



DATA-DRIVEN REOPENING
STRATEGIES FOR STATE AND
LOCAL GOVERNMENTS

**Carnegie
Mellon
University**



SUMMARY

With over twenty million Americans filing for unemployment, April 2020 represented the worst month for the U.S. economy since the Great Depression. As governors across the country begin reopening their states in the weeks and months to come, they will need detailed, real-time information not only on the spread the COVID-19 virus but also of the vitality of their state's economy and of its impact on vulnerable residents. Gov. Tom Wolf has partnered with Carnegie Mellon University to design data-driven tools that contribute to the decision-making process of the Administration as it begins to reopen the Commonwealth's economy and monitor the ongoing economic and health consequences of the pandemic. This white paper provides six data-driven principles for states to better assess and support their local economies.

CONTEXT

The magnitude and complexity of the unfolding COVID-19 economic crisis is unprecedented in recent memory. While elected officials around the world have rightfully focused on the public health crisis, far too little has been done to link it with, monitor, and mitigate the looming economic crisis. According to the most recent unemployment data, in April over twenty million Americans became unemployed, marking the worst month for the economy since the Great Depression. And most economists agree, we will continue to see job losses for months to come.

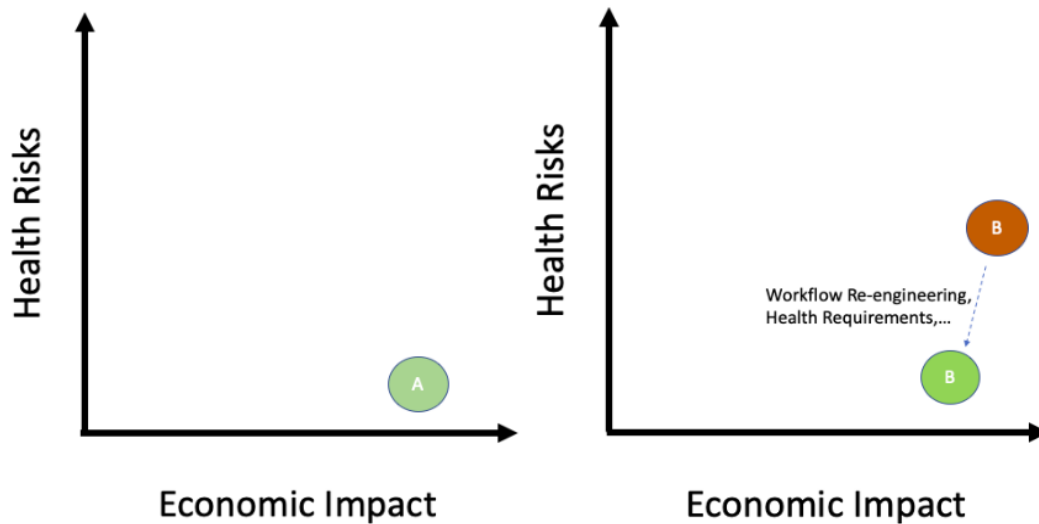
The sheer reach of closed and drastically downsized industries will call for significant, additional state and federal stimulus to prevent an even greater economic recession. Yet, in the immediate term, governors face the difficult task of beginning to safely reopen their state economies, building processes to monitor any further economic decline, and support vulnerable businesses and individuals.

Yet most states lack the type of real-time economic surveillance capacity currently used to monitor the spread of the virus. Similarly, many states do not have the data infrastructure in place to gain a holistic view of the economic and health realities that are affecting current and future demand of public services.

Carnegie Mellon believes better data-driven support tools that bring together public, private, and state agency-collected data on the utilization of public services can provide policymakers with real-time insights on the trade-offs made during staged economic reopening.

Through a better understanding of the economic and public health realities at the county and industry level, governors can more effectively identify specifically where to invest limited resources in workflow reorganization and new health requirements. For example, industries with low health risks and high economic returns are clear candidates for reopening (e.g. A in the first

graph), but what about industries or regions that have high economic value but also moderately- high health risks (e.g. B in the second graph)? If the economic case is great enough and health mitigation efforts can be effective, these industries or regions are likely good targets for workflow re-engineering to move B from high health risk to low health risk. Same is true for industries or regions that disparately impact vulnerable individuals and businesses. In the short-term, could workflow re-engineering enable re-opening them in a safe manner? At the same time could better monitoring help policy makers understand where new modes of work have emerged and will remain for the long term?



Furthermore, plummeting tax revenue, soaring unemployment, and other social service outlays are already putting pressure on state budgets. These dynamics – coupled with compliance costs of new health regulations, support with workflow re-engineering, testing and other costs associated with a safe reopening – further make the case for prudent, targeted interventions based on local needs and policy goals around achieving health and economic equity.

SHORT-FALLS OF CURRENT ECONOMIC ANALYSIS OF THE COVID-19 CRISIS

Several issues hinder states from fully leveraging existing data to help make timely economic decisions, including:

- Public/federal datasets are not updated with the frequency necessary to provide real-time insights;
- Data from different state agencies are generally not linked to provide a holistic view of the health and economic realities and utilization rate of public services;
- Most sources are not aggregated from individual person-level data and therefore make broad and inaccurate assumptions about the current economy;
- The standard curation processes of state data are often too long to provide real-time insights, even when the data is collected at higher frequencies;

- Existing data and models rely on the past to estimate the current state of the economy, compared to more timely data that can indicate where historic trends are no longer valid.

DATA-DRIVEN TOOLS TO SAFELY AND EQUITABLY REOPEN STATE ECONOMIES

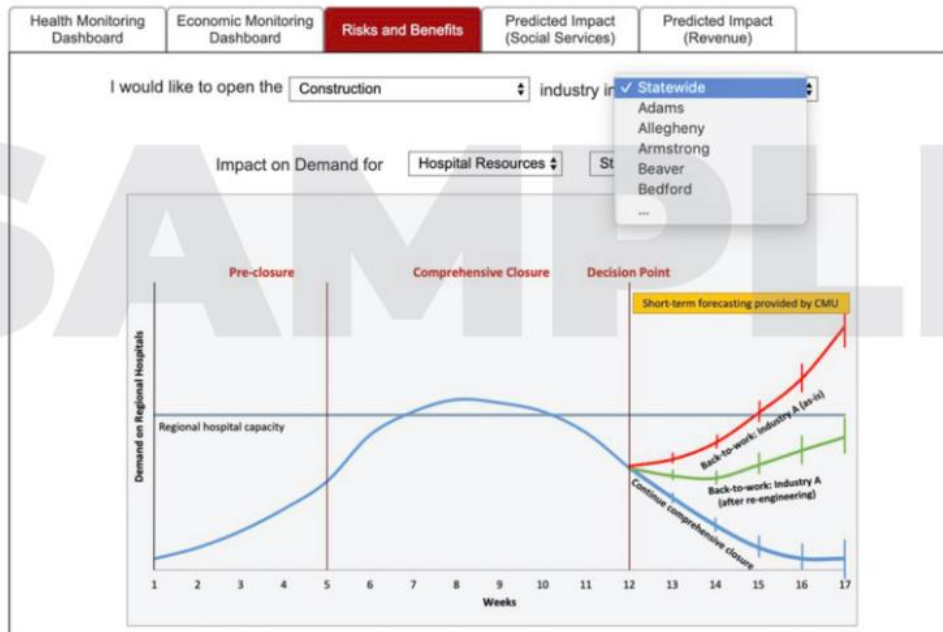
The Carnegie Mellon team's approach is a suite of tools that can aggregate and translate disparate worker and clinical-level datasets into relevant health and economic indicators in a manner that can effectively inform decision making. At the same time, any tool should be structured to serve as a clearinghouse for new data, such as contract tracing, as it becomes available. The ultimate goal is to create a repository that continuously brings to bear the most relevant data-driven insights to state governments during what will likely be a period of significant uncertainty. Building such a tool would begin with linking de-identified individual worker data from a series of state-collected administrative data and aggregating those findings to the industry and county level for policy actions.

For each county (or region) in the state, such data-driven decision support tools would help state and local elected officials answer questions such as:

- ***Which open/closed industries have seen the largest increase in unemployment claims? What types of individuals are being impacted by those closures? What policy interventions need to be created or expanded to support those individuals?***
- ***How many workers in a particular industry are over 45 years of age or have other risk factors that make them high-risk of COVID related complications?***
- ***To what extent are health risks and economic burdens disproportionately impacting vulnerable populations and businesses?***
- ***What will be the health, economic, and equity impact of opening an industry in a county or region?***
- ***If reopened, which industries/workers will experience the highest demand for nearby childcare facilities?***
- ***Given the demographics of workers in reopened counties and industries, what is the risk of overwhelming the medical capacity of local hospital referral regions?***
- ***How will commuting patterns between counties and across state lines potentially impact health risks?***

- ***Which businesses can remain working remotely without sacrificing jobs?***
- ***Which industries are 'economically essential' but carry sufficient health risks to justify investing in workplace reorganization strategies?***
- ***How do we allocate limited resources (financial, health, testing for example) to maximize health, economic, and equity related policy goals?***
- ***Which individuals and firms do we intervene on to:***
 - ***Support individuals most at risk of long-term unemployment?***
 - ***Support individuals with high risk of staying on or returning to SNAP/TANF/Medicaid***
 - ***Support at-risk businesses?***
 - ***Support at-risk regions?***

Data-Driven Tools to Reopen and Continually Manage State Economies



Source: Illustration of CMU data-decision tool

The sample dashboard illustrates the types of datasets that can be pulled together to offer linked economic-health insights at the state and county level to policymakers. For example, opening a particular sector (e.g. construction) will have specific implications for different counties and regions based on the evolving unemployment claims, tax revenue data, PPE capacity, supply chains, commuter patterns and other variables. By bringing these datasets together, elected officials will have a better understanding of the health and economic tradeoffs of different decisions.

The type of data-driven decision tools we think are essential for state reopening strategies would address six critical areas of need:

1. MODELING HEALTH AND ECONOMIC DATA TOGETHER

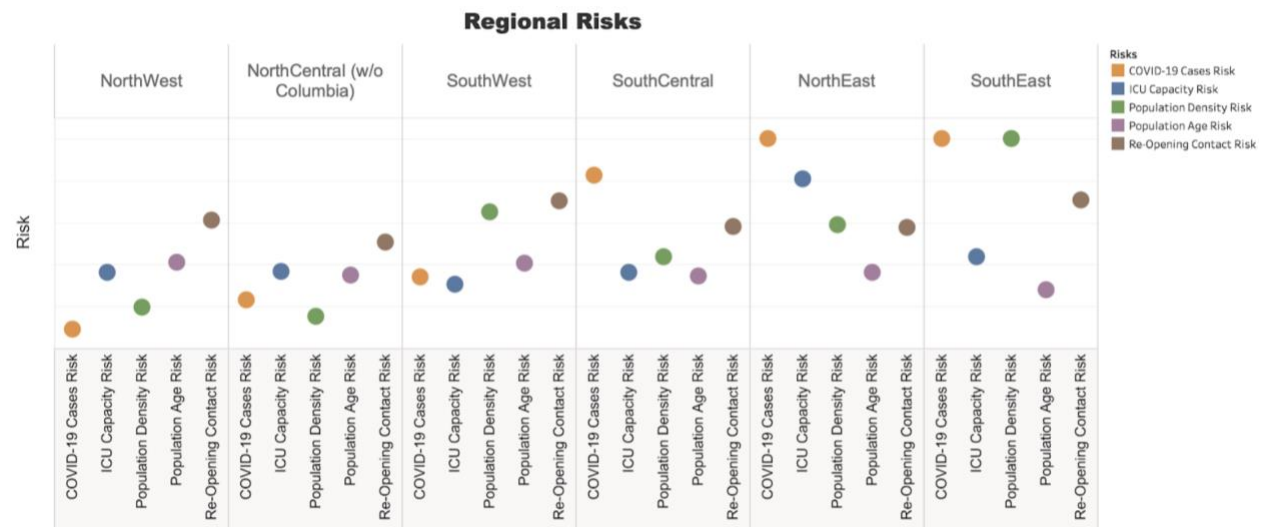
In order to make reopening decisions, elected officials must have some way of measuring and comparing the economic and health trade-offs while ensuring equitable outcomes. Managing dual crises is complicated by the fact that any given public health decision will affect the economy, and vice versa. As such, economic and health policies cannot be made in isolation. However, the existing models and data sources at the disposal of most state and local elected officials do not adequately consider both the economic and health trade-offs of policies for reopening economies. While there is no shortage of public health and economic forecasting models, but they usually lack interoperability. Epidemiologists model the expected health risks

for a given region or demographic group, while most economists consider the economic benefit of reopening certain jobs and industries. In other words, public health experts are ‘in charge’ of what parts of the state are relatively low health risk, and economists are ‘in charge’ of identifying the greatest economic pain points.

In such a scenario, policymakers are forced to structure reopening strategies by looking separately at the health risks of opening a region, industry, or occupation and the economic benefits of doing so. This method may work in the short-term as states simply reopen regions that are deemed not a public health risk. But over time, more complicated decisions may need to be made for economically essential industries and regions around the tolerable level of risk given changing economic realities.

A component of the CMU Dashboard calculates a wide variety of risk indicators associated with re-opening a set of industries in a county or region.

Decision Support Tool to Support Safely Re-Engaging the Economy



Source: *Regional Risks for Pennsylvania, CMU*

In addition to the ones shown in the dashboard above, we have also explored and are developing additional risk indicators around Commute Spread Risk, face-to-face contact risk in workplaces, Nursing home spread risk Customer contact risk, Supply Chain risk, Business Resilience Risk, Unemployment Risk, Social Service Benefits Risk, and Equity Risk.

2. LINKED, HIGH FREQUENCY DATA TO DRIVE REAL-TIME DECISION MAKING

Public health data is being collected and analyzed based on a two-week incubation period of the disease. Daily data is helping public officials stay on top of the ever changing landscape of the epidemic in terms of cases but not necessarily in terms of the underlying infection rate, especially due to the high variance in testing capacity and processes across the country. But the situation is much worse on the economic front. Some states and local governments are relying on federal data sources to inform reopening decisions (e.g. BEA, BLS, etc.). However, the time lag in these data sources impedes states' ability to understand how the pandemic and subsequent shutdown is actually playing out on the ground. At best, many of these resources are not even available for 2020. Moreover, given these datasets are often updated monthly, quarterly or even bi-annually, they will not offer relevant insights in the timeframe needed for rapid decision making. Some are augmenting federal sources with administrative data collected at a higher frequency from state agencies. A detailed analysis of unemployment claims and other daily or weekly state-based health data can dramatically improve the level of insight for policymakers and illustrate the real-time effects of reopening efforts.

3. MAXIMIZING THE BENEFITS OF REOPENING FOR VULNERABLE WORKERS AND BUSINESSES

Trends in aggregate unemployment claims clearly show the economic consequences of COVID-19 are changing almost daily. But the current level of summary data available to most state governments does not unpack these trends in a way that can influence sound policy making at the county or municipal level, and policymakers are therefore left to make decisions based on a "pre-COVID-19" world. For example, while aggregate data can suggest how many workers usually work in a closed/open industry per county, this data cannot tell how many of those workers actually remain employed. Some industries that are technically open have experienced mass layoffs (e.g. restaurants) while others that are closed have more seamlessly transitioned to remote work (e.g. universities). Understanding how workers have actually been affected--and where--is critical to structuring reopening plans. 'Real-time' data from wage records, SNAP, TANF, and unemployment claims, aggregated from the worker up to industry and counties, offer a much clearer picture of the current state of a local economy.

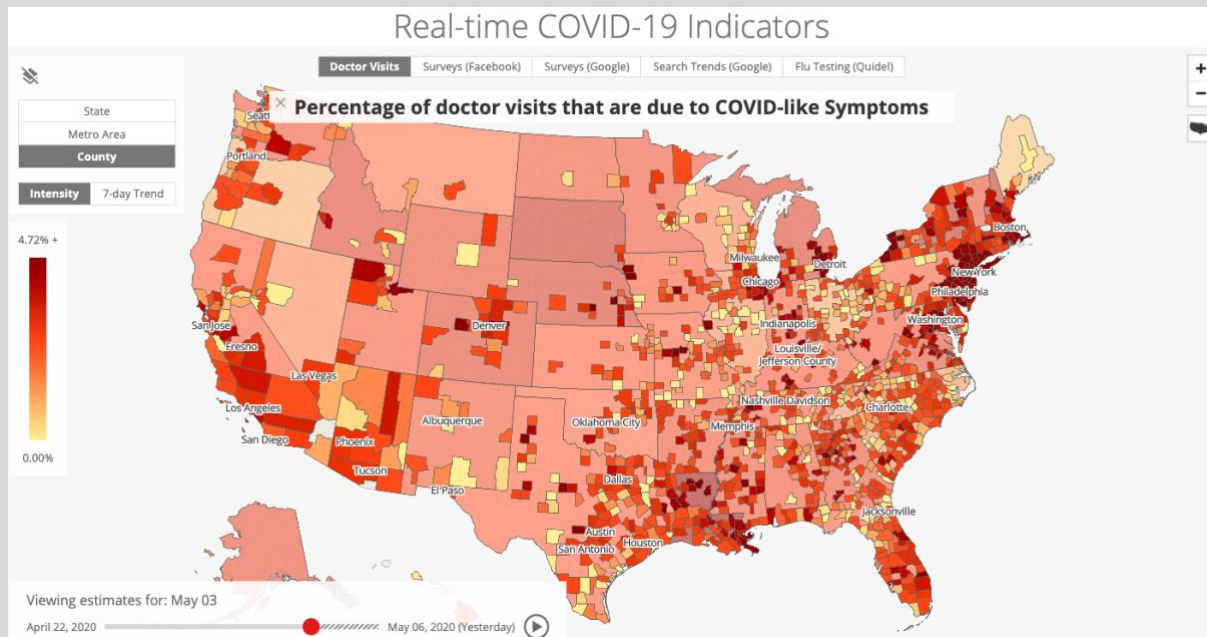
The increase in unemployment claims and demand for other social services will also have unique implications for state budgets, depending which parts of the economy experience the largest contractions. While clearly a secondary issue to the public health and economic crisis, understanding the effect of different economic scenarios on available resources can help states stave off long-term fiscal crises. Of course, the administrative data doesn't give us a complete picture of who is being impacted and how, and augmenting that with additional data sources

(who is being served by food banks for example), and field research is critical in filling those gaps, especially relating to vulnerable individuals.

CARNEGIE MELLON PARTNERS WITH FACEBOOK, GOOGLE TO DEVELOP COVIDCAST

COVIDcast displays signals related to COVID-19 activity levels across the country at the state, county, and metropolitan level. The data is derived from anonymized, aggregated data provided through partnerships with Facebook, Google and Quidel that reflects self-reported descriptions of COVID-19-related symptoms (Facebook survey) as well as search trends provided by Google.

By allowing individuals to self-report symptoms outside of those reported to medical professionals, COVIDcast is able to provide an additional layer of early stage insights into the changing dynamics of the pandemic. The data correlate well with test-confirmed cases of the disease, suggesting self-reports might soon help the researchers in forecasting COVID-19 activity. Each signal may reflect the prevalence of COVID-19 infections, mild symptoms, or more severe disease over time. Taken together, these signals can help identify rising COVID-19 activity in specific locations and will support CMU's pandemic forecasting system.



Source: covidcast.cmu.edu

4. ACCOUNTING FOR INDUSTRY INTERDEPENDENCY AND 'WRAP AROUND' SERVICES FOR WORKERS

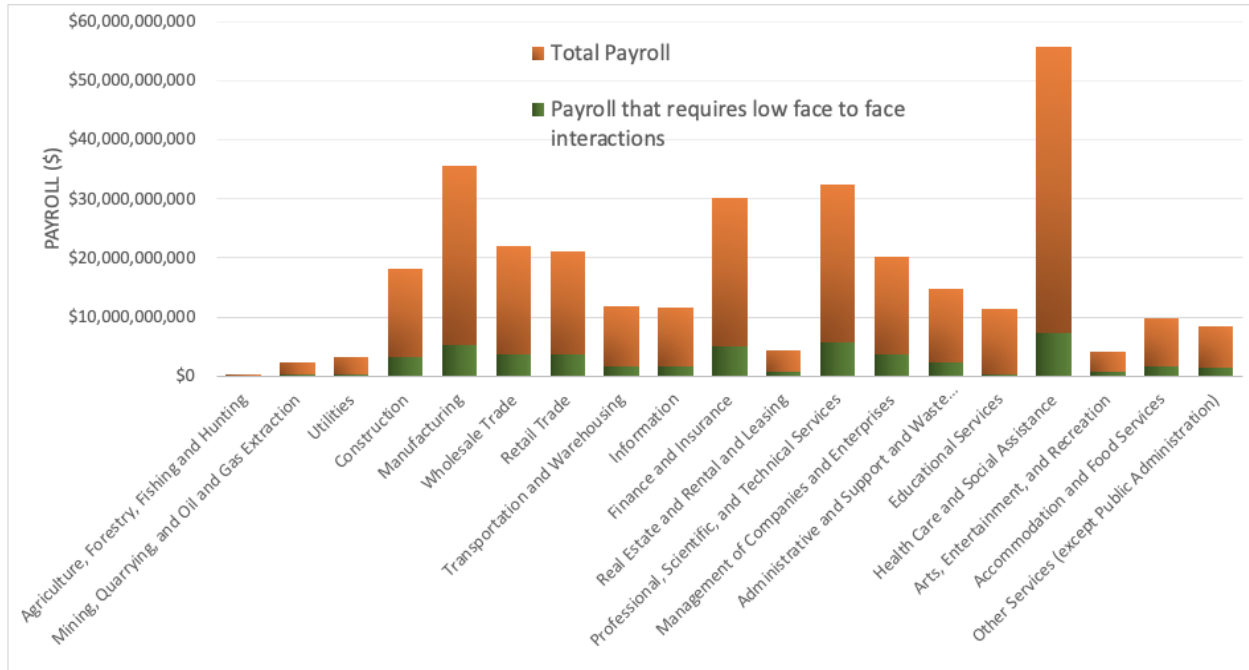
There are numerous factors that affect vulnerable workers' ability to safely return to employment beyond the open/closed status of their employer. The geographic proximity of open childcare facilities, access to public transportation and other information on the availability of public services will need to be assessed. Similarly, most businesses rely on other businesses' supply chains, which go beyond county borders. At minimum, input-output and other supply chain data could help identify which newly opened businesses, such as construction, rely on closed industries as critical inputs.

An important consideration is what interstate and intra-county commuter patterns look like. While public datasets like ACS can provide some insights, they have significant weaknesses and time lags. A potential alternative method CMU is pursuing is using real-time, de-identified, GPS phone data to understand the specific transit and transportation patterns within specific geographies.

5. DATA-DRIVEN SUPPORT TO RE-ENGINEER WORKPLACE ACTIVITIES

An effective staged reopening will likely call for some intermediary steps between now and allowing counties and industries to operate as they did pre-pandemic. Nationally, over 70 percent of private sector payroll goes to jobs that require significant human contact. First, we suggest coupling federal data that identifies the jobs with the greatest face-to-face interactions with county and worker data to estimate the health risks of certain occupations.

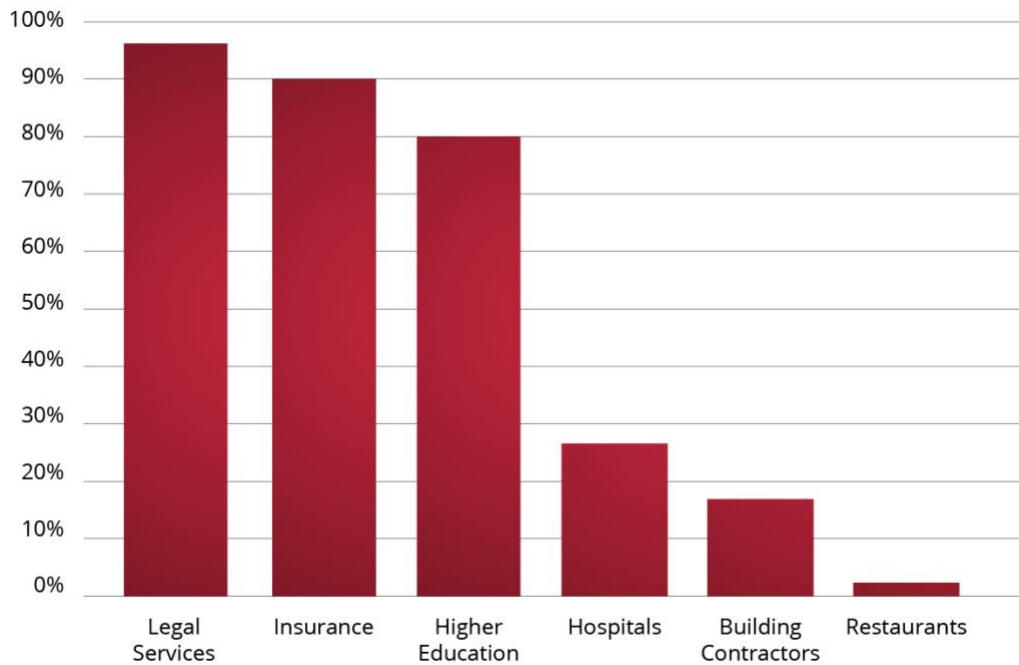
Most jobs require moderate to significant face-to-face interactions



Source: O*NET, BLS, Authors calculations.

Second, insights from these data can help state policymakers target industries and jobs that should remain, or begin transitioning, to remote work. There is a huge discrepancy between businesses that can in theory move to remote work and those that cannot. For example, legal and insurance companies and universities can likely stay remote, even if they are located in (re)opened counties. Data tools that help identify which counties are comprised of firms and workers with greater potential ability to work remotely can help a more targeted reopening.

Percent of workers with 'remote-ready' tasks



Source: O*NET, BLS, Authors calculations.

Beyond remote work, there are countless workplace reorganization practices emerging from governments and companies around the world. Cameras on construction sites are replacing older foremen, wholesalers are restructuring shifts to reduce the number of workers in warehouses, and companies are hiring chief medical officers to reform and communicate health policies. While important, these interventions are not without costs. States will have to make difficult decisions when determining which reorganization tactics are most appropriate for their economies and how much they are willing to pay—financially and politically—to support, require, and monitor compliance of these practices. Knowing the particular risks of a given industry, county, or occupation will be essential to workflow re-engineering efforts.

6. MODERATE- AND LONG-TERM HEALTH AND ECONOMIC MONITORING

A critical feature of the data-driven decision tools we are proposing is the ability to transition from guiding reopening decisions to moderate- and long-term health and economic monitoring. Firm-level monitoring recommendations for returning workers should be supported by the broader aggregate data collected in the proposed tool. For example, predicted infection rates by county - and by extension, testing resources - could be tailored based on the number of workers in high human contact jobs. Effective monitoring protocols could then answer whether those assumptions turned out to be accurate. At the same time, many jobs, workplaces, and industries will not return to their pre-COVID 19 realities. Many employers will decide that some occupations can remain remote while others can be automated or assisted with new

machine learning techniques. In other words, moderate- and long-term monitoring is essential to better understand what and where a 'new normal' has emerged and how we can prepare workers and businesses.

State health models developed by CMU and others offer recommendations for aggregating firm and industry data into useful state and county monitoring tools.

CONCLUSION

The decisions made within the coming weeks and months will likely define the scope and speed of the economic recovery. The worst case scenario is that industries and regions are reopened too quickly, and a second wave of COVID-19 costs lives and sets the economic rebound back even further. At minimum, until an effective vaccine is readily accessible, monitoring of at-risk workers, businesses and regions will remain a critical priority. Now is the time to develop the data-driven tools that can not only inform the safest possible economic reopening decisions, but also provide critical monitoring capacity to lower the risk of a second wave of the pandemic.

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