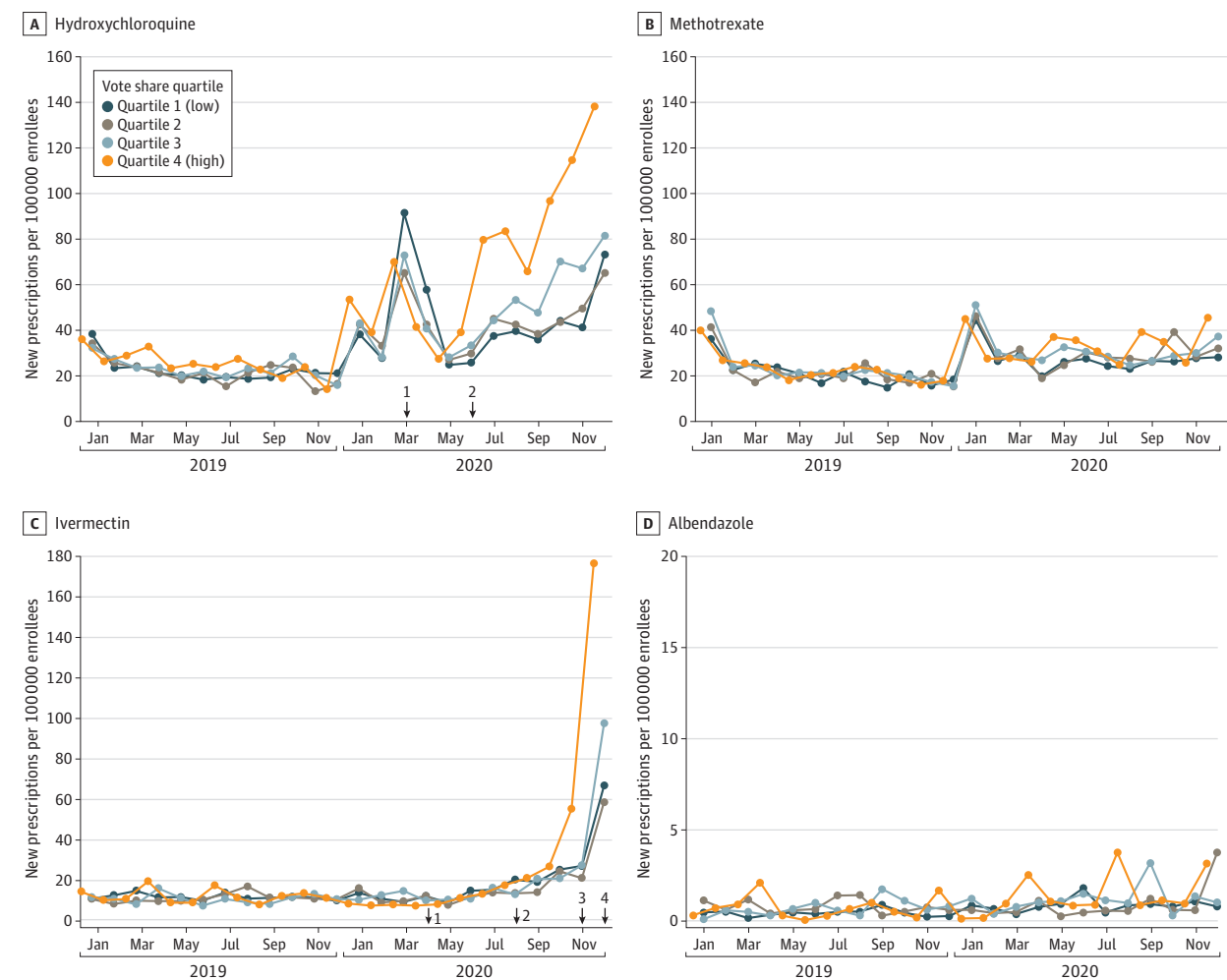
Totals are for hydroxychloroquine with methotrexate as a control and for ivermectin with albendazole as a control.

Medicare Advantage enrollees, as well as US Census data and 2020 US presidential election results. The institutional review board at Harvard University deemed the study exempt from review and waived the requirement for informed consent because deidentified data were used. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

We divided the county-level Republican vote share in the 2020 presidential election into quartiles. We assessed county-level rates of new prescriptions for hydroxychloroquine and ivermectin (ie, patients with no fills for the medication in the

previous 6 months) per 100 000 enrollees and 2 control medications, methotrexate sodium and albendazole (which have similar clinical applications as hydroxychloroquine or ivermectin, respectively, but are not proposed as COVID-19 treatments). The eTable in the Supplement shows a timeline of noteworthy events related to hydroxychloroquine, ivermectin, and COVID-19 in 2020. We captured enrollee age, sex, rural or urban residence, insurance type, and Elixhauser Comorbidity Index and county-level racial composition (data on race were self-reported and collected by the US Census Bureau), income level, and monthly COVID-19 incidence (as measured in the claims data). We fit linear difference-in-differences models at the county-month-level to estimate the differential change in new prescribing between enrollees living in the high-

Figure 2. Monthly Patterns in Rate of New Hydroxychloroquine and Ivermectin Prescribing by US County 2020 Republican Vote Share



Unadjusted monthly new prescription rates are per 100 000 enrollees of hydroxychloroquine with methotrexate as a control and ivermectin with albendazole as a control across 4 quartiles of counties, grouped by their vote share for the Republican presidential candidate in the 2020 US presidential election. Arrows show key dates for hydroxychloroquine: (1) announcement of the US Food and Drug Administration's emergency use authorization on March 28, 2020; and (2) revocation of the emergency use authorization on June 15, 2020. Key dates for ivermectin include: (1) the initial in vitro study claiming a potential antiviral effect of ivermectin⁵ on April 3, 2020; (2) the National

Institutes of Health recommendation against ivermectin use² on August 1, 2020; (3) release of a now-retracted manuscript preprint that described a clinical trial claiming 90% efficacy of ivermectin against COVID-19⁶ on November 13, 2020; and (4) a widely publicized hearing of the US Senate Committee on Homeland Security and Governmental Affairs that included testimony by Pierre Kory, MD, of St Luke's Aurora Medical Center, who promoted using ivermectin to treat COVID-19 on December 8, 2020. The eTable in the Supplement includes more details on these events.

est vs lowest quartile counties by 2020 Republican vote share, controlling for state fixed effects and all the patient characteristics listed previously. Analyses were performed in Stata, version 14 (StataCorp, LLC), and 2-sided $P < .05$ was considered to be statistically significant.

Results | The study included 18 555 844 adults with a mean (SD) age of 49.1 (18.8) years (9 699 541 [52.3%] women, 8 845 943 [47.7%] men, and 10 360 [0.01%] missing data on sex). Compared with 2019, overall hydroxychloroquine prescribing volume was elevated from June through December 2020 (42.0 new prescriptions per 100 000 enrollees vs 20.0 in 2019) after a sharp increase and fall in March and April 2020 (Figure 1). Ivermectin prescribing volume was particularly elevated in December 2020 (72.3 new prescriptions per 100 000 enrollees vs 10.6 in 2019). There were no substantive changes in overall prescribing volume for methotrexate or albendazole.

In 2019, prescribing of hydroxychloroquine and ivermectin did not differ by county Republican vote share quartile (Figure 2). In early 2020, hydroxychloroquine prescribing volume was differentially lower in the highest Republican vote share counties vs the lowest (−25.1 new prescriptions per 100 000 enrollees in April; $P < .001$). However, after June 2020, coinciding with the revocation of the US Food and Drug Administration's emergency use authorization for hydroxychloroquine, prescribing volume was significantly higher in the highest vs lowest Republican vote share counties (+42.4 new prescriptions per 100 000 enrollees, $P < .001$), 146% higher than 2019 overall baseline prescribing volume (Figure 2).^{2,5,6}

In December 2020, ivermectin prescribing volume was significantly higher in the highest vs lowest Republican vote share counties (+80.9 new prescriptions per 100 000 enrollees, $P < .001$), 964% higher than 2019 overall baseline prescribing volume (Figure 2). For both methotrexate and albendazole, we found no association between prescribing volume in 2020 and county-level Republican vote share.

Discussion | In late 2020, the number of new prescriptions for hydroxychloroquine and ivermectin was higher in counties with higher Republican vote share, whereas in early 2020, before revocation of the Food and Drug Administration's emergency use authorization, prescribing volume for hydroxychloroquine was higher in counties with a lower Republican (ie, higher Democrat) vote share. These findings were absent before the COVID-19 pandemic and for 2 control drugs.

This study has limitations. In an observational study, we could not address the causality of the association between county-level political voting patterns and prescribing of 2 ineffective COVID-19 treatments. Also, we were unable to assess the specific contribution of patient, physician, or other factors to the prescribing patterns.

These limitations notwithstanding, our findings are consistent with the hypothesis that US prescribing of hydroxychloroquine and ivermectin during the COVID-19 pandemic

may have been influenced by political affiliation. Because political affiliation should not be a factor in clinical treatment decisions, our findings raise concerns for public trust in a non-partisan health care system.

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Concept and design: Barnett, Jena, Mehrotra.

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Supervision: Barnett, Jena.

Conflict of Interest Disclosures: Prof Jena reported receiving personal fees from Bioverativ, Merck, Janssen, Edwards Lifesciences, Novartis, Amgen, Eisai, Otsuka Pharmaceuticals, Vertex Pharmaceuticals, Celgene, Sanofi Aventis, Precision Health Economics (now PRECISIONheor), Analysis Group, and Doubleday and hosting the podcast *Freakonomics, M.D.* outside the submitted work. Dr Mehrotra reported receiving personal fees from Sanofi Aventis for consulting on telemedicine outside the submitted work. No other disclosures were reported.

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