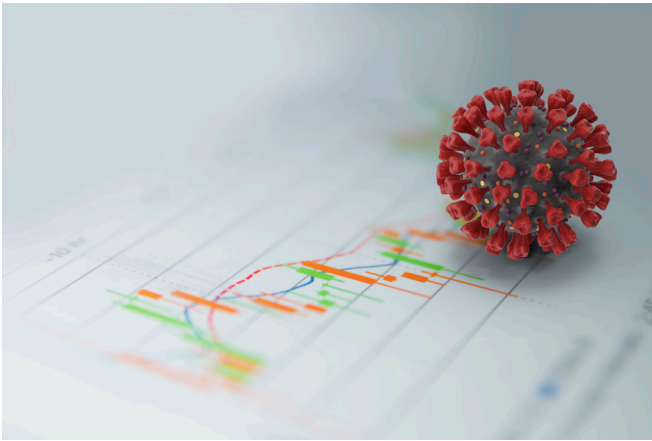


Mitigation Policy During the Pandemic

November 24, 2020

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





COVID-19 SPECIAL REPORT
**Mitigation Policy During the
Pandemic**

Initial Findings

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Prepared For
Office of the D.C. Auditor
Kathleen Patterson

Prepared by
Ellie Graeden, CEO
Talus Analytics, LLC

This is the first report 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. Initial analysis focused on collecting data on which COVID-19 policies were implemented where and when across the Region and compiling key datasets on demographics, mobility, caseload, deaths, and economic metrics. Initial analysis identified a wide range of policies implemented across the District, Virginia, and Maryland, with an emphasis on social distancing measures and enabling and relief policies. This analysis indicates a disproportional impact (by population) on Wards 4, 5, 7, and 8, the same wards with the highest proportion of population lacking health insurance and without a high school diploma. Additional analysis is being conducted to expand these findings.

[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

As the COVID-19 pandemic surges into its third wave in the fall of 2020 decision makers across the world continue to need to make rapid, life changing decisions on a daily basis. At the outset of the pandemic there was a lack of robust data to help inform these decisions, but as the months have progressed an evidence basis has been built that supports new analysis about what policies have worked when, where, and for whom, to mitigate the consequence of the event. The challenge now becomes translating the vast amount of data into timely, accurate information that can inform future decisions during this pandemic and planning for the next.

Talus Analytics has partnered with the Office of the DC Auditor (ODCA) to address that challenge. Over the course of a six-month effort Talus Analytics and ODCA will perform an analysis with the goal of defining the relative impact of COVID-19 mitigation policies to help guide leadership as the pandemic continues. The analysis presented here establishes a baseline of policies that were implemented in the National Capital Region (NCR)¹, aligned with the intent of the policy, and the data sources available to provide context, including population and demographic, mobility, COVID-19 caseload and death, economic, and geographic data.

Initial findings are as follows:

- Social distancing policies and enabling and relief measures were the majority of policies implemented in the District, Maryland, and Virginia between March and October 2020.
 - Social isolation restricting policies have been relaxed in recent months, most significantly in VA with relaxing policies implemented as early as April 2020.
 - Initial analysis suggests that early social distancing policies in the DMV appear to be aligned with the intended effect of reducing mobility.
 - Notably, the same may be true for enabling and relief measures.
- COVID-19 caseload impacts are not uniform. Manassas County, VA has experienced the greatest caseload in the NCR with Wards 4, 5, 7, and 8 experiencing the highest per capita caseload thus far within the District itself.
 - In the District, these wards are those with the highest percentage of populations lacking health insurance and without a high school diploma.

These findings pose many more questions, including whether social distancing and enabling and relief measures directly impact caseload and deaths; the impact of the pandemic on specific demographic groups across the NCR; and how these impacts differ across the NCR. Analyses will also be conducted on the economic impacts of the pandemic, including unemployment rates. These analyses, among others, will be the focus of future reports.

¹ As defined by the Metropolitan Washington Council of Governments and for this report, the National Capital Region includes: Washington, D.C.; in 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; in Virginia: Alexandria City, Arlington County, Fairfax City, Fairfax County, Falls Church City, Loudon County, Manassas City, Manassas Park City, and Prince William County.

Introduction: What policies work to manage COVID-19 spread?

As the COVID-19 outbreak has unfolded policy makers have been asked to address its impacts. However, there has been little data to support those decisions as the United States (US) has not had a large-scale pandemic unfold on US soil in modern times. Decision makers in governments across the globe have been asked to mitigate the event: understand the spread of the disease, slow its spread, reduce its impact on their populations, specifically protect vulnerable populations, deploy medical countermeasures, support health care and other essential workers, provide education, and manage economic damages. Without recent experience to guide these efforts, many of these decisions were made in the absence of sufficient data or robust analysis to provide guidance on what would work, in what way, where, and for whom. As the pandemic moves into its fourth season, significant data have and continue to be collected to help inform decision-makers as they continue to enact policies. As the US moves into the third wave of cases in late autumn 2020, decision-makers need to understand the impact of these policies - in what way, where, and for whom.

At the heart of this question are two key assumptions of governance: that the policies implemented at any level of government change the behavior of those over whom the policy has jurisdiction and that those resulting behaviors create the intended change. In the case of COVID-19 or any other disease, the goal is to mitigate the impacts of disease. Most obvious are the direct impacts, measured in total morbidity and mortality – cases and deaths. These impacts, however, have both proximal and distal measures that are relevant. Policies around social distancing are intended to change patterns of mobility and interaction, reducing the likelihood of spread between people. Reducing mobility is assumed to reduce human-human interaction, therefore reducing disease spread; this assumption is the basis for lockdown measures and stay-at-home orders.^{2,3} However, policies such as social support or relief measures may also have some impact, though these impacts have yet to be fully explored.

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 include a wide range of policy goals, from social distancing to social support measures to military action. Now, using Washington D.C. and the greater National Capital Region (NCR) as the primary focus, this initial analysis begins to assess what policies have been implemented across the region and to develop measures of success for those policies. These results will be updated as the analysis progresses over the coming months, with the goal of helping guide the decisions made both within the District and across the Region throughout the winter and second spring of the pandemic.

² Flaxman, S., Mishra, S., Gandy, A. *et al.* Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe. *Nature* 584, 257–261 (2020). <https://doi.org/10.1038/s41586-020-2405-7>

³ 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>

Key information requirements

To understand what policies have worked where, when, and for whom, the first question is 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?

When and where were policies implemented?

To understand what policies worked, the first step was to collect data on what policies were implemented when and where. The question of when a policy was implemented can be defined simply by the date when it was first enacted. However, it is equally important to understand when *during the event* the policy was implemented. What were the conditions in the region where the policy was implemented? What policies were under consideration or had already been implemented by surrounding jurisdictions?

In the context of an outbreak, one of the most critical aspects of timing is the relationships between and among current caseload, rate of spread in the community, rate of spread and caseload in the surrounding communities (e.g., commuting communities with whom the population may be likely to come in close contact), and the perception of the risk in the community. While the perception of risk is hard to measure, total daily caseload and rate of change is largely available at the country, state, county, and often city level. On the city level, outcomes are a critical measure of impact of the pandemic and of the policies implemented to mitigate the pandemic.

In this analysis the research team defined what policies were implemented in each jurisdiction in the NCR 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. Particularly in the absence of clear information about which policies would work, most locations implemented many policies to mitigate the pandemic. This analysis of policies implemented over time is designed to support robust analysis not only about what individual policies were most effective, but what policies, in what categories, taken together, over time and in a specific place were most effective.

Did those policies work?

What does it mean for a policy to work? Whether a policy works or not depends on its intent. Policy is the mechanism by which governments enact change – through change in behavior, through the change in underlying environment, or by providing incentives or punishments associated with each. Governments can affect a great deal of change in a wide range of areas associated with large scale public health or pandemic response efforts. Categorizing these policy types can help describe the type of change intended from each. The effectiveness of each policy must be measured relative to its category and the corresponding change intended. For the purposes of this analysis, policies are categorized by the following, each with a corresponding intended effect.

Policy categories

Social Distancing policies are intended to maintain distance from others, typically a minimum of 6 feet; close facilities such as public pools or community centers; cancel events; prohibit mass gatherings, or limit visitors in facilities such as nursing homes and correctional facilities.

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

Contact Tracing and Testing policies allow additional authority to expand, conduct or hire COVID-19 tracers, or to mandate testing in specific groups. For example, on June 22, 2020 Washington, D.C. authorized dentists to administer swab tests.⁴

Travel Restrictions are used to encourage a decrease in mobility. For example, on March 13, 2020, Maryland prohibited passengers on cruise ships from disembarking in the Port of Baltimore.⁵

Emergency Declarations occur when an official announces the need to exercise extraordinary governmental powers. Emergency declarations during the COVID-19 pandemic announced either a general state of emergency or a public health emergency. Emergency declarations can give officials additional powers, suspend statutes and regulations, expand immunities for certain groups, or begin the process for requesting additional aid.

Support for Public Health and Clinical Capacity policies include those intended to improve access to healthcare or reduce impact and strain in the healthcare and public health systems. These measures can include cost coverage for testing or treatment, mandatory delay or cancellations of elective procedures, legal immunity for experimental treatment provided by medical providers, licensing waivers for cross-state nurses or care providers, and emergency use or expanded market authorization for vaccines or treatments.

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 discontinuation of gas or water services.⁶ 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.⁷

⁴ Washington, D.C. Mayor's Order 2020-075.

<https://www.dcregs.dc.gov/Common/NoticeDetail.aspx?NoticeId=N0094909>

⁵ Maryland Executive Order March 12, 2020. <https://governor.maryland.gov/wp-content/uploads/2020/03/Prohibiting-Movement.pdf>

⁶ COVID-19 Response Emergency Amendment Act of 2020, Act 23-247, effective March 17, 2020. Expires June 15, 2020. <https://code.dccouncil.us/dc/council/acts/23-247.html>

⁷ Maryland Executive Order No. 20-06-19-0. https://governor.maryland.gov/wp-content/uploads/2020/06/2089_001.pdf

Military Mobilization measures allow or provide authority for the activation of military forces, such as National Guard or Medical Corps, to provide logistical and medical or law enforcement support. For example, on March 12 the Governors of Maryland and Virginia⁸ and on March 16, 2020 the Mayor of DC activated the state National Guard in response to the COVID-19 threat.

Social distancing policies are typically implemented in concert such that, while some jurisdictions implemented policies described as “Lockdown” or “Stay-at-home,” others implemented a combination of individual policies that yielded similar restrictions. In addition, the terms applied to these different types of policies vary between jurisdictions. To address this variation in terminology, standardized descriptions of these social distancing levels were developed, as described below.

Lockdown: Policies do not allow residents to leave their place of residence unless explicitly permitted to do so.

- Lockdown order in place (e.g., includes provisions requiring no movement outside or limits those leaving home for essential functions to specific household members or to only some days of the week)

Stay-at-Home: Policies limit most in-person activities and social events, as defined by simultaneous closure of schools, private sector businesses, and restrictions on mass gatherings and events.

- Stay-at-home order that includes:
 - School closures
 - Private sector closures
 - Mass gathering and/or event restrictions
- OR Combination of policies that includes all of the following:
 - School closure AND
 - Private sector closures AND
 - Mass gathering and/or event restrictions

Safer-at-Home: Policies limit activities to those specifically permitted, encouraging extra precautions and retaining limits on mass gatherings.

- Safer-at-home order in place
- OR Stay-at-home order in place with simultaneous policies that relax restrictions on (reopen) the private sector
- OR Combination of policies that includes all of the following:
 - School closure AND
 - Private sector closure with some relaxation from prior, most restrictive policies AND

⁸ Virginia, Executive Order Amended Number Fifty-One (2020): Governor Northam activates Virginia National Guard to State Active Duty. [https://www.governor.virginia.gov/media/governorviriniagov/governor-of-virginia/pdf/eo/EO-51-Declaration-of-a-State-of-Emergency-Due-to-Novel-Coronavirus-\(COVID-19\).pdf](https://www.governor.virginia.gov/media/governorviriniagov/governor-of-virginia/pdf/eo/EO-51-Declaration-of-a-State-of-Emergency-Due-to-Novel-Coronavirus-(COVID-19).pdf) ; Maryland Order of the Governor of the State of Maryland Calling the Maryland National Guard into State Active Duty: Governor Hogan activates the Maryland National Guard. <https://governor.maryland.gov/wp-content/uploads/2020/03/National-Guard.pdf>

- Mass gathering and/or event restrictions with some relaxation from initial, most restrictive policies

New Normal: A majority of public restrictions on mass gatherings and non-essential businesses are lifted or expired, with some encouraging of safeguards such as face coverings.

- No stay-at-home or safer-at-home order in place (including by expiration)
- Some restrictions on either mass gathering or private sector businesses
- Includes reopening policies for private sector and/or mass gatherings
- Schools may or may not be reopened

No Restrictions: All policies on mass gatherings and non-essential businesses, including policies governing reopening guidelines, are lifted or expired, analogous to those prior to the pandemic.

- No stay-at-home or safer-at-home order in place
- No private sector closures, and no re-opening specific policies
- No mass gathering restrictions, and no re-opening specific policies
- No school closures in place

These social distancing levels do not correspond exactly to phase language used in DC, Maryland, or Virginia, but describe the broad categories used both in the region and across the US to support comparative analysis.

The impact of each type of policy was defined by metrics based on the intent. For example, the primary goal of a social distancing policy is to limit spread within a community. However, a policy can either restrict or relax: it can be used to either place limits or lift those limits. Policies may focus on large gatherings, private or public sector places of business or work, or schools and playgrounds. The success of such social distancing policies, likely designed to restrict human-human interactions outside the family (e.g., lockdown or a stay-at-home policy), may be measured by a reduction in movement outside the home or by a reduction in movement between specific regions, and, ultimately, can be measured by a reduction in caseload.

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.

Metrics used to assess the impact of these policies may be either primary or secondary. Lockdown or stay-at-home policies may first be measurable by changes in mobility, as determined by reductions in traffic, reduced use of public transportation systems, or changes in mobile phone pings measuring movement around a city. While such mobility changes are a primary indicator, ultimately those policies are intended to reduce morbidity and mortality in the community, measured by reductions in caseload or deaths to specific populations. These metrics are considered secondary and are the ultimate intent of a combination of policies, and the ultimate measure of policy effectiveness.

Who did the policies affect and how?

As the policy impacts are evaluated, a key question is who is impacted by those policies? To understand who is affected when and where and by what policies, where people live, work, and recreate needs to be defined relative to these impacts. People living in rural communities often live several miles or more from their essential jobs or grocery stores, which are typically exempt from lockdown or stay-at-home policies. By contrast, even inter-ward mobility of a half a mile may not be essential for someone in an urban environment who can work from home and has a grocery store around the corner. Similarly, food deserts in the city can necessitate further travel for essential food shopping in some neighborhoods when compared to others within the same city. Key demographic differences can drive the different effects policies have on behavior and on the spread and impact of disease. Relevant demographic differences can include health insurance coverage, primary healthcare, and co-morbidities in different communities. These differences need to be evaluated and included in the analysis of the impact of policies on different groups to help understand what policies will be most effective in caseload and fatality reduction, while also accounting for the uneven distribution of demographic groups among essential workers. According to a weekly report from the US Centers for Disease Control and Prevention as of late October 2020, of healthcare workers hospitalized by COVID-19, more than a third were in nursing-related occupations, 73% had obesity, 72% were female, and more than 50% were non-Hispanic Black.⁹

Aligning information requirements with data

To address these information requirements, the best data available to address each are described in a data inventory. This inventory describes key data sources and a corresponding data dictionary describing the data elements from each, how they are used in the analysis, units, and sources, and other relevant metadata. The data inventory and data dictionary are published with this report and will continue to evolve throughout this project.

Stakeholder interviews

To ensure that these model data sources included the best available information for analysis within the NCR in addition to national and global datasets, individuals in critical positions were interviewed across the District of Columbia. A list of interviews to date is in Appendix A.

Interviews have highlighted valuable potential data sources, including:

- US Census Bureau data on job mobility (LEHD Job to Job Flows (J2J) and job outcomes (LEHD Post-Secondary Employment Outcomes and the LEHD Veteran Employment Outcomes),
- Data on the built environment (Replica),
- Open Data DC (Enterprise Dataset Inventory and the DC Health Planning Neighborhoods),

⁹ US Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report. October 26, 3030. 69 (43); 1576-1583. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6943e3.htm>

- Restaurant business impacts (OpenTable- State of the Industry),
- Mapping and geographic information (ESRI), and
- Unemployment and labor market research (DOES Unemployment Data).

A current total of 33 local, regional, and national datasets relevant to the analysis have been identified and are described in the data inventory. These datasets fall into a few key categories, each highlighting specific sources that are used to perform the analysis.

- **Policy data** established during the pandemic need to be identified to examine and compare what has been implemented at the national, regional, and city/county level since the outbreak has occurred. Prior to this event, no sources existed to capture this information in a format that could be analyzed as data. The research team has compiled a global dataset of over 16,000 policies as part of COVID AMP, a database of policies and plans to address the COVID-19 pandemic¹⁰, and will rely primarily on this dataset for policy analysis for this effort.
- **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. Key datasets include the US Census American Community Survey (ACS), the CDC Social Vulnerability Index, and the 500 Cities Project Health Data.
- **Mobility data** are primary indicators of human behavior change. Population movement on the scale of both the individual and the community can be used as an indicator of response to a wide range of hazards, 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 impact of social distancing policies. Key datasets include Apple mobility metrics derived from assessments of cellphone requests for directions through the platform and SafeGraph data, which rely on aggregating anonymous geolocation data from cell phones to derive high resolution movement of people.
- **COVID-19 Caseload and Death data** will be used to understand 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 which are used to graph disease data to specific policies.
- **Economic Datasets** are used to better understand the immediate, short and mid-term impacts on the NCR's economy and impact on jobs. Key datasets include DC DOES Unemployment Rates and Employee Counts by Industry.
- **Geographic** data establishes the ward, city, and capitol region boundaries to allow for detailed analysis and measurements on policy implementation, demographics, caseload and economic impacts, and mobility.

¹⁰ COVID AMP Visualizing the impact of policies on COVID response. <https://covidamp.org/>

Analysis results

The initial analyses that follow address the key information requirements. For each section, a description of key methods and data sources required to support the analysis are included. These results are in progress and represent current understanding of the conditions. The next phases of the analysis are expected to include a robust statistical analysis to provide quantitative statistics for the findings suggested by correlation analysis to further understand population-specific impacts.

When and where were policies implemented?

To understand what policies worked when and where, the first step was to identify what was implemented. This analysis provides a high-level overview of the policy environment in the NCR since March 2020 drawn from a quantitative and qualitative analysis of policies identified and catalogued in COVID AMP (see details in the Data Inventory.)

Across the NCR, as of the beginning of October 2020, DC had enacted 75 policies total across all categories with 74 enacted in Maryland and 42 in Virginia.¹¹ These counts include only those policies enacted at the state level for Virginia and Maryland and comparable policies that were enacted by the D.C. Executive Office of the Mayor or the Council of the District of Columbia. Each policy is categorized at a broad level describing the change intended from each. As shown in Figure 1A and B, social distancing policies were the most frequently implemented with policies across each region. Of the total policies implemented, 31% of the policies in the District of Columbia were in the social distancing category (Figure 1A). The proportion was similar in Maryland with 33%; Virginia had nearly 54% of its policies in this category. The absolute number in Maryland and Virginia was identical (23 policies, Figure 1B). Notably, DC has implemented a higher proportion of enabling and relief policies than Maryland and Virginia (24% in DC versus 19% in Maryland and only 7% in Virginia).

These are policies that were enacted at the **state level** for each of the three jurisdictions, to encompass the entirety of Virginia, Maryland, and the District of Columbia.

¹¹ These policy counts may include duplicates where individual policies were coded under more than one category. Analysis and capture of the policies implemented at the county level in Maryland and Virginia are in progress.

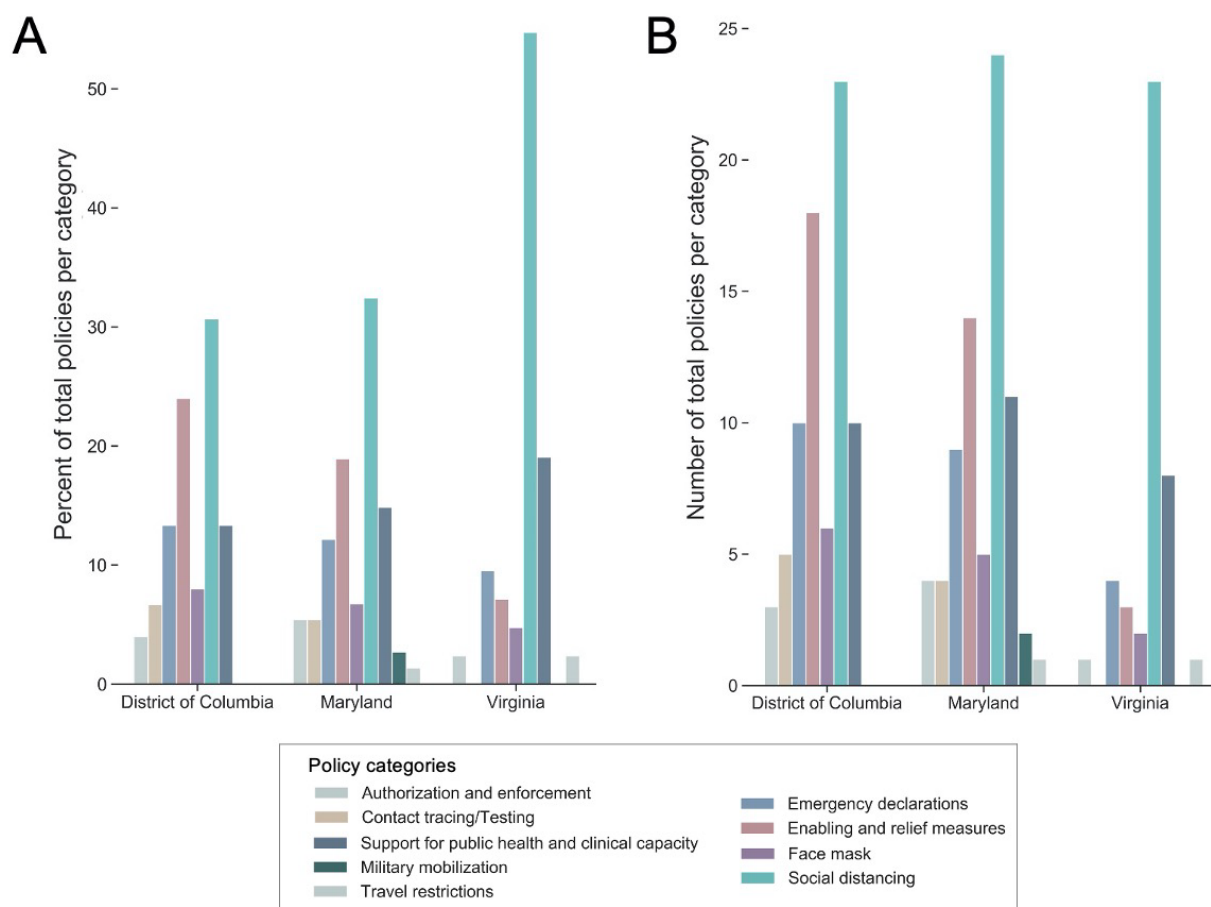


Figure 1: COVID-19 mitigation policies implemented, by category. A) Percent of policies implemented in each category in each of DC, Maryland, and Virginia from March through October 2020. B) Total number of policies implemented in each category in each of DC, Maryland, and Virginia from March through October 2020.

Social distancing measures are those that are intended to directly reduce transmission between people during an outbreak. The data were clear even very early in the COVID-19 pandemic that the virus was highly contagious and appeared to spread between both those with and without symptoms. While there was early uncertainty about the specific type of transmission that was causing the most spread of disease, it was assumed that close contact – whether through droplets, airborne transmission, or physical contact of individuals or with contaminated surfaces (e.g., doorknobs, grocery sacks, or elevator buttons) – was the primary method of spread. Therefore, policies were implemented to reduce mass gatherings and encourage or mandate that people stay home, and school closures and closures of both private and public sector buildings and businesses were put into place. As shown in Figure 2A, cases across the NCR were first identified in March 2020 with steep increases across the region, though notably greater in DC, when compared to Maryland and particularly Virginia using a population-adjusted measure of cases per 100,000 people. This increase correlated with the implementation of a series of restricting policies designed to limit interactions

across the NCR. Although cases continued to rise, beginning as early as April, officials began implementing new policies to reduce the restrictions imposed in March.

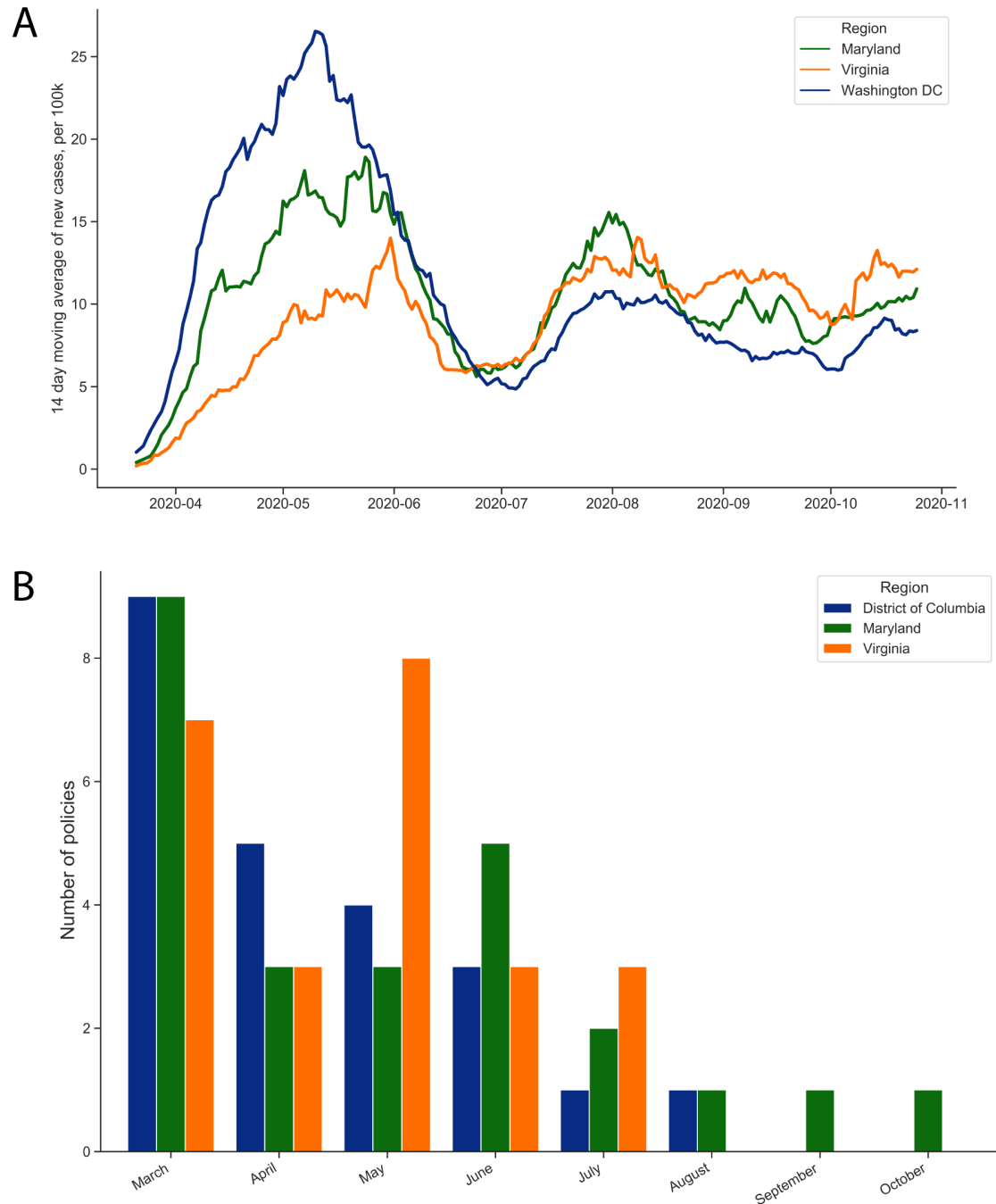


Figure 2: Policy implementation compared to COVID-19 caseload over time across DC, Maryland, and Virginia. A) COVID-19 caseload (14-day moving average new cases per 100,000 people) shown for Maryland, Virginia, and DC from mid-March through mid-October 2020. B) Total number of policies implemented in each month for Maryland, Virginia, and DC.

Not all social distancing policies are restrictive. As shown in Figure 3, social distancing policies were designed to restrict overall movement within the community and subsequently to begin relaxing policies that release or limit previously implemented policies.

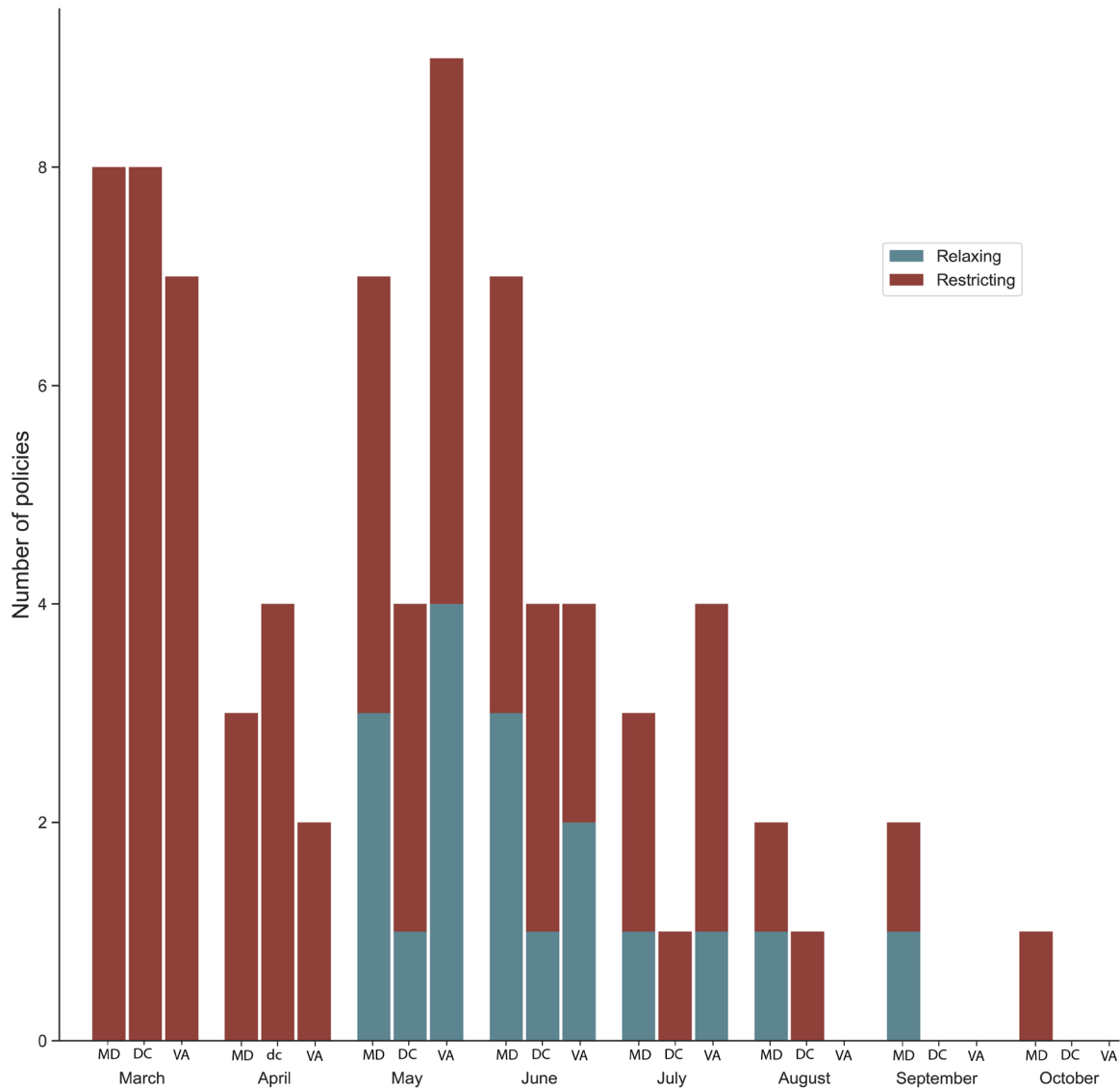


Figure 3: Restricting and relaxing social distancing policies implemented over time across the region.

The earliest social distancing policies in Maryland and DC were announced on March 12, 2020, by limiting large gatherings of more than 250 people.¹² Virginia's first major policy at the state level was

¹² Order of the Governor of the State of Maryland Prohibiting Large Gatherings and Events and Closing Senior Centers (Maryland) enacted by the Office of the Governor (<https://governor.maryland.gov/wp-content/uploads/2020/03/Prohibiting-Large-Gatherings.pdf>) and Emergency Rulemaking to Prohibit Mass Gatherings (District of Columbia) by the D.C. Department of Health

on March 16, closing schools and limiting gathering in public places such as restaurants and fitness centers.¹³ Virginia's first policy directed at any mass gathering event was not issued until March 23, 2020.¹⁴ Although cases continued to rise, beginning as early as April, Virginia began shifting to relaxing social distancing restrictions (compare caseload in Figure 2A to social distancing relaxing policies in Figure 3). By May, all three jurisdictions had implemented or adjusted policies to include both restricting and relaxing policies. As of August, Virginia added no new policies associated with social distancing. This pattern continued through the summer, as each government tried to adjust to the pandemic conditions and impacts.

For additional context, more substantive relaxing policies were implemented in Maryland starting on May 19, 2020, when small groups were allowed to gather outdoors. DC lifted the stay-at-home order on May 29, 2020,¹⁵ at which point many more activities were permitted. Virginia implemented relaxing policies in a variety of sectors in late April, beginning with allowing dining in outdoor spaces on April 24, 2020, and continuing to allow gyms, fitness centers, and stores to move into a safer-at-home phase (see above for phase definitions).

The specific type of policies implemented under social distancing also differed across the jurisdictions. These policies can be mapped to a timeline of when they were implemented based on whether they were restricting, relaxing, or "other", as shown in Figure 4. "Other" policies can be, for example, those such as the one from the statute entitled 'Coronavirus Support Emergency Amendment Act of 2020',¹⁶ specifically stating that the owner of a housing accommodation must clean common areas of the facility on a regular basis. As shown in Figure 4A, DC was impacted by high caseload early in the event and implemented social distancing policies in nearly every category, including mass gathering restrictions, distancing mandates, closures, and a stay-at home measure. The distancing mandate, private sector closures, school closures, and a stay-at-home measure for vulnerable populations have all continued into the fall. By contrast, Maryland implemented and largely maintained mass gathering restrictions, private sector closures, and a distancing mandate through the summer, with primarily relaxation measures in place into the fall (Figure 4B). Virginia, with the lowest initial caseload early in the event, as shown in Figure 4C, implemented restricting policies early in nearly every category, but released those policies and/or implemented relaxing

(https://coronavirus.dc.gov/sites/default/files/dc/sites/coronavirus/release_content/attachments/DOH_Rulemaking_Mass-Gatherings.pdf), adopted and effective March 13, 2020. Expires July 11, 2020 unless repealed sooner.

¹³ Orders of the Governor (Virginia) and State Health Commissioner declaration of public health emergency (<https://www.governor.virginia.gov/media/governorvirginiagov/governor-of-virginia/pdf/Order-of-the-Governor-and-State-Health-Commissioner-Declaration-of-Public-Health-Emergency.pdf>).

¹⁴ Executive order number fifty-three (2020); temporary restrictions on restaurants, recreational, entertainment, gatherings, non-essential retail businesses, and closure of k-12 schools due to novel coronavirus (COVID-19). [https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/EO-53-Temporary-Restrictions-Due-To-Novel-Coronavirus-\(COVID-19\).pdf](https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/EO-53-Temporary-Restrictions-Due-To-Novel-Coronavirus-(COVID-19).pdf)

¹⁵ D.C. Mayor's Order 2020-067. Effective May 29, 2020. <https://www.dcregs.dc.gov/Common/NoticeDetail.aspx?NoticeId=N0093734>

¹⁶ Coronavirus Support Emergency Amendment Act of 2020, Act 23-326, effective May 27, 2020. https://lims.dccouncil.us/downloads/LIMS/45020/Signed_Act/B23-0757-Signed_Act.pdf

policies early in the summer. Only the mass gathering restrictions were reinstated when caseloads rose again starting in August. Notably, the initial findings are complicated by the large commuting population across the NCR; additional analysis will focus on the counties specific to the NCR to help address this issue.

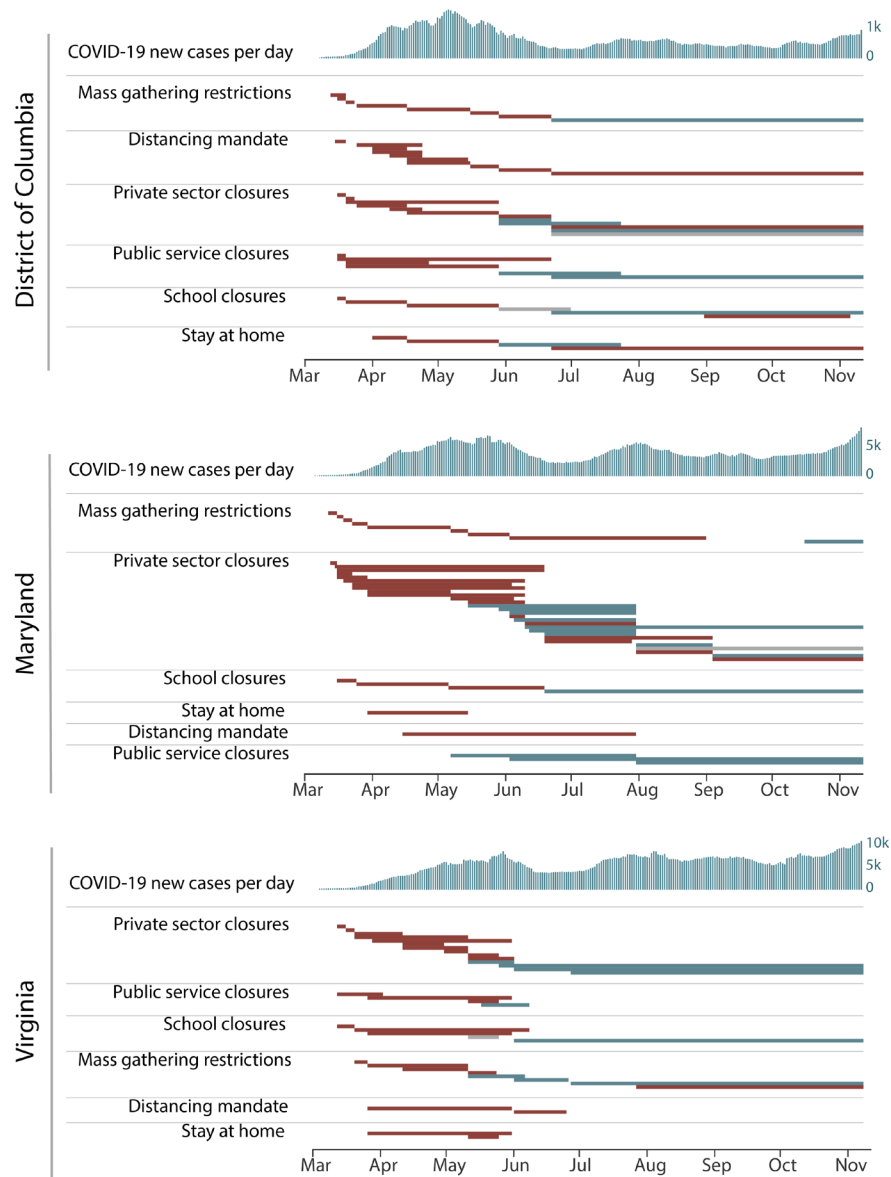


Figure 4: COVID-19 caseload and policy implementation in each social distancing category for each of DC, Maryland, and Virginia from March through October 2020. COVID-19 new cases per day over time with the duration of social distancing policies in each category shown below. Policies colored by whether they were coded as restricting (red), relaxing (green), or other (grey).¹⁷

¹⁷ New York Times COVID-19 caseload source data (<https://github.com/nytimes/covid-19-data>) are collated from a wide range of sources. A review of their methods can be found at the link.

Did the policies work?

One of the key questions faced by policy makers as the pandemic progresses is whether these policies have had their intended effect. As seen above, all three jurisdictions relied heavily on social distancing policies to manage the outbreak. These social distancing policies were assumed to work in good part by limiting general mobility. General mobility data has been collected from a variety of sources but relies heavily on mobile phone data. Apple and Facebook both collect data from applications downloaded on mobile phones; SafeGraph collects data from a wide variety of sources at higher resolution. A simple comparison of the Apple and SafeGraph data, when using the “portion at home” category of SafeGraph, shows significant alignment (Figure 5).

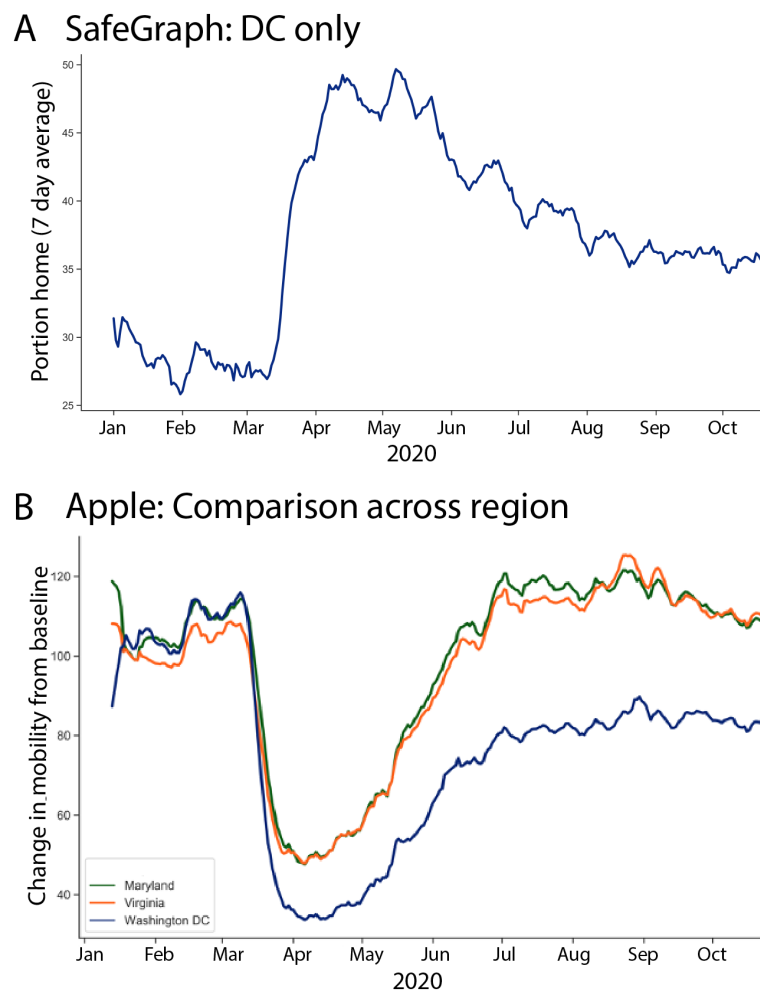
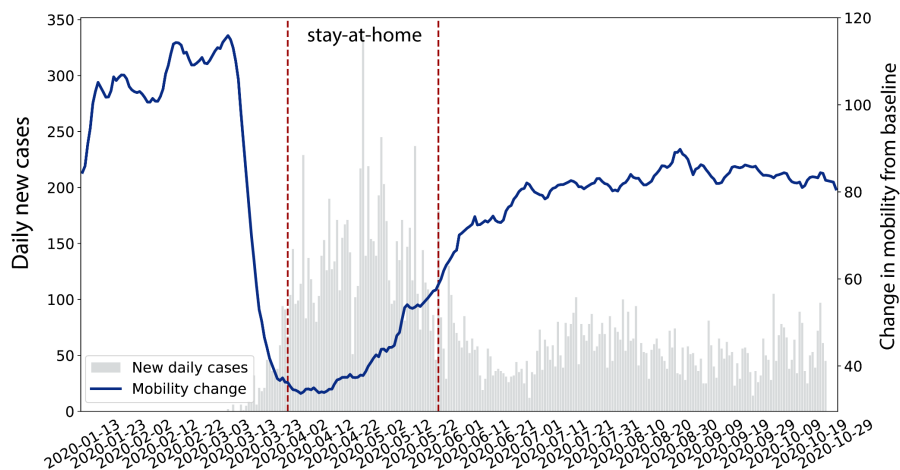


Figure 5: Comparison of mobility data sources. A) The comparison to national mobility reduction from Apple. B) The percent of people designated by SafeGraph as staying at home during the day.

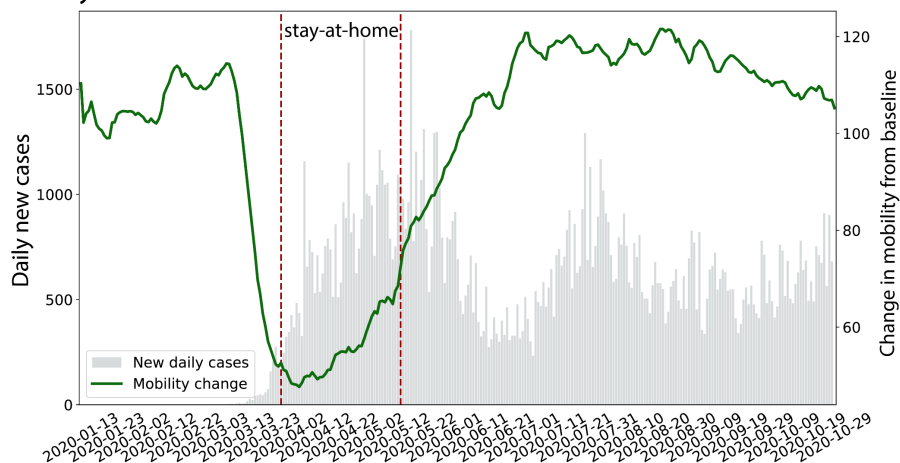
The core question related to this analysis is whether reductions in mobility correlated with COVID-19 caseload. As shown in Figure 6A, B, and C, there was a significant reduction in mobility in the

District of Columbia, Maryland, and Virginia in early March 2020. This reduction is generally aligned temporally with the stay-at-home measures implemented in mid-March and followed by a reduction of caseload in the subsequent weeks. Given the course of the disease and delay in reporting caseload, it is likely that any reduction in caseload would be anticipated several weeks following reductions in disease spread. Therefore, the initial reduction in cases in April and into May may have been correlated with the reduction in mobility seen in the prior four to six weeks. Interestingly, these mobility reductions appeared to pre-date the first implementation of stay-at-home policies, at least in the first phase of the pandemic. Further analysis will be required to better understand the relationship between when policies were implemented, changes in mobility, and changes in caseload both in the NCR and elsewhere across the US, both early in the pandemic and as more data on the fall surge in cases become available. Mobility in DC has not recovered to pre-pandemic levels (Figure 6A) and caseload has stayed reasonably stable since the initial spike early in the event. In DC, the use of mass transit dropped to its lowest level on April 18, 2020, where there was only 17% usage compared to pre-pandemic levels. Transit has remained low in DC, averaging 45% use compared to the pre-pandemic baseline. However, driving and walking mobility have risen to pre-pandemic rates in the NCR. In Maryland (Figure 6B), mobility had recovered to approximately pre-pandemic levels by mid-summer; caseload rose following the increase in mobility and has appeared to decrease subsequently, in parallel with mobility. In Virginia (Figure 6C), mobility dropped with that in DC and Maryland in March, but rose to above pre-pandemic levels by late summer, though, like Maryland, it has declined somewhat as the fall began. Cases increased following the summer increase in mobility and has remained at those inflated levels, generally following mobility changes.

A District of Columbia



B Maryland



C Virginia

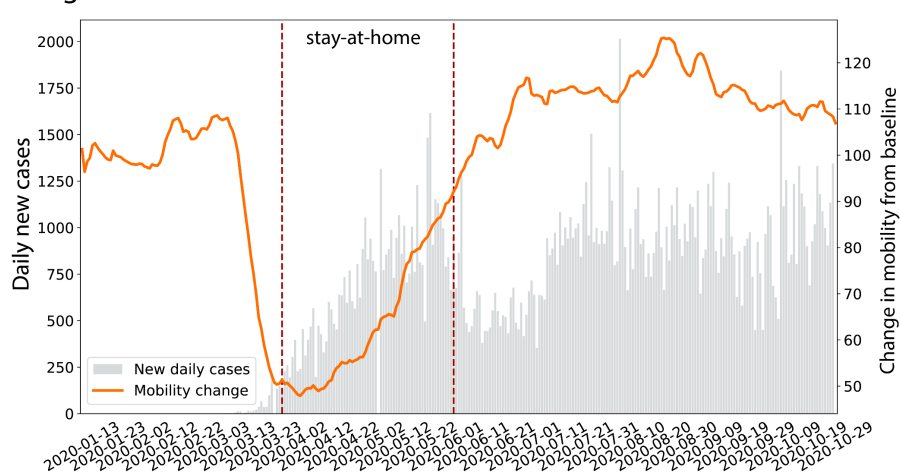
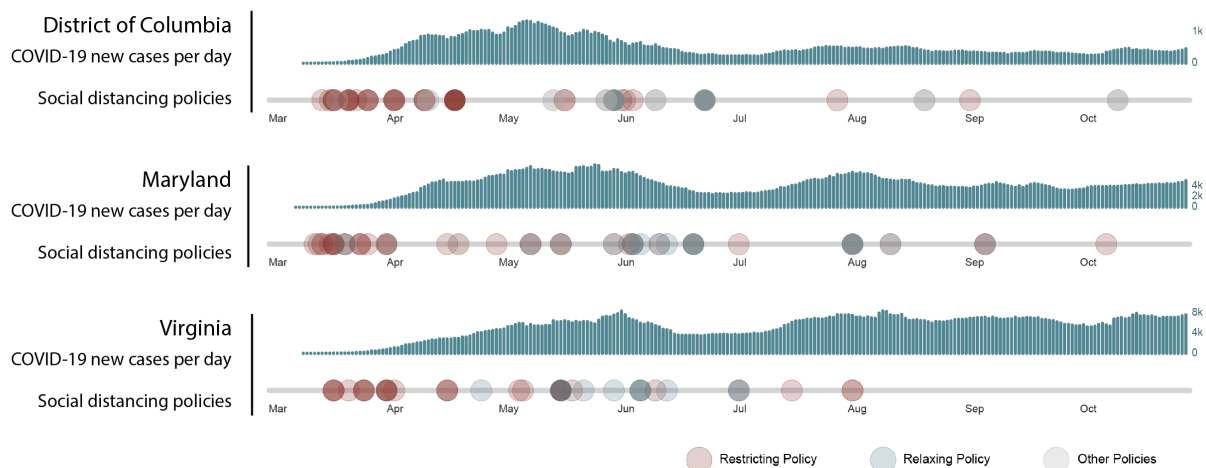


Figure 6: Changes in mobility relative to COVID-19 caseload across DC, Maryland, and Virginia.

Caseload data from the DC Mayor's office and the New York Times for Maryland and Virginia. Mobility data is from the Apple mobility dataset. A) District of Columbia B) Maryland C) Virginia

Although mobility is one marker of the relative success of a social distancing policy, the goal of COVID-19 mitigation measures is to decrease the overall spread of disease. Indeed, as shown in Figure 7, implementation of these policies aligns temporally with changes in caseload. Notably, however, this is not only true for social distancing policies (Figure 7A); the trend also holds, and may even be exaggerated, for enabling and relief measures. This trend is especially apparent when comparing the continuity of enabling and relief measures in the District through the fall, aligned with stable, low caseload, whereas Virginia implemented very few of these measures and they largely were not continued into the summer and fall, when caseload rose across the state (Figure 7B).

A Social distancing policies



B Enabling and relief measures

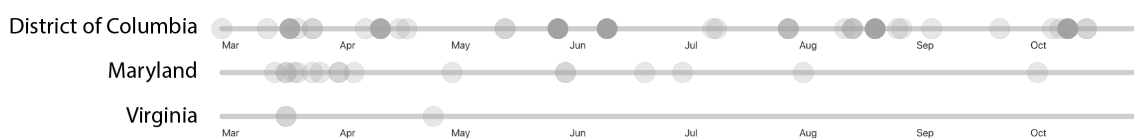


Figure 7: Policies implemented across DC, Maryland, and Virginia relative to COVID-19 caseload.

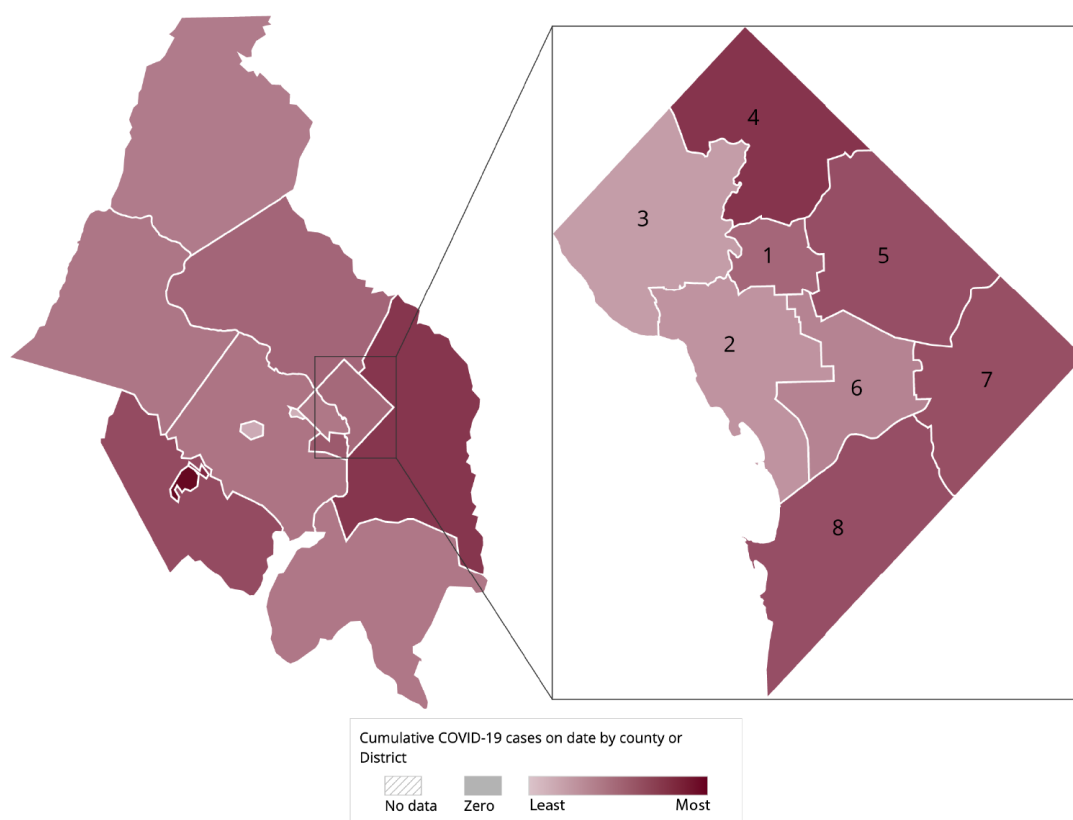
A) Social distancing policies in each the restricting, relaxing, and other categories relative to COVID-19 caseload for each jurisdiction. B) Enabling and relief measures enacted over the same time period in each jurisdiction.

The District is far more urban than either Maryland or Virginia. As a result, and as shown here, any statewide analysis is likely to obscure the differences in policy impacts between rural and urban populations. A key analysis will be to perform these same comparisons on a county-by-county basis, separating the NCR from other regions of both Maryland and Virginia. This additional analysis will help researchers understand how individual areas responded to the virus and how policies at the local level impact cases.

Who did the policies affect and how?

As the relative impact of policies on mobility and caseload of the population across the greater NCR are better understood, the relative impact on different communities or demographics can be assessed. One way to assess those impacts is to begin to analyze where people live and work relative to impacts of the COVID-19 pandemic. This analysis is just beginning and will be continued in much greater detail as the project progresses.

As shown in Figure 8, caseload across the region has not been uniform. Figure 8 shows the relative cumulative caseload across both the National Capital Region with the inset showing distribution of caseload by Ward within the District. Notably, the area with the highest caseload is Manassas County, Virginia. Within DC, Wards 4, 5, 7, and 8 have been hardest hit.



Caseload data describe 25 Oct 2020 and were published 26 Oct 2020.

Data sources for DC: DC COVID-19 surveillance data and New York Times county- and District-level caseload data, DC Health Matters 2020 population estimates. Data sources for VA and MD: New York Times county- and District-level caseload data, ACS 5-Year (2014-2018) population estimates.

Figure 8: Caseload per capita across the National Capital Region, mapped, as of October 25, 2020

Given the uneven distribution of caseload across the region, including across Wards in the District, the next phase of analysis will focus on the uneven distribution of resources, populations specifically at high-risk for both contracting COVID-19 and experiencing a severe course of disease, unemployment, and other intersecting issues related to health and social equity. The importance of

this analysis is highlighted by a simple correlative visual analysis of caseload across the District (Figure 9), which shows that the Wards experiencing highest disease load are those that have the lowest proportion of health insurance coverage and the highest numbers of those without high school diplomas.

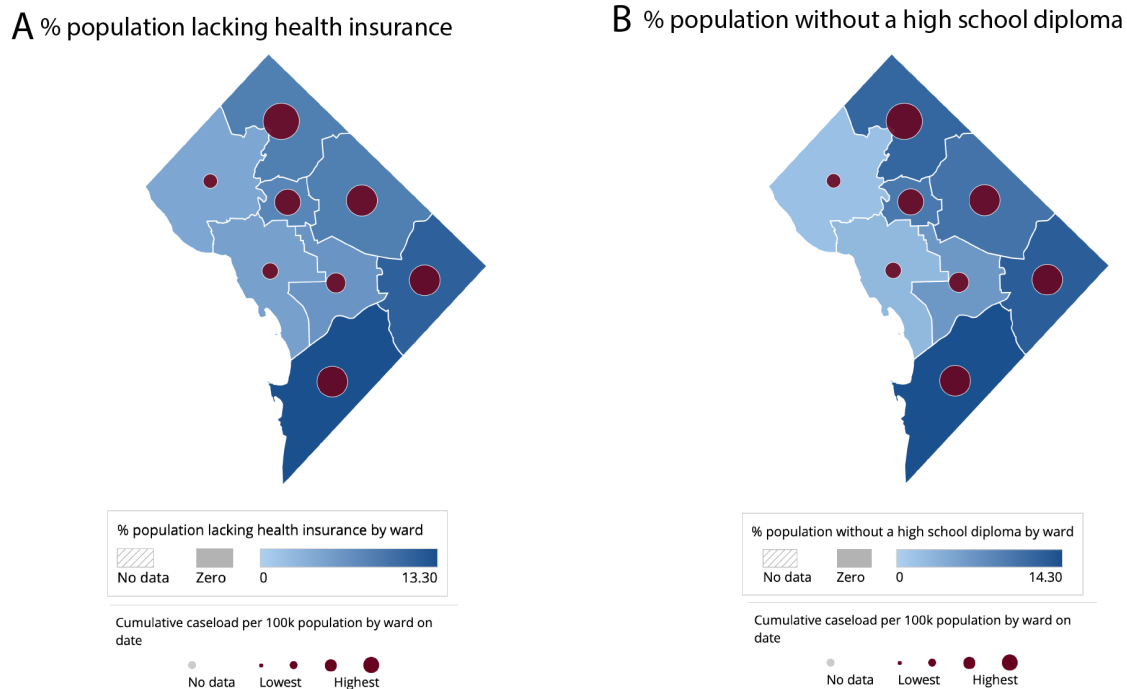


Figure 9: Correlation of health insurance coverage and education level with COVID-19 caseload by Ward across the District. A) % of the population lacking health insurance (basemap) relative to caseload (bubbles). B) % of population without a high school diploma (basemap) relative to caseload (bubbles).

Preliminary Conclusions

Understanding the impact of COVID-19 policies requires layered analysis. The initial focus was to collect all available, relevant information to create a holistic picture of the what, when, and where of policies implemented to mitigate the pandemic in the greater Washington DC area. This work creates the foundation that enables both these initial findings as well as establishing the basis for future analysis.

The initial results support the hypothesis that social distancing policies can and do play a significant role in mitigating the spread of the disease, due at least in part to reductions in mobility. In addition, policies related to relief and enabling measures may also be an important tool for mitigating impacts. Further analysis will focus on exploring these interactions more deeply and evaluating the relative impact of each type of policy on mobility, caseload, and, fatalities across the NCR through detailed statistical analysis.

Additionally, future analyses will focus on exploring the impact of policies on different demographic groups, especially focusing on essential workers and underserved and underrepresented groups. In

addition, the impact of policies focused on wearing masks, opening schools, and changing commuter mobility will be analyzed based on both caseload and fatality rates.

Work will be conducted with an eye on the ongoing impacts of COVID-19 and acknowledging that decision makers need to be given the best information and tools to protect their population as the US continues into the next wave of the pandemic.

Appendix A: Interviews

Organization
Department of Health Care Finance (<i>interview conducted after publication</i>)
Executive Office of the Mayor (<i>interview conducted after publication</i>)
Office of the Chief Technology Officer
Office of the Deputy Mayor for Health and Human Services (<i>interview conducted after publication</i>)
Office of the Deputy Mayor for Planning and Economic Development
Office of Planning
The Lab @DC

About ODCA

The mission of the Office of the District of Columbia Auditor (ODCA) is to support the Council of the District of Columbia by making sound recommendations that improve the effectiveness, efficiency, and accountability of the District government.

To fulfill our mission, we conduct performance audits, non-audit reviews, and revenue certifications. The residents of the District of Columbia are one of our primary customers and we strive to keep the residents of the District of Columbia informed on how their government is operating and how their tax money is being spent.

Office of the District of Columbia Auditor
717 14th Street N.W.
Suite 900
Washington, DC 20005

Call us: 202-727-3600

Email us: odca.mail@dc.gov

Tweet us: https://twitter.com/ODCA_DC

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