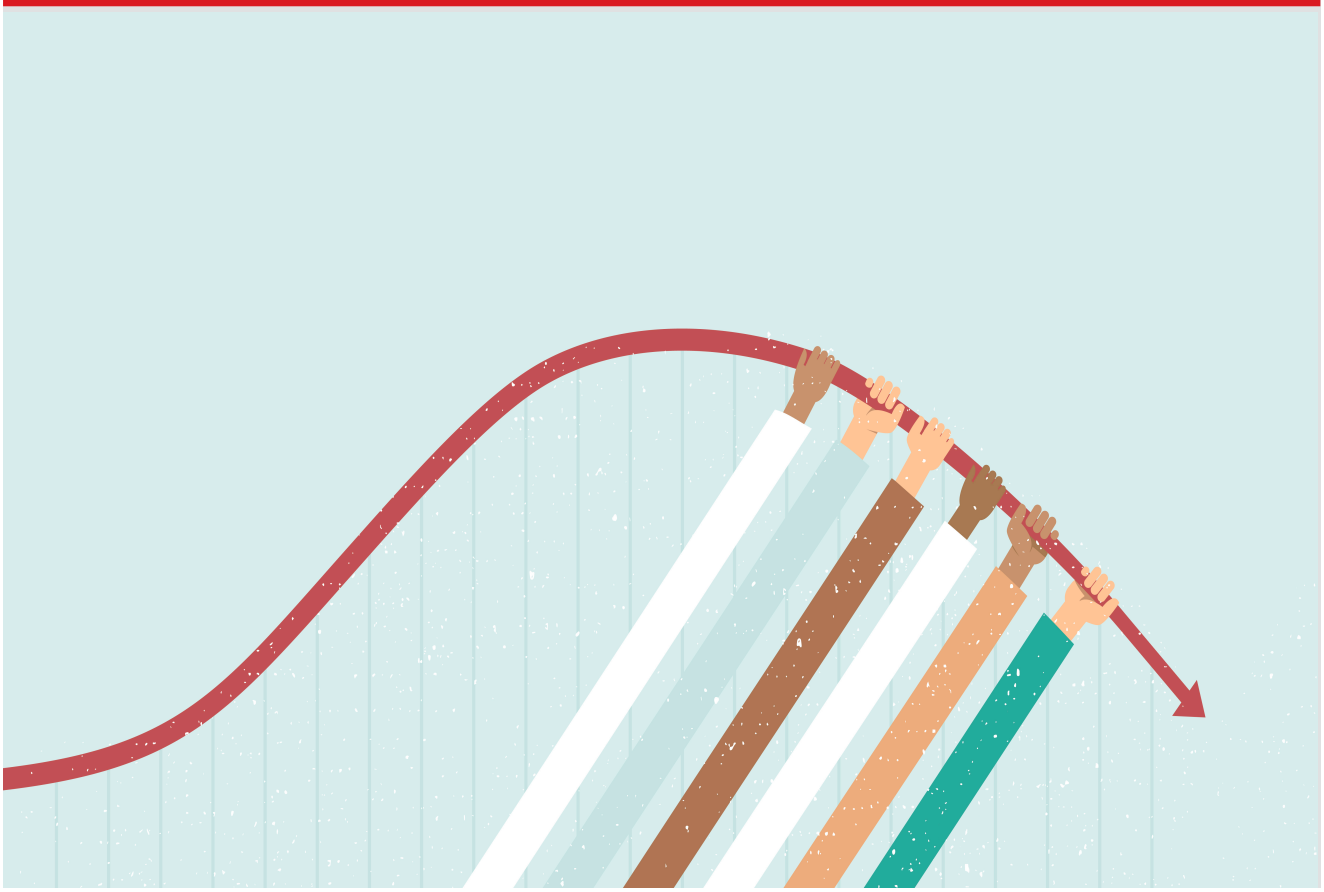
A COVID-19 SPECIAL REPORT

Bending the Curve: Policies to Mitigate COVID-19 in D.C. & the Region

April 22, 2021

A report by Talus Analytics LLC for the Office of the District of Columbia Auditor



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Georgetown University Center for Global Health Science and Security

Office of the District of Columbia Auditor

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Office of the District of Columbia Auditor

April 22, 2021

The Hon. Muriel Bowser
Mayor
The John A. Wilson Building
1350 Pennsylvania Avenue, N.W.
Washington, DC 20004

The Hon. Phil Mendelson
Chairman
Council of the District of Columbia
1350 Pennsylvania Avenue, N.W.
Washington, DC 20004

Dear Mayor Bowser and Chairman Mendelson:

I am pleased to share the fourth in a series of special reports on COVID-19, **Bending the Curve: Policies to Mitigate COVID-19 in D.C. & the Region**, prepared for the Office of the D.C. Auditor by Talus Analytics and the Georgetown University Center for Global Health Science and Security.

Talus Analytics specializes in translating complex data into actionable information for policymakers. Early in the pandemic Talus and the Georgetown Center developed an international database of public policies designed to mitigate the impact of COVID-19. ODCA partnered with Talus last fall to assess the policies implemented by the District and its neighboring states and the analyses produced three earlier reports: Mitigation Policy During the Pandemic, School Closures as a Pandemic Mitigation Policy, and Analysis of Demographics and Mobility Across DC During COVID-19.

This final report in the series analyzes the content and timing of the public policies implemented in the District, Virginia, and Maryland, and finds that District and neighbor states "had among the earliest and most comprehensive policy responses to COVID-19" and saw "fewer cases and deaths than much of the United States especially during the fall and winter surge." In mapping the type and timing of mitigation policies against case outcomes, the report ranks the District sixth among all states in apparently lessening the severity of the fall surge of COVID-19.

The report finds that the District's "enabling and relief policies" such as foreclosure delays and leave entitlements combined with early mask mandates and measured reopening policies contributed to the District's success in "bending the curve" of cases. "A key central message," the report notes, "is that early action increases the success of public policy intervention slowing disease spread and saving more lives." A major caveat on the region's success has been the country's failure: "even the areas in the United States that had the most effective response to the pandemic had many more cases than other parts of the world."

We greatly appreciate the work of our partners at Talus Analytics and Georgetown's Center for Global Health Science and Security, as well as the assistance and cooperation of District staff at the Department of Health, Office of the Deputy Mayor for Planning and Economic Development, Office of Planning, Office of the Chief Technology Officer, Lab@DC, Deputy Mayor for Health and Human Services, Office of the Chief Medical Examiner, the Department of Employment Services, and the Office of the Chief Financial Officer.

For future reference, it's clear the kind of data collection and analysis represented in this series of reports can be of significant assistance to policymakers and we look forward to continuing to share such analysis with District leaders.

Sincerely yours,

Kathleen Patterson
D.C. Auditor

COVID-19 SPECIAL REPORT

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April 22, 2021

Prepared For
Office of District of Columbia Auditor
Kathleen Patterson

Prepared by
Talus Analytics, LLC
Ellie Graeden

This is the fourth report for the Office of the D.C. Auditor (ODCA) from a collaborative effort between Talus Analytics and the Georgetown University Center for Global Health Science and Security, a research effort to be completed over a six-month period to help understand what COVID-19 mitigation policies have been and will be most effective in National Capital Region. The first analysis, published in late fall of 2020, focused on COVID-19 policies through the early fall and the impact of the pandemic and different demographics across the Region. The second report focused on COVID-19 and education policy with a specific look at issues around school closures and the science behind re-opening policy, given conditions in late 2020. The third report provided an overview of the relative impacts of COVID-19 on different populations across the District with a specific focus on the demographics of those impacted most significantly by cases and deaths. This final report builds on previous reports and the growing body of literature on pandemic response policy and provides results of analysis across the entire United States, including a detailed look the District of Columbia, Maryland, and Virginia, what policies were implemented when and where, and how those policies corresponded to caseload and deaths, with a specific focus on demographic groups across the region.

Talus Analytics is a research and development company that specializes in translating complex data into actionable information for global decision makers, specifically in context of risk. By blending scientific, economic, and policy analysis into interactive decision-making tools, partners can make real time decisions with profound impacts. During the COVID-19 pandemic, Talus Analytics has supported the US Centers for Disease Control and Prevention in developing response tools for hospital visibility and the Nevada Governor's Office to provide real time analytical support and data analysis for the response. In addition, the Talus team has worked closely with the Georgetown University Center for Global Health Science and Security to develop a comprehensive dataset of the policies implemented globally to mitigate COVID-19 provide web-based visual tools to explore those data; this platform has served as the basis for much of the work presented in this report.

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Executive Summary

More than a year into the COVID-19 pandemic, a wide range of mitigation measures and public policy interventions have been applied and tested globally. Public policies were enacted to slow the spread of the disease, manage surges in hospitalizations, and reduce the total number of deaths while navigating the importance of maintaining economic activity, providing economic relief, providing education for children, and supporting the public health response, including development, distribution, and administration of a vaccine. These approaches have been associated with different outcomes in different regions across the United States and globally.

When the pandemic began, there was little on the public record about what policies would be most effective when and where. This report builds on prior analyses and the results of a body of work published since the beginning of the pandemic to assess the role of the COVID-19 mitigation policy in reducing the impacts of COVID-19 on different populations across the United States and, specifically, in Washington D.C., Maryland, and Virginia. Key findings described here include the following.

- Early in the pandemic, states engaged in a broadly similar policy approach with strict social distancing mandates during the spring, which corresponded to a significant decrease in mobility across the country and a reduction in cases by late spring, especially in those areas that had experienced early surges.
- By fall 2020, individual states diverged significantly in their policy strategies and saw a significant difference in the severity of their fall case surges. Analysis comparing the policy environment in states with more and less severe fall caseload showed that:
    - States with more policies in place providing support for essential workers and relief funding tended to be less impacted by fall surges.
    - States that did not implement strict face mask policies and allowed early reopening of indoor spaces had a more severe and longer lasting fall surge.
- States that best mitigated the fall surge, including D.C., Maryland, and Virginia, had an effective combination of social distancing policies and enabling and relief measures.
    - Successful social distancing policies included restrictions on mass gatherings, face mask mandates, mitigation measures required for business reopening.
    - Successful enabling and relief measures included support for essential workers, modification of unemployment benefits, leave entitlement adjustments.
- In combination with prior reports in this series, and an emerging research literature, these analyses underscore the importance of establishing and maintaining a policy environment that supports populations such as frontline and essential workers who cannot stay at home and are especially vulnerable to impacts and benefit from targeted public policies.
    - Notably, racial and ethnic minorities and those socioeconomically vulnerable perform a disproportionate share of frontline and essential work.

Introduction: A year of policymaking for pandemic mitigation

We are now a year into the COVID-19 pandemic and the United States is among the countries with the most severe impacts as measured both by total number of cases and deaths overall. These impacts are disproportionate across regions of the country and have been greatest on racial and ethnic minorities. As the world has responded to COVID-19, governments enacted a wide array of non-pharmaceutical interventions – various public policies designed to mitigate the impact of the outbreak as well as research into the global response is starting give insight into what policies work. Public policy is a key tool for a novel infectious disease such as COVID-19 because when outbreaks begin, there are no existing treatments, cures, vaccines, or natural immunity from previous exposure of the population. These mitigation policies, whether implemented through executive orders and emergency declarations or policies enacted by state, local, and national governments, are a primary tool in outbreak response. While the most common and widely recognized are the social distancing measures such as stay-at-home orders and face mask mandates, other policies are focused on support for public health staffing, contact tracing and testing measures, and eviction and foreclosure delays.

As the United States is entering the second year of COVID-19, there is a great deal of research into what has and has not worked, where, and for whom. The initial U.S. policy response to the COVID-19 pandemic, starting in spring 2020, was based on scientific modeling and evidence from previous pandemics, specifically the 1918 influenza pandemic[1]. One such study based on the early 20th century outbreak that was the last to widely impact the United States found that early, sustained and layered public policy implementation was key to mitigating the consequences of the 1918-1919 wave of influenza in the United States. The policy environment of the early 1900s showed us that preventing gatherings of groups of people saves lives. Specifically, the earlier and longer a policy was in place, the longer it took for each city to reach peak mortality, while also lowering the overall mortality.

Studies published to date analyzing global policymaking from early in the COVID-19 pandemic in spring 2020 demonstrated that business closures, school closures, movement/travel restrictions, gathering restrictions, and income support were effective interventions to reduce caseload.[2,3] In some studies, these policies were found to reduce the growth rate of new infections from a

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[1] Markel, H., Lipman, H. B., Navarro, J. A., Sloan, A., Michalsen, J. R., Stern, A. M., & Cetron, M. S. (2007). Nonpharmaceutical interventions implemented by US cities during the 1918-1919 influenza pandemic. *Journal of the American Medical Association*, 298(6), 644–654. https://doi.org/10.1001/jama.298.6.644

[2] Liu, Y., Morgenstern, C., Kelly, J., Lowe, R., CMMID COVID-19 Working Group, & Jit, M. (2021). The impact of non-pharmaceutical interventions on SARS-CoV-2 transmission across 130 countries and territories. *BMC Med*, 19(1), 40. https://doi.org/10.1186/s12916-020-01872-8.

[3] Brauner, J. M., Mindermann, S., Sharma, M., Johnston, D., Salvatier, J., Gavenčiak, T., Stephenson, A. B., Leech, G., Altman, G., Mikulik, V., Norman, A. J., Monrad, J. T., Besiroglu, T., Ge, H., Hartwick, M. A., Teh, Y. W., Chindelevitch, L., Gal, Y., & Kulveit, J. (2021). Inferring the effectiveness of government interventions against COVID-19. *Science*, 371(6531), eabd9338. https://doi.org/10.1126/science.abd9338

maximum of 270% per week to as low as 49% per week.[4] Countries that implemented the most stringent lockdowns saw a decrease in cases and deaths one to four weeks after policy implementation, but the effectiveness of these policies varied widely, with the differences mostly due to the differing political systems in place.[5]

Within the United States, research into how differing policy responses affected the spring surge largely mirror the results in the global community. Lockdowns in New York City had a 50% reduction in virus transmission[6] while voluntary reduction in mobility, such as less time spent at work had an association with COVID-19 incidence and mortality that was three times more effective than that of school closures.[7] Early studies on whether people stayed home during the initial outbreak found that when mandates were followed, the spread of COVID-19 was greatly reduced.[8]

As scientific understanding of how COVID-19 spreads increased, the significance of certain activities in increasing spread of the virus through aerosols and droplets was underscored. Indeed, it is now understood that COVID-19 is transmitted primarily from person to person (i.e., much less transmission risk is now thought to stem from contact with contaminated surfaces as compared to close contact with an infectious individual). Though there is a great deal of individual variation, the proximity and time of exposure are key ingredients to infection. Talking loudly increases the number of particles by up to 50 times compared with normal speaking,[9] and the risk of infection from

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[4] Wibbens, P.D., Koo, W.W., & McGahan, A.M. (2020). Which COVID policies are most effective? A Bayesian analysis of COVID-19 by jurisdiction. *PLoS One*, 15(12). https://doi.org/10.1371/journal.pone.0244177.

[5] Thu, T. P. B., Ngoc, P. N. H., Hai, N. M., & Tuan, L. A. (2020). Effect of the social distancing measures on the spread of COVID-19 in 10 highly infected countries. *Science of the Total Environment*, 742, 140430. https://doi.org/10.1016/j.scitotenv.2020.140430

[6] Yang, W., Shaff, J., & Shaman, J. (2021). Effectiveness of non-pharmaceutical interventions to contain COVID-19: a case study of the 2020 spring pandemic wave in New York City. *J. R. Soc. Interface*, 18, 20200822. http://doi.org/10.1098/rsif.2020.0822

[7] Zimmerman, F.J., & Anderson, N.W. (2021). Association of the Timing of School Closings and Behavioral Changes With the Evolution of the Coronavirus Disease 2019 Pandemic in the US. *JAMA Pediatrics*. https://doi.org/10.1001/jamapediatrics.2020.6371.

[8] Gao, S., Rao, J., Kang, Y., Liang, Y., Kruse, J., Dopfer, D., Sethi, A.K., Mandujano, Reyes, J.F., Yandell, B.S., & Patz, J.A. (2020). Association of Mobile Phone Location Data Indications of Travel and Stay-at-Home Mandates With COVID-19 Infection Rates in the US. *JAMA Network Open*, 3(9), e2020485. https://doi.org/10.1001/jamanetworkopen.2020.20485.

[9] Asadi, S., Wexler, A. S., Cappa, C. D., Barreda, S., Bouvier, N. M., & Ristenpart, W. D. (2019). Aerosol emission and superemmission during human speech increase with voice loudness. *Scientific Reports*, 9(1), 2348. https://doi.org/10.1038/s41598-019-38808-z.

COVID-19 increases as the size of groups increases,[10, 11,12] the length of exposure increases,[13] the amount of ventilation (indoors or outdoors) decreases,[14,15] and risk increases for time spent without a mask.[16] Enclosed indoor spaces where people congregate like restaurants, gyms, places of worship, and retail settings pose the highest risk to individuals,[17,18] and studies have verified that limiting the number of people in enclosed spaces,[19] social distancing of at least 6 feet,[20] requiring the use of masks,[21,22] increasing ventilation,[23] and potentially using disinfectants on high-touch surfaces[24] can reduce the spread of infection.

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[10] Brauner, J. M., Mindermann, S., Sharma, M., Johnston, D., Salvatier, J., Gavenčiak, T., Stephenson, A. B., Leech, G., Altman, G., Mikulik, V., Norman, A. J., Monrad, J. T., Besiroglu, T., Ge, H., Hartwick, M. A., Teh, Y. W., Chindelevitch, L., Gal, Y., & Kulveit, J. (2021). Inferring the effectiveness of government interventions against COVID-19. *Science*, 371(6531), eabd9338. https://doi.org/10.1126/science.abd9338

[11] Carey, B. (2020, November 10). Limiting Indoor Capacity Can Reduce Coronavirus Infections, Study Shows. *The New York Times*. https://www.nytimes.com/2020/11/10/health/covid-indoor-venues-infections.html.

[12] McGrail, D. J., Dai, J., McAndrews, K. M., & Kalluri, R. (2020). Enacting national social distancing policies corresponds with dramatic reduction in COVID19 infection rates. *PloS One*, 15(7). https://doi.org/10.1371/journal.pone.0236619.

[13] Hu, M., Lin, H., Wang, J., Xu, C., Tatem, A. J., Meng, B., Zhang, X., Liu, Y., Wang, P., Wu, G, Xie, H., & Lai, L.. (2020). Risk of Coronavirus Disease 2019 Transmission in Train Passengers: an Epidemiological and Modelling Study. *Clinical Infectious Diseases*, 72(4), 604-610. https://doi.org/10.1093/cid/ciaa1057.

[14] Qian, H., Miao, T., Liu, L., Zheng, X., Luo, D., & Li, Y. (2020). Indoor transmission of SARS-CoV-2. *Indoor air*. https://doi.org/10.1111/ina.12766.

[15] Morawska, L., & Milton, D. K. (2020). It is Time to Address Airborne Transmission of Coronavirus Disease 2019 (COVID-19). *Clinical Infectious Diseases*, 71(9), 2311-2313. https://doi.org/10.1093/cid/ciaa939.

[16] Dangor, J. (2020, November 24). Mayo Clinic research confirms critical role of masks in preventing COVID-19 infection. *Mayo News Network*. https://newsnetwork.mayoclinic.org/discussion/mayo-clinic-research-confirms-critical-role-of-masks-in-preventing-covid-19-infection/

[17] Nishiura, H., Oshitani, H., Kobayashi, T., Saito, T., Sunagawa, T., Matsui, T., Wakita, T., MHLW COVID-19 Response Team, & Suzuki, M. (2020). Closed environments facilitate secondary transmission of coronavirus disease 2019 (COVID-19). *MedRxiv*. https://doi.org/10.1101/2020.02.28.20029272.

[18] Furuse, Y., Sando, E., Tsuchiya, N., Miyahara, R., Yasuda, I., Ko, Y. K., *et. al.* (2020). Clusters of Coronavirus Disease in Communities, Japan, January–April 2020. *Emerging infectious diseases*, *26*(9), 2176. https://doi.org/10.3201/eid2609.202272.

[19] Carey, B. (2020, November 10). Limiting Indoor Capacity Can Reduce Coronavirus Infections, Study Shows. *The New York Times*. https://www.nytimes.com/2020/11/10/health/covid-indoor-venues-infections.html.

[20] Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H. J., *et.al.* (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet*, *395*(10242), 1973-1987. https://doi.org/10.1016/S0140-6736(20)31142-9.

[21] Dangor, J. (2020, November 24). Mayo Clinic research confirms critical role of masks in preventing COVID-19 infection. *Mayo News Network*. https://newsnetwork.mayoclinic.org/discussion/mayo-clinic-research-confirms-critical-role-of-masks-in-preventing-covid-19-infection/.

[22] Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H. J., *et.al.* (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet*, *395*(10242), 1973-1987. https://doi.org/10.1016/S0140-6736(20)31142-9.

[23] Pease, L. F., Wang, N., Salsbury, T. I., Underhill, R. M., Flaherty, J. E., Vlachokostas, A., *et. al* . (2021). Investigation of potential aerosol transmission and infectivity of SARS-CoV-2 through central ventilation systems. *Building and Environment*, 107633. https://doi.org/10.1016/j.buildenv.2021.107633.

[24] Chin, A., Chu, J., Perera, M., Hui, K., Yen, H. L., Chan, M., Peiris, L. & Poon, L. (2020). Stability of SARS-CoV-2 in different environmental conditions. *The Lancet Microbe*, 1(1), e10. https://doi.org/10.1016/S2666-5247(20)30003-3.

Policy implementation around these science-based findings were verified in summer and early fall by studies. Implementing a statewide mask mandate was shown to reduce rates of hospitalization and reduce the strain on the health care system,[25] while modeling scenarios for reopening suggested that widespread use of masks (75% compliance) had the potential to reduce infections, hospitalizations, and deaths by more than one-third compared to no mask use.[26] Face mask mandates, in particular, are a strong evidence-based component in mitigating the impacts of COVID-19 in the transition from stay-at-home and safer-at-home approaches to allowing the opening of more non-essential businesses, with public mask use mandates in place before re-opening.[27]

Starting early in the COVID-19 pandemic, a collaborative research team including Talus Analytics and the Georgetown University Center for Global Health Science and Security developed a comprehensive database of the policies implemented both domestically and globally to mitigate COVID-19. The policies described in the COVID Analysis and Mapping of Policies (COVID AMP) database and corresponding website[28] include a wide range of policy goals, from social distancing to social support measures to military action. COVID AMP captures dozens of data elements about each policy, coded by a team of researchers, that describe the policy in terms of type, applicable legal authorities underlying the policy, dates in effect, related policies, and other elements as well as the policy document itself. The comprehensive nature of the dataset is designed to support research and analysis of policy approaches across the United States and globally.

Here, we have used extensive data available from the COVID AMP policy dataset as the basis for policy analysis, including a comparison of the policy environments in regions of the United States that experienced different levels of impacts from the pandemic (based on COVID-19 cases and fatalities) and to analyze the policy environment in Washington, D.C. and the greater NCR[29] within this context of U.S. policy-making. Overall, the goal is to provide evidence for what policies worked, where, and for whom, to inform policy-making for the remainder of this pandemic and future infectious disease threats. This report follows from prior reports that described the policy environment in Washington, D.C., and the surrounding NCR in the context of COVID-19 impacts

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[25] Joo, H., Miller, G.F., Sunshine, G., Gakh, M., Pike, J., Havers, F.P., Kim, L., Weber, R., Dugmeoglu, S., Watson, C., & Coronado F. (2021). Decline in COVID-19 Hospitalization Growth Rates Associated with Statewide Mask Mandates - 10 States, March-October 2020. *MMWR Morb Mortal Wkly Rep*., 70(6), 212-216. https://doi.org/10.15585/mmwr.mm7006e2.

[26] Zhang, K., Vilches, T.N., Tariq, M., Galvani, A.P., & Moghadas, S.M. (2020). The impact of mask-wearing and shelter-in-place on COVID-19 outbreaks in the United States. *Int J Infect Dis*., 101, 334-341. https://doi.org/10.1016/j.ijid.2020.10.002.

[27] Kaufman, B.G., Whitaker, R., Mahendraratnam, N. et al. (2020). Comparing Associations of State Reopening Strategies with COVID-19 Burden. *J Gen Intern Med*, 35, 3627–3634. https://doi.org/10.1007/s11606-020-06277-0.

[28] Talus Analytics. (2021). *COVID AMP: Visualizing the impact of policies on COVID response.* https://covidamp.org/

[29] The National Capital Region is defined for this analysis as: Washington, D.C.; Maryland: Town of Bladensburg, Bowie City, College Park City, Charles County, Frederick County, Gaithersburg City, Greenbelt City, Hyattsville City, Laurel City, Montgomery County, Prince George's County, Rockville City, Takoma Park City; Virginia: Alexandria City, Arlington County, Fairfax City, Fairfax County, Falls Church City, Loudon County, Manassas City, Manassas Park City, and Prince William County.

and the disproportionate burden of the pandemic on specific neighborhoods across D.C. that are home to a larger proportion of non-White residents and Wards where residents are less likely to be able to work from home.

Presented here are the results of a national analysis of the U.S. policy environment over the course of the pandemic to date, with a specific focus on D.C., Maryland, and Virginia. The analysis focused on COVID-19 case outcomes in the fall of 2020, since this is when the most severe and widespread COVID-19 impacts occurred in the country and was a time when states took very different policy approaches to reopening. While even the areas in the United States that had the most effective response to the pandemic had many more cases than other parts of the world such as New Zealand and Australia, D.C. has among the lowest per-capita case and fatality rates in the United States. The findings here support previous research showing that early face mask policies mattered most, and states that reopened businesses with mitigation measures in place were able to reduce the impact of the fall surge. Key to these states' success was to also enact policies that support citizens through relief funding and supporting essential workers. This is supported by the results in D.C., Maryland, and Virginia that were broadly successful in mitigating early and comprehensive response in public policies that mitigate COVID-19 spread.

Global comparison at peak

Australia
2.29 cases per 100K; 0.09 deaths per 100K

New Zealand
1.6 cases per 100K; 0.03 deaths per 100K

United Kingdom
91.15 cases per 100K; 1.91 deaths per 100K

United States
71 cases per 100K; 0.96 deaths per 100K

Washington, D.C.
47 cases per 100K; 0.83 deaths per 100K

Analysis and methods

To understand what policies have worked where, when, and for whom, we first need to define the key information requirements that underpin each of those elements. What does it mean for a policy to have worked? What types of policies have been implemented when and where? To whom did those policies apply? What were those policies intended to accomplish?

Defining and capturing public policies implemented during the pandemic

Public policy measures were implemented across the United States during the pandemic to induce changes that people and communities could make to help slow the spread of infectious illnesses for which the human population has little existing immunity (i.e., pandemic influenza, novel coronavirus). Public policy (also referred to in the literature as non-pharmaceutical interventions or

NPIs) are used because they are one of the best ways to control a pandemic when vaccines or other preventative measures are not yet available.[30]

COVID AMP is a platform to collate and analyze the policies implemented to manage the COVID-19 pandemic collecting over 31,000 global COVID-19 mitigation policies identified and coded as of March 2021 to provide a complete record of policies implemented at the international, national, state, and county level.[31] Prior to this event, no sources apparently existed to capture this information in a format that could support detailed policy analysis. In COVID AMP, policies are defined as mandates issued by a government authority. From a public health analysis perspective, each policy document (i.e., a specific Executive Order) typically contains multiple policies enacting non-pharmaceutical interventions. For example, Mayor's Order 2020-075 in the District of Columbia enacted numerous NPIs, including mass gathering restrictions, private sector closures, masking requirements, and capacity limitations.[32]

COVID AMP collected and coded each policy with key information about when the policy started, when it ended, the jurisdiction for which the policy applied, the legal basis for these policies, and information about the category of action the policy was intended to drive. This analysis focuses on four broad categories of policies that can be further broken down into more specific components: the sub-category and the specific target of the policy itself.

Policy categories, subcategories, and targets

Categories

Social Distancing policies are intended to maintain distance from others, typically a minimum of six feet; close facilities such as public pools or restaurants and bars; cancel events; prohibit mass gatherings, or limit visitors in facilities such as nursing homes.

Mask Requirements establish mandates or guidance on the use of face coverings. These policies can contain enforcement provisions for noncompliance on a specific group, a specific location such as public transportation, or throughout a locality.

Enabling and Relief Measures cover a wide array of policies intended to aid or assist a specific group. For example, many locations have established moratoriums on evictions or foreclosures including Washington, D.C., on March 17, 2020, which also included a clause prohibiting cut-offs of

[30] US Centers for Disease Control and Prevention. (2020, April 27). *Nonpharmaceutical Interventions (NPIs)*. USA.gov. https://www.cdc.gov/nonpharmaceutical-interventions/index.html.
[31] Talus Analytics. (2021). *COVID AMP: Visualizing the impact of policies on COVID response*. https://covidamp.org/
[32] Washington, D.C. Office of the Mayor. (2020, June 19). *Phase Two of Washington, DC Reopening* (Mayor's Order 2020-075). https://www.dcregs.dc.gov/Common/NoticeDetail.aspx?NoticeId=N0094909

gas or water services.[33] Policies can also relax or release former restrictions such as Maryland's June 19, 2020, order extending permit and license renewals for the duration of the state of emergency.[34]

(COVID AMP provides even more detail on the types of policies implemented globally, including Support for Public Health and Clinical Capacity, Military Mobilization, and Emergency Declarations. Those policies were not explicitly examined in the current analysis.)

Key subcategories

Subcategories aim to classify the intent within each policy category. Social distancing policies have the broad goal of reducing human contact, but this can be achieved in a variety of ways, such as preventing gatherings, closing businesses or limiting the capacity of a retail store.

- **Mass gathering restrictions** limit the number of people from different households who can gather in a social setting
- **Private sector closures** mandate the closure of certain in-person businesses, including essential and nonessential business
- **Adaptation and mitigation measures** aim to mitigate viral transmission by requiring businesses to follow protocols such as limiting capacity, regularly disinfecting surfaces, enforcing social distancing, or increasing ventilation
- **Face masks** (broad mandate) means that the general public is required to wear face masks or coverings when they are outside of their own homes
- **Eviction and foreclosure delays** temporarily halt evictions and foreclosures to prevent low-income or otherwise vulnerable tenants from losing housing during the pandemic which might be due to job loss, wage cuts, or other hardships exacerbated by COVID
- **Hazard pay** offers essential workers wage increases because their increased exposure to COVID-19 at work elevates the health risk associated with their jobs
- **Leave entitlement adjustments** expand the conditions under which workers can take sick leave to account for circumstances like mandatory quarantine or care of a sick family member
- **Modification of unemployment benefits** may increase benefits or expand eligibility for who can claim unemployment
- **Relief funding** provides direct payments, affordable loans, or other financial support to businesses and individuals who have been affected by the pandemic
- **Stimulus payments** in the form of cash to individuals or businesses
- **Support for essential workers** extends access or expands benefits to healthcare, childcare, or other services to essential workers

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[33] Washington, D.C. Council of the District of Columbia. (2020, March 17). *COVID-19 Response Emergency Amendment Act of 2020* (D.C. Act 23-247). https://code.dccouncil.us/dc/council/acts/23-247.html

[34] Maryland. Governor of the State of Maryland. *Amending and Restating the Order of March 12, 2020, Extending Certain Licenses, Permits, Registrations, and Other Governmental Organizations, and Authorizing Suspension of Legal Time Requirements* (Executive Order No. 20-06-19-01). https://governor.maryland.gov/wp-content/uploads/2020/06/2089_001.pdf

Targets

Targets capture those to whom each policy applies, and they define how a policy affects a community. Some targets represent broad swaths of the population (e.g., 'General population' is used for policies that apply to all persons in the community), while others represent smaller groups of individuals or businesses (e.g., essential workers or attendees at gyms). Identifying targets is critical for comparing and evaluating policy efficacy. In the case of mitigation policies, some business settings are more likely to create high-risk for viral transmission. For example, restaurants and bars present a high risk for viral transmission because eating and drinking requires the removal of masks, and in-person dining often involves laughing or conversing in a concentrated area for a relatively long period of time. Additionally, targets help reveal the breadth of a policy: a mask mandate for the general population will have a much stronger effect on community transmission than a mask mandate that only applies to older adults or another subgroup.

Policy Impacts

Determining whether a policy is successful starts with understanding its intent. Each government policy has a goal of producing change, through change in behavior, change in the underlying environment, or by providing incentives or punishments associated with each. The success of social distancing policies, which are typically designed to restrict human-human interactions outside of the family are measured in a general reduction of movement. If these policies are to be successful in the way they are ultimately intended, a successful reduction in mobility would subsequently lead to lower cases and deaths.

Similarly, policies focused on providing enabling and relief measures may have the goal of reducing the threat of unemployment, providing childcare so essential workers can continue to go to work, providing food for school age children who otherwise go hungry, or supporting workers in need of paid sick leave. The impact of these policies may be reflected in reduced unemployment, increased mobility due to the necessity to go to essential employment, or decreased mobility due to the social support necessary to comply with a stay-at-home or lockdown policy.

- **COVID-19 Caseload and Death data** are used to evaluate the impact of the pandemic on human lives. Key datasets include *The New York Times* COVID-19 Case Data which gathers and publishes COVID-19 cumulative case and death counts and are used to analyze disease data against specific policy implementation. Case and death data, including demographic information for the District of Columbia, is from the D.C. Coronavirus website (https://coronavirus.dc.gov/data). Cases and death data outside the United States are from Johns Hopkins University[35].

[35] Johns Hopkins University. (2021). *COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University* [Data set]. Retrieved from https://github.com/CSSEGISandData/COVID-19.

- **Mobility data** are primary indicators of human behavior change. Population movement on the scale of both the individual and the community can be used to evaluate human-infrastructure and human-human interaction patterns and is being used widely in the context of COVID-19 to evaluate the effect of social distancing policies. Key datasets include the Google Covid-19 mobility reports[36] and SafeGraph social distancing dataset[37], both of which rely on aggregating anonymous geolocation data from cell phones to derive high resolution movement of people.
- **Essential work** is a classification used to designate specific types of work and workers as necessary and therefore allowed to continue working during other closures. To approximate how many people are considered essential workers, and therefore were not able to work from home, jobs categories and classification of those job categories based on whether or not the job can be performed from home, was adapted from Dingel and Neiman (June 19, 2020)[38,39] in combination with occupation data from the U.S. Census American Community Survey (2014-2018) to capture census tract level resolution for the occupations of residents across D.C.[40]
- **Population and demographic data** provide key information about who lives and works in the NCR. These data include not only basic counts, but information on demographic characteristics of those populations. The key datasets are the U.S. Census American Community Survey (2014-2018)[41] and the CDC Social Vulnerability Index.[41]

Analysis Methods

Case and death calculations. Case and death outcomes were taken as a seven-day rolling average in order to smooth-out individual reporting anomalies. Each area analyzed was recorded as the number of cases or deaths per 100,000 people, so that areas with a different sized population could be normalized against each other.

Mobility calculations. The average change in mobility is based on either SafeGraph or Google mobility data. In the SafeGraph dataset, a pre-pandemic baseline was calculated prior to the stay-at-home period (January-February 2020) and all changes are represented as the percent change from that timeframe. The Google mobility data comes from the COVID-19 mobility data set and examines changes in visits and lengths of stays, as a comparison to a pre-pandemic baseline. Google

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[36] Google. (2021). *COVID-19 Community Mobility Reports* [Data set]. https://www.google.com/covid19/mobility/.
[37] SafeGraph. (2021). *SafeGraph Places* [Data set]. https://docs.safegraph.com/docs.
[38] Dingel, J. I., & Neiman, B. (2020). How many jobs can be done at home? *University of Chicago, Booth School of Business, NBER, and CEPR.* https://github.com/jdingel/DingelNeiman-workathome/blob/master/DingelNeiman-workathome.pdf.
[39] Dingel, J. I., & Neiman, B. (2020). How many jobs can be done at home? [Code repository]. *University of Chicago, Booth School of Business, NBER, and CEPR.* https://github.com/jdingel/DingelNeiman-workathome.
[40] U. S. Census Bureau. (2019). *American Community Survey Data.* USA.gov. https://www.census.gov/programs-surveys/acs/data.html.
[41] CDC Social Vulnerability Index. https://data.cdc.gov/browse?tags=social%20vulnerability%20index

mobility patterns are broken down by categories such as residential, workplaces, grocery/pharmacy, retail and recreation (places like restaurants, cafes, shopping centers, and theme parks).

Understanding how many in the population can work from home versus the number who perform essential work. To understand how many job categories can transition to working from home, we used the methods and results from Dingel and Neiman (June 19, 2020)[42] including the code.[43] Finally, we used occupation data from the American Community Survey (2014-2018) to get census tract level resolution to identify the broad occupations that employ residents in D.C.[44]

Fall surge state outcome ranking methods. The seven-day average number of new daily cases (from *The New York Times*) was calculated per 100,000 (using census data). The start of each state's fall surge was defined as the first day each state reached 15 cases per 100k for 7 days in a row (using the seven-day moving average to smooth over differences in reporting). From that date until Feb 19, 2021, the area under the curve was calculated to quantify the extent of the fall surge, capturing both the peak (severity) and length of time each state was impacted. Each state was then ranked against each other based on the numerical severity of their fall surge.

Fall surge modeling methods.: In order to understand which policies may have had the greatest impact on cases during the fall surge, the best performing states and the worst performing states were compared using a series of decision tree-based models. A model was built using the policies states had in place to identify whether a state's case outcomes were in the best or worst group. The model could then identify, with 85% accuracy, which states had the least or greatest COVID-19 case impacts on a new set of policy data. Since the database captures a large number of policies, this approach can narrow in on a set of policies that had an impact, as measured by the type of polices that differed most among states with higher or lower numbers of cases or deaths.

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[42] Dingel, J. I., & Neiman, B. (2020). How many jobs can be done at home? *University of Chicago, Booth School of Business, NBER, and CEPR*. https://github.com/jdingel/DingelNeiman-workathome/blob/master/DingelNeiman-workathome.pdf.

[43] Dingel, J. I., & Neiman, B. (2020). How many jobs can be done at home? [Code repository]. *University of Chicago, Booth School of Business, NBER, and CEPR*. https://github.com/jdingel/DingelNeiman-workathome.

[44] U. S. Census Bureau. (2019). *American Community Survey Data*. USA.gov. https://www.census.gov/programs-surveys/acs/data.html.

Findings

The COVID-19 timeline across the United States

All states across the United States have experienced significant impacts from the COVID-19 pandemic with some states experiencing impacts earlier than others and all states being hard-hit in the fall case surge. In spring and summer 2020, impacts were more concentrated in a subset of states and more cases were seen in urban areas, including D.C. than in less heavily populated areas. As shown in Figure 1, the spring surge saw a peak case count of 36,676 cases nationwide on April 24th, and a peak in reported COVID-19 deaths of over 2,700 in mid-April.

Following policy actions and changes in behavior, states were able to 'flatten the curve', bringing down the average number of daily cases (Figure 1A). D.C. peaked at 27.4 cases per 100,000 residents (referred to as 'per 100k' for the remainder of this report) in the spring surge, and 1.7 deaths per 100k, putting D.C. above the average state during the spring. However, throughout the rest of the pandemic year and through the implementation of key policies, D.C. kept relative cases lower than most of the country, even when accounting for the national surges in the summer and fall. Though the fall surge of the pandemic was still worse than the spring, D.C. had a lower number of cases, peaking at 47 cases per 100k, than the United States high of 71 cases per 100k (highest seven-day moving average after August 1, 2020). Deaths in the fall surge were reduced in D.C., both relative to the spring surge and to the U.S. average, peaking at 0.83 deaths per 100k (Figure 1A, D).

While Washington, D.C., and certain states kept cases lower than other states as noted earlier the overall loss of life in the United States has been higher when compared to other countries including on a per capita basis (see Figure 1B, Australia, New Zealand, and Canada as examples for comparison). For comparison, Australia saw, at its peak, 2.29 cases per 100k, with 0.09 deaths (716 cases, 59 deaths on their worst day) and New Zealand had 1.6 cases per 100k, and 0.03 deaths per 100k. Canada has also had much better pandemic outcomes than the United States, though it still saw an increase in cases in the fall compared to spring. More like the United States, the United Kingdom had a very severe fall surge, by some measures even worse than the United states, peaking at 91.15 cases per 100k and 1.91 deaths per 100,000 UK residents.

Over the course of the pandemic, the United States successfully reduced the likelihood that someone who contracts COVID-19 would die from the disease, measured in the aggregate as the case fatality rate (CFR). The CFR for the shows that new treatments and better understanding of the COVID-19 disease did improve CFR as time went on (Figure 1D). As the pandemic became more controlled in the summer and into the early fall, case fatality rates stayed at a much lower rate throughout. The District of Columbia had an initially high CFR, but the numbers stabilized with the U.S. average. However, the fall surge reversed some of these gains for D.C. and nationally (Figure 1D; see January and February).

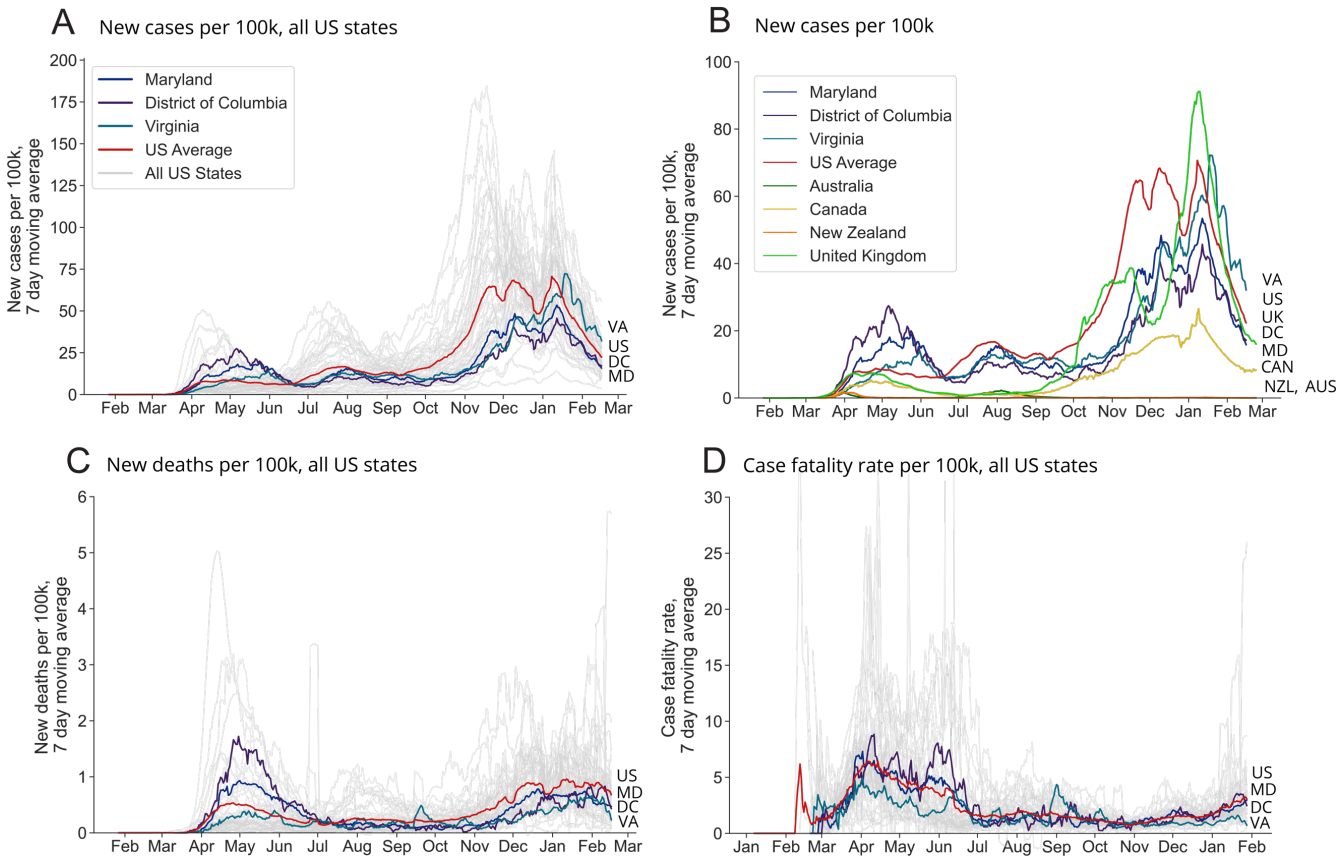

Figure 1: Cases and deaths across the United States, and globally. U.S. data is from the New York Times[45] and global cases from Johns Hopkins University.[46] The population data is from a repository of census data, globally[47] and each country's cases (A, B) and deaths (D) are calculated per 100k to normalize the data. Data are a seven-day moving average. Case fatality rate (D) is calculated as deaths/cases (per 100k), again using seven-day moving average.

[45] New York Times COVID-19 caseload source data (https://github.com/nytimes/covid-19-data)

[46] Johns Hopkins University. (2021). *COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University* [Data set]. Retrieved from https://github.com/CSSEGISandData/COVID-19.

[47] John Snow Labs. (2018). *Population Figures by Country* [Data set]. https://datahub.io/JohnSnowLabs/population-figures-by-country.

Using policy to mitigate COVID-19: Spring surge versus fall surge

Understanding the types of policies that change behavior and ultimately shape the outcomes of the COVID-19 pandemic in cases and deaths is key to determining the best path forward both in handling COVID-19 as an endemic disease and to inform future policy decisions in the next widespread public health emergency. The pandemic timeline can be viewed through the lens of each surge throughout 2020 and into 2021: the initial spring surge, the summer surge, then the fall surge. Each timeframe had a set of circumstances that influenced both policymakers and individual human behavior. The following analysis examines state-level policy environments, including D.C., to determine the policies that mattered most for reducing cases and for what types of policies is there evidence that behavior changed in ways that protected the public, and particularly vulnerable populations, from COVID-19.

The first special report in this series—an analysis of COVID-19 mitigation policies through early October 2020–identified that the earliest and most frequent types of policies enacted in D.C., Virginia, and Maryland were social distancing policies, though most other policy types (e.g., enabling and relief measures, face mask policies, support for public health and clinical capacity) also became part of the policy environment in the region.[48] To better understand how state policy environments have changed through the pandemic we compared the policy types enacted in the spring and in the fall of 2020, in order to capture differences in policymaking that reflects the different realities at these two times in the pandemic.

As shown in Figure 2, the general policy environment across states shifted as the pandemic unfolded. Strict social distancing measures in the spring, like stay at home orders and private sector business closures, evolved into mitigation measures for reopening and face mask policies in the summer and fall. To compare how the United States changed, we compared all policies enacted between March 1, 2020, and June 1, 2020, with policies enacted between August 1, 2020, and November 1, 2020, and summarized policies at a national scale across the United States (Figure 2). Each bar represents the proportion of policies of each type (e.g., social distancing, face masks, enabling and relief) relative to all policies enacted in that time frame. By fall, the proportion of policymaking related to social distancing decreased as the focus of new policies shifted to supporting reopening and early policymaking related to vaccinations. The trend was the same when considering all policies in place including not just those newly enacted but all those that remained in place, underscoring the shift toward a broader consideration of policies needed as the pandemic continued.

[48] Talus Analytics (2020, November 24). *Mitigation Policy During the Pandemic*. Office of the District of Columbia Auditor. Available from https://dcauditor.org/report/mitigation-policy-during-the-pandemic.

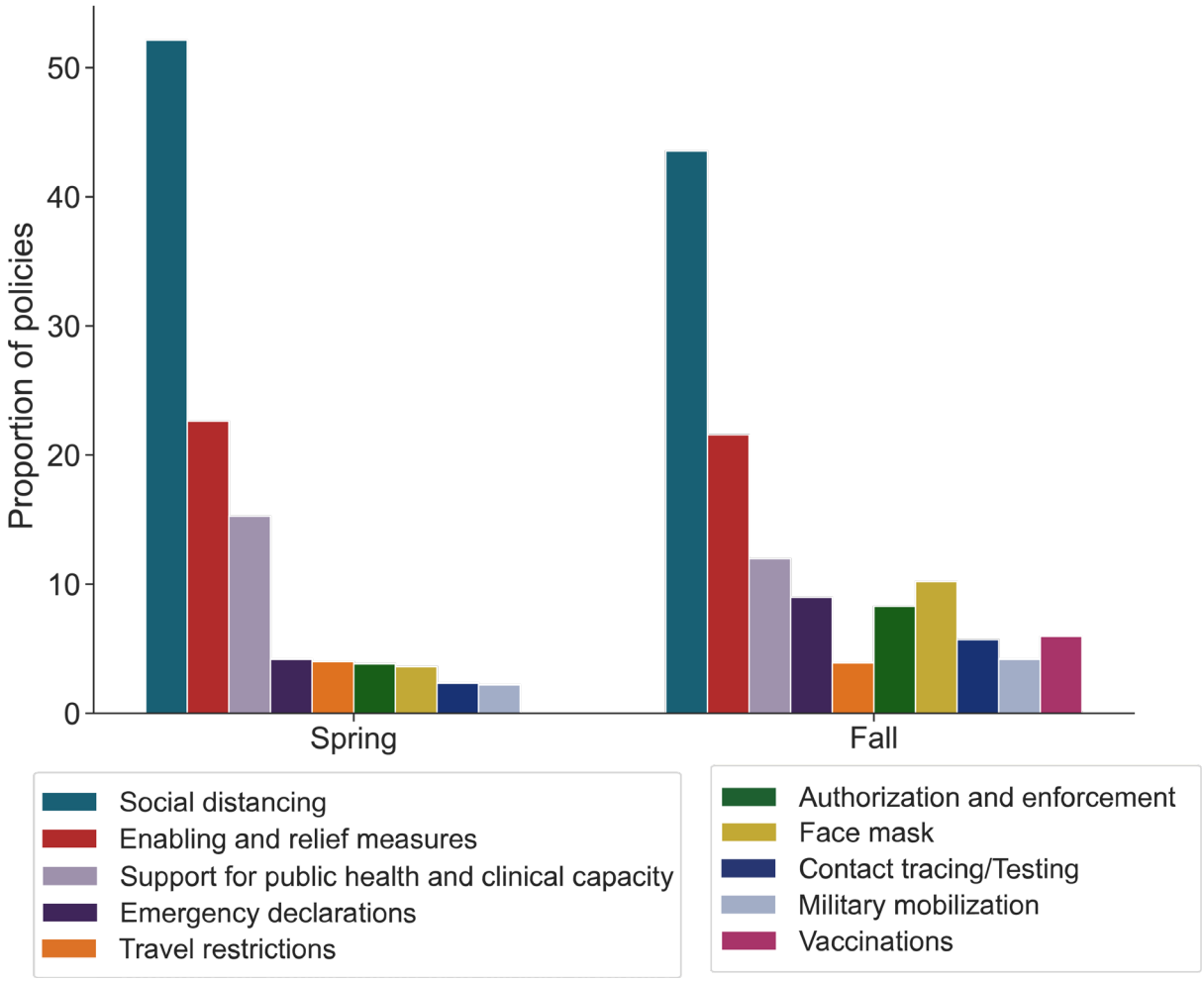

Figure 2: COVID-19 mitigation policies enacted, by policy category, as a percentage of all policies in the spring and fall of 2020. The spring policy environment included any policy written between March 1 and June 1, 2020, while the fall policy environment was any policy written between August 1, 2020, and November 1, 2020, corresponding timeframes of the spring surge in cases and the fall surge in cases.

In D.C., policies in place in the fall of 2020 included a set of new policies addressing enabling and relief measures and vaccinations (Figure 3A), which stands out in comparison to the rest of the country and to both Maryland and Virginia, where enabling and relief measures either held steady or were less likely to be enacted in the fall (Figure 2, 3B, 3C). Additional differences of note include the fact that face mask policies appeared earliest in D.C., while Maryland and Virginia passed these policies at the state level in advance of the fall surge with Virginia putting far more masking policies in place as the pandemic progressed (Figure 3B, C). Authorization and enforcement policies also rose in the fall most notably in Maryland and Virginia, with a lesser increase in D.C. Contact tracing the testing policies were implemented in D.C., but not in either Maryland or Virginia in the fall, even as these measures were highlighted as critical for the public health response.

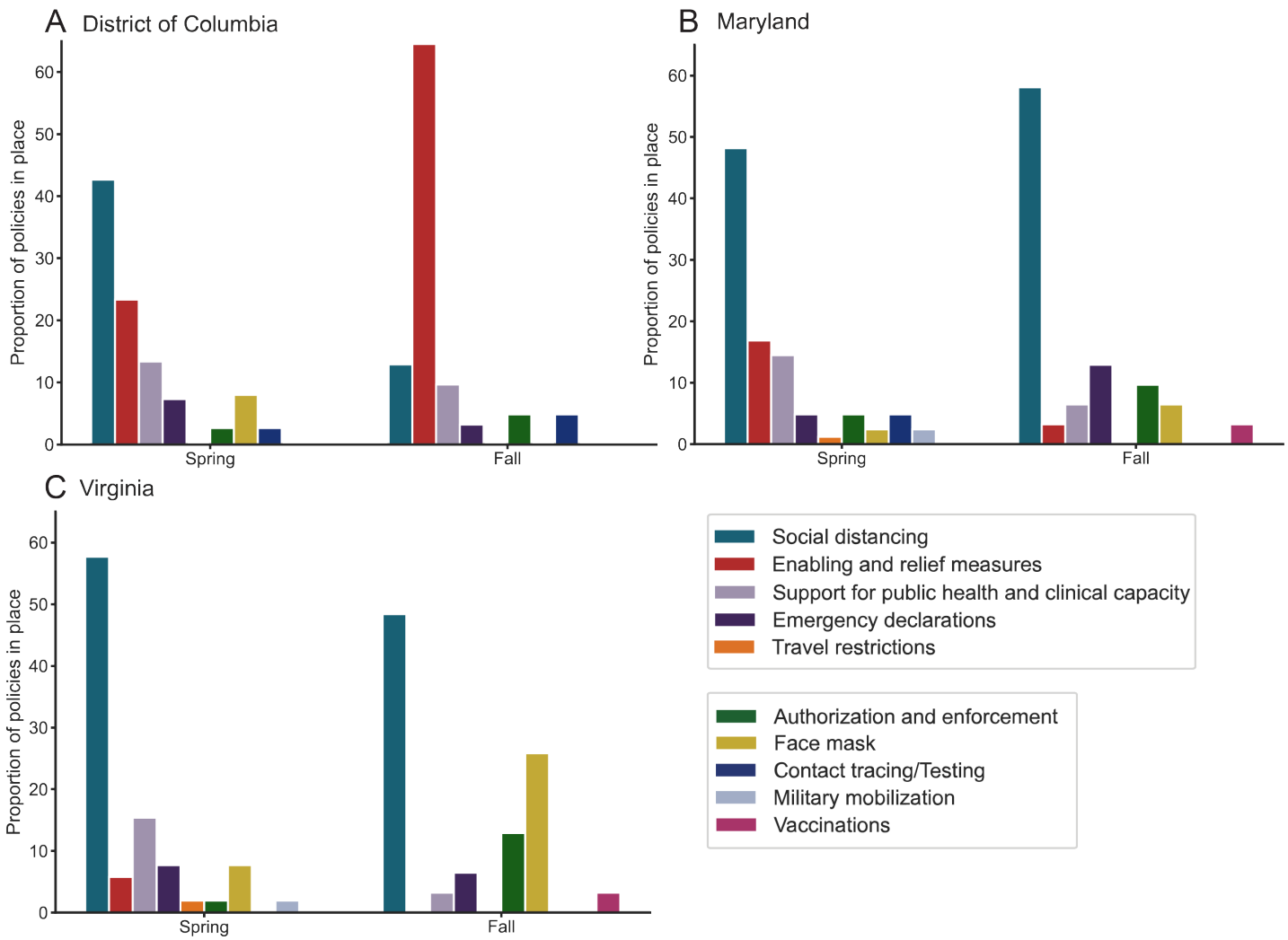

Figure 3: COVID-19 mitigation policies enacted in D.C., Maryland, and Virginia, by policy category, as a percentage of all policies in the spring and fall of 2020. The spring policy environment included any policy written between March 1 and June 1, 2020, while the fall policy environment was any policy written between August 1, 2020, and November 1, 2020. The District of Columbia continued to enact far more enabling and relief policies throughout the pandemic compared to Maryland and Virginia.

Within these major policy types, the shifts in state-level policy environments between spring and fall included a shift toward fewer states with policies mandating 'stay-at-home' or 'safer-at-home;' fewer mass gathering restrictions, and a reduction in policies regulating private sector and public service closures (Figure 4). Instead, the policy landscape included a greater proportion of states with face mask mandates and a continuation of policymaking that supported reopening businesses, such as the category of "adaptation and mitigation measures," a category of policies that include requirements for businesses as they resume or increase in-person operations.

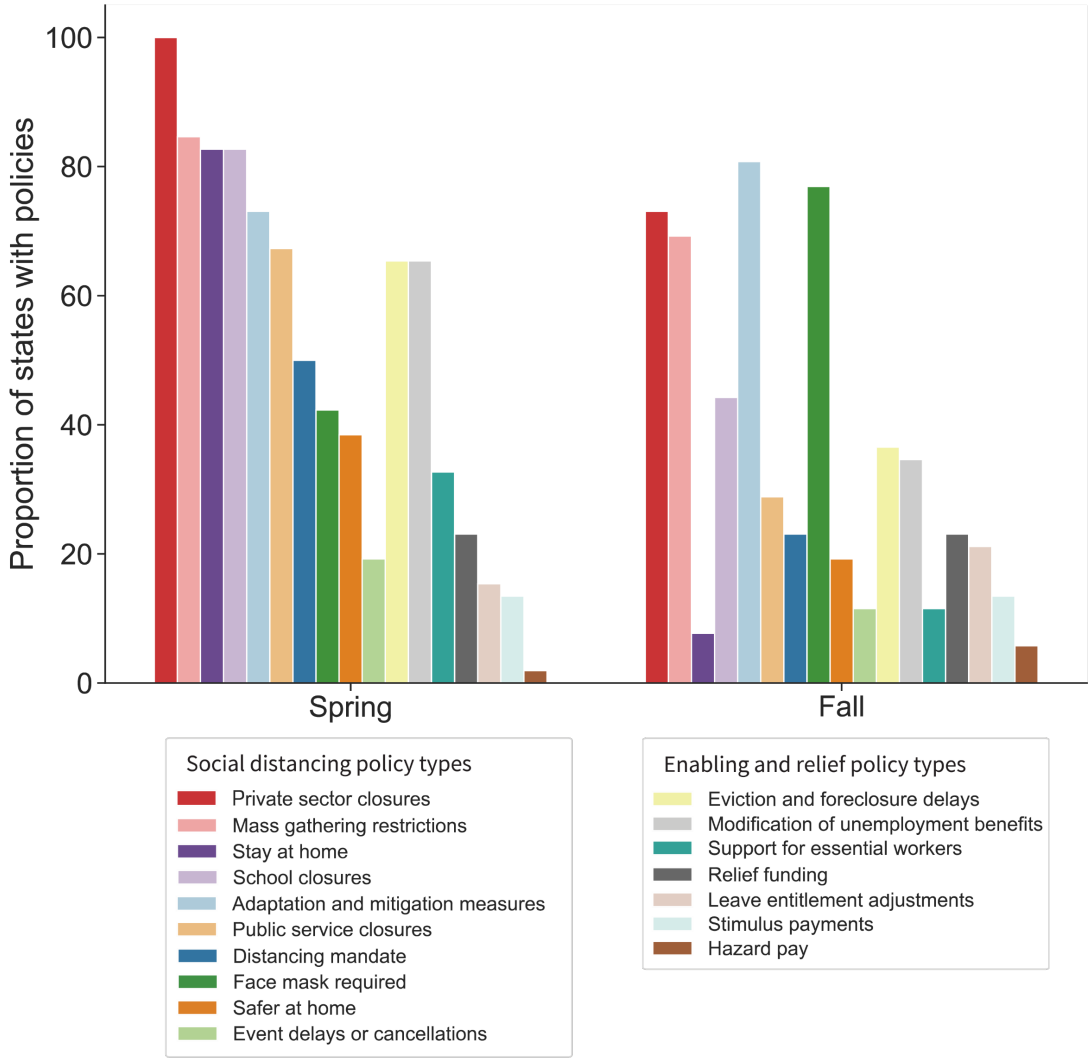

Figure 4: Proportion of states with key policy types in place in spring and fall 2020. Select policy types within the social distancing and enabling and relief categories showing the shift in policy environment.

In the initial spring surge, most states implemented strict 'Stay at home' orders. Consistent with these policies the overall behavior of individuals changed: people listened to the public messaging, and mobility around the country plummeted. This change in behavior can be measured by a number

of sources, including anonymized data that is made available through Google.[49] The peak change in mobility, measured through the anonymized locations captured from mobile phones, was observed in mid-March 2020 across the United States including D.C., Maryland and Virginia (Figure 5A, next page). Mobility patterns corresponding to staying at home, reducing trips to retail stores and work all showed large reductions from March until April (Figure 5A-D). Interestingly, D.C. had a much larger change in mobility patterns when compared to Maryland, Virginia and the U.S. average providing evidence that the policy environment in these states, and the District of Columbia to a greater extent, achieved the goal of changing public behavior in ways that reduce COVID-19 spread.

As the pandemic continued into the summer, the mobility behavioral patterns show that people gradually began leaving their homes for work or shopping (Figure 5). The only behavior that rebounded to a similar level as pre-pandemic movement was making a trip to the grocery store. Otherwise it is apparent that people were still modifying their behavior throughout 2020 to stay home more than during the pre-pandemic time period even though not as drastically as during the spring. The District of Columbia had a much larger change in mobility, compared to both the region and the U.S. average which suggests that more residents were able to work from home, and indicating that general social distancing policies aimed at encouraging people to avoid or reduce non-essential trips from home were successful in keeping people at home.

[49] Google. (2021). *COVID-19 Community Mobility Reports*. https://www.google.com/covid19/mobility/

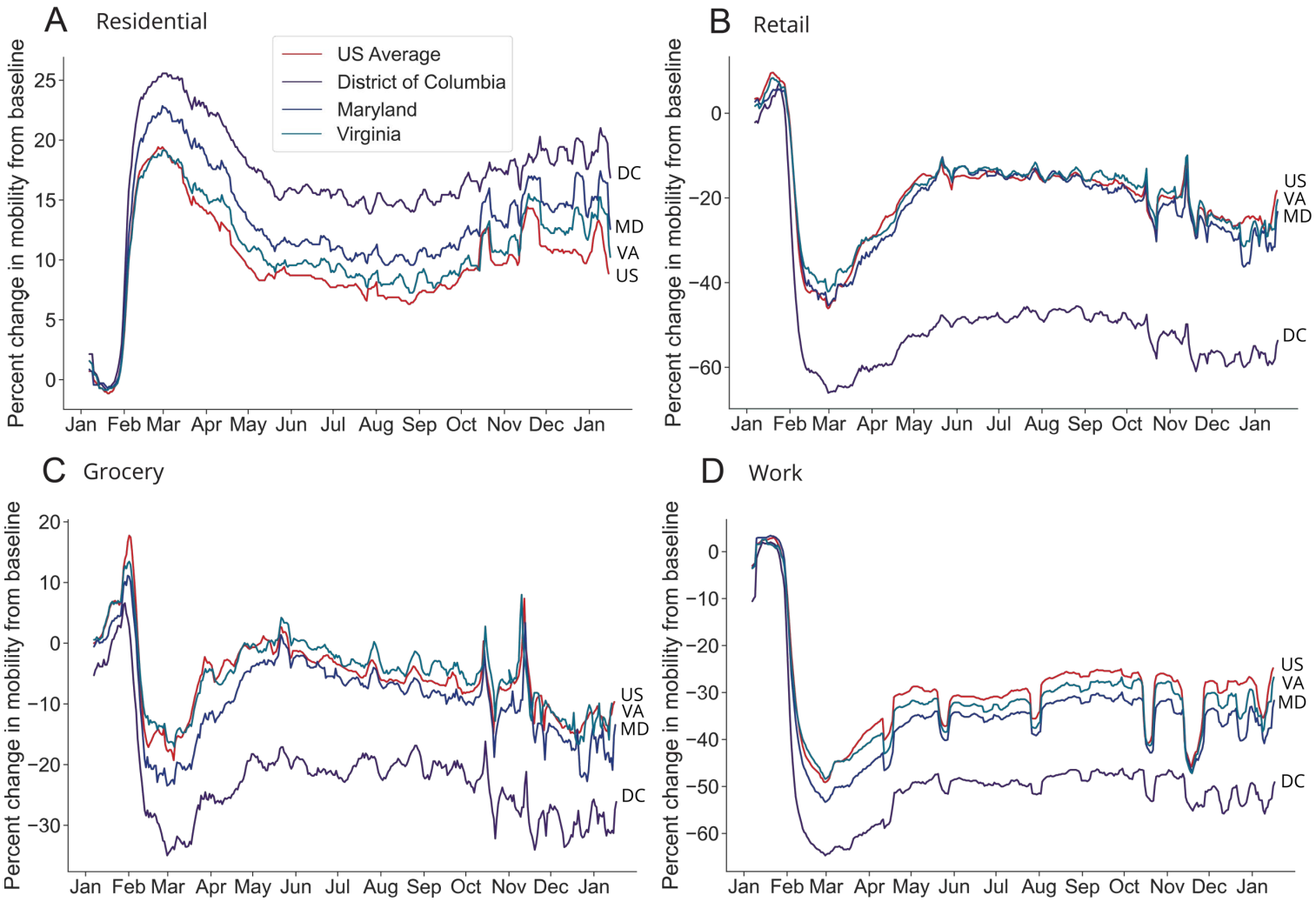

Figure 5: Mobility data across the United States. Google mobility data comes from aggregated, anonymized cell phone location data. The data shows how time spent in a specific type of location changed compared to the baseline, which was the median value from the 5-week period of January 3- February 6, 2021.

What policies were most successful in mitigating COVID-19?

As described in the previous section, the policy environment shifted from a relatively uniform approach early in the pandemic to states diverging in their approaches to what would reopen when, under what regulations, and the level of public support in place for industries and residents. Figure 6 (next page) summarizes these different approaches: each bubble represents the average length of time a policy was in place in a given category enacted by a state and states are ordered from least impacted (top) to most impacted (bottom) in terms of fall case count. (See Analysis & Methods for a detailed description of the approach of capturing fall surge case impacts, which accounts both for different starting points for fall surges and normalizes for state population size).

Overall, states with the heaviest fall caseload enacted fewer total policies, for a shorter period of time and from among a smaller set of the policy types. States with better outcomes, including the District of Columbia, tended to have a greater total number of policies and cover many of the policy types. However, these trends in the policy environment were not always consistent, with some states enacting quite a few policies while still having a very difficult fall surge, including Rhode Island as an example. Other states, like Virginia, relied on individual counties to implement any enabling and relief policies but still fared better than most during the fall surge. We performed a deeper analysis to assess which policy types, if they had been put in place prior to increases in cases in a state, might most likely explain differential outcomes during the fall surge, as described in the next section.

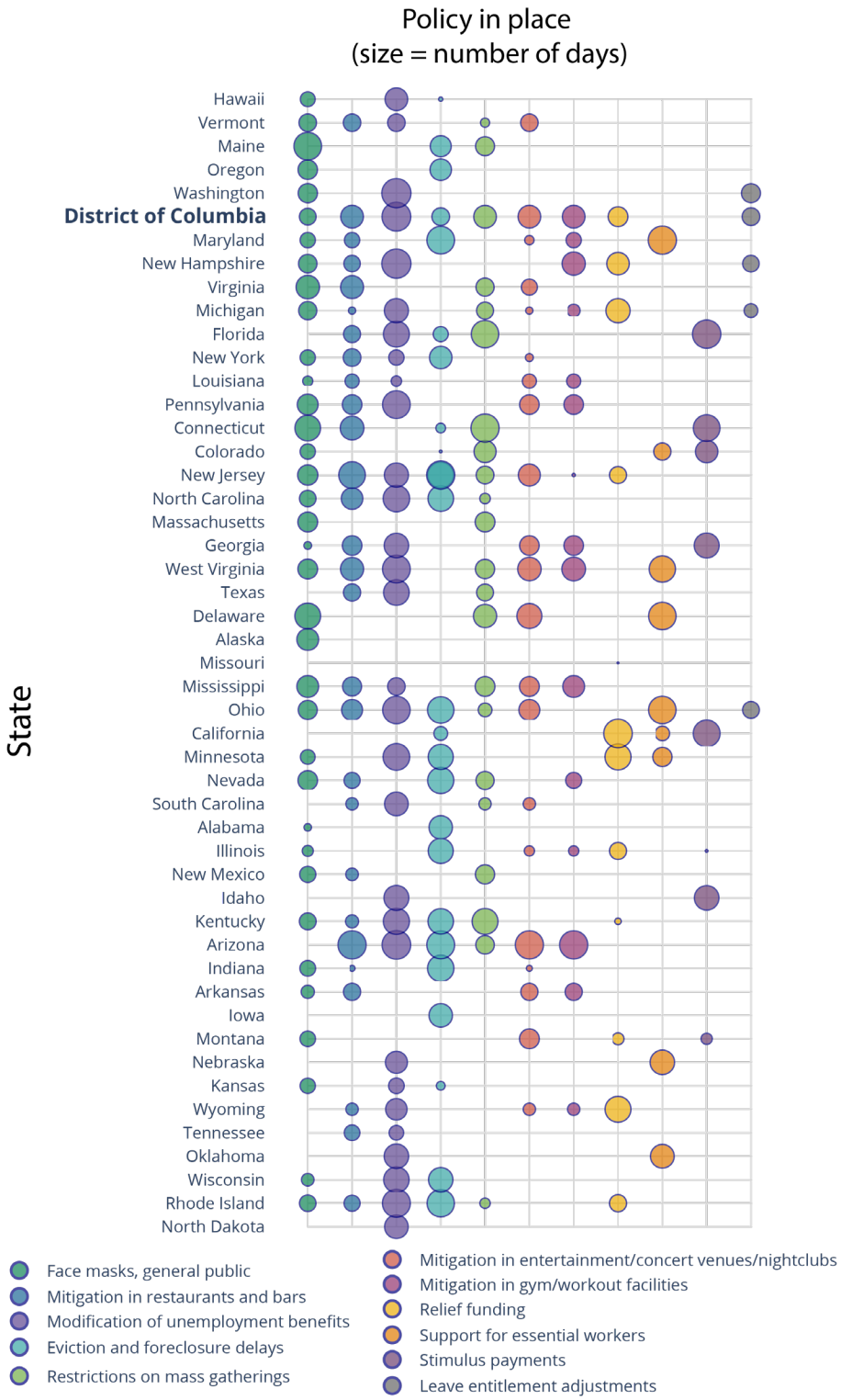

Figure 6: Number of COVID-19 mitigation policies, by type, for all states and the District of Columbia. States are listed in order by the impact of their fall surge, based on both case outcomes and the length of time the fall surge occurred. States with less fall surge impact are listed at the top. The bubbles represent the length of time a policy was in place, prior to the start of each state's fall surge- the larger the bubble, the earlier the policy was enacted.

Comparing how states "re-opened"

The fall surge was unlike the initial spring surge in the United States. Rather than a few concentrated locations of COVID-19 outbreaks, the pandemic spread widely across the country, including in more rural areas. Also, unlike the spring surge, each state now had a mix of policies in place. Some states were essentially fully open, while others still had strict social distancing policies in place. Due to this mix of policy environments and case outcomes, the fall surge provides a unique opportunity to examine what policy environment may have been the most effective.

To identify differences in policy environment between states with greater and less impacts of COVID-19 during the fall surge, we grouped states based on the severity of their fall surge. First, this analysis asked when the fall surge started in a state, based on when cases in the seven-day average reached 15 cases per 100k for 7 days in a row. States were then grouped into quartiles based on the magnitude of fall cases (Figure 7; Table A1 lists complete ranking based on state fall cases).

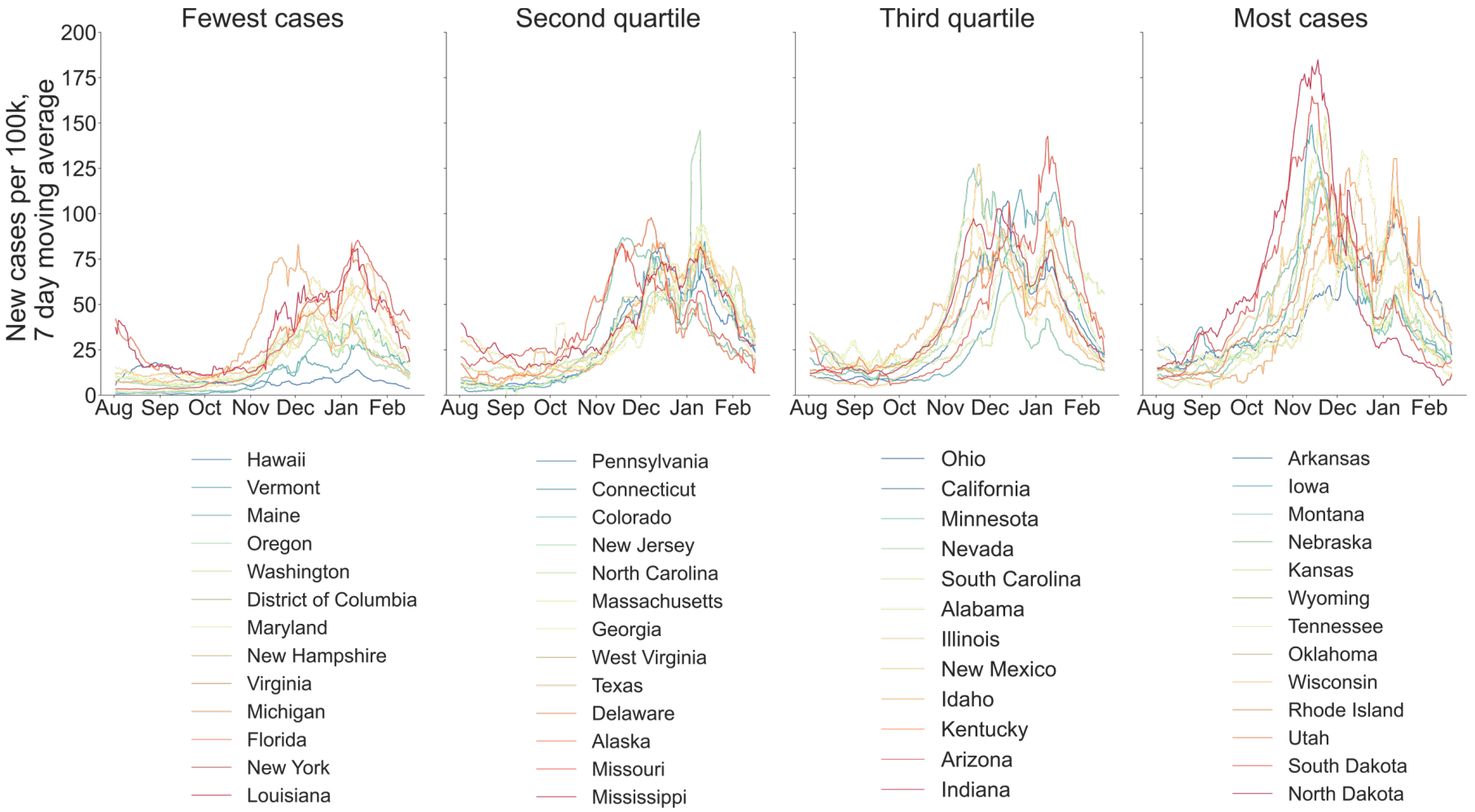

Figure 7: States grouped by quartile based on total cases and length of the fall surge. The seven-day moving average for cases was calculated using the New York Times data. Each state was ranked based on the fall surge outcome and grouped into 4 quartile-based categories. States are listed in each quartile top to bottom as least impacted to most.

For this analysis, social distancing policies were defined to include all policy interventions designed to reduce transmission of COVID-19. In the fall, this category included policies that define what industries could return to in-person operations, on what timeline, and under what requirements for mitigating COVID-19 risk. For states with the most cases (most impacted quartile), the average number of policies in place 60 days before the respective start date of their fall surge was just 3 policies (Figure 8) compared to an average of 9-15 policies among the states with lower caseload (all other quartiles).

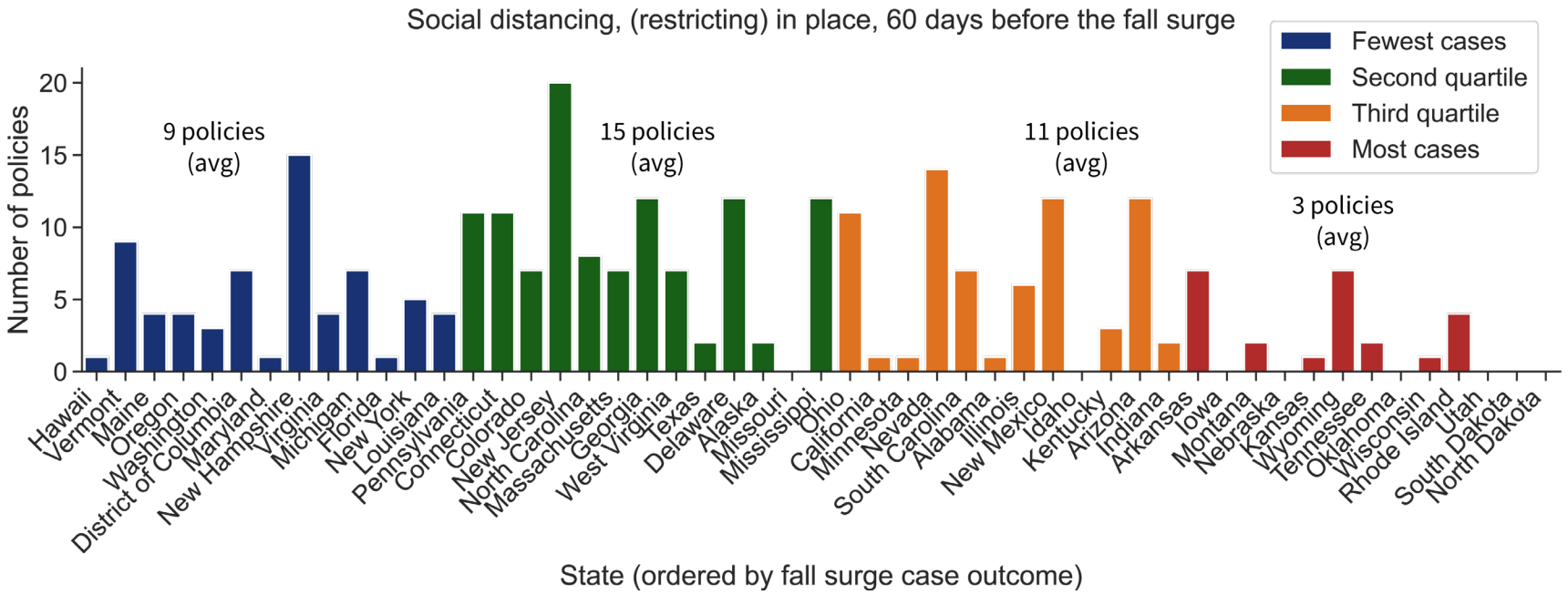

Figure 8: Social distancing policies in place before the fall surge for states that experienced different levels of impact. For each state, the total number of restricting, social distancing policies in place 60 days prior to the fall surge is plotted, ordering the states by their fall surge outcome.

Changes in mobility patterns in these four groups of states appear to follow policy implementation. The states more impacted in the fall (as defined as those with more cases) had residents less likely to stay home and more likely to spend time at retail and grocery stores throughout the summer and into the fall. Their residents were also less likely to change their behavior as the fall surge began (see Figure 9). While all states showed a significant reduction in mobility and corresponding increase in the amount of time spent at home (Figure 9A), the quartile of states least impacted by cases in the fall surge had notably less mobility in the retail setting compared to other states (Figure 9B). Activity associated with grocery shopping was also significantly reduced, and those states with the highest caseload during the fall surge had noticeably more activity in the sector throughout the pandemic, but especially in the summer of 2020 compared to those who more effectively limited cases (Figure 9C). These changes were not directly mirrored by mobility associated with work, which was more evenly distributed, though this activity was still most reduced in those states with the least cases (Figure 9D).

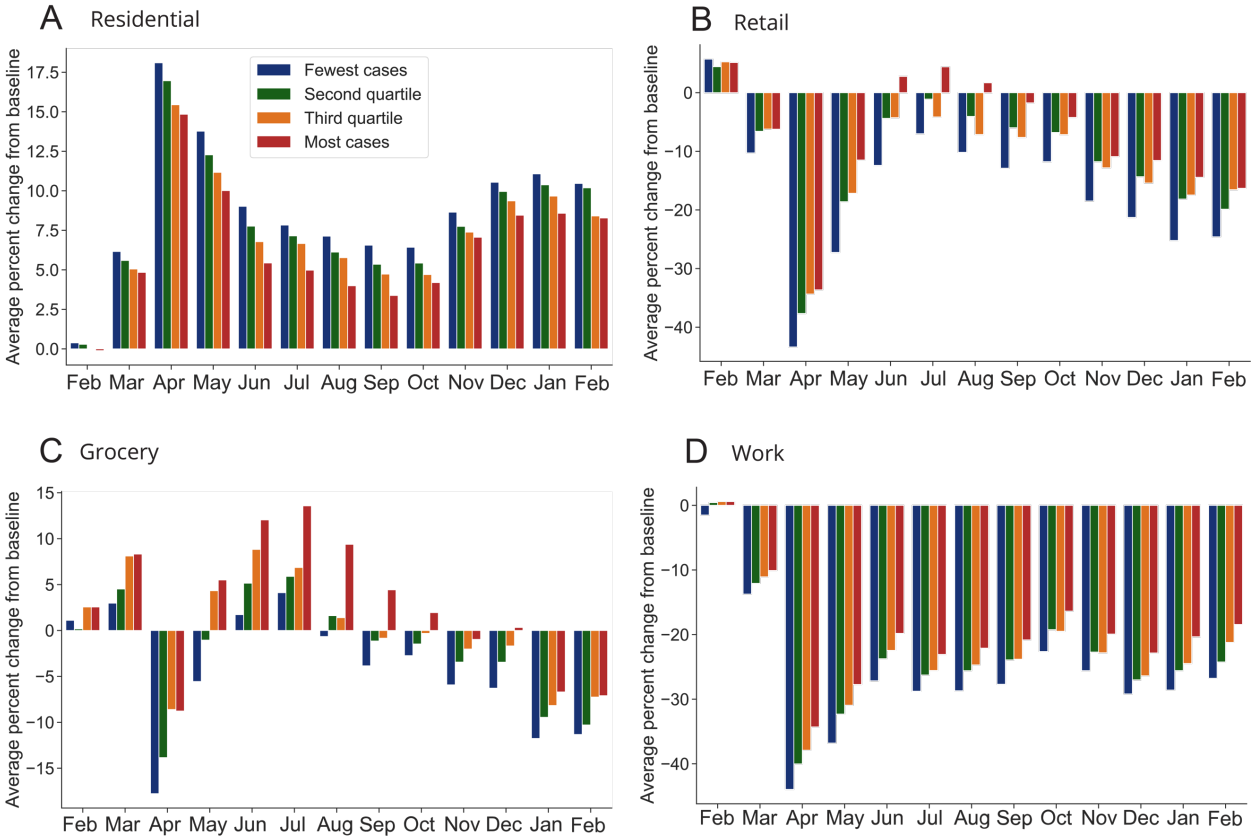

Figure 9: Mobility comparison across groups of states, based on the fall surge outcome. The average change from pre-pandemic baseline in the Google mobility data, across each month.

To understand which policies among the broad category of social distancing had the greatest impact on cases during the fall surge, we compared states with the most fall cases with those having the least cases using a decision tree-based modeling approach (see Analysis & Methods section) designed to identify what types of policies best explained differences in fall impacts across states. Then, the

model considered social distancing policies in place[50] in each state to group them by predicted outcome for whether they were among the more or less impacted states by COVID-19 cases in the fall, using the four quartile groups of states, including D.C. Across many runs of the model, we identified the key policy types that distinguished between the most and least impacted states.

The strongest statistical predictor of better outcomes in the fall surge was a broad, state-level face mask mandate addressing face mask requirements in public and private business settings (Figure 10, deep red bars to the left represent policy types associated with less case burden). Policies that required face masks in private businesses, but did not address other settings, were also associated with fewer cases but to a lesser extent than the broader face mask mandates. Mitigation policies -- those that define requirements for risk mitigation as businesses operate during the pandemic -- also were associated with lower case burden when in place for bars and restaurants as well as concert venues/night clubs. Interestingly, it seemed important to have some form of mass gathering restriction policy in place even when restrictions were relaxed from their initial levels, as indicated by the fact that both relaxation and further restrictions on mass gathering both were associated with lower case burden. It may be that simply providing clear policy guidance around mass gathering restrictions is the most important factor rather than the level of stringency. For example, the sustained decreases in mobility described earlier may reflect a public understanding of risk and lead individuals to be less likely to gather in large groups regardless of the policies in place. Overall, more and longer re-openings of non-essential businesses and the reopening of bars and restaurants were associated with more case burden (Figure 10, blue bars to the right).

[50] Policies in place at any point in the 60 days before the date marked as the start of the fall surge in a given state were considered by the model.

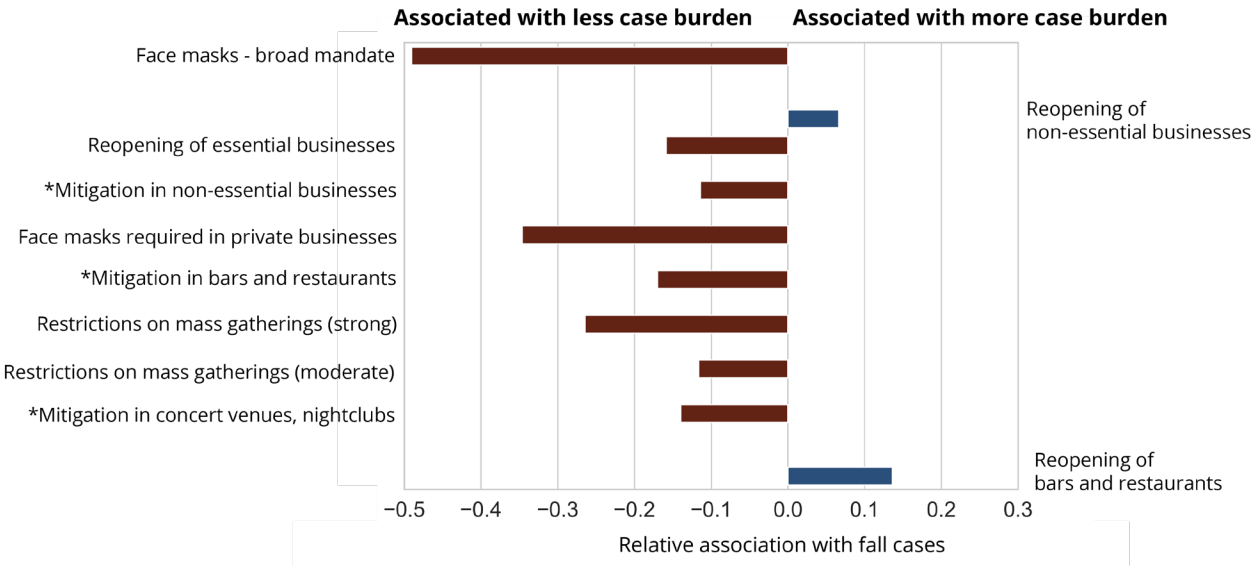

Figure 10: Policies identified to have an impact on fall surge outcomes, for the best versus worst performing states. Face mask mandates (both broad and specific to essential businesses), restrictions on gatherings, and a focus on mitigation in restaurants and concert venues were more likely to correspond with states that had relatively fewer cases in the fall. *Mitigation measures refer to requirements for risk-reduction that a business must implement to re-open, such as capacity limitations, cleaning requirements, or reduced hours of operation.

Looking at social distancing policy sub-types identified by the model and the differential fall case outcomes (e.g., broad face mask mandate, mitigation measures for bars and restaurants), there are clear trends that states with fewer of these policies in place 60 days before their fall surge saw a higher caseload in the fall (Figure 11). The four groups of states segmented by fall surge cases in Figure 11 show the significance of public policy on combatting the spread of COVID-19. Generally, restricting indoor gatherings has been key to preventing widespread community infections.51 Broad face mask policies in place were more likely to have been implemented in states that had better fall surge outcomes particularly as states move to reopen businesses, consistent with previous research on the benefits of face masks on preventing COVID-19 spread.[52]

[51] Kaufman, B.G., Whitaker, R., Mahendraratnam, N. et al. (2020). Comparing Associations of State Reopening Strategies with COVID-19 Burden. *J Gen Intern Med* 35, 3627–3634. https://doi.org/10.1007/s11606-020-06277-0.

[52] Joo, H., Miller, G.F., Sunshine, G., Gakh, M., Pike, J., Havers, F.P., Kim, L., Weber, R., Dugmeoglu, S., Watson, C., & Coronado F. (2021). Decline in COVID-19 Hospitalization Growth Rates Associated with Statewide Mask Mandates - 10 States, March-October 2020. *MMWR Morb Mortal Wkly Rep.*, 70(6), 212-216. https://doi.org/10.15585/mmwr.mm7006e2.

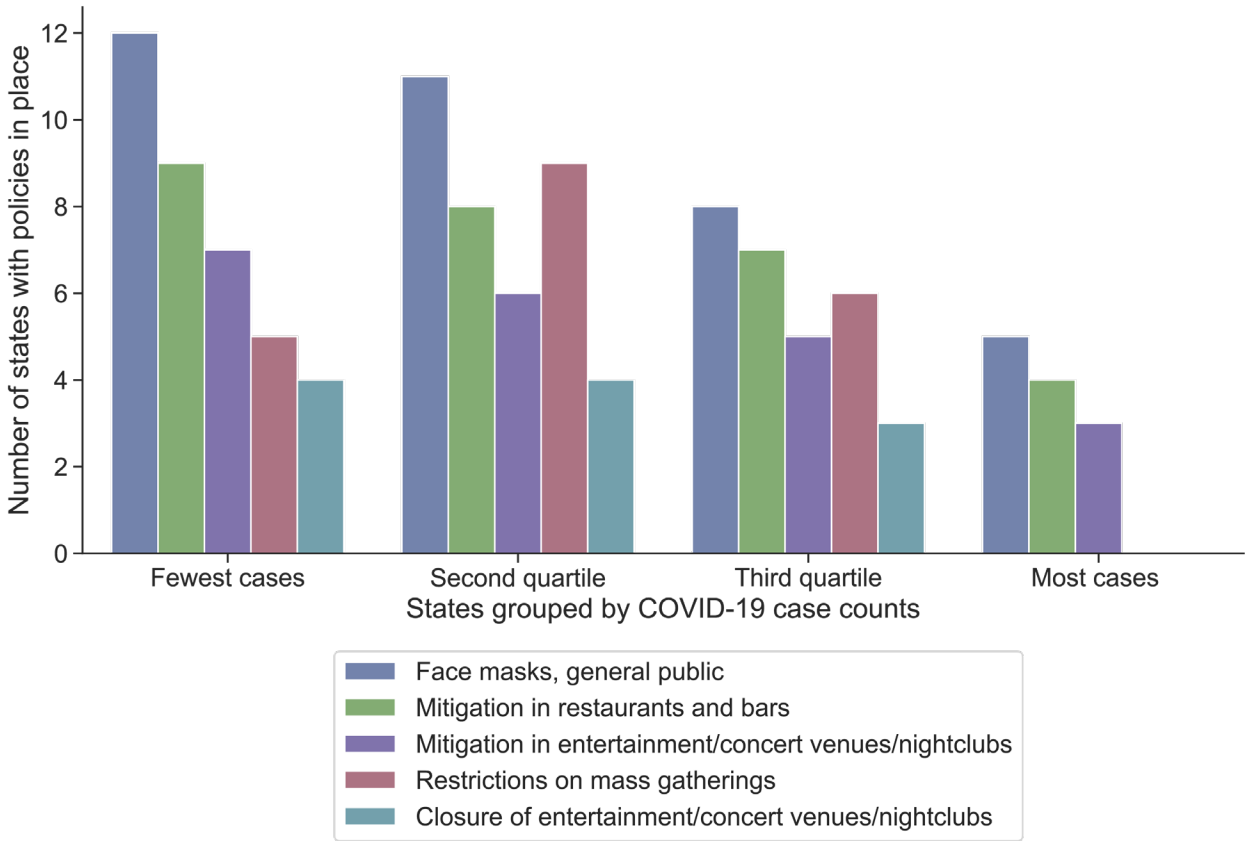

Figure 11: **Number of states with key social distancing policies in place, 60 days prior to the fall surge**. A state was considered as having a policy in place if the policy started any time before the fall surge, that did not expire within 60 days of the start of the surge. The average length of time a policy was in place, across all areas was 80 days, with only 7% of policies implemented for fewer than 14 days.

The timing of social distancing policies was also a key to success. Not only did more states with better outcomes in the fall surge have face mask policies in place along with restrictions on mass gatherings and mitigation measures for bars and restaurants, but they also had these policies in place earlier in the pandemic, specifically relative to the fall surge, than states that had the most cases (Figure 12).

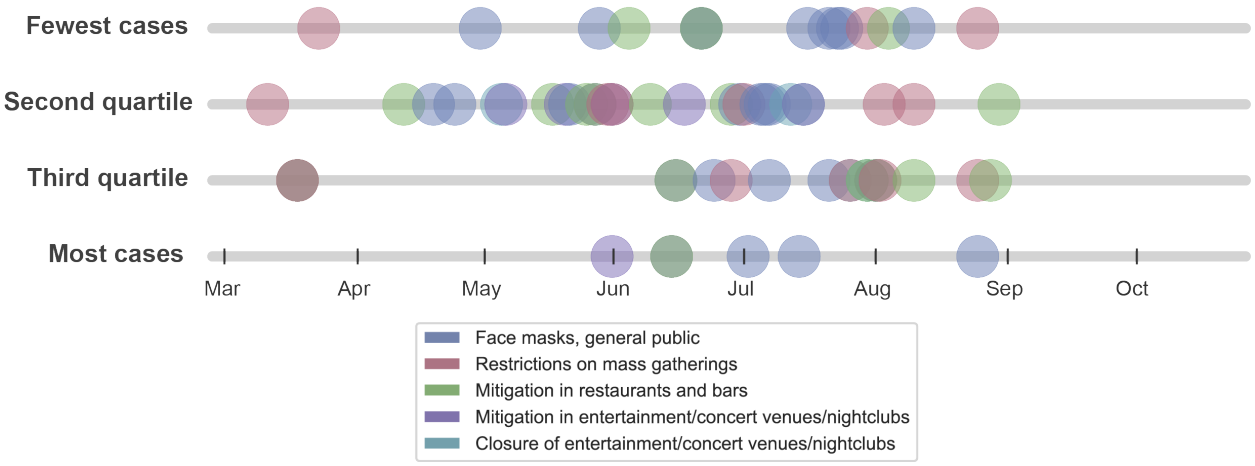

Figure 12: Timing of key social distancing policies. Each circle represents when a state has implemented a policy from key social distancing categories that was in place for at least 30 days before October 1, 2020.

What policies beyond social distancing had an impact?

A prior special report in this series[53] analyzed COVID-19 cases and fatalities within D.C., by Ward, relative to the demographics of each Ward and the likelihood that residents within specific Wards have occupations amenable to transition to work from home during the pandemic. Since not everyone has a job that can be performed at home, this report underscored the importance of supporting those essential workers who must leave home and come into contact with the general public each day (e.g., those working in healthcare, grocery, retail, hospitality, etc.). Furthermore, across the United States, the disproportionate COVID-19 impacts on Black and Hispanic Americans are compounded by the fact that a greater proportion of frontline and essential workers are Black and Hispanic.[54] As reported previously, the D.C. Wards with the highest case fatality rates include Wards with greater proportions of Black residents (Figure 13A, B).

Key findings from this prior report indicated that essential and frontline workers appear to be more mobile, concentrated in Wards 7 and 8, and to a lesser extent, Wards 4 and 5. The effect of social distancing policies and efforts to promote work from home did not increase stay-at-home behavior equally and evenly across D.C. At the neighborhood scale, inability to work from home correlated with more mobility (Figure 13C) and aligned with social and economic risk factors including lower income, lower high school graduation rates, and higher indexed measures of social vulnerability (Figure 13D). Taken together, analysis in the prior report showed that racial and ethnic groups and

[53] Talus Analytics. (2021, January 26). *Analysis of Demographics and Mobility Across D.C. During COVID-19*. Office of the District of Columbia Auditor. Available from https://dcauditor.org/report/analysis-of-demographics-and-mobility-across-d-c-during-covid-19.

[54] Zelner, J., Trangucci, R., Naraharisetti, R., Cao, A., Malosh, R., Broen, K., Masters, N., & Delameter, P. (2020). Racial Disparities in Coronavirus Disease 2019 (COVID-19) Mortality Are Driven by Unequal Infection Risks. *Clinical Infectious Diseases*, 72(5), e88-e95. https://doi.org/10.1093/cid/ciaa1723

essential workers and geographic areas of D.C. with large populations not able to work from home are the same as those areas most impacted by COVID-19 and those areas with the largest Black and Hispanic populations, consistent with national trends and underscoring the importance of policies aimed at protecting frontline and essential workers as they can also help to protect those most vulnerable based on social and economic standing.

Given the importance of considering social support as part of the COVID-19 pandemic response identified in the prior report, the following section uses the COVID-AMP dataset to analyze what supporting policies were in place, when and where, and whether having these policies in place aligns with better outcomes in terms of COVID impacts. In COVID-AMP, these supporting policy types comprise the "Enabling and relief" policy category.

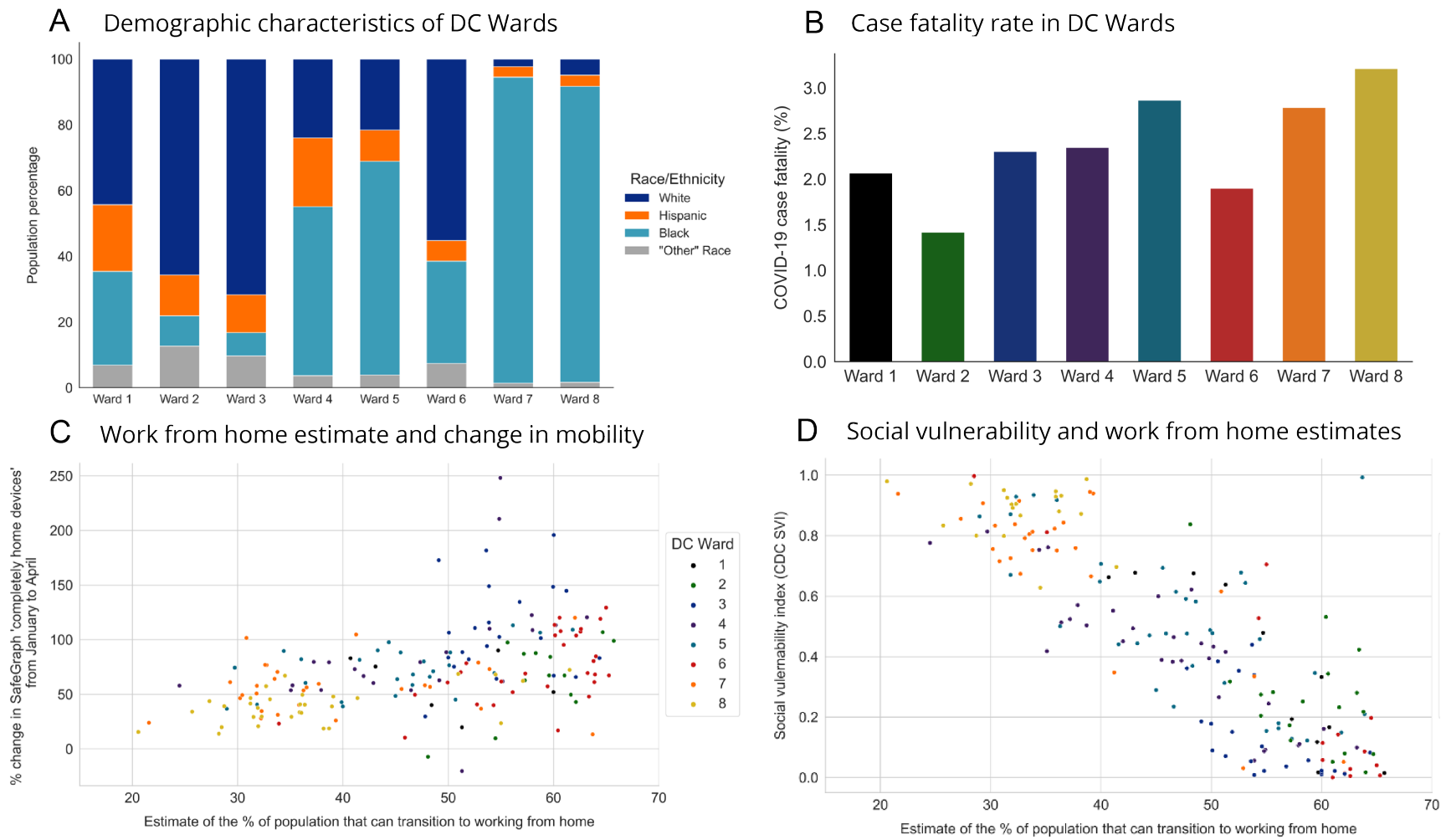

Figure 13: Previous findings from report analyzing of demographics and mobility across D.C. during COVID-19, as of March 16, 2021. A. Relative demographic breakdown of D.C. Wards. **B.** Case fatality rate by D.C. Ward, which is highest in Ward 8. **C.** Relationship between ability to transition to work from home and staying at home. Note: when considering percent change, the value can be read as "1.5 times (150%) the baseline mobility level. Correlation coefficient 0.42, $p<0.0001$. **D.** Relationship between Social Vulnerability Index (CDC SVI) and the estimate of the population that can work from home. Correlation coefficient 0.7, $p<0.0001$. Colors for D.C. Wards as in panel C.

Evaluating the role of enabling and relief measures

The two main groups of policies that states implemented to both combat the pandemic and support its citizens are categorized in COVID-AMP as 'Social distancing' and 'Enabling and relief'. Social distancing policies aim to combat COVID-19 by reducing the transmission of the virus between individuals. Enabling and relief policies typically center around stimulus payments, providing regulatory relief, changing leave entitlement, delaying evictions and foreclosures, and other measures to support essential workers. Each state had its own response in terms of enacting policies in this category. Enabling and relief policies afford a mechanism to provide support to vulnerable populations and to frontline and essential workers.

States that had the most severe fall surge, measured as a combination of length of time and number of cases, had only about half the number of enabling and relief policies in place as states that had lower caseloads (Figure 14, bars in red at right). The approach described above for analyzing social distancing policies was applied to groups of states based on the magnitude of cases during their fall surge and the number of enabling and relief policies in place 60 days prior to the fall surge (Figure 14). Notably, there was not a significant difference in the total number of policies in the top three quartiles, as ranked by fall surge caseload. However, those in the lowest quartile had half the policies overall.

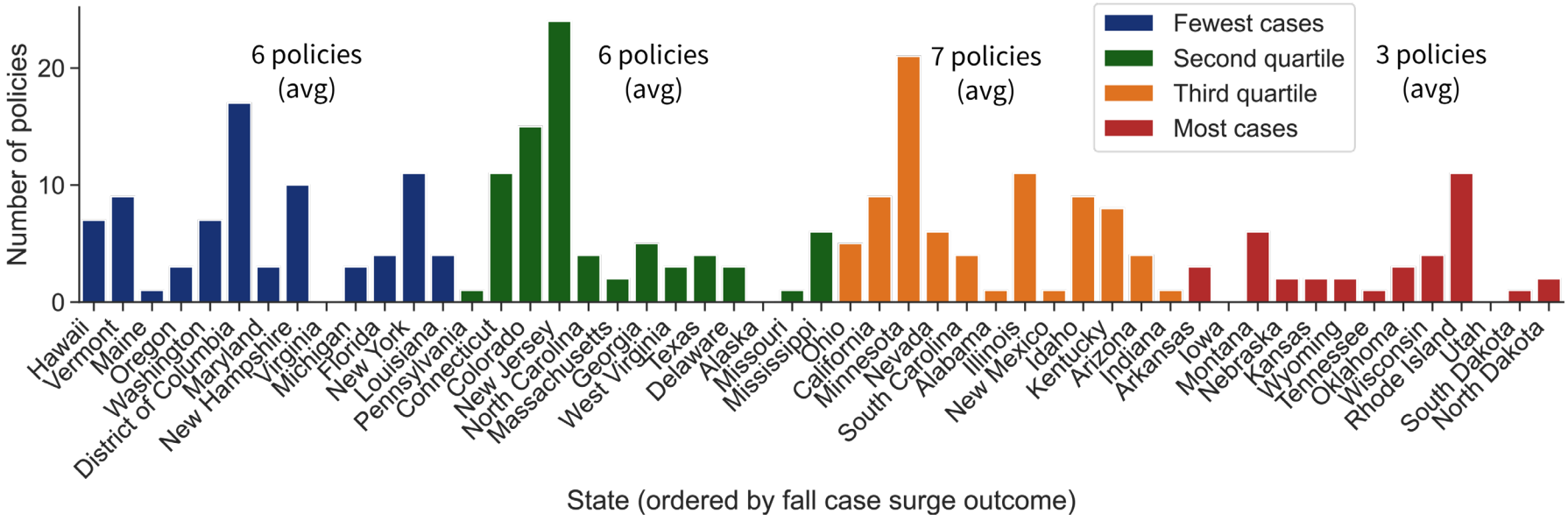

Figure 14: Enabling and relief policies enacted at the state level. The total number of enabling and relief policies that were active at some point during the 60 days leading up to each state's fall surge. States are ordered by the impact of their fall surge case outcome.

As shown in Figure 15, when these types of enabling and relief measures were analyzed in more detail, there were a few policies that were more likely to be enacted in all but the most impacted states. Specifically, modification of unemployment benefits and leave entitlements were both significantly more frequently found in those states with the fewest cases in the fall, as compared with states with the greatest fall surge.

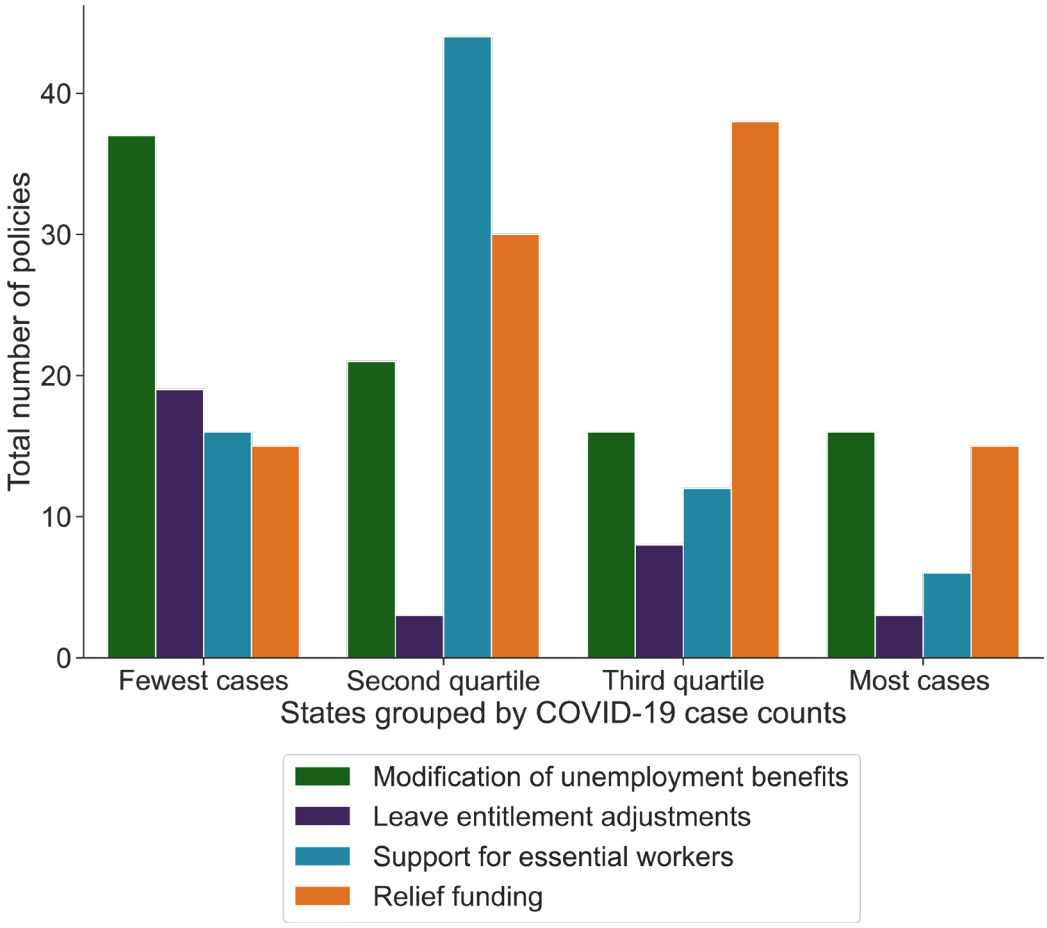

Figure 15: **Enabling and relief policies**. Total number of enabling and relief policies enacted in four key categories across all states, based on fall surge outcomes. Though a single policy type was not favored among the best performing states, there were many more total policies in places in those states, compared to the group of states with the most cases during the fall surge.

While we have focused on COVID-19 cases, obviously fatalities from COVID-19 are an important outcome by which to measure policy efficacy. This metric is particularly important given the disproportionate risk of dying from COVID-19 among essential workers. To consider fatalities in the fall surge as part of understanding what differentiated a successful policy environment, each state was ranked based on population-adjusted loss of life (per 100,000 state residents) totaled across the course of the state's fall surge, using the same fall timeframe used for cases. States were then grouped into quartiles and the relative grouping of each state was compared for cases versus deaths. Notably, those states that ranked much lower on fatality outcomes relative to rank based on cases

include Florida, Georgia, Michigan, Louisiana, Texas, Missouri, West Virginia, Pennsylvania, New Mexico, Indiana, Mississippi, Arizona, and Alabama.

When comparing states that had more deaths during the fall surge relative to cases, a key set of policies stood out. States that had more deaths were also those that had very few policies in place that supported workers, both through relief funding and other specific supports (Figure 16). The economic and social pressures on essential workers and vulnerable populations have a ripple effect, causing more people to have to go to work, even when that puts them or their families at risk, and means they are more likely to contract COVID-19 and bring the virus home. These states also tended to have earlier starts for their fall surges, suggesting an additional potential impact of not having those policies in place (data not shown).

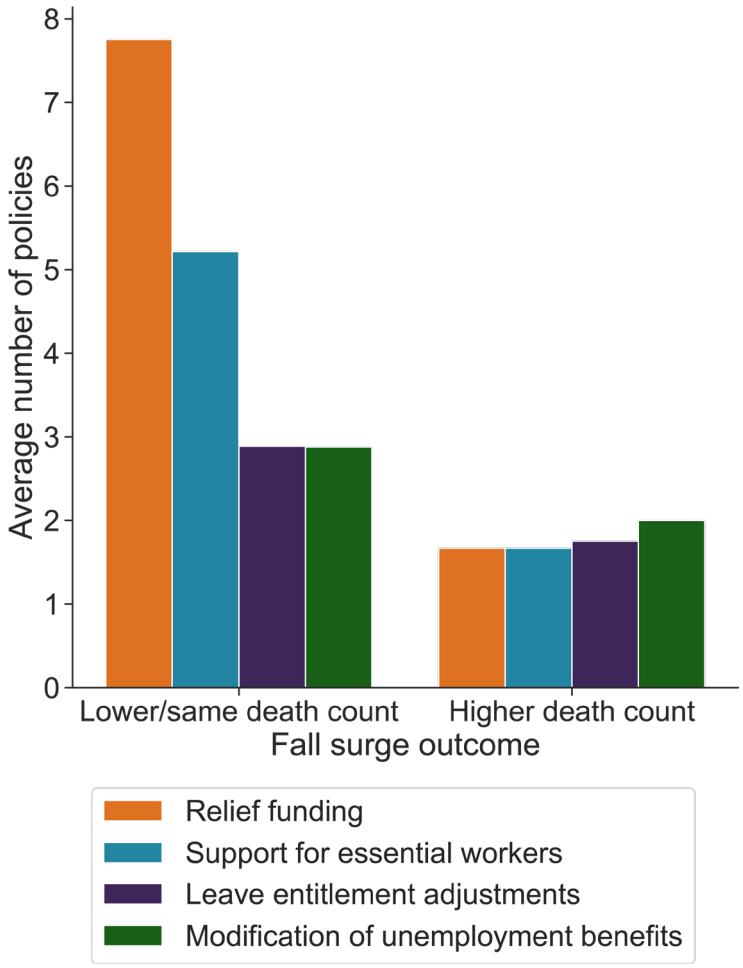

Figure 16: Key subset of enabling and relief policies in states that had worse relative death outcomes, compared to cases, during the fall surge. Average number of enabling and relief policies in states with worse death outcomes in the fall, as assessed by having moved to a more impacted group of states for deaths compared to cases. A policy was considered active prior to the fall surge if it was started at any point prior to when the state reached 15 cases per 100k and had not expired within 60 days of that date.

The timing of enacting enabling and relief policies also appears important for states that had lower fall impacts, but in a different way than social distancing policies, which appears to primarily have been a distinction of having policies in place early. For enabling and relief policies, the key seems to be early implementation and ongoing retention. The top two categories of states for fall case outcomes continuously enacted policies in the summer and early fall, not only having more policies in place, but having those benefits available sooner and apparently continuing to update policies as conditions changed (Figure 17). Previous research has found factors outside of just age that explain excess COVID-19 deaths, include living in a highly populated area with higher air pollution and less access to regional healthcare facilities.[55]

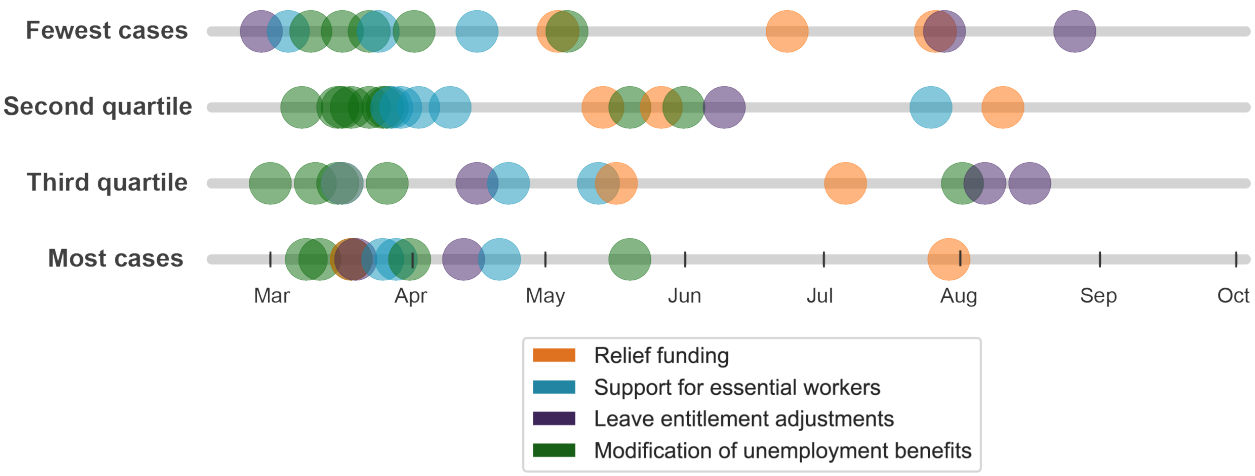

Figure 17: Timing of enabling and relief policies, prior to October 1, 2020. Each dot represents when a state enacted a policy. States are grouped based on their fall surge case outcomes into fewest to most cases. Nearly all states enacted some enabling and relief measures during the initial spring surge.

Layering public policy actions

While staying home and avoiding contact with others is possible for some workers, it is often not an option for essential workers or economically vulnerable non-essential workers who rely on wages to cover basic costs of living. To support these workers during a pandemic, a stable economic support system needs to provide the financial option to stay home without fear of losing their homes, being unable to care for dependents, or going into debt. Additionally, essential workers may require access to childcare, additional healthcare coverage, or increased compensation in exchange for putting themselves at higher risk of contracting COVID-19.

[55] Esteban Correa-Agudelo, Tesfaye B. Mersha, Andrés Hernández, Adam J. Branscum, Neil J. MacKinnon, Diego F. Cuadros (2020). Identification of Vulnerable Populations and Areas at Higher Risk of COVID-19 Related Mortality in the U.S. medRxiv 2020. https://doi.org/10.1101/2020.07.11.20151563

Though the research is still evolving, initial analysis from the COVID-19 pandemic has shown that the ability to work from home, and conversely, the number of workers that are considered 'essential' is an important determinant of impacts as are the public policy protections in place to support these populations. There is evidence that areas of the country with more essential workers have had both higher cases and deaths from COVID-19. In one analysis, it was reported that COVID-19 growth rate increased in states with higher percentages of essential workers (during reopening) but that supporting those workers by providing health insurance access for low-income workers (via Medicaid expansion) helped to reduce COVID-19 cases in a reopening model.[56] Another study analyzed when stay-at-home orders were enacted and lifted across the states and showed a strong linkage between social safety net protections (paid sick leave, expanded access to Medicaid Health Insurance, higher state minimum wage, higher welfare benefits) and the likelihood a state will shut down earlier and reopen later.[57]

Taken together, the emerging literature and the policy analysis presented here indicate that a comprehensive policy environment that address social distancing and enabling and relief-type policies is the most effective approach in pandemic response. The District, Maryland, and Virginia all largely adopted this approach, and the Region has seen lower cases and fatalities on a per capita basis than most states. The District in particular, has enacted a comprehensive set of enabling and relief policies, actively adding to these policies through the fall (Figure 18). The initial implementation of strict social distancing policies in the spring had the intended success in the NCR. Stay at home orders were in place by late March in Maryland, D.C. and Virginia. Cases and deaths began declining in the area by mid-May (Figure 18, top).

As the initial impacts of the pandemic began to recede, Maryland and Virginia began implementing policies intended to slowly reopen elements of the economy previously restricted as part of social distancing policies passed to slow COVID-19 spread in the spring. The District of Columbia, consistent with having suffered a higher impact from the initial spring surge, had a more measured approach to reopening by comparison. Virginia was the first to reopen outdoor dining, followed by allowing indoor dining and gyms by June 5th (with some capacity limitations). Maryland reopened indoor dining on June 12, 2020, and indoor gym facilities on June 19, 2020. The District of Columbia reopened indoor dining and gyms on June 22, 2020, with more strict capacity limitations than Virginia. See Table A2 in the appendix for a summary of key dates in reopening of these higher risk indoor settings.

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[56] Zhang, X., & Warner, M.E. (2020). COVID-19 Policy Differences across US States: Shutdowns, Reopening, and Mask Mandates. *Int J Environ Res Public Health*, 17(24), 9520. https://doi.org/10.3390/ijerph17249520.

[57] Warner, M.E., & Zhang, X. (2020). *Social Safety Nets and COVID-19 Stay Home Orders across US States: A Comparative Policy Analysis*. Unpublished manuscript. http://cms.mildredwarner.org/p/309.

The District of Columbia was successful in implementing all of the key policies shown to reduce impacts during the COVID-19 pandemic in the United States through early 2021 (Figure 18). Strict stay-at-home orders during the early spring surge were successful at flattening the curve, and although the community was negatively impacted by the high rate of cases and deaths, the city was successful in preventing an additional summer spike in cases. The early face mask mandates and careful consideration of reopening restaurants, businesses and gyms aligns with the lesser and delayed fall surge compared to most states. Maintaining mass gathering restrictions, having a face mask mandate in place early, and having defined key adaptation and mitigation measures prior to opening restaurants, bars, and other higher risk settings, were all successfully implemented in the District and region. The mobility changes in D.C. also indicate that policies worked- the initial stay at home orders had the largest impact, but D.C. residents stayed at home more often than people in Maryland, Virginia and across the United States (Figure 5). Part of the success can likely be attributed to the key enabling and relief policies that were put in place in D.C. that helped support citizens through relief funding, leave entitlement adjustments, modification of unemployment benefits and eviction and foreclosure delays.

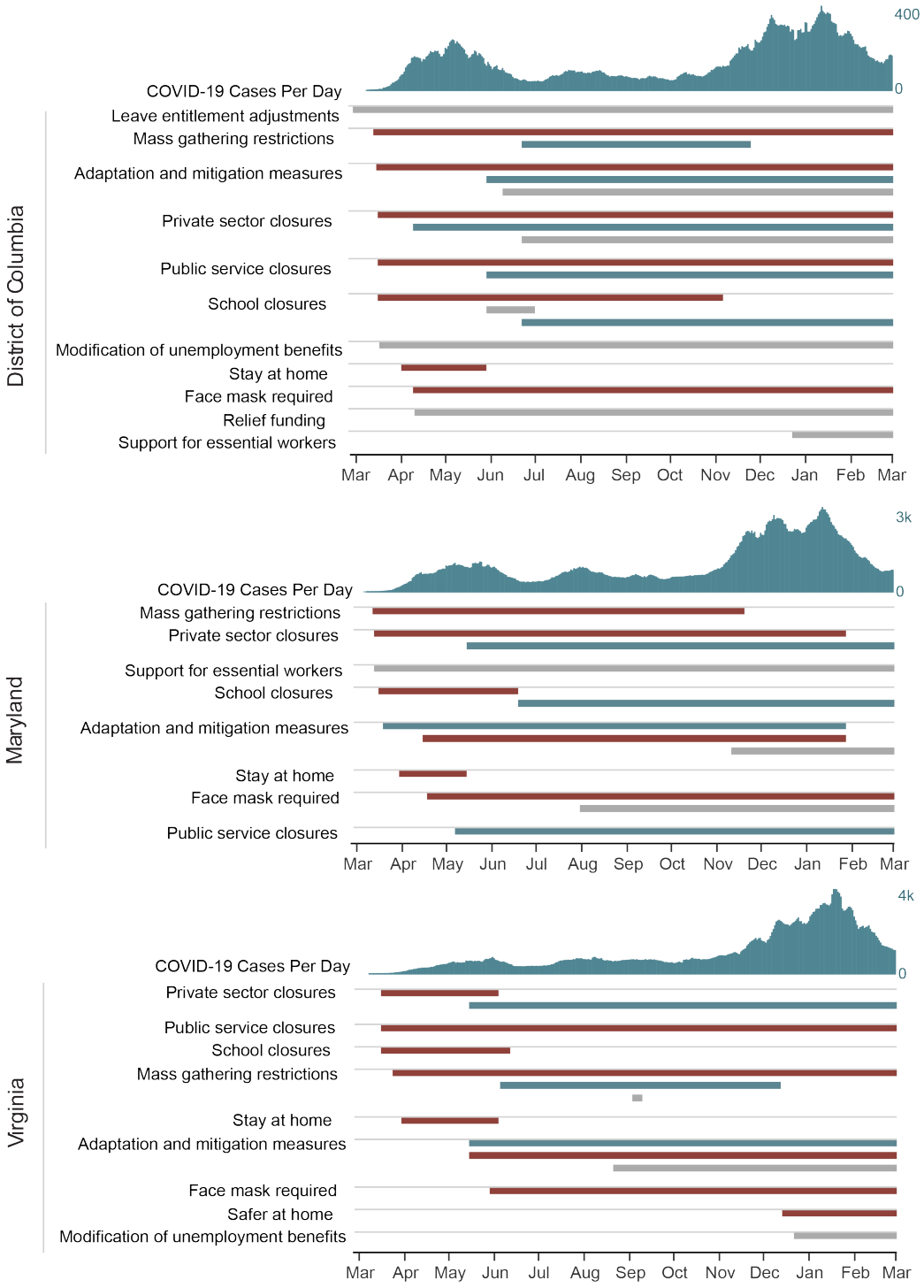

Figure 18: COVID-19 caseload and key policy implementation for of D.C., Maryland, and Virginia from March 2020 through March 2021. COVID-19 new cases per day over time with the duration of policies in each category. Policy timeline colored by whether policy is restricting (red), relaxing (green), or other (grey). Restricting and relaxing captures the directional intent of policies (a policy reducing mass gatherings from unlimited size to 10 people is restricting and one that shifts from 10 to 100 is relaxing). 'Other' applies to policies not designed to change stringency of mitigation measures, such as guidance for how essential workers are to be supported or changes to unemployment benefit programs.

While these policies were often based on existing social services (e.g., modifying unemployment benefits), others were adapted from policies that are often enacted during an economic downturn (e.g., business grants, eviction delays). Still others are unique to a public health crisis or natural disaster, including the establishment of temporary field hospitals or providing personal protective equipment (PPE) to essential workers. However, these policies have rarely been implemented and examined in a pandemic scenario prior to the COVID-19 health emergency.

Conclusions

D.C. implemented an earlier and more comprehensive set of public policies in response to COVID-19 than nearly anywhere in the United States, which contributed relative success in keeping cases and loss of life lower than most states. As noted, on a global scale, the United States has had among the worst records in cases and loss of life. States that had the most severe case impacts during the fall surges had very few policies in place. States with less severe impact in the fall had differences among policies in place, but the key differentiator of success was a policy environment with a robust combination of both social distancing and enabling and relief policies.

This analysis coupled with other research underscores the specific policy actions that are needed both in the context of new surges of COVID-19 and future outbreaks. A key central message is that early action increases the success of public policy intervention slowing disease spread and saving more lives.[58,59,60] Countries like New Zealand and Australia, and others with stringent and nationally consistent policies were able to significantly reduce impacts in terms of cases and deaths, 'flattening the curve' faster and even preventing recurring surges in some cases.[61,62]

Given the substantial economic and mental health considerations that come with extended stringent measures to control disease spread, great pressure existed to reopen more activities from restaurants and bars to schools and in-person offices. How these activities resumed, under what types of mitigation measures, and with what types of concurrent social support shaped the impacts of 'reopening' both globally and in the United States. Countries that were able to transition from strict

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[58] Markel, H., Lipman, H. B., Navarro, J. A., Sloan, A., Michalsen, J. R., Stern, A. M., & Cetron, M. S. (2007). Nonpharmaceutical interventions implemented by US cities during the 1918-1919 influenza pandemic. *Journal of the American Medical Association*, 298(6), 644–654. https://doi.org/10.1001/jama.298.6.644

[59] Wibbens, P.D., Koo, W.W., & McGahan, A.M. (2020). Which COVID policies are most effective? A Bayesian analysis of COVID-19 by jurisdiction. *PLoS One*, 15(12), e0244177. https://doi.org/10.1371/journal.pone.0244177.

[60] Thu, T. P. B., Ngoc, P. N. H., Hai, N. M., & Tuan, L. A. (2020). *Effect of the social distancing measures on the spread of COVID-19 in 10 highly infected countries.* Science of the Total Environment, 742, 140430. https://doi.org/10.1016/j.scitotenv.2020.140430

[61] Liu, Y., Morgenstern, C., Kelly, J., Lowe, R., CMMID COVID-19 Working Group, & Jit, M. (2021). The impact of non-pharmaceutical interventions on SARS-CoV-2 transmission across 130 countries and territories. *BMC Med*, 19(1), 40. https://doi.org/10.1186/s12916-020-01872-8.

[62] Brauner, J. M., Mindermann, S., Sharma, M., Johnston, D., Salvatier, J., Gavenčiak, T., Stephenson, A. B., Leech, G., Altman, G., Mikulik, V., Norman, A. J., Monrad, J. T., Besiroglu, T., Ge, H., Hartwick, M. A., Teh, Y. W., Chindelevitch, L., Gal, Y., & Kulveit, J. (2021). Inferring the effectiveness of government interventions against COVID-19. *Science*, 371(6531), eabd9338. https://doi.org/10.1126/science.abd9338

lock downs to reopening with low transmission rates focused on testing paired with successful contact tracing measures to control further outbreaks.[63] The United States never achieved this level of control over spread of the virus. Instead, mitigation during large case surges was carried out through a combination of public messaging and public policy. The analysis presented here, and an emerging policy analysis literature for this pandemic, are beginning to identify what types of policy environments were in places that achieved better outcomes. As scientific knowledge of COVID-19 spread has advanced quickly, it is now clear that face mask policies with compliance[64,65,66] are very effective and that proper ventilation,[67] and even reducing loud speaking and singing, can significantly help reduce spread. Incorporating this information in public policy decisions remains important for managing and mitigating COVID-19 and is an important consideration for other airborne diseases with person-to-person spread.

Importantly, the COVID-19 pandemic has had disproportionate impacts by population and location, and these disparities are likely to continue and be true for future large-scale infectious disease outbreaks. Those especially vulnerable include those who must leave home go to work because they cannot work from home; fear taking time off even if they feel sick because of lost income or job insecurity; lose a job; or face foreclosure or loss of rental housing. As observed for D.C. in prior reports, and consistent with national trends, these vulnerabilities often compound one another and disproportionally affect racial and ethnic minorities, particularly Black and Hispanic Americans. In the analysis presented above, policies to support vulnerable populations were, along with "social distancing" policies, associated with better outcomes in preventing and reducing fall surges in states with both in place. These included: defining requirements for businesses to enact mitigation measures to help protect workers and customers as they reopen, support directly to essential workers and in the form of relief payment, extension of unemployment benefits, relief from foreclosures and evictions, and others. D.C., and the neighboring states of Maryland and Virginia, had among the earliest and most comprehensive policy responses to COVID-19. Though nowhere in the United States contained spread of the virus as successfully as other parts of the world, the National Capital Region fewer cases and deaths than much of the United States, especially

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[63] Lewis, D. (2020, December 14). Why many countries failed at COVID contact-tracing — but some got it right. *Nature News Feature*. https://www.nature.com/articles/d41586-020-03518-4

[64] Joo, H., Miller, G.F., Sunshine, G., Gakh, M., Pike, J., Havers, F.P., Kim, L., Weber, R., Dugmeoglu, S., Watson, C., & Coronado F. (2021). Decline in COVID-19 Hospitalization Growth Rates Associated with Statewide Mask Mandates - 10 States, March-October 2020. *MMWR Morb Mortal Wkly Rep.*, 70(6), 212-216. https://doi.org/10.15585/mmwr.mm7006e2.

[65] Zhang, K., Vilches, T.N., Tariq, M., Galvani, A.P., & Moghadas, S.M. (2020). The impact of mask-wearing and shelter-in-place on COVID-19 outbreaks in the United States. *Int J Infect Dis.*, 101, 334-341. https://doi.org/10.1016/j.ijid.2020.10.002.

[66] Kaufman, B.G., Whitaker, R., Mahendraratnam, N. et al. (2020). Comparing Associations of State Reopening Strategies with COVID-19 Burden. *J Gen Intern Med*, 35, 3627–3634. https://doi.org/10.1007/s11606-020-06277-0.

[67] Pease, L. F., Wang, N., Salsbury, T. I., Underhill, R. M., Flaherty, J. E., Vlachokostas, A., ... & James, D. P. (2021). Investigation of potential aerosol transmission and infectivity of SARS-CoV-2 through central ventilation systems. *Building and Environment*, 107633. https://doi.org/10.1016/j.buildenv.2021.107633.

during the fall and winter surge; this success appears to be directly tied to the public policy environment implemented and highlights the value and importance of robust, data-driven policy in the context of these types of public health emergencies and infectious disease outbreaks.

Appendices

Table A1: List of states in each fall surge outcome grouping, based on cases

Fewest cases	Second quartile	Third quartile	Most cases
Hawaii	Pennsylvania	Ohio	Arkansas
Vermont	Connecticut	California	Iowa
Maine	Colorado	Minnesota	Montana
Oregon	New Jersey	Nevada	Nebraska
Washington	North Carolina	South Carolina	Kansas
District of Columbia	Massachusetts	Alabama	Wyoming
Maryland	Georgia	Illinois	Tennessee
New Hampshire	West Virginia	New Mexico	Oklahoma
Virginia	Texas	Idaho	Wisconsin
Michigan	Delaware	Kentucky	Rhode Island
Florida	Alaska	Arizona	Utah
New York	Missouri	Indiana	South Dakota
Louisiana	Mississippi		North Dakota

Table A2: Key reopening policy timeline for D.C., Maryland, and Virginia.

Location	Restaurant reopening (outdoor)	Restaurant reopening (indoor)	Gym reopening (indoor)	Face mask required
District of Columbia	5/29/2020	First opening 6/22-12/23/2020 with capacity limitations Second opening: 1/22/2021	6/22- 11/25/2020 with capacity limitations Second opening: 12/17/2020 with capacity limitations	5/29/2020
Maryland**	5/29/2020	First reopening: 6/12 with capacity limitations	6/19/2020 with capacity limitations	2 policies: 5/15/2020, 7/31/2020
Virginia**	5/15/2020	6/5/2020 with capacity limitations	6/5/2020 with capacity limitations	5/29/2020

**Allowed policy implementation at the county/city level that may have differed from the state's policies.

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